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1961/60

REPORT ON 1960 PLANT FOSSIL COLLECTIONS FROM THE BOWEN BASIN, QUEENSLAND.

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SUMMARY

Large numbers of plant fossil specimens were collected in the Bowen Basin in 1960 by field parties in the Mt Coolon and Clermont areas. The collections are described and representative specimens are illustrated. Age determinations of fossil horizons are made wherever the plant fossils are diagnostic.

A Devonian Protolepidodendron and Psilophytites flora occurs in the Bulgonunna Volcanic Series and a Devonian to Lower Carboniferous Lepidodendroid flora in the Drummond Group. Lower Bowen sediments are poorly represented. Very large collections of Upper Bowen specimens yielded fertile material of Glossopteris angustifolia Bgt. of exceptional evolutionary interest, and excellently preserved material of Phyllotheca australis Bgt. and P. robusta Fm. Triassic plants are identified in the Teviot Formation and a Dicotyledonous leaf of probably Tertiary age was collected at locality MC 222F on the Newlands 1-mile.

Two field parties working in the Bowen Basin in Queensland in 1960 on the Mt Coolon and Clermont 4-mile sheets collected large numbers of plant fossil specimens. Details of localities, plants identified and descriptions of specimens follow :-

Part I : Localities on the Mt Coolon 4-mile Sheet

1. M C.81 F.

Locality: Mt Harry Marsh 1-mile; at Rosetta Creek crossing. Pt 81, Photo 5405, Run 2, Mt Coolon 4-mile area. At the base of the Bulgonunna Volcanics.

Collector: E.J. Malone.

A large number of Lepidodendroid fossils are associated with branching Psilophytalean axes of the sort referred to the form genus Psilophytites. (Figure 4, Plate).

The Lepidodendroid material is mainly in the form of impressions of decorticated stems and there are some casts of small stems. A large cone - Lepidostrobus - is sufficiently well preserved for some detail of structure to be seen. (Figure 1, Plate 1). Tests for spores were carried out by P.R. Evans on the powdery film on the surface of this cone but unfortunately were negative.

None of the stem impressions shows features diagnostic of Lepidodendron. The few showing surface features are referable to Protolepidodendron. There is no horizontal ridge separating each leaf base from the one below, and the leaf bases are arranged in vertical lines as well as ascending spirals. Figure 2 shows a surface impression of a medium sized stem. The pattern of leaf bases with very little relief is different from patterns occurring at any decortication level in a Lepidodendron. An impression of a larger stem, slightly decorticated, is seen in Figure 3. The arrangement of leaf bases is again in straight vertical lines and an ascending spiral and is consistent with characteristics of a decorticated Protolepidodendron. A decorticated form of this sort on its own could not be safely

distinguished from decorticated Lepidodendron.

Stigmaria ficoides Bgt., presumably in this instance the root system of the Protolepidodendron, occurs in some of the specimens. (S. in Figure 1).

The presence of a Lepidostrobus cone superficially indistinguishable from a cone of Lepidodendron cf. L. aculeatum Stbg. at Loc. CL 134 (Clermont 4-mile), is of interest as no record can be found of cones with Protolepidodendron.

A species of Protolepidodendron, P. yalwalense described by Walkom (1928) in Upper Devonian rocks at Yalwal in N.S.W. is very similar to the material under discussion, which is therefore referred to that species.

Age of the specimens:

The association of Protolepidodendron yalwalense Walk. and Psilophytites sp. is believed to indicate a Devonian age (Probably Upper Devonian).

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2. M C.886 F.

Locality: Buchanan 4-mile area; 100 yds East of St Ann's Crossing and 20 yards north of road.
Drummond Beds; near base of Beds, slightly above the unconformity between Drummond Beds and Anakie Metamorphics.

Collector: E.J. Malone.

The impressions in these specimens are of decorticated Lepidodendroid stems and two small Calamite stems. Figure 5 (Plate 2) shows a stem which is only slightly decorticated and referable to Protolepidodendron. It is similar to P. lineare Walk. None of the other stem impressions are determinate, and the example of Stigmaria ficoides which is present does not determine whether they are Lepidodendron or Protolepidodendron.

The determination of Protolepidodendron lineare Walk. from one determinate specimen is not very reliable in view of the confusingly similar decortication forms in the Lycopodiales,

PLATE I.

Protolepidodendron yalwalense Walk.

Figure I: Lepidostrobus. Natural size.

Figure 2. Surface impression.

Figure 3. Decorticated.

Figure 4. Psilophytites sp.

PLATE 2.

Figure 5. Protolepidodendron lineare Walk.
Natural size.

Figure 6. Glossopteris angustifolia Bgt.
with scale leaves and a shell.

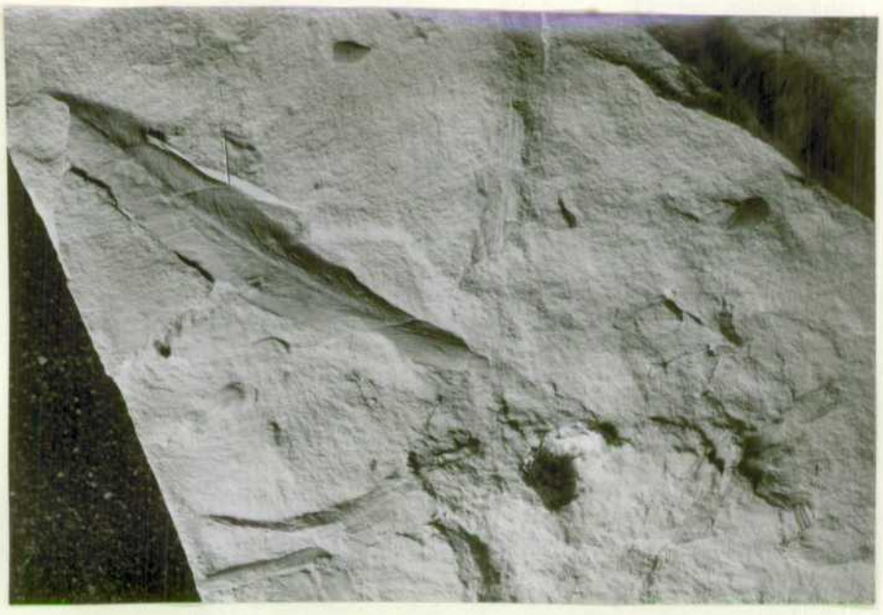

Figure 7. Rootlets. Natural size.

but the specimen shows features not typical of Lepidodendron. The evidence for generic identification is fairly reliable, but the species identification may be in doubt.

Age of the specimens: Devonian.

Reference and Selected Bibliography for MC 81 F and MC 886 F.

Hirmer, M. . . . . 1927 .. "Handbuch der Palaeobotanik" R. Oldenbourg, Munich and Berlin.

Hoeg, O.A. . . . . 1952 .. Psilophytites, a new form genus of Devonian plants. Palaeobotanist 1, 212-214.

Seward, A.C. . . . 1910 .. Fossil Plants II. Cambr. Univ. Pr.

Walkom, A.B. . . . 1928 .. Lepidodendroid remains from Yalwal, N.S.W. Proc. Linn. Soc. N.S.W. 53,3;310-314.

3. M C.1066 F.

Locality: Stockton 1-mile sheet; Run 2, Photo 153, pt 1066.
Lower Bowen Sediments.

Collector: A.R. Jensen.

The one specimen from this locality contains an impression of Glossopteris indica Sch. a very common plant in Permian and Lower Triassic horizons.

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4. M C.535 F.

Locality: Hillalong 1-mile; Run 3, photo 56, pt 535.
Very fine, white siltstone.
Upper Bowen Sediments.

Collector: D.W.P. Corbett.

Glossopteris angustifolia Brong., narrow scale leaves of Glossopteris, stems of Phyllotheca sp., a seed of Samaropsis? type (Text figure 1) and small shells are associated in these specimens. Figure 6 (Plate 2) shows Glossopteris angustifolia, scale leaves and shells.

Text Figure 1.

Seed X 2.

Age of the Specimens:

In the event of the shells being determinate, a close estimate of age might be possible. All the plant species present occur in Permian and Lower Triassic horizons.

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5. M C.225 A.

Locality: Newlands 1-mile; Run 1, photo 127, pt 225.
Upper Bowen Sediments.

Collector: A.R. Jensen.

The specimens are weathered and contain indeterminate plant fragments and one portion of lamina of Glossopteris indica type.

Age of specimens: Permian or Lower Triassic.

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6. M C.46 F.

Locality: Newlands 1-mile, Run 1, photo 25, Pt 46.
Carbonaceous shale, Upper Bowen Sediments.

Collector: E.J. Malone.

A few layered impressions of leaves of Glossopteris indica Sch. are associated with very large numbers of small, branching rootlets. Figure 7, Plate 2, shows two small specimens with densely crowded rootlets.

Age of Specimens: Permian or Lower Triassic.

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7. M C.233 F (a) and (b).

Locality: Newlands 1-mile, Run 1, photo 27, pt 233.
Upper Bowen Sediments.

Collector: A.R. Jensen.

The following plants are identified :-

Phyllotheca australis Brong. (Figures 8, 9, 10, and 11, Plate 3).

Glossopteris browniana Brong.

Glossopteris indica Sch.

Nummulospermum bowenense Walk. (Text Figure 2).

Sphenopteris lobifolia Morr. (Figure 11, Plate 3).

The material of Phyllotheca australis is illustrated in Figures 8 - 11. It is of interest as all the vegetative phases of the plant are present. In a recent revision of the species, Townrow (1954) reviews the occurrence of the species and concludes that it is a Permian form whose presence in Triassic strata has yet to be proved. He regards records of Triassic occurrences by Walkom and others as inconclusive and based on unsatisfactory material. Walkom (1922) positively identified P. australis in the Lower Bowen Series, but material from the Upper Bowen he referred to Phyllotheca sp. The full range of forms seen in the present material leaves no doubt as to the identity of the plant. The range of the plant in Australia cannot be stated to be Permian only, as Townrow believes, as it is in an association which occurs in Lower Triassic as well.

Text Figure 2.
Nummulospermum bowenense Walk.
Nat. size.

The seed Nummulospermum bowenense illustrated in text figure 2 occurs plentifully in Upper and Lower Bowen Series. It is regarded as probably the seed of a species of Glossopteris.

References for M C.233 F.

Townrow, J.A. 1954 .. On some species of Phyllotheca. Jnl. Proc. Roy. Soc. N.S.W. 9;39-63.

Walkom, A.B. 1922 .. Palaeozoic floras of Queensland. 1. The flora of the Lower and Upper Bowen Series. Qld. Geol. Surv. Publ. 270.

PLATE 3.

Phyllotheca australis Bgt.

Figure 8. Stems and leaf sheaths. Magn.X 2.

Figures 9 and 9a. Stems and leaf sheaths. Natural size.

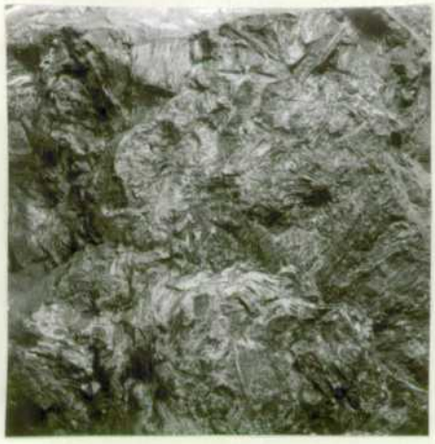
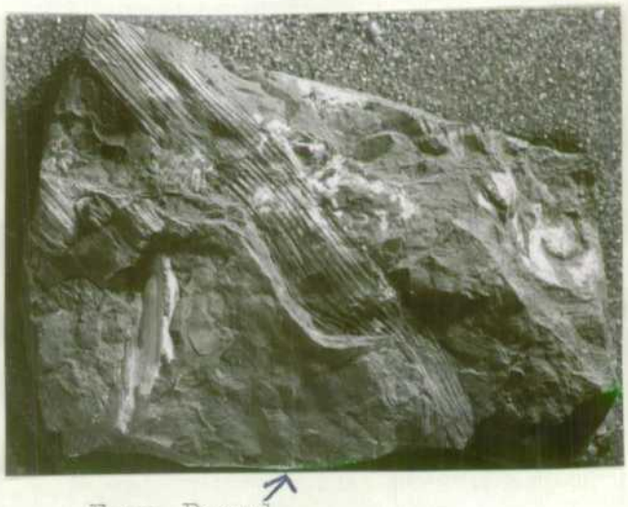


Figure 10. Leaf sheath X 2.

Figure 11. Stem. Natural size.

Figure 11a. Stem X 2



Fern Frond.
Sphenopteris lobifolia
Morr.

8.M C. 1017 F (a).

Locality: Stockton 1-mile; Run 2,photo 149, pt 1017.

Collector: A.R.Jensen,

The following plants are identified:

Phyllotheca australis Bgt.

Glossopteris indica Sch.

Sphenopteris lobifolia ?

Cladophlebis roylei Arber

Samaropsis dawsoni (Shirley). Figure 12. This seed is large- maximum length 2 cm; maximum width across wings near base 1.5cm. The species was described from Lower Bowen Series.

Figure 12:
Samaropsis dawsoni.
X 2.

Age of specimens: Permian or Lower Triassic

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9. M C. 62 F.

Locality: Newlands 1-mile; Run 6, photo 41, pt/62.
Ferruginous siltstone. Upper Bowen sediments.

Collector: E.J.Malone.

Glossopteris indica Sch. leaves in great numbers, closely layered, are associated with occasional Glossopteris browniana Bgt. and a few fronds of the fern Cladophlebis roylei Arber.

Age of specimens: Permian or Lower Triassic.

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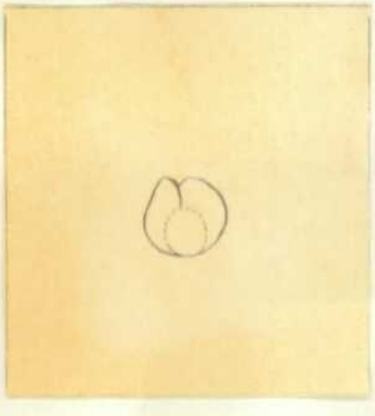
10. M C 23[illegible] F (a).

Locality: Newlands 1-mile; Run 1, photo 27, pt 236.
Upper Bowen Sediments.

Collector: A.R.Jensen.

Paper-thin layers of very large numbers of leaves of Glossopteris compose these specimens. Most of the leaves are of G.indica Sch. with a few of G.browniana Brong. and G. angustifolia Brong. and a few scale leaves of Glossopteris.

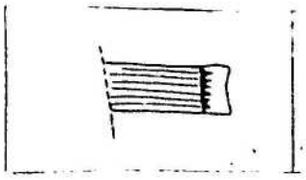
Text Figure 3.
Seed. Nat.size.



An impression of a seed is seen in text figure 3. It is approximately 1cm.in diameter, has a divided apex and a round nucule situated at the bottom of the wing. It may be a poorly preserved example of Nummulospermum bowenense Walk.

Text Figure 4.

Phyllotheca sp.
(Nat. size)



There are two impressions of small Equisetalean stems showing thickened ridges at the nodes. These are referred to Phyllotheca sp. (Text figure 4).

Age of Specimens: Permian or Lower Triassic.

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11. M C.292 F (b).

Locality: In Blenheim Creek near Nebo-Collinsville Road, Crossing.
Upper Bowen sediments.

Collector: A.R. Jensen.

Large numbers of layered impressions of leaves of Glossopteris indica Sch. are poorly preserved. The specimens are deeply weathered and disintegrating.

Age of specimens: Permian or Lower Triassic.

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12. M C.755 F.

Locality: Hillalong 1-mile; Run 7, photo 13, pt 755.
Siltstone. Upper Bowen sediments.

Collector: L.G. Cutler (Q.G.S.)

Glossopteris indica Sch., G. browniana Bgt. and G. angustifolia are associated in these specimens. A partially petrified stem which may be Vertebraria is to be sectioned for microscopic examination.

Age of Specimens: Permian or Lower Triassic.

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13. M C.289 F.

Locality: Stockton 1-mile; Run 2, photo 79, pt 289.

Collector: A.R. Jensen.

An impression of Vertebraria indica Royle showing overlapping segments in four vertical series is seen in Figure 13. Impressions of this sort were originally believed to be rhizomes of Glossopteridae but are now thought

to be decortication forms of normal stems of the family. They occur in Permian and Triassic Glossopteris floras.

Age of Specimens: Permian or Lower Triassic.

Text Figure 13.

Vertebraria indica Royle

(Nat. size).

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14. M C.608 F.

Locality: Stockton 1-mile; Run 3, photo 87, pt 608. Upper Bowen sediments.

Collector: A.R. Jensen.

The following plants are identified in these poorly preserved, weathered specimens:-

Phyllotheca sp.

Cladophlebis roylei Arber

Sphenopteris sp.

Glossopteris indica Sch.

Age of Specimens: Permian or Lower Triassic.

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15. M C.727 F.

Locality: Burton Downs 1-mile, Near Kemmis Creek Homestead. Pt. 727, Photo 75, Run 4, Burton Downs 1-mile area. Siltstone. Upper Bowen.

Collector: P.E. Bock (Q.G. Survey).

The following plants are identified in these specimens :-

Glossopteris indica Sch.

Glossopteris browniana Bgt.

Glossopteris conspicua Fm.

Glossopteris spathulato-cordata Fm.

Scale leaves of Glossopteris - three types

Fertile scale leaves of Glossopteris - Lidgettonia australis sp. nov.

Seeds. Cone of unknown affinity.

Sphenopteris polymorpha Fm.

Phyllotheca australis Brong.

Age of Specimens: Permian or Lower Triassic.

A detailed description of the Fertile Glossopteris Material follows. An introductory note on the Glossopteridae precedes the descriptions for the benefit of anyone interested in the subject :-

Introductory Notes on the Morphology and Systematic Position of the Glossopteridae

Leaves of Glossopteris and Gangamopteris are so common in Permian strata in India, Africa and Australia that it is surprising how little is known of the morphology of the plants which bore them. Only in a few rare instances have leaves been found attached to stems, and until 1952 no evidence was available on the reproductive mechanisms or the systematic affinities of the plants.

Associated with Glossopteris floras wherever they occur, scale leaves or "scale fronds" are usually found. They have never been seen in any way connected to recognised Glossopteris fossils and there has been much discussion as to their nature and function.

Another fossil type regularly found associated with Glossopteris is Vertebraria, the segmented stem-like impressions whose nature is still incompletely understood. Vertebraria was believed to represent the rhizomes of Glossopteridae because it was believed that Glossopteris was a fern (some modern ferns have similar leaves) and a fern growth habit of leaves and stems arising from a creeping rhizome was postulated.

From recent intensive studies by Mrs Plumstead in South Africa, from Indian authors and others, a different picture of the habit of the Glossopteridae is emerging. It

now seems likely that Glossopteris and Gangamopteris were trees with their leaves in clusters on short shoots of limited growth. These clusters of leaves of graded sizes are believed to have been deciduous, and careful investigation of banks of fossilised leaves has revealed many still in cluster groups, a feature not readily preserved under conditions of fossilisation. It is thought that a great deal of the fossil wood, including forests of tree stumps, referred to Dadoxylon in Africa at least, is the wood of Glossopteris and Gangamopteris trees. It is also possible that Vertebraria represents a decortication level in stems or roots of these trees. Mrs Plumstead instances a specimen in which different levels of decortication are seen, one of which shows the tissue splitting into blocks as in Vertebraria.

In 1952, Mrs Plumstead found a fructification - Scutum du Toitides - attached to Glossopteris indica, and since then she has found reproductive structures attached to about twelve species of Glossopteris, three of Gangamopteris, and one of Palaeovittaria. The fructification which belongs to Gangamopteris - Ottokaria - was recorded in India in 1902 but not known to be definitely of Glossopteridae, although it was suspected that this was the case.

The types of fructification described by Plumstead connected to Glossopteris leaves are referred to the genera Scutum, Hirsutum, Cistella, Lanceolatus and Pluma. Gangamopteris bears Ottokaria, and Palaeovittaria bears a Lanceolatus type. Details of the fructifications vary, but all are massive, stalked structures borne on the upper surface of leaves in an axial position. The fruiting body in each case is a cone-like body bearing seeds. Interpretation of the structure and morphology of the immature organ is still the subject of controversy, but each is in two sections, with corresponding male and female halves which fuse to enclose the final fruiting body.

It is not known whether fertile leaves bearing structures of the types described by Plumstead have a special position in each leaf cluster. Plumstead suggested that the scale leaves might be like bud scales at the base of the clusters as they are not concerned in reproduction in the South African Lower Permian species she described.

Discovery of Scutum thomasii is reported by J.F. Rigby in N.S.W. (Letter to Editor, Australian Jnl. of Science, Jan. 1961) in a Lower Permian assemblage with Gangamopteris and Glossopteris. No doubt further fructifications of all the types described by Plumstead will be found by systematic collecting in the Coal Measures of this age.

It now appears likely that the younger Glossopteris floras have progressed to a different reproductive form which is directly associated with the so-called scale leaves. Arber and other authors have suggested at various times that the scale leaves must be concerned with reproduction. In 1958, H. Hamshaw Thomas described a fertile Glossopteris from Upper Permian strata near Lidgetton in South Africa. He found small leaves, differing from the sterile Glossopteris leaves in size, shape and venation, bearing rows of stalked cupules on their edges. The cupules were open campanulate or dise-like, finely striated, with lobed margins. The venation of the fertile leaves was comparable to Gangamopteris. Scale leaves are described associated with the fertile and sterile leaves in the material. The term "cupule" is used for the reproductive bodies from comparison with Pteridosperms.

Hamshaw Thomas created the genus Lidgettonia for the fertile leaves and referred them to Lidgettonia africana sp. nov. The Glossopteris leaves associated with them were of G. indica type but could obviously not be referred to that species as G. indica is known to bear Scutum. It was suggested that the leaves should be referred to G. communis, an original species an

original species abandoned by Arber in 1905 in his Revision of the Glossopteris Flora and included in G. indica in order to limit the number of species by creating a form-species, as the range of variation in all species is considerable.

In the past five years very large numbers of Glossopteris and Gangamopteris leaves and scale leaves have been examined from Bureau field collections but no trace of reproductive structures has been seen.

The present collection from Locality M C 72/ F has yielded undoubted fertile material of a type similar to Lidgettonia, extra information on the nature of scale leaves, and a probable explanation of a problematical fossil known previously from Glossopteris floras. The nature of the fertile material is such that it is believed to represent a "missing link" forerunner of the Angiosperms - a concept of the most extraordinary botanical interest.

A full description follows of the selected specimens from which preliminary description of the fertile Lidgettonia australis sp. nov. has been compiled. It is possible that a second species might be present. Advice is being sought on the generic affinity of the material and it may be necessary to create a new genus.

Description of Specimens Containing Fertile Material and Associated Forms

Specimen A.

Figure 14A.

Glossopteris angustifolia Bgt. (1 and 2) associated with Glossopteris browniana (3) and scale leaves (4 and 5). The scales are of the type referred to Lidgettonia australis but are sterile in this case.

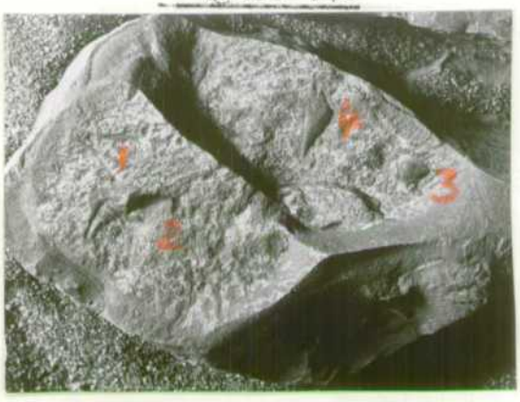
Specimen B.

Figure 14B.

A large cordate scale of Lidgettonia australis type is seen at (1). A scale of this sort (2) has radiating markings at its base indicating the point at which a fructification was attached. A small sterile scale is seen at (4). The base of a leaf of Glossopteris angustifolia (3) and a small equisetalean stem (5) complete the assemblage.

Specimen C.

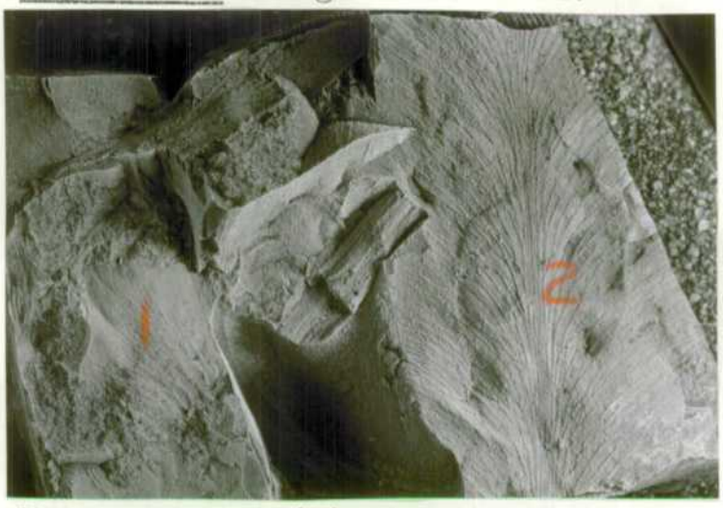
Figure 14C



Scale leaves of L. a. type (2 and 3), a pointed scale (4) and a branching filament (1) are associated. The branching filament is of the same appearance as fragments of filament which occur throughout the material.

Specimen D.

Figure 14 D. Magnification X2.



The scale leaf (1) in this specimen is different from those referred to Lidgettonia australis. It resembles the scale leaf figured with Lidgettonia africana. The leaf (2) is a larger example of Glossopteris angustifolia.

On Plate 4 is a photograph of Lidgettonia africana - a copy of the plate illustrating Hamshaw Thomas' description of the species, included here to allow comparison with the present material.

Specimen E.

Figure 14 E. Magnification X 2.

This is a most interesting specimen showing a small triangular scale (of Lidgettonia australis type) attached to a foliose organ with venation as in Gangamopteris. It is the only example in which a scale is seen attached to an entire foliose organ of this sort. There are several examples of impressions of parts of lower, foliose sections of this type and in some there is venation intermediate in type between Gangamopteris and Glossopteris angustifolia. A full series is present grading into typical small leaves of Glossopteris angustifolia.

PLATE 4.

Copy of Plate illustrating "Lidgettonia, a new type of fertile Glossopteris", by H.Hamshaw Thomas.(Bulletin of the British Museum (Natural History) Geology. Vol.3, No.5. 1958).

1

2

3

LIDGETTONIA AFRICANA

The lower, foliose organ in this specimen is similar to the fertile leaf in L. africana. (The top of the fertile leaf in L. africana shows no differentiation as a scale.)

Specimen F.

Figure 14 F. Magnification X 2.

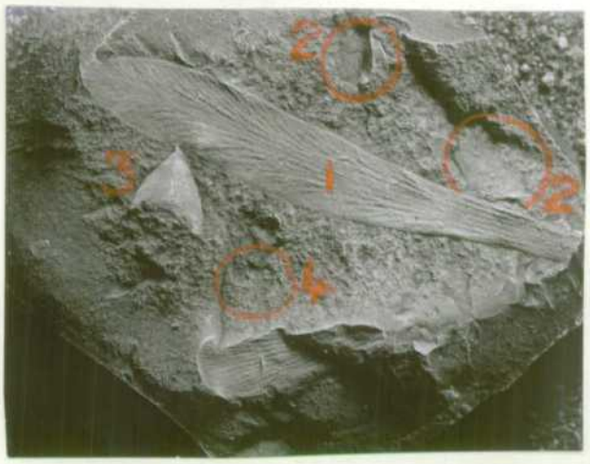
Figure 14F shows both faces of an impression of part of a lower, foliose organ of the same type as seen in 14E in attachment to a scale leaf. It has gangamopteroid venation and on the surface are small round spots which are believed to be sporangia. A fossil of this sort could be referred to "Dictyopteridium sporiferum" a problematical fossil recorded in Glossopteris floras, regarded as a fertile fern frond of unknown affinity. There are other small fragments of tissue in the material which seem to be in a highly fertile state with densely crowded, larger sporangia. These are more strictly "Dictyopteridium sporiferum" than 14F. It has proved impossible to obtain satisfactory photographs of these fragments.

Specimen H.

Figure 14 H. Magnification X 2.

A scale of Lidgettonia australis type is seen attached to a lower, foliose section which is relatively short and broad, and which is characteristically two-lobed at the bottom. (1). The scale with attached lower part has a "molar with double root" appearance. It is associated with Glossopteris angustifolia (2) and Glossopteris indica (3). Speciment I.

Figure 14 I. Magnification X 2.



A small leaf of Glossopteris angustifolia (1) with somewhat gangamopteriod appearance is associated with a fragments of "Dictyopteridium sporiferum" (2), a scale of Lidgettonia australis type and a detached "cupule" (4). At the base of the leaf, where it is narrowed to a petiole, there are a number of minute rings, each about .5 mm in diameter.

Specimen J.

Figure 14 J. Natural size.

A small leaf of Glossopteris angustifolia (1) and a scale leaf of Lidgettonia australis type with fragments of tissue attached - all that remains of the foliose part, are present in this specimen.

Specimen K.

Figure 14 K. Magnification X 2.

The scale (1) in this specimen is different from any so far described and illustrated. It tapers to a neck below, and two filaments are attached at the point of narrowing. Other filaments are present, one a (2) is forked. This specimen is not believed to be in any way concerned in the reproduction of Glossopteris angustifolia - Lidgettonia australis. It is believed to be fragmentary evidence of a second reproducing species - possibly the G. indica which is also present. If the scale was attached to a laminal section (or "Fertile leaf") bearing other pairs of filaments, the close relationship to Lidgettonia africana would be obvious. The forking of filaments would not agree, however. In the event of future collections revealing more material and substantiating this new species of Lidgettonia, the name L. bowenense is suggested.

The evidence is too meagre in the present collection to allow more than recording of this specimen. It is hoped that future collections may contribute more material of this type and elucidate the problem. At present, filament fragments, one with attached seed (?) are assumed to be related to this specimen.

Specimens M and N. (both faces of specimen containing type material).

Figures M and N. Magnification X 2.

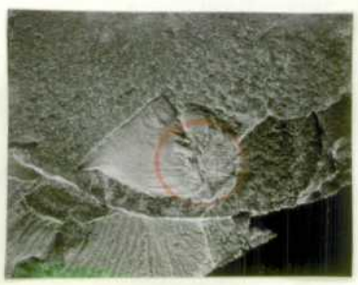
Three scales of Lidgettonia australis type are present. Scale (I) is attached to an almost complete foliose section with two-lobed base. Scale leaf (2) has, at its base, a small rosette-like body apparently made of narrow, filamentar segments radiating from a central point. In the centre is a dense small rosette apparently of small seeds on the central axis. Similar bodies - "Cupules" - can be seen on scale (1) at the point of junction of scale and foliose section, and on the base of scale (3). There are several fragments of detached cupules (4). The cupules attached to the scales and fossilised separately do not have the massive open-campanulate disc as in Lidgettonia africana. Each appears to be a whorl (or whorls) of small seeds on a central axis, surrounded by a whorl of bracts.

The cupule in each case is attached at the junction of scale and laminal section. It is sessile and solitary.

Specimen O.

Figure 14 O.

Magnif. X 2.



This is a further example of a scale with part of lower part attached and the impression of a cupule at the junction of scale and laminal part.

Specimen P.

Figure 14 P. Natural size.

Figure P (a). X 3.

An apex of a leaf of Glossopteris angustifolia is seen at (1). The midrib persisting right to the apex is a characteristic of the species. At point S a fragment of a cupule is seen. It is enlarged X 3 in Figure P (a).

Specimen Q.

Figure 14 Q. Magnification X 2.

A pair of small leaves (1) with venation half way between gangamopteriod type and that in young leaves of Glossopteris angustifolia is present. A smaller pair (2) has entirely gangamopteriod venation. This pair is of interest as the one complete leaf has its tip modified in texture, resembling a scale in continuity with the lamina. The relationship of the smaller pair to the larger is evident, and the larger, though more flimsy in appearance, is obviously related to the less modified small leaf occurring in speciment I. (Fig. 141).

A branching filament, the long arm terminated by a seed (?) is present (3).

Specimens R, S, T.

Figures 14 R, [illegible], and 14 T. Magn. X 2.

Detached cupules are seen in these two specimens.

Specimen U.

Figure 14 U. Magn. X 2.

On the edge of specimen 14 U is a fragment of an impression. It appears to be part of a campanulate disc with alternating lobes of different texture. It might be part of the basal disc of a cupule of some other species, and its nature remains obscure. The piece of ribbed tissue at (2) which appears at first sight as though it might also be part of an obscure organ, may be a fragment of Equisetalean stem. The specimen is illustrated because of the obscure nature of its fossils.

Specimen W.

Figure 14 W.

Natural size.

A small, detached cone is illustrated in Figure 14 W. Its affinities are unknown.

Specimen X.

Figure 14 X. Magnification X 2.

This specimen contains an impression of a leaf of Glossopteris indica type with a lobed, raised structure with surface pitting situated over the midrib in the middle of the lamina. There appears to be continuity between lamina and the structure in some places at least. No known fructification of Glossopteridae resembles this complex, composite structure and it is probable that the superimposition of the lobed structures and the leaf is coincidental.

Conclusions on the Fertile Material

Normal foliage leaves of Glossopteris angustifolia are associated with small leaves typically of the species, with partially and extensively modified small leaves and fragments of lamina, and with leaf scales and "scale fronds". The term "scale frond" is here used in a new sense to describe composite structures of scale and lamina which are extensively modified leaves and are here described for the first time.

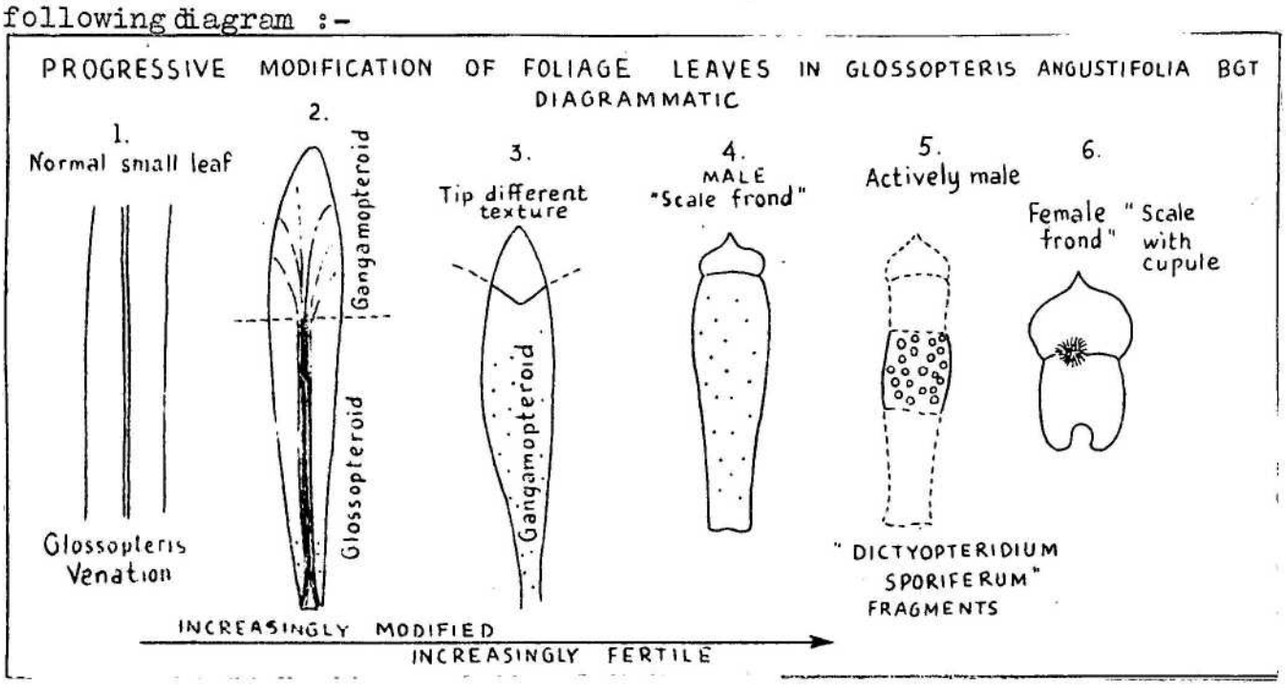
A series exists from normal small leaves of the species with normal venation, through forms in which the lower half of the leaf is normal and the upper gangamopteriod, to forms with entirely gangamopteroid venation. Some of these gangamopteroid leaves are further modified, while still resembling normal small leaves in shape and size, by having their tips altered in texture so that each apex represents a scale merging into the lamina. These with scales partially differentiated are linked with more extensively modified forms by one specimen in which an elongated gangamopteroid lamina is terminated by a fully developed scale leaf. Many portions

of gangamopteroid lamina minus scales are present in the material, with large and small cordate scales which are often deeply concave in impression.

Some of the larger, cordate scales are seen attached to laminal sections which are relatively short and broad and characteristically two-lobed below. These are female "scale fronds". They bear cupules at the point of junction of scale and lamina, each sessile and solitary and apparently composed of a whorl of seeds on the central axis surrounded by a whorl of bracts.

The male "scale fronds" consist of elongated gangamopteroid lamina with a scale (shallowly cordate, smaller) at the top. Sporangia are borne scattered on the surface and the actively fertile laminae with closely crowded sporangia are the "Dictyopteridium sporiferum" whose affinity was previously unknown. All modified leaves seem to have spots on the surface, the numbers increasing with the increase in modification, so all may be potentially or residually fertile.

The progressive modification of foliage leaves in Glossopteris angustifolia to form male and female scale fronds is of great evolutionary significance. If the progressively modified leaves were arranged on short shoots with the most modified furthest from the main axis of the plant, a "flower" of sorts would be present. This is demonstrated by the following diagram :-



It has become increasingly obvious in recent years that the search for Angiosperm flower ancestors must be started in Jurassic or Cretaceous fossil floras at least. The evidence of leaf specialisation in Glossopteris angustifolia of early Triassic age at the youngest shows it to be a missing link of greater antiquity than had ever been assumed to exist.

Selected Bibliography for Fertile Glossopteris Material

Hamshaw Thomas, H. 1952..A Glossopteris with whorled leaves. Palaeobotanist I. 435-438.

1958..Lidgettonia, a new type of fertile Glossopteris. Bull.Brit.Mus. (Nat.Hist.)Geol.3,5.

Pant, D.D. 1958..The structure of some leaves and fructifications of the Glossopteris flora of Tanganyika. Bull.Brit.Mus. (nat.Hist.)Geol.3,4.

Plumstead, E.P. 1956..On Ottokaria, the fructification of Gangamopteris. Trans.geol.Soc.Sth.Afr. 59,211-236.

1958..(a) Further fructifications of the Glossopteridae and a provisional classification based on them. Trans.geol.Soc.Sth.Afr. 61,51-75.

1958..(b) The habit of growth of Glossopteridae. Trans.geol.Soc.Sth.Afr. 61, 81-96.

Walkom, A.B. 1922..Palaeozoic floras of Queensland. I. Flora of the Lower and Upper Bowen Series. Qld.geol.Surv.Publ. 270.

1928..Notes on some additions to the Glossopteris flora in N.S.W. Proc.Linn.Soc.N.S.W. 53, 5; 555-564

16: M C. 697 F.

Locality: Stockton 1-mile; Run 4, photo 45, pt. 697.
Teviot Formation.

Collector: A.R. Jensen.

In these specimens, very large numbers of plant fragments are jumbled together, lying in all planes, mostly fragmentary and indeterminate; indeterminate wood and stem impressions and casts, sculptured fern stems, possibly fragmental small cones, etc.

The only determinate fossils are well preserved pinnules of Dicroidium, mostly D. feistmanteli (Johns) Gothan - Figure 15 - and a few of D. odontopteroides (Morris) Gothan - Figure 16.

Pinnules of this sort were originally referred to Thinnfeldia but Townrow (1957) has separated several natural groups.

Dicroidium feistmanteli and D. odontopteroides are regarded as typically Middle Triassic forms, becoming increasingly rare into Rhaetic strata and differing in cuticle and other features from Thinnfeldia, which is a younger genus.

Age of specimens: Triassic.

Reference and selected bibliography for M C. 697F.

Townrow, J.A. 1957..On Dicroidium, probably a pteridospermous leaf, and other leaves now removed from the genus.
Trans.geol.Soc.Sth.Afr. 60; 21-56

Walkom, A.B. 1925..Fossil plants from the Narrabeen stage of the Hawkesbury Series.
Proc.Linn.Soc.N.S.W. 50,3; 214-224.

1915..Mesozoic floras of Queensland. Pt.I,ctd. Floras of the Ipswich and Walloon Series.
Qld.geol.Surv.Publ. 257.

duToit, A.L. 1927..The fossil flora of the Upper Karroo beds.
Ann.Sth.Afr.Mus.22; 19-420.

Jones, O.A. and de Jersey, N.J. 1947. The flora of the Ipswich coal measures: Morphology and floral succession. Pap.Dept.Geol.Univ.Qld. n.s. 3; 1-88

17: M C. 222 F (a).

Locality: Newlands 1-mile; Run 4, photo 113, Pt. 222.

Collector: A.R. Jensen

A fragment of Dicotyledonous leaf is illustrated in Figure 17.

Age of specimen: Tertiary or younger.

PLATE 5.

Figure 15. Dicroidium feistmanteli (Johns) Gothan.
Natural size.

Figure 16. Dicroidium odontopteroides (Morr.) Gothan.
Magn. X 2.

Figure 17. Dicotyledonous leaf.
Magn.X 2.

Part II; Localities on the Clermont 4-mile.

1. C L. 134

Locality: Head of Rankin Ck.

Drummond Group.

Collector: R. J. Paten

About fifty specimens containing Lepidodendroid fossils were collected at locality C L 134. The material is excellently preserved and is of considerable interest as it includes cones, leaves, young stems with leaves attached, older stems, and also Stigmaria with attached rootlets. Most of the fossils are impressions but there are two partially petrified stems and possibly a petrified leaf which will be sectioned for microscopic examination.

All determinate specimens are referable to Lepidodendron. There are no surface impressions of trunks or large branches. Figures 18, 19, 20 and 21 illustrate the leaf-base arrangement in young branches. The sculpturing of leaf bases is clearly seen. These stems closely resemble Lepidodendron aculeatum Sternb. But in the absence of surface impressions of more mature stems, the determination might not be reliable. They are of a type common in Lower Carboniferous strata in Northern and Southern hemispheres.

Figure 22 shows a short shoot or a branch of limited growth. It is about 3 cm. long and tapers rapdily from about 1 cm. wide at the base to .25 cm. wide at its tip. It has densely crowded leaf bases with leaves attached to the lower bases.

Figure 23 shows a compression of young cone split open. The form of the cone scales is seen at the base of the cone. It is referable to Lepidostrobus. Portion of a surface impression of a larger, older cone is seen in Figure 24. A leaf with median vascular strand, Lepidophyllum, is

PLATE 6.

Lepidodendron cf.L. aculeatum Stbg.

Figure 18.
Young stem.X 2.

Figure 19.
Young stem. X 2.

Figure 20.
Stem with leaves attached.
Magn.X 2.

Figure 21.
Magn.X 2.

Figure 22.
Short shoot X 2.

seen adjacent to the cone in Figure 23.

Figure 25 shows Stigmaria ficoides Bgt. with attached rootlets. The surface of the rootlets in this and some other examples is sculptured and gives the appearance of minute pitting. Stigmaria is the buttress and root region of Lepidodendron (and Protolepidodendron) trees.

Age of specimens: Lower Carboniferous.

2: C L. 303/10.

Locality: At Brumby Well, on Banchory Holding.
Drummond Group

Collector: M. A. Randal

Two specimens show impressions of large examples of Stigmaria ficoides Bgt. Figure 26 shows one of these specimens. They are similar to examples of Stigmaria at locality C L 134 but this is not very significant as Stigmaria from all strata are similar.

Age of specimens: Probably Carboniferous

3: C L. 362

Locality: Alpha Road crossing on Eastern Ck.
Drummond Group

Collectors: M. A. Condon, J.J. Veevers and M.A. Randal

Twenty specimens collected at this locality contain poorly preserved lepidodendroid fossils in the form of casts and impressions. All stems are deeply decorticated and there is no indication of surface appearance. Decorticated forms

PLATE 7.

Figure 23. Young cone. Natural size.
Lepidostrobus.

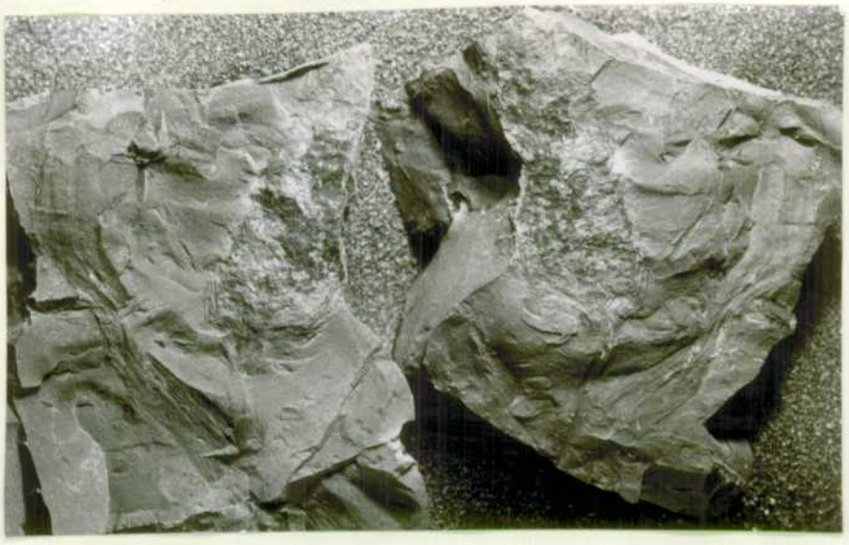
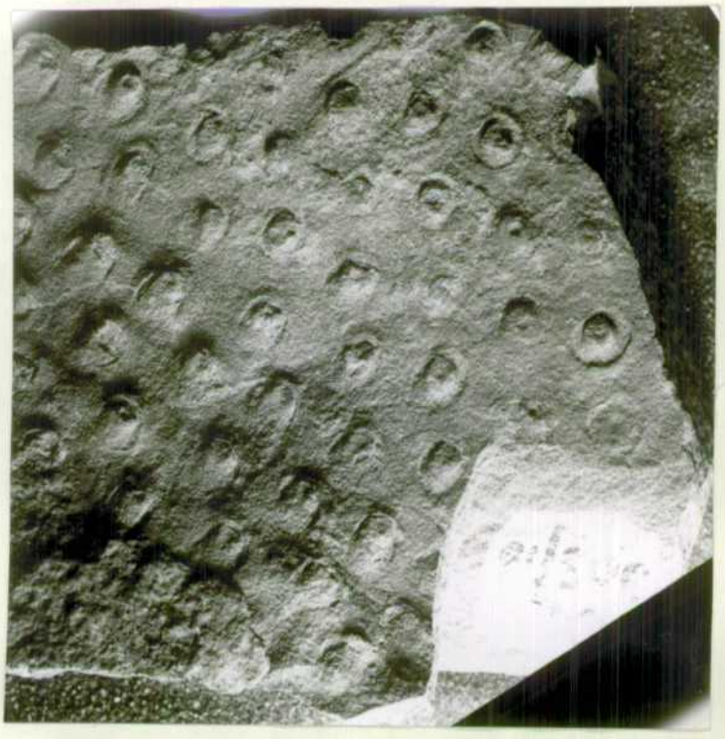


Figure 24. Lepidostrobus.
Magn. X 2.

Figure 25. Stigmaria ficoides
Attached rootlets. Natural size.

Figure 26. Stigmaria ficoides.
Natural size.



show well spaced leaf bases and are similar to Lepidodendron veltheimii and other Lower Carboniferous species. There are several examples of Stigmaria.

Age of specimens: Probably Carboniferous

----oOo----

Selected bibliography for Lepidodendroid fossils in CL 134, CL 303/10 and CL 362.

Hirmer, M. 1927....Handbuch der Palaobotanik. Oldenbourg, Munich and Berlin.

Seward, A.C. 1910....Fossil Plants. II Cambr. Univ. Pr.

Arnold, C.A. 1949....Fossil floras of the Michigan Coal Basin Univ. of Michigan Pr. Ann Arbor, VII, 9.

Canright, J.E. 1959....Fossil plants of Indiana. Indiana,Dept.Conserv,geol Surv.Rept. Prog. 14.

4: C L. 254/2b.

Locality: 3 miles S.W. of Mt. Donald

Collector: R. G. Mollan.

Plants identified :-

Noeggerathiopsis hislopi (Bunb).- Figure 27.

Glossopteris ?

Age of Specimens : Permian.

5: C L. 254/3a.

Locality: 3 miles S.W. of Mt. Donald.

Collector: R. G. Mollan

The following plants are identified:-

Noeggerathiopsis hislopi (Bunb).

Glossopteris indica Sch.

Vertebraria ?

Noeggerathiopsis hislopi occurs in Lower Bowen Series and Walkom (1922) records it doubtfully from Upper Bowen. It is a Perman form and has not been found in Upper Bowen in the present collection. There is no evidence of the abrupt extinction of the species at the end of the Permian age and it may continue into Triassic as a less important member of the flora. It has recently been recorded with Glossopteris browniana in Parsora beds in India (Lele, 1955) of Middle Triassic age.

Age of Specimens : Permian.

Reference: Lele, K.M. 1955....Plant fossils from Parsora in the South Rewa Gondwana Basin. Palaeobotanist 4, 23-33

6: C L. 262/1

Locality: 3 miles west of Peak Downs Homestead.

Collector: R. G. Mollan

The only determinate fossil in these specimens is Glossopteris indica Sch.

Age of specimens : Permian or lower Triassic.

7. C L. 304/17. See page 32.

8 : C L. 304/15.

Locality: 1 mile N.W. of Daunia Homestead.

Upper Bowen Sediments.

Collector: M. A. Randal

Indeterminate.

9: C.L. 307/8.

Locality: 3.6 miles N. of Daunia Homestead.

Upper Bowen sediments.

Collector: M. A. Randal.

The following plants are identified:-

Cladophlebis roylei Arber. Figure 37.

Phyllotheca sp.

Glossopteris indica Sch.

Glossopteris browniana Bgt.

Seed or Fruiting body: These are 1.25 cm in diameter. They have a wing surrounding the central seed or fruit which has a regular pattern. The appearance is similar to that in fertile Glossopteris material of Lower Permian age, and it is possible that these bodies are detatched fructifications of Glossopteris. (Figure 38).

Age of specimens : Permian or Lower Triassic.

PLATE 8.

Figure 27. Natural size.
Noeggerathiopsis hislopi.

Figure 28. Natural size.
Glossopteris indica and pointed apex of G.conspicua.

Figure 30. Glossopteris angustifolia & G.conspicua.
Natural size.

Figure 31 Glossopteris spathulato-cordata Fm. Magn.X 2.

7. C L.304/17.

Locality: 1.5 miles N.N.W. of Daunia Homestead.

Collector: M.A.Randal.

The following plants are identified:-

Glossopteris indica Sch. Figure 28.
Glossopteris conspicua Fm. Figures 28 and 30.
Glossopteris angustifolia Bgt. Figure 30.
Glossopteris scale leaf. Figure 32.
Glossopteris spathulato-cordata Fm. Figure 31.
Phyllotheca, cf.P.robusta Fm. Figures 34, 35 and 36.
Tissue with cone impression ? Figure 33.

Age of specimens: Permian or Lower Triassic.

Description of unusual specimens:

a. Glossopteris conspicua Fm.

The apex of a leaf of this type seen in Figure 28 is an acute point. The specimens described by Feistmantel do not have such an acute apex. However, specimens in Upper Permian or Lower Triassic strata in South Africa (duToit, 1927) have similar pointed form. Du Toit notes that the typical forms in India occur in beds older than Damuda, whereas the pointed forms in South Africa occur only in younger beds.

b. Phyllotheca cf. P.robusta Fm.

Whorls of leaves showing a sheathing basal part and long, pointed free segments (about 20 per whorl) are present in considerable numbers. Figures 34, 35 and 36 show typical examples. One large and a few small Phyllotheca stems are present. The leaf sheaths do not resemble Phyllotheca australis closely, neither the type material illustrated by Townrow (1954) nor material of the species at locality M C233F in the present collection. They are referred to Phyllotheca robusta tentatively, although a specimen figured by Walkom (1922) has fewer segments in each whorl. Each segment has a median vein.

Reference for C L 304/17

Townrow, J.A., 1954: On some species of Phyllotheca. Jnl.and Proc.Roy. Soc.N.S.W.89; 39-63.

du Toit, A.L. 1927: The fossil flora of the Upper Karoo Beds. Ann.Sth.Afr.Mus. 22; 2,5; 289-418.

PLATE 9.

Figure 32. X 2.
Glossopteris scale leaf.

Figure 33.
Indeterminate Magn.X 2.

Figure 34. Nat.size.
Phyllotheca stem.

Figures 35 and 36. Natural size.
Phyllotheca robusta.

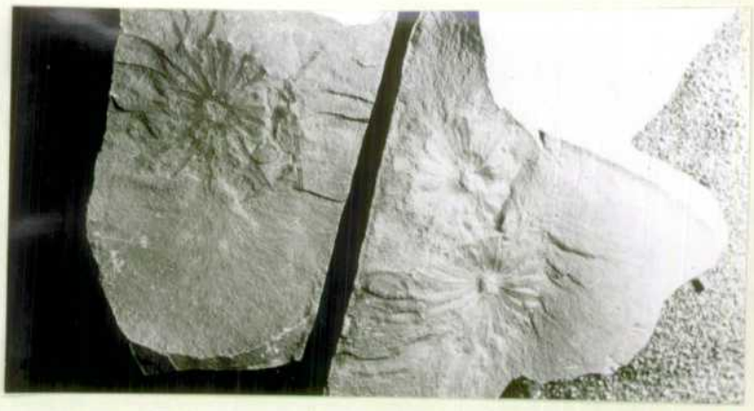


Figure 37.
Cladophlebis roylei.

Figure 38. Magn.X 2.
Possibly fructification
of Glossopteris.

10: C L. 310/20.

Locality: 1.8 miles N.N.W. of Daunia homestead.

Upper Bowen sediments.

Collector: M. A. Randal.

Large numbers of impressions, a few casts and two petrifactions of stems of Phyllotheca are present. Several specimens show leaf whorls and young stems of the same type as the Phyllotheca robusta Fm. recorded at C L 304/17. Some of the stem impressions are of large stems up to 5 cm. wide.

Figures 39 and 40 show a large stem impression and small stems with leaf whorls. A small petrified stem is to be sectioned for microscopic examination.

Age of specimens : Permian or Lower Triassic

11: C L. 314/6

Locality: 2.6 miles S.S.E. of Winchester Homestead

Collector: M.A. Randal

Glossopteris indica Sch., a fragment of Glossopteris conspicua Fm., Nummulospermum bowenense Walk. and small shells are associated in these specimens. Figures 41a and b and Figures 42 show the assemblage.

In the event of the shells being determinate, a close estimate of age might be possible. On the floral evidence the age of the specimens is Permian or Lower Triassic.

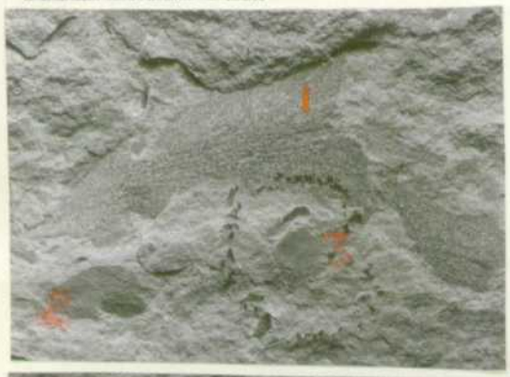
PLATE 10.

Figure 39.
Phyllotheca stem.
Natural size.

Figure 40.
Phyllotheca robusta.
Magn. X 2.

Figure 41. Magn.X 2.
Glossopteris sp. (1)
Glossopteris conspicua (2)
Shells (3) and (5)
Nummulospermum (4)

a.



b.

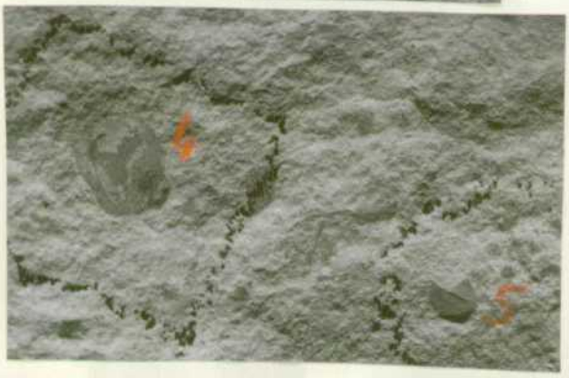


Figure 42.
Shells. Magn.X 2.

12: C L. 347.

Locality: 6 miles W.S.W. of Winchester Homestead.

Upper Bowen sediments.

Collector: M. A. Randal

Glossopteris indica Sch. associated with Phyllotheca sp. indicate a Permian or Lower Triassic age.

13: C L. 4/2

Locality: 5 miles N. of Cotherstone Homestead

Collector: J. J. Veevers.

Preservation is poor. The following are identified:-

Glossopteris indica Sch.

Glossopteris browniana Bgt.

Glossopteris angustifolia Bgt.

Glossopteris conspicua Fm.

Phyllotheca sp.

Samaropsis sp.

Age of specimens : Permian or Lower Triassic

14: C L. 170

Locality: ½ mile N. of Douglas Creek Homestead.

Collector: R. J. Paten.

Large numbers of small, pointed cone scales are present.

Figure 43 shows a face of one of the specimens in which the cone scales are densely massed. Small equisetalean stems are also present. No determination can be made but cone scales in such numbers suggest Mesozoic and not Palaeozoic age.

Age of specimens: Mesozoic ?

Figure 43:
Cone Scales.
Magn. X2

15: C L. 246/6b.

Locality: Fletcher's Awl

Collector: R.G. Mollan.

Indeterminate.

Appendix. List of plants identified in Upper Bowen sediments in 1960 collections.

Glossopteris indica Sch

angustifolia Bgt.

browniana Bgt.

conspicua Fm.

spathulato-cordata Fm.

Scale leaves - sterile.

Lidgettonia australis sp. nov. = fertile Glossopteris angustifolia

~~Lidgettonia australis~~ sp. nov. = fertile ~~Glossopteris angustifolia~~

Lidgettonia bowenense sp. nov. ?.

Vertebraria indica Royle.

Samaropsis dawsoni (Shirley)

Samaropsis sp.

Nummulospermum bowenense Walk.

Phyllotheca australis Bgt.

Phyllotheca robusta Fm.

Phyllotheca sp.

Sphenopteris lobifolia Morr.

Sphenopteris polymorpha Fm.

Gladophlebis roylei Arber

PLANT FOSSIL LOCALITY MAP

MT COOLON, CLERMONT AND PART OF BUCHANAN 4 MILE AREAS

QUEENSLAND

Scartwater HS
MC 886 F
MC 81
ROSETTA R.
MT COOLON
SUITTOR
RIVER
Pasha HS
Avon Downs
MC 236
MC 46
MC 233
MC 225 a
MC 222a
MC 62
MC 1017
MC 1066
MC 292
Bienheim Ck
MC 697
BOWEN RIVER
MC 535
MC 755
MC 72
Kemmis Ck HS
5 0 5 10 15
MILES
Main roads
CL 362 Fossil localities
BUCHANAN 4 Mile area
MT COOLON 4 Mile area
CLERMONT 4 Mile area
NORTHERN INLAND HWY
Logan Ck
Miclere Ck
Mistake Ck
ISAACS
North Ck
CL 307/8
CL 304/17
CL 310/20
CL 304/15
Daunia HS
CL 347
Winchester HS
CL 314/6
RIVER
CL 134
Ripstone Ck
Hughes Ck
CLERMONT-COAST HWY
CL 246/6b
CL 254/3a
CL 254/2b
CL 4/2
Campbell Ck
Cotherstone HS
Phillips Ck
Blair Athol HS
Wolfang Ck
Oaky Ck
Eastern Ck
CLERMONT
CL 362
Douglas Ck HS
CL 170
Sandy Ck
CL 303/10
CL 262/1
N

Bureau of Mineral Resources, Geology and Geophysics. April, 1961.

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