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REPORT ON 1960 COLLECTIONS OF MESOZOIC PLANT FOSSILS FROM THE NORTHERN TERRITORY

by

Mary E. White

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SUMMARY.

Plant fossils were collected from thirteen localities in the Northern Territory. Elements of the same Flora, of Upper Jurassic or Lower Cretaceous age, occur at all localities from which determinate specimens were obtained. Preservation at some localities is good and some interesting Williamsonia female strobili are described. Bennetitalean fronds, Conifer foliage, twigs, and cones, and three ferns are associated with them.

As the plant fossil horizons were closely associated with marine faunal horizons in the field, it will shortly be possible to determine the age of the plants accurately and this will be of assistance in elucidating Mesozoic stratigraphy in Australia generally. Determination of the age of many Mesozoic strata has been made by comparison of the floras with extra-Australian floras, without the benefit of cross-checking with marine faunal determinations.

INTRODUCTION.

Plant fossils were collected in 1960 by S. K. Skwarko from thirteen localities in the Northern Territory. The plant fossil localities were closely associated with marine faunal localities and it may shortly be possible to date the plant horizons accurately when determinations of fauna have been made. As many Mesozoic strata in the Northern Territory have been dated on floral evidence only for lack of other fossil evidence, correlation of the flora and fauna will be of interest and will enable cross-checking of datings based on palaeobotanical evidence in other areas.

Preservation of the plant fossils is poor at most localities, and at four localities the remains are indeterminate. Elements of the same Flora occur at all determinate localities, and on palaeobotanical evidence alone an Upper Jurassic or Lower Cretaceous age is indicated.

If marine faunal determinations enable the close dating of the plant collections in this instance, it must be emphasised that the total span of the Flora must remain inconclusive for the time being. It should not be assumed that if the plant assemblage in these collections is proved to be Lower Cretaceous (as appears likely - Skwarko, personal communication), the same plants elsewhere indicate Lower Cretaceous age without question. The stratigraphic "resolving power" of Floras should not be overestimated. Only by cross-checking of plant horizons containing a similar Flora with marine faunal datings in many instances all over Australia can a complete picture be obtained. Floras generally have a very considerable time range without alteration.

Details of localities, plants identified, ranges of individual species and notes on their distribution in Australia and elsewhere, follow. A representative selection of specimens is illustrated and the Figures should prove useful for comparison with past and future collections.

I. LOCALITY T T 32.

Locality: Bauhinia Downs 4-mile sheet; Bauhinia Downs 1-mile sheet. 2 miles N.W. of Old Bauhinia Downs Homestead.
Specimens F 21889 - F 21903 and F 21920

Preservation is good and the following plants are identified:-

Bennetitalean Flowers; Williamsonia sp. female strobilus and receptacles.

Pterophyllum fissum Feist.
Otozamites bengalensis (Morr.)
Otozamites bechei Brong.
Seeds, probably of Bennetitalean.
Conifer foliage and stems : Brachyphyllum and Pagiophyllum types.
Cone of Arthrotaxites type.
Thinnfeldia pinnata Walk.
Microphyllopteris gleichenioides O. & M.
Hausmannia sp.
Petrified stem.
Silicified wood.

1. Bennetitalean Flowers:

(a). Whole flower; Williamsonia sp.
Figures 1 and 2; specimen F 21889.

A cast of an incompletely expanded ovulate flower forms a major part of specimen F 21889. The flower consists of a receptacle, which was probably pyriform, surrounded by long, narrow bracts. The bracts are united below into a perianth approximately 1cm. deep. The free, narrow segments are approximately 6 cm. long and between .25 and .35 cm. wide. The base of the flower is seen in Figure 1. The perianth of joined bracts forms the outer layer. It is followed by another continuous layer of similar texture which probably represents a second bract whorl. In the restoration of an ovulate strobilus of Williamsonia by Lignier (see Seward 1917; p. 432) two whorls of bracts are indicated. The zone between the perianth layers and the ring which represents the receptacle base was composed of interseminal scales and megasporophylls, and has been replaced by mineral matter. The receptacle has been filled by sediment as well. No petrifaction of tissues has occurred in this coarse sandstone preservation and no minute detail of the fructification is visible.

The flower is of the same general type as Williamsonia gigas Carr. but smaller and with narrower bracts. It is similar to Williamsonia blandfordi Feist. from Cutch (Upper Gondwanas).

Figure 1 : Williamsonia sp.

Female strobilus. Natural size.
Specimen F 21889, seen from below.

Figure 2 : Williamsonia sp.
Specimen F 21889 seen from above.

Williamsonia flowers of this type occur in Jurassic strata in England, Europe and Mexico, and in the Upper Gondwanas in India. The anatomy of a complete flower is not fully understood. Male flowers consisting of a whorl of petal-like microsporophylls fused below into a shallow cup, with synangia on their inner surfaces, may have been attached to the top of the receptacles of a female strobilus in the position of the "infundibular appendage" in the reconstruction by Lignier cited above; or the male whorl could occupy a position between the bracts and the female strobilus as in Angiosperms; or the flowers might have been unisexual.

Williamsonia flowers occur with fronds of Zamites and Ptilophyllum and stems of Bucklandia type in Europe and India. Related Bennetitalean fronds which presumably have similar fructifications are Pterophyllum, Anomozamites, Otozamites, Dictyozamites, Taeniopteris (in part) and Nilssonia. There is no indication in the present case as to which foliage was associated with the flower.

No reference has been found to female Williamsonia strobili in Australia. Male flowers are known from a few localities but none of these are of the large variety which occur with Williamsonia gigas and related species. Details of occurrences of male flowers in Australia are as follows:-

1. Small male flowers (?) referred to Williamsonia sp. are described from the Narabeen Stage of the Hawkesbury Sandstone. (Walkom, 1925).

2. Small male flowers occur in the Ipswich Series. (Walkom 1917 and Jones and de Jersey 1947).

3. Small male flowers(?) are described from the Hawkesbury Sandstone (Mount Piddington) by Walkom (1932).

The range of Williamsonia flowers is Mid-Triassic to Upper Cretaceous. Bennetitaleans are rare in Triassic, dominant in Jurassic and Lower Cretaceous, then decline rapidly.

(b). Deeply impressed encrustation of hollow receptacle of Bennetitalean Flower. (portion of a Williamsonia flower)

Figure 3, Specimen F 21898.
(Magnification X 2).

Seed:
Carpolithes circularis type.

This pyriform receptacle measures 1.7 cm. from apex to junction of stalk and has a maximum width of 1.3 cm. Its surface is grooved and furrowed somewhat irregularly vertically. The segments caused by the furrowing taper towards the apex, where they unite in an acute point.

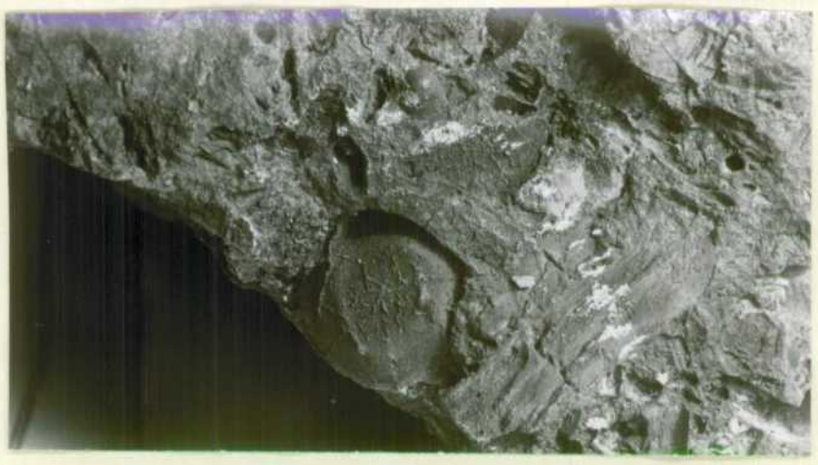
This receptacle is part of a Williamsonia flower. It is unfortunate that no more than the inside cast of the strobilus is preserved.

(c). Figure 4, from specimen F 21898, shows a hemispherical body, diameter 1 cm., with two ridges on its surface. It is enclosed round half its circumference in a cherty integument. At the upper end it is possible to see the inside of the integument, and it is obvious that the region in the small triangle between the integument and the body is the apex of a receptacle of the same type as seen in Figure 3. The hemispherical body looks very much like a large seed on first sight, but it is presumably the cast of the inside of the receptacle which has shrunk away from the receptacle walls. The ridges on its surface represent the furrows on the inside of the receptacle seen in Figure 3. There are some thread-like connections between the inner receptacle wall and the cast. A second example of a similar round body, which has been dorsoventrally flattened, occurs on the other edge of specimen F 21898. A cherty wall surrounds it as well, with a few thread-like connections to the central body.

Figure 4:

Specimen F 21898, Magnification X 2.

Cast of receptacle of Williamsonia sp.



(d). Specimen F 21920. Figure 5.

A stem approximately 2.5 cm. wide and 7 cm. long widens out into a bulbous body approximately 4 cm. wide and 3 cm. long with a pointed apex.

The stem portion is partially silicified and was obviously woody.

At the junction of the stem and bulbous body there is a gap in the mineral in-filling of the cast, and a small area of ridged tissue is visible, (a) in Figure 5, not unlike the inside of the receptacle seen in Figures 3 and 4. In the centre of the bulbous region the cast is hollowed and the irregular ridges of silicified material disappear converging towards an acute apex which would be under the surface apex of the organ. There is a faint indication of the outer edge of a pyriform receptacle at (b).

Figure 5.

Bennetitalean Flowering Stem.

Natural size. Specimen F 21920.

The outermost layers of the cast at the top contain narrow slits such as might have been left by bracts. The zone between the ? bract outer layers and the receptacle wall is filled in with uniform mineral matter. No tissues are preserved.

This specimen is a fertile branch of Williamsonia, a stem bearing a female strobilus in terminal position.

Bibliography and References for Williamsonia Flowers:

Feistmantel, O., 1877. Jurassic (Liassic) flora of the Rajmahal group in the Rajmahal Hills. Fossil flora of the Gondwana System (ser. 2) pt. 2, pp. 53 - 164. Mem. Geol. Surv. Ind. Palaeont.Indica.

Feistmantel, O., 1877. Jurassic (Liassic) flora of the Rajmahal group from Golapili, near Ellore, South Godavari. Fossil Flora of the Gondwana System (ser. 2) pt. 3. Mem. geol. Surv. Ind. Palaeont.Indica.

Bibliography and References for Williamsonia Flowers - cont'd.:

Jones, O. A. and de Jersey, N.J., 1947. The flora of the Ipswich Coal Measures. Morphology and Floral Succession. Univ. Qld. Pap. (Geol.) III n.s.3.

Seward, A.C., 1917. "Fossil Plants" III. pp. 421-477. Cambr. Univ. Press.

Sitholey, R.V. and Bose, M.N., 1953. Williamsonia santalensis sp. nov. A male fructification from the Rajmahal Series, with remarks on the structure of Ontheanthus polyandra Ganju. Palaeobotanist 2, 29-39.

Thomas, H. H., 1913. The fossil flora of the Cleveland District of Yorkshire. I: The flora of the Maske Quarry. Quart.Jnl.geol.Soc.Lond. 69, p. 223.

Walkom, A.B., 1917. Mesozoic floras of Queensland pt. 1 concld. Flora of the Ipswich and Walloon Series. Qld.geol.Surv. Publ. 259.

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

Walkom, A.B., 1932. Fossil plants from Mount Piddington and Clarence Siding. Proc.Linn.Soc.N.S.W. 57,3; 123-126.

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2. Bennetitalean Fronds:

Pterophyllum fissum Feist.

Figures 7 and 8, specimens F 21894, F 21890. (also in Figures 9, 13).

Figure 7 of specimen F 21894 shows well preserved fronds of the species. Fronds at the top of the photograph show the paired apex. Segmenting of the lamina is uneven, in the Anomozamites manner. Often adjacent segments are joined along most of their length, resulting in paired appearance. Hence the "fissum" for the divided apex.

Figure 7. Specimen F 21894, Natural size.

Pterophyllum fissum Feist. (top, lower left & right) with Otozamites bengalensis (Morr)(centre) and small Brachyphyllum twigs.

Fronds showing "fissum" type segments.

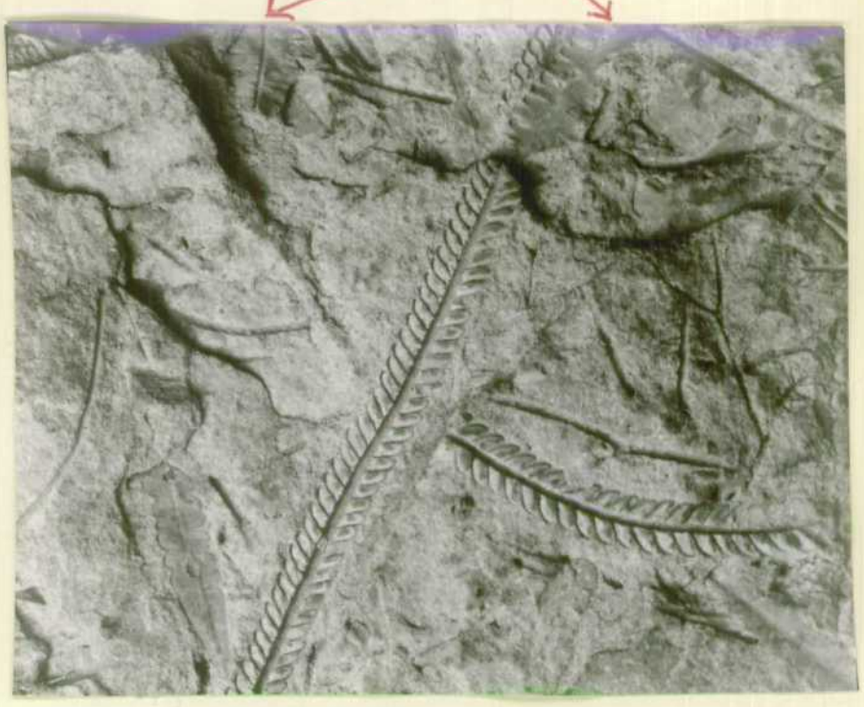

Figure 8 of specimen F 21890 shows terminal parts of two fronds. These appear more flimsy than most other examples and resemble the "Nilssonia acuminata Presl." illustrated by Gothan (1913). They are not a distinct form, however, and are young, terminal parts of fronds falling within the range of variations within P. fissum.

Figure 8.
Specimen F 21890, Magnification X 2.

The choice of the generic name Pterophyllum for these fronds is arbitrary. They could equally well be accommodated in Anomozamites or Nilssonia.

Pterophyllum fissum Feist. was described from the Rajmahal series in India. It may not be strictly distinct from Pterophyllum minus L. & H. (Anomozamites lindleyanus Schimp.) as it is seen that in the present material, which could not be separated satisfactorily into more than one species, the divided apex of the pinnule is variable and may not be evident. It is rather a case of pairing of adjacent pinnules to give an effect of paired apices in some cases than a regular notching of the apex of each pinnule. Those with undivided apices could be referred to P. minus, the rest to P. fissum. Similar fronds are referred to Nilssonia compta (Phill.) by Arber (1917) from New Zealand Lower Jurassic, and there is general similarity to Nilssonia elegans Arber (1917) from Middle Jurassic.

The range of fronds of this type is from Mid-Triassic, with particular abundance in Upper Jurassic and Lower Cretaceous times.

In Australia, Pterophyllum fissum occurs in the Longsight Sandstone in the Georgina Basin. (see Records 1959/35). The plant horizon in the Longsight Sandstone is below the Cretaceous macrofossil horizon, and its age is Lower Cretaceous or possibly Upper Jurassic.

Nilssonia plutovillensis Walk. from Lower Cretaceous in Cape York Peninsula, is a similar but larger form, as is Nilssonia schaumbergensis (?) Dunk. from the Burrum Series. (Walkom, 1919, Fig. 14 and 15, Plate I.)

References for Pterophyllum fissum:

Arber, E.A.N., 1917. The earlier Mesozoic floras of New Zealand. N.Z. geol.Surv.Palaeont.Bull. 6.

Gothan, von W., 1913. Die unter-liassische (rhatische) flora der umgegend von Nurnberg. Abh. d. Nat. Ges. Nurnberg. XIX.Berlin.

Walkom, A. B., 1919. Mesozoic floras of Queensland. 3 & 4. The floras of the Burrum and Styx River Series. Qld. geol. Surv. Publ. 263.

3. Bennetitalean Fronds: Otozamites bengalensis (Morr).

Figure 9, specimen F 21894.
(also in Figures 7, 15, 19.)

Many well preserved fronds between .4cm. and .8 cm. wide are present. In Figure 9 the fronds are seen from below, with the midrib, or rachis, deeply impressed and the pinnules showing characteristic slightly falcate form.

The limits of the species are ill-defined and there is variation in size and shape. There is some doubt whether in the present material it is possible to determine more than one species. There are, however, three distinct types of pinnule and the species bengalensis, bechei, and feistmanteli are provisionally determined.

Figure 9. Otozamites bengalensis (Morr). with Pterophyllum fissum Feist. and twigs of Brachyphyllum.

Specimen F 21894. Natural size.

4. Bennetitalean fronds: Otozamites bechei Brong.

Figure 10, specimen F 21891.

In Figure 10 a frond is seen from above. The pinnule bases are attached along the middle of the rachis and cover it completely. The pinnules are less falcate than those in Otozamites bengalensis described above.

Figure 10. Otozamites bechei Brong.

Specimen F 21891, Magnification X 2.

In Australia, Otozamites occurs mostly in the North of the Continent, not in the South, and is absent in Victoria and South Australia. It is recorded only from Queensland and Western Australia but may yet appear in Northern New South Wales. Its limited distribution during Jurassic and Lower Cretaceous times is paralleled by the restricted distribution of Modern Cycads, which do not extend into Victoria and Tasmania. Similar climatic factors may have affected the spread of the plants then as now.

Otozamites occurs in Upper Triassic, Jurassic and Lower Cretaceous horizons in other parts of the world. Walkom (1921, p. 150) states that Otozamites is only known in Jurassic strata in Australia. This statement was based on the belief then current that the Upper Gondwanas in India, with which the flora was correlated, followed without time break after the Middle Gondwanas. It has since been shown that this is not so, and Arkell (1956) refers the Rajmahal Series to Lower Cretaceous. Many plant fossil horizons in Australia have been dated as Jurassic by comparison of their floras with Upper Gondwana floras. It is therefore necessary to review the evidence on which "Jurassic" strata have been identified and to correct the error where necessary.

With increased geological mapping in Northern Australia, it is becoming obvious that Otozamites was a very common and widespread genus. A short list of localities from which it has been recorded gives some indication of this:-

Queensland: Thane's Creek and Durikai (S.W. of Warwick); Talgai; Darling Downs near Toowoomba; Kalbar, Beaudesert; near Esk; Cracow, etc. All from Walloon Series and its equivalents.

Western Australia: Minginew; Madinganarra, Derby District; Dampierland-Broome Sandstone; Nanutarra Formation; Misery Shale, Perth Basin; Julia Formation, Yarragadee Beds.

Northern Territory: Localities TT 32, TT 34, TT 36, TT 11, TT 18, TT 24, of the present collection.

References for Otozamites:

Arkell, W. J., 1956. "Jurassic Geology of the World." Oliver & Boyd, London.

Walkom, A. B., 1921. On the Occurrence of Otozamites in Australia, with descriptions of specimens from Western Australia. Proc. Linn. Soc. N.S.W. 46, 1; 149-153.

5. Conifer Fragments:

(i). Stems and foliage — In Figure 11 of specimen F 21895, three conifer stem types are seen. These are

(a) very thin stems of Brachyphyllum type with a pattern of overlapping scale leaves. (Also seen in Figures 7 and 9).

(b) Fragments with linear leaves projecting from the stem, the stem having also a Brachyphyllum-like arrangement of overlapping leaves.

(c) Larger stems of the Pagiophyllum type with coriaceous leaves of Araucarian type.

Figure 11.

Conifer fragments, with Otozamites bechei Brong.

Specimen F 21895, Natural size.

Brachyphyllum

Pagiophyllum

Conifer foliage and stem fragments can be classified in many ways, but because of the diversity of vegetative form in all the families and the variations even in one plant, it is most unsatisfactory to attempt accurate classification without the aid of cones or cone-scales.

(ii). Cones. A cross-section of a cone is seen in Figure 12. There are also small fragments of cone in the material, and from a study of the fragmentary evidence affinity with Arthrotaxites is suggested. Arthrotaxites is a Southern Hemisphere genus of Conifers, a fact which strengthens the tentative identification, as Florin (1952) has shown that fossil conifer floras were either Northern or Southern in affinities. Many southern Conifer foliage and stem fragments previously identified with genera with northern distribution should be reclassified in southern genera. Arthrotaxites has Brachyphyllum type foliage.

Figure 12.

Arthrotaxites cone.

Specimen F 21899.
Magn. X 2.

Selected references and Bibliography for Mesozoic Conifers:

Berry, E.W., 1911. Lower Cretaceous deposits of Maryland. Maryland geol.Surv.Publ.

Florin, R., 1952. On two conifers from the Jurassic of South-eastern Australia. Palaeobotanist 1, 177-182.

Seward, A.C., 1903. Fossil floras of the Cape Colony. Uitenhage Series. Jurassic. Ann. Sth. Afr. Mus. 4.

Seward, A.C., 1919. "Fossil Plants" IV. Cambr. Univ. Pr.

Vishnu-Mittre, 1957. Studies in the fossil flora of Nipania (Rajmahal Series) Bihar - Coniferales. Palaeobotanist 6 (2).

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Walkom, A.B., 1921. Mesozoic floras of N.S.W. I. Fossil plants from Cockabutta Mt. and Talbragar. Mem.geol.Surv. N.S.W. Palaeont. 12.

Walkom, A.B., 1928. Fossil plants from Plutoville, Cape York Peninsula. Proc.Linn.Soc. N.S.W. 53, 2.

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6. Seeds:

There are several small, more or less oval, seeds approximately 3 mm. X 2.5 mm. in size. These are of Carpolithes circularis type and are probably the seeds of Williamsonia flowers. An example is illustrated in Figure 3.

7. Fern frond: Microphyllopteris gleichenioides O. & M.

Figure 13, of specimen F 21893, shows a small frond 3.5 cm. long and .35 cm. wide which is referred to Microphyllopteris gleichenioides. Presumably it was part of a bipinnate frond. The pinnule size is greater than that in the more complete, bipinnate frond illustrated in Figure 21. It is not possible to assert that Microphyllopteris is undoubtedly a fern. It is not known in fertile condition and may be a Bennetitalean frond.

Figure 13.

Specimen F 21893, Magnification X 2.

Pinna of Microphyllopteris gleichenioides O. & M. with fronds of Pterophyllum fissum Feist.

Microphyllopteris is recorded from the following localities and horizons in Australia:-

Burrum Series, Qld. (Lower Cretaceous); Cape York Penin., Plutoville (Lower Cretaceous); Misery Shale, Perth Basin, W.A.; Wittecarra Formation, W.A.

In India it occurs in the Upper Gondwanas (Rajmahal and Jabalpur, Lower Cretaceous). It occurs in the Wealden beds in England and Europe.

8. Fern Frond: Thinnfeldia pinnata Walk.

Figure 14, specimen F 21896, shows a frond referred to Thinnfeldia pinnata Walk. The species was described from the Talbragar Beds (Jurassic).

Figure 14.

Thinnfeldia pinnata Walk, with

Pterophyllum fissum.

Specimen F 21896, Magnification X 2.

9. Fern Fragment: Hausmannia sp.?

Figure 15, specimen F 21897, shows part of a leaf of a Dipteridinous fern of Hausmannia type. The fragment is too small for close identification. Thistype of fern ranges from Rhaetic to Lower Cretaceous.

Figure 15.

Hausmannia sp. with Otozamites bengalensis (Morr.) Specimen F 21897, Magnification X 2.

10. Petrified stem: Figure 16 of specimen F 21901 shows a small petrified stem which was sectioned for microscopic examination. Preservation of internal tissues was excellent. Figures 17 and 18 show small areas of the slides in which the tissues are seen in transverse and longitudinal sections. The transverse section of the stem shows ten annual rings. The wood is of very regular small tracheids. Growth has been slow to result in such a small diameter in ten years. There is evidence, in the presence of clear annual rings, of seasonal growth fluctuations. The wood resembles modern Cupressus wood and is almost certainly the wood of the Brachyphyllum-type Conifer associated with it at this locality.

Figure 16.

Petrified stem.

F 21901. Natural size.

Figure 17.

Transverse Section of petrified stem.
Magnification approximately X 12.

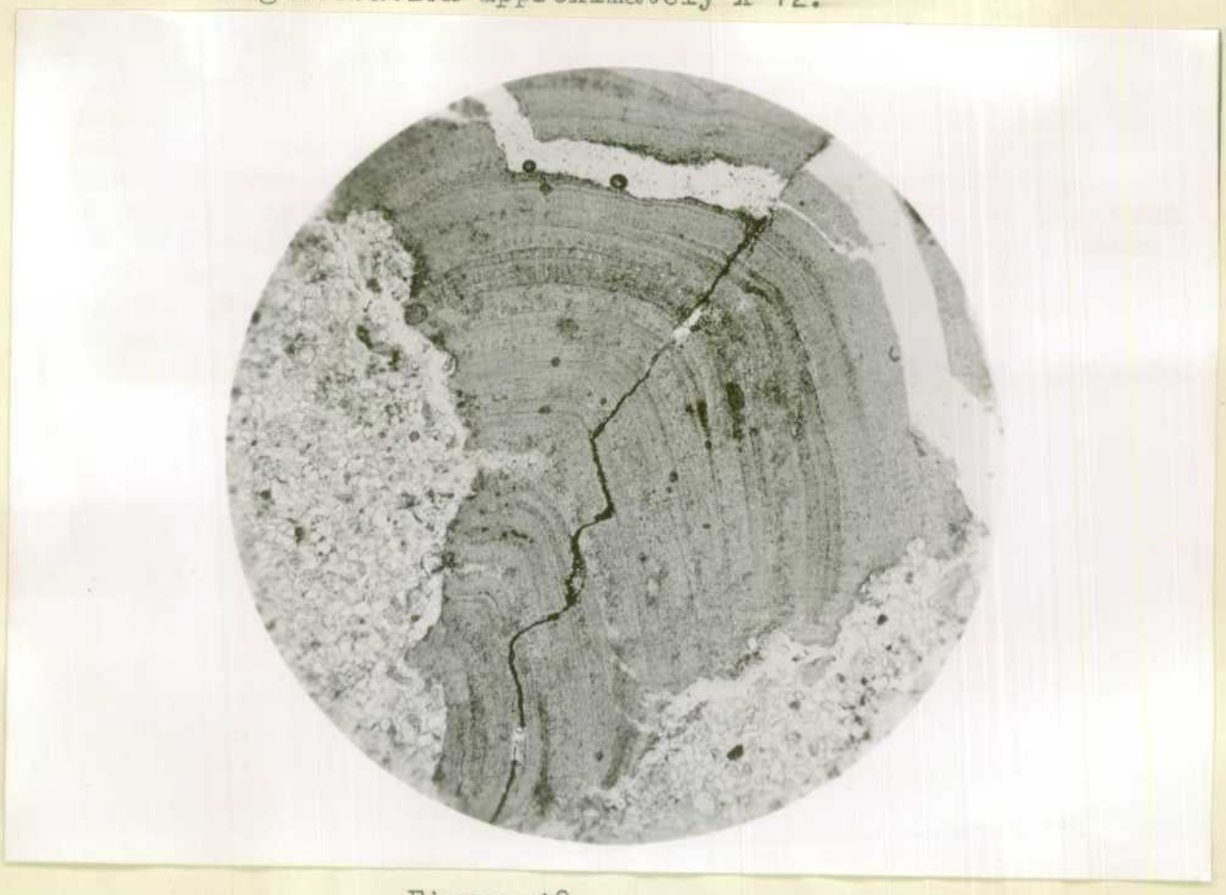


Figure 18.

Longitudinal Section of Petrified stem.
Magnification X approx.

11. Fossil Wood:

Figure 19 of specimen F 21902 shows a piece of fossil wood. Microscopic examination of sections ground from this specimen showed that some cell structure was preserved but distortion of the wood was too great for determinations to be made.

Figure 19.

Fossil wood. Specimen F 21902.

Natural size.

12. Petrified stem:

Figure 20, specimen F 21900, shows a fossilised stem which has been weathered into a conical shape. A transverse section prepared for microscopic examination showed six annual rings and a central pith cavity. Cell preservation is poor and no reliable conclusions can be reached on the affinities of the stem, other than that it is probably of a Conifer.

Figure 20.

Petrified stem weathered into conical form.
Specimen F 21900. Natural size.

II. LOCALITY TT 34.

Locality: Bauhinia Downs 4-mile sheet; Bauhinia Downs 1-mile sheet; approximately 8 miles N.E. of Three Knobs, 6 miles North of Leila Top crossing.

Specimens F 21905, F 21904.

Preservation is mainly poor at this locality.

The following are identified:-

(a). Microphyllopteris gleichenioides O. & M.

Figure 21, specimen F 21904, shows a bipinnate frond of this species.

Figure 21.

Microphyllopteris gleichenioides O. & M.

Specimen F 21904. Magnification X 2.

(b). Conifer fragments of Brachyphyllum and Elatocladus type.

(c). Otozamites bechei Brong.

(d). Two large seed-like bodies which may be casts of receptacle contents as seen in Figure 4.

III. LOCALITY TT 36.

Locality: Tanumbirini 4-mile; about 8 miles N. of Tanumbirini Homestead.

Specimens F 21906, F 21907.

Preservation of most of the specimens is poor.

Figure 22, specimen F 21906, shows a stem of Brachyphyllum type with a "chicken wire" bark pattern, smaller Brachyphyllum twigs with impress of overlapping leaves, a frond of Otozamites bengalensis (Morr). and a poorly preserved frond of Pterophyllum fissum Feist.

Also identified at this locality are Otozamites bechei Brong. and small, round seeds, .3 cm. in diameter, of Carpolithes circularis type.

Figure 22.

Specimen F 21906, Magnification X 2.

Brachyphyllum stems (top and centre)

Otozamites bengalensis (Morr.), bottom.

IV. LOCALITY TT 23.

Locality: Bauhinia Downs 4-mile; Yalco Creek 1-mile.
Approximately 50 miles N. of Cow Lagoon.
Specimens F 21916 and F 21908.

Conifer foliage of Elatocladus planus (Feist.) type is associated with Brachyphyllum stems. Figure 23 illustrates an example. A very poorly preserved frond of Pterophyllum fissum Feist. is the only other determinate form present.

Figure 23.

Elatocladus planus (Feist.) with Brachyphyllum twigs. Specimen F 21908, Natural size.

V. LOCALITY TT 11.

Locality: Katherine 4-mile sheet; Black-Cap 1-mile sheet.
2 miles N. of TT 10 (which is 7 miles N.W. of the Mainoru-Maranboy Rd.; up the West bank of the Bukalorkmi Creek.)

V. LOCALITY TT 11 continued:

Specimens F 21909 - F 21912.

Preservation is poor. The following are identified:-

(a). Otozamites feistmanteli Zingo. (?)

Figure 24 of specimen F 21910 shows the fronds which are tentatively referred to this species.

(b). Ptilophyllum oligoneurum Ten. Woods (?).

Small fronds of Nilssonia type similar to the species described from the Burrum Series in Queensland (See Jack and Etheridge, 1892). Figure 25 illustrates a frond of this type.

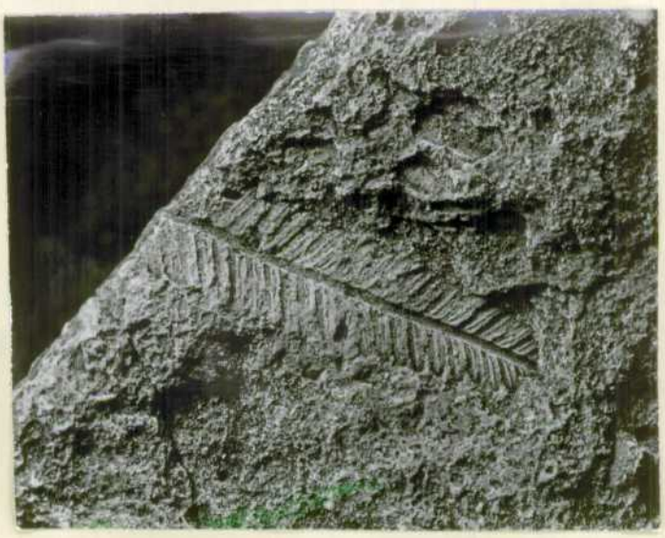
Figure 24.

Otozamites feistmanteli Zingo.

Specimen F 21910. Natural size.

Figure 25.

Ptilophyllum oligoneurum Ten. Woods. (?).
Specimen F 21909. Magnification X 2.



V. LOCALITY TT 11 continued:

(c). Conifer fragments:

Figure 26, specimen F 21911, shows conifer foliage with leaves of two types - scale-like leaves adpressed to the stem, and elongate leaves projecting outwards.

Figure 26. Conifer foliage.

Specimen F 21911, Natural size.

VI. LOCALITY TT 18.

Locality: Katherine 4-mile sheet; Waterhouse 1-mile sheet; 5½ miles South of Maranboy - Mainoru Rd.; 10 miles East of Beswick Homestead.

Specimens F 21913 - F 21915.

The following are identified:-

(a). Otozamites bengalensis (Morr.). Figure 27, specimen F 21913.

(b). Ptilophyllum pecten (Phill.)

(c). Equisetalean stem, indeterminate.

(d). Conifer fragments - Elatocladus sp.

(e). Ptilophyllum oligoneurum Ten Woods. (?).

(f). Taeniopteris spatulata McClell.

Figure 28, of specimen F 21914, shows an example of this species. Taeniopteris spatulata is a most characteristic plant of the Jurassic in Australia, having nowhere been found in rocks older than Jurassic. (Walloon Series and equivalents in Queensland, Clarence and Artesian Series in N.S.W.) It occurs in the Lower Cretaceous Burrum and Styx River Series in Queensland, in the Rajmahal Series in India, and from Rhaetic in Tonkin and New Zealand.

Figure 27.

Otozamites bengalensis (Morr.)

Specimen F 21913. Natural size.

Figure 28.

Taeniopteris spatulata McClell.

Specimen F 21914. Magnification X 2.

VII. LOCALITY TT 24.

Locality: Bauhinia Downs 4-mile sheet; Mallapunyah 1-mile sheet; 4miles N.E. of Top Station Hill, at junction of MacArthur River and Tooganinie Ck.

Specimen F 21917.

Preservation is poor.

The following are identified:-

Elatocladus planus (Feist.). Conifer foliage.

Brachyphyllum type conifer twigs.

Pagiophyllum type conifer stems.

Otozamites bechei Brong.

VIII. LOCALITY TT 26.

Locality: Bauhinia Downs 4-mile sheet; Borroloola 1-mile;

1 mile North of Borroloola.

Specimens F 21918.

Preservation is very poor.

Fronds of Pterophyllum fissum Feist. are associated with conifer foliage and stems (Elatocladus and Brachyphyllum).

IX. LOCALITY TT 35.

Locality: Mount Young 4-mile sheet; 1½ miles S.E. of Rosey Creek Hstd.
Specimens F 21919.

These specimens are indeterminate except for a few conifer fragments.

X. LOCALITY TT 3.

Locality: Pine Creek 4-mile sheet; Tabletop 1-mile sheet; West side of Pine Creek - Darwin road, 4.8 miles N. of Pine Creek.
Indeterminate.

XI. LOCALITY TT 4.

Locality: Pine Creek 4-mile sheet; Burrundie 1-mile sheet, West side of Pine Creek - Darwin road, 7 miles N. of Pine Creek.
Indeterminate.

XII. LOCALITY TT 27.

Locality: Bauhinia Downs 4-mile sheet; Borroloola 1-mile sheet; 1 mile N.W. of Borroloola.
Indeterminate.

XIII. LOCALITY TT 31.

Locality: Bauhinia Downs 4-mile sheet; Bauhinia Downs 1-mile sheet, 5 miles N., 30° W. of Old Bauhinia Downs Homestead.
Indeterminate.