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PRELIMINARY REPORT ON MICROPALAEONTOLOGY OF SAMPLES FROM THE BONAPARTE GULF BASIN

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INTRODUCTION

This report is based on the micropalaeontological examination of outcrop and subsurface samples from the Bonaparte Gulf Basin. Surface samples from the Burt Range Limestone, Septimus Limestone and Spirit Hill were collected in the Burt Range Basin by Mr. E. P. Utting, Chief Geologist, Westralian Oil Limited (Utting, 1957). Subsurface samples from shot holes were collected by Messrs. E. R. Smith and C. S. Robertson, Geophysicists, Bureau of Mineral Resources, who made a long seismic traverse across the Carlton Basin, a seismic traverse across the Keep River to Spirit Hill, and numerous short traverses in the Milligan's Lagoon area, north of Mount Septimus (Robertson, 1957). Westralian Oil Limited also submitted cuttings from four percussion bores put down in the Burt Range Basin, viz. Milligan's No. 1, Milligan's No. 2, Milligan's No. 3 and Spirit Hill No. 1 (Utting, 1957). The locations of all these samples are shown on Plate 1.

The fossiliferous subsurface samples are mainly of the same lithological type, grey calcareous pyritic shale containing a rich marine fauna. Foraminifera, bryozoa, ostracods and crinoid columnals are abundant; small brachiopods, gastropods, pelecypods, holothurian sclerites and echinoid remains are common; sponge spicules, cephalopods, annelids, and conodonts are poorly represented. This report is mainly concerned with the foraminifera, ostracoda, and holothurian sclerites.

Foraminifera: The presence of Carboniferous foraminifera is the first record of foraminifera of this age in Australia. Foraminifera have been previously recorded in "Carboniferous" rocks of Western Australia by Howchin (1895), and the same author recorded foraminifera in the "Permocarboniferous" rocks of Tasmania (1894). Chapman and Howchin (1905) recorded foraminifera in the "Permocarboniferous" Limestones of New South Wales, but the rocks in all these localities are now places in the Permian, (Chapman, Howchin and Parr, 1934; Crespin, 1958 MS).

Endothyrid foraminifera have been discovered in the Upper Palaeozoic rocks of Australia for the first time. Miss I. Crespin, who has identified the foraminifera mentioned in this record, considers that the early record of Endothyra in the Permian of New South Wales (Chapman and Howchin, 1905; Chapman, Howchin and Parr, 1934) is based on a misidentification.

Some genera known previously only from the Australian Lower Permian are now found to have a stratigraphical range similar to those in the Upper Palaeozoic

of North America. These genera are Apterrinella, Calcitornella, Earlandia, Hemigordius, Glomospirella, Orthovertella, and Tetrataxis.

Ostracoda: Most of the species are undescribed, and have been found in Australia for the first time. Many of the species have close affinities to some of the North American forms, e.g. Carboprimitia sp., Kirkbya spp., Kirkbyella sp., Macronotella hypercala and Polytylites sp.

According to Cooper (1942, 1946) the genus Polytylites is characteristic of the Upper Mississippian and Lower Pennsylvanian, and the genus Carboprimitia is confined to the Elvira Group at the top of the Mississippian. In Australia however, the ostracods cannot yet contribute to precise age determinations in Palaeozoic rocks while our knowledge of the stratigraphical ranges of both genera and species is so incomplete. This is illustrated by the fact that in Australia, Macronotella hypercala an American Middle Devonian species occurs in samples with Carboniferous foraminifera, and that specimens of Polytylites have been recently found in a sample of the Upper Devonian Sadler Formation of the Fitzroy Basin.

Some of the ostracod species found in the Carbon-iferous of the Bonaparte Gulf Basin also occur in the Laurel Beds (Lower Carboniferous) of the Fitzroy Basin, e.g., Jonesina n. sp. 1 (referred formerly to Lochiella), species of Paraparchites, Macrocypris and Microcheilinella.

Holothurian Sclerites: This report records the presence of holothurian sclerites in the Palaeozoic rocks of Australia for the first time. These forms are closely allied to species previously found in the Carboniferous of North America and Scotland. The only previous record of fossil holothurian remains in Australia is that of T. S. Hall (1902), who reported a species of Chiridota from the Tertiary rocks of Victoria. F. Chapman (1914) and F.A. Singleton (1941) have referred to this occurrence.

SURFACE SAMPLES FROM THE BURT RANGE BASIN

Burt Range Limestone

Locality E of E. P. Utting, west of Mount Septimus, 50 feet below the top of the Burt Range Limestone and the base of the Enga Sandstone. The matrix within the valves of brachiopods Leptaena and Rhipidomella was examined for microfossils, but none were found.

Septimus Limestone

1) "Zone" D of E. P. Utting, northern flank of Mount Septimus, basal part of the exposed Septimus Limestone.

Ostracoda: Bairdia sp. B.

B. sp. F? (an internal cast)

Macrocypris sp. A

Paraparchites sp.

Remarks: Macrocypris sp. A has been previously found in the Lower Carboniferous Laurel Beds of the Fitzroy Basin.

2) "Zone" C of E. P. Utting, northern flank of Mount Septimus. Crinoidal limestone; poorly fossiliferous, ostracods rare.

Ostracoda: Bairdia sp. F

3) Locality B.S.3a of G. A. Thomas, north-west part of Mount Septimus, between 100 and 150 feet from the top of the Septimus Limestone.

Sandy, partly silicified limestone, containing triaxon sponge spicules, indicating the former presence of a Hexactinellid sponge, brachiopods identified by G. A. Thomas as Camarotoechia, Composita, Leptaena, Recticularia and Rhipidomella, gastropods Platyceras or allied genus, and abundant crinoid columnals. No ostracods were found.

- 4) "Zone" A of E. P. Utting, top part of the formation, a highly silicified crinoidal limestone, yielding only triaxon sponge spicules, brachiopod fragments, and crinoid columnals. No ostracods were found.
- 5) Spirit Hill Locality B of E. P. Utting (also J. E. Glover locality 9), 3 miles north-north-east of Spirit Hill. A yellow-brown calcarenite which yields a rich ostracod fauna.

Ostracoda: Acratia sp. B

Bairdia sp. B

 \underline{B} . sp. C.

A. sp. D.

B. sp. E.

B. sp. F.

Eukloedenella? sp.

Glyptopleura sp.

Jonesina n. sp. 1

Paraparchites sp. B.

Age Significance: Jonesina n. sp. 1 has been previously found in the Lower Carboniferous of the Fitzroy Basin in the Laurel Beds (upper Tournaisian, on brachiopod evidence), and in Bore BMR 2 (Laurel Downs) core samples between the depths of 250-912 feet, which may correspond in part to the Laurel Beds. This species has also been found in the top parts of the Upper Devonian sequences of Bore BMR 2 (1,775-1,785 feet) and Associated Freney Oil Company's Sisters No. 1 Bore (7,140-7,145 feet). Paraparchites sp. B is conspecific with one of the Laurel Beds species of this genus, also Bairdia sp. D. is closely related, but not conspecific with the species of Bairdia found in the Laurel Beds.

The ostracod species referred to above suggest that this sample and the Laurel Beds are approximately the same age. This agrees with the brachiopod evidence provided by G. A. Thomas who correlates Spirit Hill locality B with the Septimus Limestone, which he also correlates with the Laurel Beds of the Fitzroy Basin.

SUBSURFACE SAMPLES

Carlton Basin, Seismic Traverse "A".

The following shot hole samples were examined for microfossils: S.P.1, 6 to 27, 29 to 31, 33, 36 to 38, 40, 48, 52, 54 to 62, 64 to 68, 70 to 80, 82, 86 to 87, 111, and 132.

Of the 108 samples received and examined, only 23 (from between S.P. 62 and S.P. 87) were fossiliferous.

S.P. 62, 0-50 feet. Poorly preserved unidentifiable fossil fragments, including a small gastropod and an ostracod.

S.P. 64, 0-65 feet. Small, poorly preserved, immature moults of ostracods, tentatively assigned to the genus Basslerella, brachiopod spines, echinoid remains (cidaroid tubercular plates), and skeletal elements of holothuroids (minute wheels).

S.P. 66, 0-65 feet. Poorly preserved crinoid columnals.

S.P. 67, 0-65 feet. Poorly preserved crinoid columnal, and one ostracod specimen tentatively referred to Basslerella sp.

S.P. 73, 0-50 feet. Crinoid columnals and ostracods, Paraparchites sp. A and Cavellina sp. cf. C. ovatiformis (Ulrich).

S.P. 73, 50-65 feet. As above.

S.P. 75, o-50 feet. Poorly preserved ostracods, Paraparchites ? sp. indet.

S.P. 75, 50-65 feet. Poorly preserved ostracods, Paraparchites ? sp. indet.

S.P. 75, 50-65 feet. As above.

S.P. 67, 0-55 feet. Holothuroid sclerites (wheels and sieve plates), Protocaudina traquairii (Etheridge) and Eocaudina sp. Small, poorly preserved immature moults of ostracods, including Bairdia sp.

S.P. 76, 55-65 feet. A rich well-preserved fauna of foraminifera, ostracods, holothuroid sclerites (wheels and sieve plates), echinoid spines and tubercles, crinoid columnals, and spiny rhombic fish scales.

For aminifera: (Identified by Miss I. Crespin)

Endothyrid genera

Apterrinella sp.

Hemigordius sp. nov.

cf. Tolypammina sp.

Orthovertella sp.

Tetrataxis conica Ehrenberg

Genus allied to Recent <u>Calcituba</u> or Lower Cretaceous <u>Washitella</u>.

Ostracoda: Bairdia sp.

Cavellina sp. cf C. ovatiformis

Microcheilinella spp.

Paraparchites sp.

Paleochiridota primaeva (Etheridge)? Holothuroidea:

Paleochiridota n. sp.

Paleochiridota sp.

Eocaudina? sp.

S.P. 77, 0-50 feet. Poorly preserved crinoid columnals.

S.P. 77, 50-65 feet. Rich fauna of foraminifera, small immature os tracod moults, holothuroid sclerites (wheels and sieve plates), spiny rhombic fish scales, and a conodont fragments (denticulate blade type).

> Foraminifera: (Identified by Miss I. Crespin)

> > Endothyrid genera

Apterrinella sp.

Calcitornella sp.

Earlandia aff. condoni Crespin MS

Earlandia cf. minuta (Cushman and Waters)

Bairdia sp. F ? (immature moult) Ostracoda:

Kirkbya sp. A.

Paraparchites sp.

Polytylites sp.

Macrocypris sp.

Macronotella sp. cf. M. hypercala Kesling and Kilgore

Youngiella sp. A

Other undetermined genera

Holothuroidea: Paleochiridota sp.

Eocaudina sp.

S.P. 78, 0-55 feet. Poorly fossiliferous, yielding only crinoid columnals, echinoid tubercles, and an indeterminate os tracod.

S.P. 78, 55-65 feet. Two poorly preserved ostracod specimens, one of which is probably a species of Kloedenella.

S.P. 79, 0-50 feet. Poorly preserved fauna; foraminifera, ostracods, a small gastropod, and sponge spicules. Also unidentified objects superficially resembling megaspores (white, hollow, siliceous, approximately triangular in outline, heavily sculptured with trilete design, about 0.5 mm. in diameter). It is possible that they are recent seeds.

> Foraminifera: Endothyrid genera

Ostracoda: Bairdia sp. F

Kirkbya sp. B

S.P. 79, 50-65 feet. Poorly preserbed fauna; for aminifera, ostracods, crinoid columnals, echinoid tubercles, internal cast of a pelecypod, spiny rhombic fish scales, sponge spicules and holothuroid sclerites.

Foraminifera: Endothyrid genera

Ostracoda: Bairdia sp.

- S.P. 80, 54-64 feet. Poorly preserved cri noid columnals and fragments of the ostracod genus Paraparchites.
- S.P. 82, 50-65 feet. Poor fauna, sponge spicules and a ? megaspore ? specimen of the same type as those found in B.P. 79, 0-50 feet.
- S.P. 86, 0-50 feet. One spiny rhombic fish scale.
- S.P. 86, 50-65 feet. Minute immature gastropods, pelecypods, fragments of an immature straight nautiloid or ammonoid, and a few ostracods.

Ostracoda: Bairdia sp. indet.

Macronotella hypercala Kesling and Kilgore

S.P. 87, 0-50 feet. Poorly preserved indeterminate ostracods, crinoid columnals, and one foraminifera belonging to the Endothyrid group.

Age Significance: Traverse "A" crosses the Weaber Group, Burt Range Limestone, Cockatoo Sandstone, on to Lower Palaeozoic and Upper Proterozoic sediments. The fossiliferous samples are apparently located on the Burt Range Limestone (S.P. 62 and S.P. 82), and the Cockatoo Sandstone (S.P. 86 and S.P.87) according to the map of the Bonaparte Gulf Basin by Traves (1955, also Plate 1, this record). It is interesting to note that the combined evidence of the foraminifera, holothuroid sclerites and ostracods indicate that Carboniferous rocks are present along the traverse in the vicinity SSW of Ninbing.

Evidence for Carboniferous age:

Foraminifera: The endothyrids are the most rapidly-evolving group of the foraminifera found in the Carlton Basin samples and therefore may provide the most reliable indication as to the age within the Carboniferous period. At least three species of skew-coiled endothyrids have been found. These forms have not been definitely determined generically, but they will be studied at a later date.

The genus <u>Tetrataxis</u> ranges from Mississippian to Permian and Miss I. Crespin has recorded this genus from the Lower Permian of Western Australia. The species of <u>T. conica</u> Ehrenberg is recorded from the Callytharra Formation, is present in samples from both the Spirit Hill and Carlton Basin Traverses. Fragmentary tests of <u>Earlandia</u> are present in S.P.77, Carlton Basin, and the species is closely allied to <u>E. condoni from the Lower Permian (Callytharra Formation) of Western Australia. Mrs. H. T. Plummer first recorded this genus in the Middle Pennsylvanian of Texas from the Brownwood Shale (1930), and later from the Strawn Group (1945). Cummings (1955) gives the absolute stratigraphic range of <u>Earlandia</u> as from Upper Tournaisian (Lower Carboniferous) to Upper Autunian (Lower Permian). The species of <u>Hemigordius</u> from S.P. 76, Carlton Basin, is probably new.</u>

Ostracoda: Species of Cavellina appear to be conspecific with the specimens referred to C. ovatiformis (Ulrich) from the Laurel Beds (Lower Carboniferous) of the Fitzroy Basin. Also species of Paraparchites and Microcheilinella are similar to those found in the Lower Carboniferous sequence of Bore BMR2. The genus Youngiella occurs in the British Lower Carboniferous, and the genus Basslerella ranges from the Pennsylvanian into the Permian in the United States. According to Cooper (1942-1946) the genus

Polytylites ranges throughout the Chesterian Series (Upper Mississippian) into the Ti Valley Series (Lower Pennsylvanian). The stratigraphical range of Polytylites must be extended however, as well-preserved silicified specimens belonging to this genus have been recently found in the Upper Devonian Sadler formation of the Fitzroy Basin, and two of the ostracod species from the Upper Devonian Olentangy shale of Ohio, referred to Amphissites by Stewart and Hendrix (1945), could be more appropriately placed in the genus Polytylites, e.g. A. bernhageni and A. carmani. The occurrence of the species referred to Macronotella hypercala Kesling and Kilgore is interesting as this species occurs in the Middle Devonian of the United States.

Holothuroidea: Protocaudina traquairii ranges from Lower Carboniferous to Permian. Paleochiridota has only been found in the Carboniferous, and P. primaeva occurs in the Upper Carboniferous of Scotland. Eocaudina is a long-ranging genus, and its species can only be reliably identified when complete specimens are available.

Conclusions: The ages of these samples at the present stage cannot be more exactly defined than Carboniferous. At present the ostracods cannot contribute to precise age determinations as insufficient is known of their stratigraphical ranges in the Palaeozoic rocks of Australia. As the endothyrids are a rapidly evolving group of foraminifera, they may provide a more precise and reliable determination.

The nature of the junction between the Carboniferous and Devonian sediments in the Carlton Hasin should be investigated in the area SSW of Ninbing.

Burt Range Basin

(a) Spirit Hill Seismic Traverse

Samples from 32 shot holes (S.P. 301 to S.P. 349) were received, and of the 19 samples examined, the following were unfossiliferous:

S.P. 301 (75-95 feet), 304 (75-85 feet), 308 (0-50 feet), 309 (0-65 feet), 310 (50-65 feet), 313 (0-54 feet), 318 (50-75 feet), 323 (0-74 feet), 325 (0-75 feet), 327 (0-55 feet), 328 (0-50 feet), 331 (0-80 feet), 336 (55-65 feet), 341 (0-42 feet), 349 (40-55 feet).

The following samples were fossiliferous:

S.P. 305, 75-85 feet. Brachiopod spines, ostracods Cavellina sp. A, and crinoid columnals.

S.P. 306, 60-85 feet. One well-preserved foraminifer, brachiopod spines, a small indeterminate pelecypod, ostracods, crinoid columnals, and echinoid spines.

Foraminifera: (Identified by Miss I. Crespin)

Tetrataxis sp. nov.

Ostracoda: Bairdia sp. G.

Bairdia sp.
Cavellina sp.

Microcheilinella sp.

Paraparchites sp.

S.P. 307, 75-85 feet. Rich fauna of foraminifera, brachiopod remains, a small Grammysia - like pelecypod, small low and high spired gastropods, a damaged scolecodont (left dental plate, 0.32 mm. long of a polychaete annelid), ostracods, crinoid columnals, and echinoid remains (cidaroid spines and tubercles).

Foraminifera (identified by Miss I. Crespin)

Endothyrid genera

Earlandia sp.

Glomospirella sp.

Orthovertella sp.

Rectocornuspira sp.

Tetrataxis conica Ehrenberg

Tetrataxis sp. nov.

cf. Tuberitina sp.

Genus allied to Recent Calcituba or Lower Cretaceous Washitella.

Ostracoda:

Bairdia sp. C

Bairdia sp. F

Bairdia sp. G

Cavellina sp. A

Jonesina sp.

Kirkbyella sp. cf K. gutkei Croneis and Bristol

Macronotella hypercala Kesling and Kilgore

Paraparchites sp. A

Paraparchites sp.

Polytylites sp.

Youngiella sp. A

S.P. 326, 44-54 feet. Poorly preserved ostracods, Bairdia sp., crinoid columnals and a cidaroid tubercle.

Age Significance: Samples S.P. 306 and S.P.307 are definitely Carboniferous, but the ages of S.P. 305 and S.P. 326 are uncertain. The ages of the Spirit Hill Traverse samples S.P. 306 and 307 cannot be very different from the ages of the Carlton Beain Traverse samples S.P. 76 (55-65 feet) and S.P. 77 (50-65 feet), as in both localities these samples contain many species of foraminifera and ostracods in common, e.g. Endothyrid species, Earlandia spp., Orthovertella sp., Tetrataxis conica, Macronotella hypercala, Microcheilinella sp., Paraparchites sp. A., Polytylites sp., and Youngiella sp. A.

The ostracod specimen referred to <u>Kirkbyella</u> sp., found in sample S.P. 307 (75-85 feet), closely resembles the North American species K. gutkei, which ranges from the Upper Chesterian (Glen Dean Limestone) into the basal Pennsylvanian (i.e. Namurian).

(b) Milligan's Lagoon Seismic Traverses

Samples from 34 shot holes (S.P. 403 to S.P. 467) were received, collected from meismic traverses "B", "C", "D", "E", and "F". Thirteen samples were selected for

examination representing an equal spread along each traverse, viz. S.P. 403 (50-60 feet), S.P. 406 (0-70 feet), 411 (60-70 feet), 412 (65-75 feet), 422 (60-68 feet), 424 (54-66 feet), 430 (0-75 feet), 432 (65-75 feet), 437 (65-75 feet), 449 (54-75 feet), 459 (65-75 feet), 462 (50-74 feet), 467 (20-70 fee6).

Only two samples yielded microfossils:

S.P. 403, 50-60 feet, Traverse "B". Poorly preserved black casts of indeterminate fossils, and an ostracod specimen tentatively assigned to the genus <u>Paraparchites</u>.

S.P. 449, 54-75 feet, Traverse "E". Ostracods, crinoid columnals, echinoid tubercles and a small brachiopod.

Ostracoda:

Bairdia sp. B

B. sp. C

B. sp. D

B. sp. E

B. sp. F

Cavellina sp.

Jonesina n. sp. 1

Macrocypris sp. A

Microcheilinella sp.

cf. Primitia sp.

Age Significance: The age of sample S.P. 403 is unknown. Sample S.P. 449 contains the species Macrocypris sp. A which has been found in the lower part of the Septimus Limestone (Zone D), and in a surface sample of the Laurel Beds (Lower Carboniferous) of the Fitzroy Basin.

Jonesina n. sp. 1 has been previously found in the Laurel Beds (upper Tournaisian - on brachiopod evidence), and in Bore BMR 2 core samples in the Lower Carboniferous sequence between the depths of 250 and 912 feet which may correspond in part to the Laurel Beds, and in the top part of the Upper Devonian sequence (1775-1785 feet). This species has also been found in the top part of the Upper Devonian sequence of the Sisters No. 1 Bore at 7,140-7,145 feet.

The species referred to cf. Primitia sp. has been previously found in the Upper Devonian section of the Sisters No. 1 Bore at 7,400-7,405 feet, and at 7,645-7,650 feet. Therefore, the age of Sample S.P. 449 is older than the previously described samples, and has a maximum possible time range from Upper Devonian to Lower Carboniferous (at least Tournaisian). A Tournaisian age is perhaps more likely, as Bairdia sp. C, B. sp. E, B. sp. F. and Jonesina n. sp. 1 occur in Spirit Hill Locality B, which G.A. Thomas (personal communication) correlates with the Septimus Limestone on the basis of brachiopod evidence. Therefore, it is possible that sample S.P. 449 represents a part of the Septimus Limestone.

(c) Milligan's No. 1 Bore

Forty-five samples of cuttings from the depths 0-472 feet were received and examined; those taken from the first 185 feet were unfossiliferous.

185-197 feet. Two poorly preserved ostracods, Cryptophyllus sp., ? Paraparchites and a fragment of crinoid columnal.

197-209 feet. Bryozoa, brachiopod fragments, and crinoid columnals. No ostracods found.

209-221 feet. Bryozoa, brachiopod fragments, small immature gastropods, ostracods and crinoic columnals:

Ostracoda:

Bairdia sp. C

Cryptophyllus sp.

Paraparchites sp. A

P. sp. (small form, perhaps an immature P. sp. A)

221-233 feet. Bryozoa, brachiopod fragments, small immature pelecypods, ostracods and cidaroid tubercles.

Ostracoda:

Bairdia sp. F

Basslerella sp.

Carboprimitia sp. A

Cryptophyllus sp.

Kirkbya sp. (immature moult)

Paraparchites sp. A

233-245 feet. Bryozoa, a pyritized internal cast of a pelecypod, and ostracods.

Ostracoda:

Carboprimitia sp. A

Cryptophyllus sp.

Paraparchites sp. A

245-257 feet. Bryozoa, small immature pelecypods, ostracods, and crinoid columnals.

Ostracoda:

Basslerella sp.

Carboprimitia sp. A

Cryptophillus sp.

Paraparchites sp. A

257-269 feet. Bryozoa, ostracods and crinoid clumnals.

Ostracoda:

Bairdia sp. C

Cavellina sp. (immature moult)

Cryptophyllus sp.

Paraparchites sp. A

269-281 feet. Bryozoa, brachiopod fragments, ostracods rare.

Ostracoda:

Cryptophyllus sp.

Paraparchites sp. A

281-293 feet. Bryozoa, brachiopod fragments, small gastropods, abundant ostracods, cidaroid spines and tubercles:

Ostracoda:

Basslerella sp.

Carboprimitia sp. A

Cavellina sp.

Cryptophyllus sp.

Paraparchites sp. A

293-305 feet. Bryozoa, brachiopod fragme ats, ostracods and crinoid columnals.

Ostracoda:

Acratia sp. A

Basslerella sp.

Carboprimitia sp. A

Cavellina sp.

Cryptophyllus sp.

Paraparchites sp. A

317-329 feet. Bryozoa, brachiopod fragments, few ostracods (Cryptophyllus sp. and Paraparchites sp. A) and crinoid columnals.

329-341 feet. Bryozoa, small gastropods, a small pelecypod, numerous ostracods, and crinoid columnals.

Ostracoda:

Acratia sp. A

Bairdia sp. B

B. sp. C

Carboprimitia sp. A

Cryptophyllus sp.

Paraparchites sp. A

341-353 feet. Bryozoa, immature brachiopods and shell fragments, a small gastropod (Xenophora?), part of the taxodont dentition of a pelecypod, ostracods and crinoid columnals.

Ostracoda:

Acratia sp. A

Bairdia sp. indet.

Carboprimitia sp. A

Cryptophyllus sp.

Paraparchites sp. A

353-365 feet. Bryozoa, brachiopod fragments, small gastropods, ostracods and crinoid columnals.

Ostracoda:

Acratia sp. A

Basslerella sp.

Carboprimitia sp. A

Cryptophyllus sp.

Macrocypris sp.

Paraparchites sp. A

365-377 feet. Bryozoa, brachiopod fragments, small gastropods, ostracods and crinoid columnals.

Ostracoda:

Carboprimitia sp. A

Cryptophyllus sp.

Paraparchites sp. A

377-389 feet. Bryozoa, brachiopod fragments, small gastropods, ostracods, crinoid columnals and echinoid spines.

Ostracoda:

Acratia sp. A

Carboprimitia sp. A

Cryptophyllus sp.

Paraparchites sp. A

389-400 feet. Bryozoa, immature brachiopods, a pyritized pelecypod and crinoid columnals.

Ostracoda:

Acratia sp. A

Cryptophyllus sp.

Paraparchites sp. A

400-412 feet. Brachiopod fragments, immature pelecypods, small high spired gastropods, ostracods and echinoid spines.

Ostracoda:

Carboprimitia sp. A

Cryptophyllus sp.

Paraparchites sp. A

412-424 feet. Bryozoa, small pelecypods, ostracods, crinoid columnals and echinoid spines.

Ostracoda:

Carboprimitia sp. A

Cryptophyllus sp.

Paraparchites sp. A

424-436 feet. Bryozoa, brachiopod fragments, gastropods, ostracods, and crinoid columnals.

Ostracoda:

Carboprimitia sp. A

Cryptophyllus sp.

Paraparchites sp. A

436-448 feet. Brachiopod fragments, ostracods and crinoid columnals.

Ostracoda:

Acratia sp. A

Carboprimitia sp. A

Cryptophyllus sp.

Paraparchites sp.

448-460 feet. Brachiopod fragments, small pelecypods and gastropods, ostracods and crinoid columnals.

Ostracoda:

Carboprimitia sp. A

Cryptophyllus sp.

Paraparchites sp. A

460-472 feet. Brachiopod fragments, small pelecypods and gastropods, ostracods, crinoid columnals, cidaroid spines and tubercles. Among the brachiopod fragments a trilobed cardinal process was found, which G. A. Thomas reports to be similar to those of Carboniferous productids.

Ostracoda:

Basslerella sp.

Carboprimitia sp. A

Cryptophyllus sp.

Hollinella sp.

Paraparchites sp. A

Youngiella ? sp. B

Age Significance: The presence of Bairdia sp. C, Basslerella sp., Carboprimitia sp. A and Cryptophyllus sp. indicate a Carboniferous age. Bairdia sp. C occurs in Spirit Hill Locality B and S. P. 449, which are probably the stratigraphical equivalents of the Septimus Limestone (upper Tournaisian - brachiopod evidence). The well-preserved specimens Cryptophyllus appear to be closely related to those collected from the Lower Carboniferous Laurel Beds. The genus Basslerella occurs in the United States, and ranges from basal Pennsylvanian into the Permian. According to Cooper the generic range of Carboprimitia is confined to the Elvira Group (uppermost Mississippian) which is approximately equivalent to the Lower Namurian.

Milligan's No. 1 contains a different fauna compared with those of the Carlton Basin and Spirit Hill Traverse. Foraminifera are not found in Milligan's No. 1, but bryozoans are abundant, and brachiopods, gastropods, pelecypods, crinoids, and echinoids are represented. Bryozoans are not found in the Carlton Basin and Spirit Hill Traverse samples, but foraminifera holothurian and fish remains are abundant, and brachiopods, pelecypods, gastropods and echinoid remains are poorly represented. The differences between these two faunas are also reflected by the ostracods. The ostracod fauna of the Carlton Basin, Spirit Hill Traverses, is typified by Bairdia sp. G, Kirkbya spp. A and B, Macronotella sp., Polytylites sp., and Youngiella sp. A. The following species are typical of the Milligan's No. 1 ostracod fauna:- Acratia sp. A, Bairdia sp. C, Basslerella sp., Carboprimitia sp. A, Cryptophyllus sp, Hollinella sp., and Youngiella? sp. B.

Bairdia sp. F and Paraparchites sp. A are common to both faunas.

These differences could suggest either:

- i) One fauna succeeding the other, i.e. as time-marking assemblages; or
- ii) different conditions of environment (e.g., depth) approximating to the same age, i.e., facies-assemblages.

The former suggestion seems more probable, as the topmost fossiliferous sample of Milligan's No. 2 (111-123 feet) contains representatives of the Carboniferous fauna of the Spirit Hill and Carlton Basin traverse samples, whereas below 123 feet the ostracod fauna is the same as that in Milligan's No. 1 (185-472 feet).

(d) Milligan's No. 2 Bore

Fifteen samples of cuttings from the depths 0-186 feet were received and examined; those taken from the first lll feet were unfossiliferous.

111-123 feet. Foraminifera, bryozoa, small brachiopods (Athyrids and Rhynchonellids, age unknown - G.A. Thomas), small gastropods, ostracods, crinoid columnals, holothurian remains, cidaroid spines and tubercles, and fish scales.

For aminifera (identified by Miss Crespin)

Endothyranella aff. powersi (Harlton)
Tetrataxis sp. nov.

Ostracoda: Bairdia sp. F

Carboprimitia sp. A

Cavellina sp.

Macronotella hypercala

Paraparchites sp. A

Holothuroidea: Eocaudina sp.

123-135 feet. Foraminifera, brachiopod fragments, small gastropods, ostracods, holothurian fragments crinoid columnals, cidaroid tubercles and fish scales.

For aminifera: (identified by Miss Crespin)

Thurammina sp. nov.

Ostracoda: Carboprimitia sp.

Paraparchites sp. A

135-147 feet. Bryozoa, brachiopod fragments, small gastropods, ostracods, crinoid columnals, and cidaroid spines.

Ostracoda: Cavellina sp.

Cryptophyllus sp.

Paraparchites sp. A

147-159 feet. Bryozoa (including the screw-like axis of Archimedes), small gastropods and pelecypods, a scolecodont (forcep of a polychaete annelid), ostracods, crinoid columnals, holothurian remains, and cidaroid tubercles.

Ostracoda: Basslerella sp.

Carboprimitia sp. A

Cavellina sp.

Paraparchites sp. A

Holothuroidea: Eccaudina spp.

159-171 feet. Brachiopod fragments, a small gastropod, ostracods, crinoid columnals, indeterminate holothurian sieve plates, and echinoid remains.

Ostracoda: Basslerella sp.

Carboprimitia sp. A

Paraparchites sp. A

171-186 feet. Bryozoa, brachiopod fragments, small low and high spired gastropods, ostracods, crinoid columnals, holothurian remains (sieve plates), cidaroid tubercles and possible conodonts.

Ostracoda: Basslerella sp.

Carboprimitia sp. A

Cryptophyllus sp.

Paraparchites sp. A

Holothuroidea: Eocaudina sp.

Age Significance: This bore provides a close link between the Carboniferous sequence of the Spirit Hill and Carlton Basin Traverses and that of Milligan's No. 1 Bore. The ostracod fauna of Milligan's No. 2 (123-186 feet) and

Milligan's No. 1 (185-472 feet) are very closely related. Holothurian sclerites which are so abundant in the Carlton Basin sequence, are present in Milligan's No. 2 Bore but not in Milligan's No. 1 Bore. The uppermost fossiliferous sample of Milligan's No. 2 (111-123 feet) contains the foraminifera Endothyranella aff. powersi and Tetrataxis sp. nov., and the ostracod Macronotella hypercala, which indicates an age approximating to that of the Spirit Hill and Carlton Basin Traverses samples. Therefore there is some evidence to suggest that the Carboniferous samples of the Spirit Hill and Carlton Basin Traverses are slightly younger than that of Milligan's No. 1 Bore.

(e) Milligan's No. 3 Bore

No fossils were found in the 8 samples of cuttings provided for examination (0-90 feet).

(f) Spirit Hill No. 1 Bore

Twenty samples of cuttings from the depths 0-295 feet were received and examined; they were found to be very poorly fossiliferous. Fossils were found only in the samples taken from the following depths.

48-60 feet. One internal cast of an ostracod, possibly Paraparchites.

72-84 feet. A small pyritized gastropod ?

192-204 feet. An indeterminate cast of a pelecypod, a pyritized gastropod? cast, and three ostracod specimens belonging to the species <u>Paraparchites</u> sp. A.

228-240 feet. One ostracod specimen, Cavellina?

<u>252-264 feet.</u> A small pyritized part of either a primitive ammonoid (straight, bactriticone type), or a straight nautiloid, with the siphuncle in contact with the ventral margin.

Age Significance: The poor preservation of the few fossils found in the samples does not permit any definite conclusions concerning the ages of the sediments penetrated by Spirit Hill No. 1 Bore. Paraparchites sp. A, the only identifiable ostracod species found in this bore commonly occurs in the samples from the Carlton Basin and Spirit Hill Traverses and in Milligan's Bores. Also the primitive ammonoid (or nautiloid?) appears to be a form similar to that found in S.P. 86 (50-65 feet) of the Carlton Basin traverse.

Conclusions

The fossiliferous samples may be broadly divided into two groups:

(a) A major group of Carboniferous shaly sediments which includes the seismic shot hole samples 76 to 87 of Traverse "A", Carlton Basin, 306-307 of the Spirit Hill Traverse, and percussion bore hole samples from Milligan's Bores Nos. 1 and 2, and possibly Spirit Hill No. 1. The fossiliferous section of Milligan's No. 1 Bore and the lower part (123-186 feet) of Milligan's No. 2 Bore are slightly older than the seismic shot point samples referred to above.

(b) A minor group which, according to the brachiopod evidence provided by G. A. Thomas is of Lower Carboniferous (upper Tournaisian) age. This group includes the Spirit Hill Locality B sample, which can be correlated in part with the Laurel Beds on the basis of the ostracods, and with the Septimus Limestone on the evidence of the brachiopods. Shothole sampled S.P. 449 in Milligan's Lagoon area, also can be correlated in part with the Spirit Hill Locality B and Laurel Beds samples.

References

- Chapman, F., 1914 Australasian Fossils. Melbourne; Geo. Robertson.
- , and Howchin, W., 1905 A Monograph of the Foraminifera of the Permo-Carboniferous Limestones of New South Wales. N.S.W. geol. Surv. Mem, Palaeont. 14, 1-22.
- , Howchin, W., and Parr, W.J., 1934 A Revision of the Nomenclature of the Permian Foraminifera of New South Wales. Proc. Roy. Soc. Vic., n.s. 47 (1) 175-189.
- Cooper, C.L., 1941 Chester Ostracodes of Illinois.

 Illinois geol. Surv. Rep. Invest. 77, 1-101.
- , 1942 Occurrence and Stratigraphic Distribution of Paleozoic Ostracodes. J. Paleont. 16, (6), 764-776.
- , 1946 Pennsylvanian Ostracodes of Illinois.
 Illinois geol. Surv. Bull. 70, 1-177.
- Crespin, I., 1958 Permian Foraminifera of Australia.

 <u>Bur. Min. Resour. Aust. Bull.</u> 48 (in press).
- Cummings, R.H., 1955 <u>Nodosinella</u> Brady, 1876, and associated Palaeozoic genera. <u>Micropaleont</u>. 1, (3), 221-238.
- Hall, T.S., 1902 New or little known Fossils from the Tertiaries of Victoria. Proc. Roy. Soc. Vict. n.s., 15, (1), 81-85.
- Howchin, W., 1894 On the Occurrence of Foraminifera in the Permo-Carboniferous Rocks of Tasmania.

 Aust. Assoc. Adv. Sci. (Adelaide, 1893), 1, 334.
- , 1895 Carboniferous of Western Australia with descriptions of new species. Trans. Roy. Soc. S. Aust. 19, 194-198.
- Plummer, H.J., 1930 Calcareous foraminifera in the Brown-wood shale near Bridgeport, Texas. <u>Texas Univ. Bull.</u>, no. 3019, 5-21.
- , 1945 Smaller foraminifera in the Marble Flats, Smithwick, and lower Strawn strata around the Llano uplift, Texas. <u>Ibid.</u>, no. 4401, 209-271.
- Robertson, C.S., 1957 Preliminary Report on a Seismic Survey in the Bonaparte Gulf Area, June-October, 1956. Bur.Min. Resour. Aust. Rec. 1957/46 (unpubl.).

- Singleton, F.A., 1941 The Tertiary Geology of Australia. Proc. Roy. Soc. Vict., n.s., 53 (1), 1-125.
- Stewart, G.A., and Hendrix, W.E., 1945 Ostracoda of the Olentangy shale, Franklin and Delaware Counties, Ohio. J. Paleont. 19, (2).
- Traves, D.M., 1955 The Geology of the Ord-Victoria Region,
 Northern Australia. Bur. Min. Resour. Aust.
 Bull. 27, 1-133.
- Utting, E.P., 1957 Report on Exploration and Geology within Permit No. 3, Northern Territory during 1956. Westralian Oil Limited Rep. (unpublished).



BONAPARTE GULF AREA - W. A. AND N.T.

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Mt Septimus

cle APW PWCV,