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MONOGRAPH ON THE TRIASSIC FLORA OF BALD HILL, BACCHUS MARSH, VICTORIA.

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(Plates X.–XIII. and text figure.)

I.—INTRODUCTION.

The existence of a Triassic flora in the Bacchus Marsh District was suggested and tentatively held by geologists for many years, but the evidence had been obscured by the confusion of two horizons. Thus, Sir Fredk. McCoy was always impressed with the Triassic aspect of the Bacchus Marsh flora as a whole; and the earlier mistaken view, that the "*Schizoneura* bed" occurred beneath the *Gangamopteris* sandstone of Bacchus Marsh, only added to the difficulty.

Writing in 1892, McCoy[1] said that he recognized Lower Triassic rocks in specimens obtained by W. H. Ferguson "from a newly discovered bed just under the famous *Gangamopteris* sandstone of Bacchus Marsh," in which he identified *Schizoneura* and *Zeugophyllites*.

Apparently the error of inverting the relative positions of these two beds arose through a slip in drawing the preliminary sketch, though Mr. Ferguson correctly represents in sketch-section No. 1, sent to the National Museum on 29th July, 1891, the *Gangamopteris* beds underlying the adjacent rocks that contain the *Schizoneura* flora (see text-fig. p. 123).

In some notes on glacial deposits of Bacchus Marsh, Messrs. Officer and Balfour[2] refer to McCoy's determination of *Schizoneura* and *Ptilophyllum* from this locality, and state "They all come from the *Schizoneura* bed—a thin clayey band about 4 inches in width. The horizon is apparently above that of the *Gangamopteris* beds."

1 McCoy, F. 1892, p. 30. (Full references are given at the end of this work.)
2 Officer and Balfour 1894, p. 143.

Since these references to a Triassic flora were made, *Taeniopteris Sweeti* has been discovered, and the present writer has reviewed this and other forms of the flora in later papers, notes on which are made in the next section, on the literature.

Quite lately other fossils have been collected by Mr. F. A. Singleton, M.Sc., and myself. These, together with the original examples collected by Mr. Ferguson in 1891, many of which have never been referred to, seem to fairly establish the claims of this interesting bed as a representative of the Triassic system in Victoria.

The classic section in which these plant remains are found is in a trench in the Council Paddock at Bald Hill: and it may be useful for future collectors to refer to the appended notes, which were made by Mr. Singleton and myself, of the exposed beds. It may be remarked that Messrs. Officer and Balfour gave details only slightly differing from those now furnished, in their paper on the Bacchus Marsh glacial beds.[3]

GENERALIZED SECTION SEEN IN THE TRENCH AT THE COUNCIL PADDOCK, BALD HILL, JULY, 1919. (SINGLETON AND CHAPMAN).[4]

Bed.	ft.	in.
8. Sandy shale	2	0
7. Pebbly conglomerate, grits and chert, with ferruginous cement (circ.)	1	6
6. Plant remains in fine siliceous sandy shale ..	0	5
5. Friable, current-bedded sandy shales with sericite	0	8
4. Shaley siliceous mudstone with plant remains ..	0	6
3. Current-bedded sandy shales	4	0
2. Parting, with pebbles	0	1
1. Current-bedded sandy shale (circ.)	10	0

Base of trench.

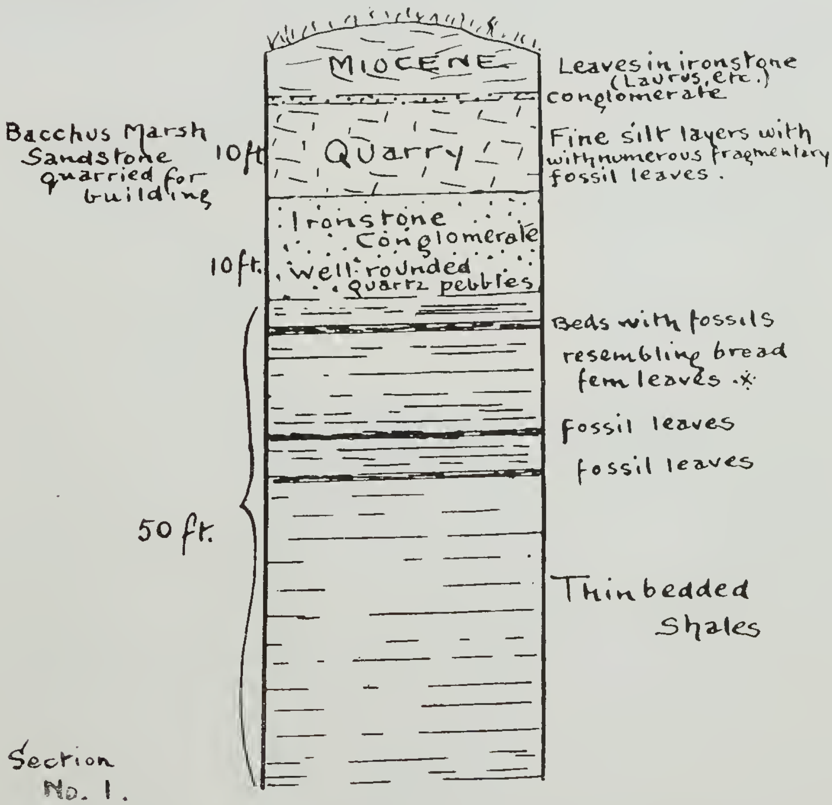
II. PREVIOUS REFERENCES TO THE LATER FLORA OF BALD HILL.

FERGUSON, W. H., 1891.[5]—This was the first notice by the discoverer, Mr. Ferguson of the Geological Survey of Victoria, of the higher horizon with plants, at Bald Hill. The description runs as follows: "At the Bald Hill a shallow quarry has been excavated along the crest of a ridge for about 150 yards; a bed of very fine-grained siliceous sandstone outcrops here, and in it are numerous fossils new to the Bacchus Marsh Sandstones. They are quite distinct from the fossil fern, *Gangamopteris*, which up to the present was the only fossil plant found in the formation. The

3 *Id.* 1894, p. 140.
4 Further stratigraphic comments on this section will be made in a paper to be published by Mr. F. A. Singleton, who will deal with the relationships of the beds of this locality.
5 Ferguson, W. H., 1891, pp. 31–32.

fossils are generally casts, but are occasionally preserved as a film of carbon. The layer that contains the fossils thins out and thickens most capriciously, and is replaced by a conglomerate, which consists of an ironstone matrix thickly studded with small quartz pebbles, and differs in general appearance from the glacial conglomerate of the district. The new fossils have been sent to Professor McCoy for identification. The deposit is covered by Miocene sands and ironstone layers containing dicotyledonons leaves. The fossiliferous siliceous sandstone rests on 10 feet of ironstone conglomerate, and below the conglomerate in sandy and earthy layers, stained by oxide of iron, fossil leaves resembling *Gangamopteris* may be obtained and also pieces of wood. About 300 yards to the north of this quarry showing the siliceous rock, a quarry has been opened up in massive sandstone. This foundation lies between glacial conglomerate and yields various species of *Gangamopteris*."

FERGUSON, W. H., 1891.—A manuscript report (in the National Museum), not hitherto published, was forwarded by A. W. Howitt, Secretary for Mines, to McCoy on 29th July, 1891. These are notes to accompany a box of fossils from Bacchus Marsh, sent to Professor McCoy :—



Sketch-section by W. H. Ferguson, 29.7.91, at Bald Hill. Fossils obtained in small quarry on hillside. Scale 20ft. to 1in.—reduced

* Probably the *Ptilophyllum*.

"At section No. 1, showing fine silt layers resting on ironstone conglomerate, there were obtained 35 samples of white, grey, and yellow very fine-grained sandstone containing numerous plant impressions. Small specimen in siliceous stone resembling rootlets and marked unique was the only one of that kind found. Of specimen No. 1, an eight-rayed fossil, the Department possesses a duplicate. Five specimens, four of leaves and one of wood, marked fossil leaves, in earthy, sandy ironstone layers 20 to 30 feet below silt layers were found in beds indicated by red lines on section.

At section No. 2 the fossil fern leaves, in grey sandstone, marked Numbers 4, 5, 6, were found as indicated by an arrow on the section. Th especimens of fossil leaves, casts of fruits or seeds and sample of wood, all in ironstone, were collected at two localities, some on the N.E. bank of the Werribee River about 2 miles below the Gorge, others on a hill 200 yards west from bridge where Ballan-road crosses the Korkuperrimal or Lyall's Creek, and about 2 miles from Bacchus Marsh Township." (N.B. The latter reference relates to Tertiary plant remains.—F.C.).

McCoy, F., 1892.[6]—That author places on record his discovery of *Schizoneura* and *Zeugophyllites* in the collection obtained in 1891 by W. H. Ferguson. An error is made here in placing the newly discovered bed "just under the Gangamopteris sandstone," which misled McCoy to correlate both series with the Trias.

Officer, G., and Balfour, L., 1894.[7]—In describing the glacial deposits of Bacchus Marsh, they refer to *Schizoneura* and another genus, *Ptilophyllum* (*P. Officeri*) McCoy. Sir Fredk. McCoy's description of the latter species is included in this paper.

Etheridge, R., Jun., 1894.[8]—Referring to Sir F. McCoy's determination of *Schizoneura*, as recorded in the Ann. Rep. Secy. for Mines, 1891, he remarks:—"It will be observed that the specimens are spoken of as comminuted." In this paper Etheridge describes *Schizoneura australis*, sp. nov., occurring between the Upper Coal Measures and the Hawkesbury Sandstone.

David, T. W. E., 1896.[9]—In this paper the two beds at Bald Hill are mentioned as follows:—"Well preserved plant remains are present on at least two horizons; on the lower horizon occur the three species of *Gangamopteris* already referred to, and on the higher, specimens of *Zeugophyllites*, *Schizoneura*, &c. The total thickness of the glacial beds seen in the upper portion of Korkuperrimal Creek, as measured last December, proved to be 1,427 feet. To this, Mr. Brittlebank estimates a thickness of about 700 feet of strata should be added, to carry the section from the top of the *Gangamopteris* beds to the top of the strata seen above the *Schizoneura* horizon."

6 McCoy, F., 1892, p. 30.
7 Officer, G., and Balfour, L., 1894, p. 143.
8 Etheridge, R. jun., 1894, p. 32–33.
9 David, T. W. E., 1896, p. 298.

McCoy, F., 1898.[10]—A new species of *Taeniopteris* (*T. Sweeti*) is described from the upper beds at Bald Hill. In the original description McCoy states this fossil to come from the *Gangamopteris* Sandstones at Bald Hill, whereas by the matrix it is seen to belong to the *Schizoneura* bed.

Arber, E. A. N., 1905.[11]—A reference is given to "*Taeniopteris* sp. (from Victoria)," the author stating that—"This genus occurs rarely with *Gangamopteris* in the Bacchus Marsh Sandstones of Victoria." He also regards the specimen as "too fragmentary to permit of an accurate specific diagnosis." The genus was thought only so far to have occurred once, but whilst examining the late Mr. Geo. Sweet's collection, donated to the National Museum by his daughter, Dr. G. Sweet, several fragmentary specimens were found. This fossil does not occur with *Gangamopteris*, as Newell Arber thought, and the original type, as well as some of the other fragments, is in good condition.

Chapman, F., 1914.[12]—The author transfers the genus *Zeugophyllites* to *Phoenicopsis* and mentions the occurrence of *Taeniopteris* (*Macrotaeniopteris*) in the upper beds of Bald Hill.

Chapman, F., 1919.[13]—*Taeniopteris Sweeti* is referred to. *T.* (*Macrotaeniopteris*) *wianamattae* Feistmantel, and *Ptilophyllum Officeri* McCoy is identified with *Ptilophyllum oligoneurum* T. Woods, now a synonym of *Ptilophyllum* (*Williamsonia*) *pecten* Phillips sp.[14]

III.—DESCRIPTION OF THE PLANT REMAINS.

Series—**PTERIDOPHYTA.**

Class—**EQUISETALES.**

Genus—Phyllotheca, Brongniart, 1828.

Phyllotheca indica Bunbury.

Plate X., figs. 4, 6, 9. Plate XI., fig. 15.

Phyllotheca indica Bunbury, 1861, Quart. Journ. Geol. Soc., vol. XVII., p. 335, pl. X., figs. 6–9. Schimper, 1869, Traité de Paléont. Vég., vol. I., p. 289. Feistmantel, 1876, Journ. Asiatic Soc., Bengal, vol. LXV., pt. 2, p. 346. Idem, 1880, Mem. Geol. Surv., India—Pal. Indica, ser. XII.—Flora of the Gondwana System, vol. III., pts. 2 and 3, p. 67, pl. XIIa., figs. 3–9. Oldham, 1893, Manual Geol., India, pl. opp. p. 162. Seward, 1898, Fossil Plants, Cambridge Univ. Press, vol. I., p. 287, fig. 680. Arber, 1905, Cat. Foss. Plants, Brit. Mus., "The Glossopteris Flora," p. 20, text-fig. 6.

10 McCoy, F., 1898, p. 285.
11 Arber, E. A. N., 1905, p. 128.
12 Chapman, F., 1914, p. 68.
13 Chapman, F., 1919, pp. 149–50.
14 Walkom, A. B. 1917, p. 14.

Observations.—The plant-stems in the present series, referred to *Phyllotheca indica*, have the characteristic short internodes seen in the Raniganj fossil remains. The slender filamentous leaves found attached, or in close association with the stems, show their relationship to the above species rather than to *P. australis*, which has the leaf-whorls more closely adherent to the stem. This conclusion is further supported by the form of the internodes, which tend to widen distally and also bear strong, linear, superficial grooves. The stem in one example (fig. 4) consists of about eight segments, whilst the other (fig. 15) has seven; it is slender and closely comparable with some of Feistmantel's figures of this species.

Dimensions of the Victorian Specimens.—The stem here figured (fig. 4) measures at its widest part about 2·3mm.; the second specimen (fig. 15) has a stem diameter of only 1·5mm. Indian specimens figured by Feistmantel measure from 2·5 to 5mm. in diameter. As a contra-comparison, a typical example of *Phyllotheca australis* in the National Museum collection has a stem-diameter of 14mm.

Leaves.—Although complete leaf-whorls have not been preserved in the present instances, the occasional leaves are similar to those of *P. indica*, both in shape and habit. The leaves are of moderate length, aciculate, and are bent outward or upward from their point of attachment, and often strongly recurved near the extremity.

Rhizomata with Tubers.—Portions of straight or flexuous rhizomes, bearing sac-like bodies appended by a filamentous attachment, are not uncommon on some of the slabs of cream-coloured, porcellanous mudstone from the trench on Bald Hill, two of which are figured (figs. 6 and 9). The coarse sclerenchymatous texture of the rhizome is shown in strong relief, whilst the attaching filaments and tubers are of a more tenuous structure. The latter are represented by a thin impression or mere stain on the rock. These sac-like bodies are not so well-rounded as in modern *Equisetaceae*, or the fossil *Equisetites* figured elsewhere.[15] This irregular form of the tubers may therefore be peculiar to the allied genus *Phyllotheca*, to which, up to the present, no rhizomes or tubers seem to have been assigned. Since these tubers are here associated in the same horizon and on the same slabs, their probable relationship to *P. indica* seems to be fairly strong.

Nodal Diaphragms.—In fig. 15 can be seen two nodal diaphragms, and since they are disposed at right angles to the surface of the stem-nodes, seem to point to their having been the nodal attachment of branches; otherwise to account for their present position on the stem would necessitate their displacement to a plane at right angles to their original position, and this could hardly have taken place

15 See *E. Burchardti* Dunker, figured by A. C. Seward, 1898, p. 279, fig. 65; or *E. yokohamae* Seward, ibid, p. 280, fig. 66. Also *E. wonthaggiensis* Chapman, 1912, pl. XII., fig. 1.

without a great amount of distortion in the stem. These nodal diaphragms, although small, are not comparable in detailed structure with Arber's New Zealand species, *Phyllotheca minuta*,[16] unless it could be proved that these apparent nodes of the branches differed from the nodes of the stem, to which Arber's figured specimens seem to belong.

Distribution.—*Phyllotheca indica* Bunbury, has not before been recorded from Australian rocks. It is found in India in the Raniganj sub-stage of the Damuda stage (Upper series of Lower Gondwana).

Divisions of the Lower Gondwana (for reference above)—

Stage ..	.. Damuda	..	Raniganj Ironstone Shales Barakar
Stage ..	.. Talchir	..	Karharbari Talchir proper.

PHYLLOTHECA AUSTRALIS Brongniart.

(Plate XI., fig. 16.)

Phyllotheca australis Brongniart, 1828, Prodr. Hist. Végét. Foss., p. 152. McCoy, 1847, Ann. Mag. Nat. Hist., vol. XX., p. 156.

Phyllotheca ramosa McCoy, 1847, ibid., p. 156, pl. XI., figs. 2, 3.

Phyllotheca Hookeri McCoy, 1847, ibid., p. 157. pl. XI., figs. 4–6.

Phyllotheca concinna T. Woods, 1883, Proc. Linn. Soc. N.S. Wales, vol. VIII., pt. I., p. 75. pl. IX., fig. 2.

Phyllotheca australis Brongn., Feistmantel, 1890, Mem Geol. Surv., N.S. Wales, Pal. No. 3, p. 79, pl. XIV., figs. 2–5. Arber, 1905, Cat. Foss. Plants, Brit. Mus. The Glossopteris Flora, p. 17, pl. II., figs. 6–8. Walkom, 1915, Queensland Geol. Surv., Publ. No. 252, " Mesozoic Floras of Queensland," pt. I., p. 32, pl. I., fig. 5,[17] Walkom, 1925, Paper, T., Proc. Roy. Soc. Tas. for 1924, p. 74.

Observations.—From an examination of the type specimen in the Museum of the Geological Society of London, Prof. A. C. Seward[18] was of the opinion that it is impossible to distinguish between *P. indica* and *P. australis*. So far as the present writer has been able to judge, from the Australian examples and from the fuller drawings by Feistmantel of *Phyllotheca indica*, there are some notable points of difference between the two species, which were also remarked upon by Newell Arber.[19]

16 Newell Arber, 1917, p. 27, pl. II., figs. 5 and 9.
17 For more complete synonymy, see Arber, 1905, p. 17.
18 Seward, 1898, p. 288.
19 Arber, 1905, p. 21.

The almost perfect leaf-sheath here figured (fig. 16) shows its characteristic contracted form. It can be matched with a stem of equal diameter in the National Museum collection, having the whorls in position, and which was obtained from the uppermost coal seams at Newcastle, New South Wales.

The figured specimen referred by Dr. Walkom to this species, from the Ipswich Series (Trias.), of Denmark Hill, Ipswich, Queensland, has more distinctly separate leaves than usual ; their shortness and narrowness makes them referable to *Phyllotheca* rather than to *Neocalamites*, as Walkom has remarked.

Phyllotheca concinna T. Woods, from the Hawkesbury Sandstone of Sugarloaf Hill, New South Wales, represents a probable joint with indications of leaf-sheaths, and not unlike the specimen here figured (fig. 16).

Dimensions. The leaf-whorl, as preserved in the Bacchus Marsh specimens, has a maximum diameter of 26mm., whilst the height of the whorl, that is, the length of the longest leaves, is 35mm.

Distribution. *Phyllotheca australis* is confined to Australia and Tasmania. It is commonest in the Middle and Upper Coal Measures (Permian) of New South Wales, but is occasionally found in the Triassic. The Ipswich Series, in Queensland, of similar age, contains this species, as recorded by Dr. Walkom ; and there is a specimen from Brisbane in the National Museum. Feistmantel recorded *Phyllotheca australis* from the Mersey Coal-field and the Jerusalem Basin of Tasmania.[20]

The record of *Phyllotheca australis* in the Progress Report (No. III.) of the Victorian Geological Survey, p. 60, as occurring in the Jurassic of Cape Patterson, appears to be open to some doubt. The specimen has not been found in the collection of the National Museum ; there is, however, an example from the Albert River, Gippsland, labelled by McCoy as *P. australis*, but this identification seems open to question, as only the denuded stem is seen, with traces of joints, and might more justifiably be referred to *Equisetites* which is not uncommon in those beds. The Gippsland Coal-measures, have generally been accepted as the equivalent of the upper Mesozoic of Queensland (Walloon Series), but there are a few interesting occurrences of exceptional plant species which may, with further study, prove the existence of a Triassic flora as well, and which, from the already known evidence, must be the case in Tasmania. The working out of the exact succession of floras, in both areas is much to be desired. That for Tasmania has already been commenced by Dr. Walkom, who has recently published a paper on Tasmanian Mesozoic Plants,[21] and the writer, in collaboration with Miss I. Cookson, hopes shortly to undertake the description of the Victorian Mesozoic Flora.

20 Feistmantel, 1890, pp. 59–60.
21 Walkom, 1925.

Genus SCHIZONEURA, Schimper and Mugeot, 1844.

SCHIZONEURA MICROPHYLLA sp. nov.

Plate X., figs. 1–3, 5, 7, 8, 10–12. Plate XI., figs. 13, 14, 17, 18.
Plate XII., fig. 35. Plate XIII., figs. 43, 48.

Description.—Stems long, straight, moderately slender; surface fluted; pith-casts strongly grooved. Jointed at distant intervals. Leaflets apparently forming a loose sheath and numbering about 7 to 10, small, aciculate or pointed ovate, sometimes with blunt apices and traces of fission. Bases of leaves inserted in depressions at the nodes. Nodal diaphragms present, resembling those of *Equisetites*, but radially grooved to the centre. Vestiges of diaphragms seen attached to the stems in the fossils, probably representing in some cases the junction of branches.

Evidence of Fruiting Cone.—In 1903 Mr. R. Etheridge, jun., figures a specimen of *Schizoneura* from the Upper Coal Measures of New South Wales,[22] having on the end of the leaf-bearing axis two strobils, 2 to 2·5 cm. long. As Newell Arber remarks,[23] "the preservation is not sufficiently good to afford any details as to the morphological structure of the cone."

In this present instance we are more fortunate, since the surface of the cone is beautifully preserved, showing a polygonal cellular structure, probably the bases of sporophylls, which apparently having shrunken, have been resolved into a series of subangulate areas, each with a central pit. To the sides of the fruit are attached sharply pointed uninerved, bracteate sporophylls, and these were in all probability disposed over the surface and were detached before fossilization. The grooved pith-cast of the stem to which the fruit is joined, leaves no doubt as to the relationship of this cone to *Schizoneura microphylla*. This cone measures 6mm. in length: the width of the base of the body of the fruit being 2mm., whilst the total width of the cone with the bracts measures 7.5 mm.

Leaves.—The leaflets of the whorl are seen in figs. 1, 2, 3, 7, 8, 11, 12, 13 and 17. In figs. 1, 3, 8, 11 and 12 they are slender, aciculate to acutely pointed, or calamitean; whilst in 13 and 17 they are distinctly truncated. It is quite possible, however, that these latter may eventually be proved to belong to another species, especially since the venation is more distinctly parallel than in the other aciculate forms. The probable number of leaflets to the whorl in this species is about 5. In fig. 17 the nodal diaphragm forms an interesting feature between the only two leaves of the whorl preserved. Figs. 2 and 14 evidently represent the actual

22 Etheridge, R., jun., 1903, p. 234, pls. XLVIII. and XLIX.
23 Arber, 1905, p. 9.

surface impression of the stem, as the flutings are not deeply impressed ; in fig. 2 the starlike appearance in the middle of the fossil may indicate the cracking of the cortex by pressure taking place over a newly forming branch.

Nodal Diaphragms.—That seen in fig. 5 is so like the form in *Equisetites* that one might pause before referring it to *Schizoneura*, of which there have apparently been as yet no records in the present assemblage. But the discovery of other *Schizoneura* stems with the nodal diaphragms more or less in position, makes their reference to this genus certain. In *Schizoneura* the radii of the diaphragm are perhaps less numerous than in *Equisetites*, but the central papilla is well developed as in that genus as would be expected from their similarity in general structure.

Dimensions—

Diameter of widest stem, 7·5 mm.
Diameter of an average stem, circ, 6 mm.
Longest stem-fragment preserved, 10·5 cm.
An aciculate leaf measures 19 mm. by 2·5 mm. at the base.
Internodes often seven times the width of the stem.

Observations.—The stems of the above species of *Schizoneura*, as they are preserved in the Bacchus Marsh siliceous mudstones, are conspicuously straight, and distinctly and deeply grooved in the pithcasts, or with parallel sulcations when the surface impression is represented. The nodes are very distant and not always clearly visible. It was undoubtedly the character of the straight and conspicuously grooved stems with distant nodes that led McCoy to place these plant remains, apparently without hesitation, in the genus *Schizoneura*, for the leaf remains associated with these stems are very indistinct. It was only by carefully scanning every piece of material with a lens, that the fragmentary evidence here figured was obtained.

As regards the narrow, straight, and deeply grooved stems with inconspicuous leaf-sheaths, these structural characters find their nearest relationship with the smaller foliaceous varieties of *Schizoneura*, like *S. meriani* Schimper, of the Keuper of Stuttgart.

Comparisons.—Species like *Schizoneura gondwanensis*, Feistmantel, *S. australis* Etheridge, jnr.[24] and *S. africana*, Feistmantel, have the leaf-sheath typically developed from a basal sheath into a pair of large oblong-ovate leaves, with occasional sheaths with narrow leaflets. These leaflets may number, as in *S. gondwanensis*, as many as ten. In the present species one of the distinctive characters is the apparently uniform, aciculate, leaf-like whorl, the

24 In passing it may be pointed out that Newell Arber, in his *Glossopteris Flora*, pp. 5 and 9 (*tom supra cit.*), regards *S. australis* Eth, jun. as a synonym of *S. gondwanensis*

separate components of which amount to about five. It would be unsafe to assume that the large paired ovate leaves did not exist in this form, but no evidence is seen in the present series, whilst the leaflets are comparatively abundant.

It is just possible that the specimens figured by Feistmantel as *Schizoneura gondwanensis*[25] from the Damuda Series, and associated with a flora of Triassic affinities represent an undescribed form and more nearly related to the above, *S. microphylla.* In these figures the leaf whorls are shown to be more irregularly divided into several linear or wedge-shaped leaves, which are characteristically split at the apex. A comparison of this form with figs, 1, 3, and 7 of the present series shows a close resemblance where the leaflets of the latter are obtuse, or with a slight cleavage.

Class—**FILICALES.**

Fam.—**Cyathaceae.**

Genus—CONIOPTERIS, Brongniart, 1849.

CONIOPTERIS DELICATULA Shirley sp.

(Plate XI., figs. 24, 28.)

Coniopteris delicatula Shirley.

Coniopteris delicatula Shirley. 1898, Queensland Geol. Surv. Bull. 7, p. 18, pl. X., fig. 1.

Triphyllopteris botryoides Shirley, 1898, ibid., p. 20, pl. XVII., fig. 1.

Coniopteris delicatula Shirley sp., Walkom, 1917, Queensland Geol. Surv. (Dept. Mines), Publ. No. 257, pt. I. continued (Filicales), p. 6, pl. IV., fig. 2 ; text fig. 3.

Observations.—The flexibility of the rachis and the almost ragged tips of the pinnules would preclude a reference of the above figured specimens to Shirley's *Sphenopteris superba,*[26] to which it otherwise bears some resemblance. It is difficult indeed to separate the two genera on mere fragments, for the same type of venation occurs in both. The balance of evidence, however, seems in favour of a reference to *Coniopteris* because of the less rigid character above noted. Figure 28 represents the apical part of a pinnule with both acuminate and blunted tips to the lobes. Figure 24 has the bases of the pinnules expanded, and they are not so deeply incised as in Walkom's figure 2 on plate X. ; but this may be the result of dessication before fossilization.

Distribution.—*Coniopteris delicatula* was known only from the Ipswich Series (Trias.) of Shorncliffe, Sandgate, Queensland

25 Feistmantel, 1879, p. 9, pl. I., figs. 2 and 3.
26 Shirley, 1898, p. 18, pl. IV., fig. 8.

Fam.—**Thinnfeldieae** Walkom, 1917.

Genus—Thinnfeldia Ettingshausen, 1852.

Thinnfeldia Feistmantelli Johnston.

(Plate XII., fig. 30).

Thinnfeldia Feistmantelli Johnston, 1895, Proc. Roy. Soc. Tasmania figs. 2, 16.

Thinnfeldia odontopteroides, var. *triangulata* Shirley, 1898, Queensland Geol. Surv., Bull, 7, p. 22, pl. X., fig. 2.

Thinnfeldia odontopteroides, var. *normalis* Shirley, 1898, ibid., p. 21, pl. XI.

Thinnfeldia odontopteroides, var. *rhachidis* Shirley, 1898, ibid., p. 21.

Thinnfeldia odontopteroides (pars.) Seward, 1910, Fossil Plants, vol. II., p. 538, fig. 356 (A, B, D), 357.

Dicroïdium Feistmanteli Johnston sp., Gothan, 1912, Abhandl. Naturh. Gesellsch. Nürnberg, vol. XIX., heft 3, p. 78, pl. XVI., fig. 1. Antevs, 1913, K. Svensk. Vetenskaps Akad., Handl., vol. L., No. 5, p. 3, pl. I., figs. 1–7. Idem, 1914, ibid., vol. LI., No. 6, p. 52, pl. I., figs. 5, 6; pl. V., fig. 1.

Thinnfeldia Feistmanteli Gothan sp., Arber, 1917, New Zealand Geol. Surv., Palaeont. Bull., No. 6, p. 49, pl. V., fig. 4.

Thinnfeldia Feistmanteli Johnston, Walkom, 1925, Papers and Proc. Roy. Soc., Tasmania for 1924, p. 77, fig. 4.

Observations. In the absence of the distinctive feature of the branching rhachis of the frond, the above determination may be regarded as somewhat provisional; but the rhombic form of the pinnules and thickened rachis points, however, in the direction of the above species. The form of the pinnules and the odontopteroid venation compare very closely with specimens from the Trias of Leigh's Creek Coalfield, South Australia.

The figured specimen was collected by the late Dr. T. S. Hall, and is now in the National Museum.

Distribution—Mesozoic: Tasmania. Ipswich Series (Triassic) and Walloon Series (Jurassic) of Queensland. Trias., South Australia. Rhaetic: Argentine and New Zealand.

Thinnfeldia lancifolia Morris sp.

(Plate XI., figs. 20, 21).

Pecopteris odontopteroides, var. *lancifolia* Morris, 1845, in Strzelecki's Physical Description of New South Wales, p. 249, pl. VI., fig. 4.

Thinnfeldia media T. Woods, 1883, Proc. Linn. Soc., N. S. Wales, pl. VI., fig. 1.

Thinnfeldia odontopteroides Morris sp., var. *falcata*, T. Woods, 1883, ibid., pl. VIII., fig. 1.

Thinnfeldia odontopteroides Morris, sp. var. *superba*, Johnston, 1885, Papers and Proc. Roy. Soc. Tasmania, p. 372.

Thinnfeldia media T. Woods, Johnston, 1888, Geol. Tasmania, pl. XXIV., fig. 5.

Pecopteris (*Thinnfeldia*) *odontopteris* Morris, Johnston, 1888, ibid., pl. XXV., figs. 1, 2, 4.

Thinnfeldia superba Johnston, 1888, ibid., pl. XXVI., figs. 4, 5.

Thinnfeldia lancifolia Morris sp., Szajnocha, 1888, Sitzungsb. d. k. Akad. Wiss. Wien, vol., XCVII., p. 231, pl. I., figs. 4B, 5-7.

Thinnfeldia odontopteroides Morris sp. (pars), Feistmantel, 1890, Mem. Geol. Surv. N.S. Wales, Palaeontology, No. 3, pl. XXIX., fig. 4 (?).

Thinnfeldia odontopteroides Morris sp. var., Etheridge jnr., 1892, Geol. and Palaeont., Queensland, pl. XVII., fig. 7.

Thinnfeldia media T. Woods, Etheridge jnr., 1892, ibid., pl. XVIII., fig. 10.

Thinnfeldia buftoni Johnston, 1896, Papers and Proc. Roy. Soc. Tasmania for 1894–5, p. 61, fig. 18.

Thinnfeldia indica Feistmantel, var. *aquilina*, Shirley, 1898, Queensland Geol. Surv., Bull. No. 7, p. 21, pl. VI., fig. 2.

Thinnfeldia indica Feistm. var. *media*, Shirley, 1898, ibid., pl. V., fig. 1.

Thinnfeldia odontopteroides Morris sp. (pars.), Dun, 1909, Rec. Geol. Surv. N.S. Wales, vol. VIII., p. 314, pl. XLIX., fig. 1.

Dicroïdium lancifolia Morris sp., Gothan, 1912, Abhandl, Naturh. Gesellschaft Nurnberg, vol. XIX., p. 78, pl. XVI., figs. 2–4.

Thinnfeldia lancifolia Morris sp., Arber, 1913, Proc. Roy. Soc. Lond., Ser. B., vol. LXXXVI., p. 346, pl. VIII., fig. 7.

Dicroïdium lancifolium Morris sp., Antevs, 1914, K.Svenska Vet. Akad. Handl., vol. LI., No. 6, p. 58, pl. V., figs. 6, 7.

Thinnfeldia lancifolia Morris sp., Walkom, 1917, Queensland Geol. Surv. Publ. No. 257, p. 21, pl. III., fig. 3; pl. IV., fig. 1; pl. VII., fig. 2; text-fig. 6. Arber, 1917, New Zealand Geol. Surv. Palaeont., Bull. No. 6, p. 49, pl. V., figs. 1, 2, 6. Walkom, 1925, Papers and Proc. Roy. Soc. Tasmania for 1924, p. 78.

Observations. The pinnules here figured are quite typical as compared with those seen in the median part of the frond of *T. lancifolia.* The distinct and characteristic midrib forks and dies out before reaching the apex. The absence of the incurvation of the upper margin of the pinnule near the base precludes its reference to *T. indica* Feistmantel.

Distribution. Found in both the Trias (Ipswich Series) and the Jurassic (Walloon Series) in Queensland, Mesozoic of Tasmania. The Rhaetic of New Zealand and the Argentine.

THINNFELDIA ODONTOPTEROIDES Morris sp.

(Plate XI., fig. 19.)

Pecopteris odontopteroides Morris, 1845, in Strzelecki's Description of New South Wales, p. 249. figs. 2 and 3. Carruthers, 1872, Quart. Journ. Geol. Soc., vol. XXVII., p. 355. pl. XXVII., figs. 2, 3.

Thinnfeldia obtusifolia (pars.) Johnston, 1888, Geol. Tasmania. pl. XXV., figs. 7, 14 ; pl. XXVI., figs. 21, (?) 7, (?) 15.

Thinnfeldia odontopteroides Morris sp., Feistmantel, 1890. Mem. Geol. Surv. N. S. Wales, Palaeontology, No. 3, pl. XXVI., fig. 2 ; pl. XXVIII., fig. 8 ; pl. XXIX., figs. 1, 2, 3, 5. Etheridge, jnr., 1892, Geol. and Pal., Queensland. pl. XVII., fig. 1. Dun, 1909, Rec. Geol. Surv. N.S. Wales. vol. VIII., pl. XLIX., fig. 2. Seward, 1910, Fossil Plants, vol. II., p. 538, fig. 358.

Dicroïdium odontopteroides Morris sp., Gothan 1912, Abhandl, Naturh. Gesellsch. Nurnberg, vol. XI. heft 3, p. 78, pl. XVI., fig. 5. Antevs. 1914, K. Svenska Vetenskaps Handl., vol. LI., No. 6, p. 55, pl. II., figs. 2, 3 ; pl. IV., figs. 6, 7.

Thinnfeldia odontopteroides Morris sp., Walkom, 1917, Queensland, Geol. Surv. Publ. No. 257, p. 19, pl. III., fig. 1. Arber, 1917, New Zealand Geol. Surv. Palaeont. Bull. No. 6, p. 50. Walkom, 1925, Papers and Proc. Roy. Soc. Tasmania for 1924, p. 78, fig. 5.

Observations. The pinnules here figured, representing as they do the typical oval and bluntly pointed shape seen usually in *T. odontopteroides*, is referred to that species. The venation is alethopteroid rather than odontopteroid as in most of the examples of *T. odontopteroides.* Arber[27] remarks, however, "nerves all arising directly from the rachis, and spreading throughout the lamina with dichotomy, or a more or less well-marked median nerve may

27 Arber, 1917, p. 50.

be present, giving off forked lateral nerves at an acute angle." Thus, according to that author, both types of venation may be present.

Distribution. Ipswich and Walloon Series of Queensland (Trias and Jurassic). Hawkesbury Sandstone and Wianamatta Shales of New South Wales; also at Dubbo, New South Wales; Leigh's Creek, South Australia (Triassic); Port Phillip, near Grice's Creek and South Gippsland (Jurassic).

FERN-LIKE PLANTS.—INCERTAE SEDIS.

Genus—TAENIOPTERIS Brongniart, 1828.

TAENIOPTERIS WIANAMATTAE Feistmantel sp.

(Plate XIII., fig. 51.)

Macrotaeniopteris wianamattae Feistmantel, 1878, Palaeontographica, Suppl. vol. III., Lief. 3, Heft 3, p. 107, pl. XIII., fig 2. Wilkinson, 1879, Ann. Rep. Dept. Mines, N.S. Wales, p. 215, pl. V. T. Woods, 1883, Proc. Linn. Soc. N.S. Wales, vol VIII., p. 118, pl. 10A. Feistmantel, 1890. Mem. Geol. Surv. N.S. Wales, Palaeont. No. 3., p. 116, pl. XXVII., figs, 1, 2. Etheridge, jun., 1892, Geol. and Pal. Queensland, p. 376. Dun, 1898, Austr. Assoc. Adv. Sci., vol. VII., p. 397.

Taeniopteris sweeti McCoy, 1898, Proc. Roy. Soc. Vict., N.S., vol. X., pt. II., p. 285, and text-fig.

Macrotaeniopteris woodsi Dun, 1898, Austr. Assoc. Adv. Sci., vol. VII., p. 399.

Taeniopteris sp. Arber, 1905, Cat. Foss. Plants (Glossopteris Flora), Brit. Mus., p. 128.

Taeniopteris (*Macrotaeniopteris*) sp. Chapman, 1914, Australasian Fossils, p. 88.

Taeniopteris wianamattae Feistm. sp., Walkom, 1917, Queensland Geol. Surv. Pub. No. 257, pt. I., p. 38.

Taeniopteris (*Macrotaeniopteris*) *wianamattae* Feistm. Chapman, 1919, Victorian Naturalist, vol. XXXV., No. 10, pp. 149, 150, 152.

Note on the Type-specimen of T. Sweeti McCoy.—I have carefully examined the type of *Taeniopteris Sweeti* described (ref. above) by McCoy, and find it to be identical in all the preserved characters, such as width of lamina, and spacing and forking of secondary veins, with *T. wianamattae*. This I have already stated in another place. In the original description McCoy says that the specimen came from the *Gangamopteris* Sandstone. The character of the matrix, however, clearly shows its origin to be from the upper, siliceous layer in the trench at Bald Hill (see remarks *antea*, p. 124).

Distribution of T. wianamattae.—In Queensland this species occurs at Ipswich, where it is rare (T. Woods); and at the Tivoli Coal Mine (R. Etheridge, jun.). Both of these localities are in the Ipswich Series, of Triassic age.

In South Australia the Leigh's Creek coal borings have revealed examples of *T. wianamattae*.[28] A re-examination of plants from that series, by Miss Cookson and myself, show also the presence of *Thinnfeldia Feistmanteli*, *Cladophlebis Albertsi*, *Taeniopteris Dunstani*. *T. cf. Tenison-woodsi* and *Equisetites rotiferum*. The balance of evidence, therefore. is strongly in favour of a Triassic age for the series and may be compared with the lower part of the Upper Coal Measures in Tasmania.

Series—GYMNOSPERMEAE.

Class—CYCADALES.

Genus—PTILOPHYLLUM (Morris, foliage, 1841). WILLIAMSONIA (Carruthers, flowers, 1870).

PTILOPHYLLUM (WILLIAMSONIA) PECTEN *Phillips sp.*

(Plate XII., fig. 36.)

Cycadites pecten Phillips, 1829, Geol. Yorkshire, p. 148, pl. VII., fig. 22.

Pterophyllum pecten Phillips sp. Lindley and Hutton, 1834, Fossil Flora, vol. II., pl, CII.

Ptilophyllum acutum Morris, 1840, Trans. Geol. Soc. Lond., ser. 2, vol. V., p. 327, pl. XXI., figs. 1–3.

Ptilophyllum oligoneurum T. Woods, 1883, Proc. Linn. Soc. N.S. Wales, vol. VIII., p. 149., pl. VII., figs. 2–4. Etheridge, 1892, Geol. and Palaeont, Queensland, p. 382, pl. VII., fig. 11; pl. XVI., fig. 2.

Ptilophyllum Officeri McCoy, 1894, Proc. Roy. Soc. Vict., vol. VI., p. 143.

Williamsonia pecten Phillips sp., Seward, 1900, Cat. Mesozoic Plants, Brit. Mus. Jurassic Flora, vol. I., p. 190, pl. II., fig. 7; pl. III., text-figs. 30–35.

Ptilophyllum (Williamsonia) pecten Phillips sp. Walkom, 1917, Queensland Geol. Surv. Pub. No. 259, Mesozoic Flora of Queensland, pt. 1., p. 14, pl. V., fig. 6.

Ptilophyllum cf. *oligoneurum* T. Woods, Chapman, 1919, Victorian Naturalist, vol. XXXV., p. 150.

28 Chapman, 1919, p. 149.

Observations.—The present figured specimen of the frond of *Ptilophyllum pecten* in the Trias of Bacchus Marsh seems to bear out Newell Arber's conclusion that *P. acutifolium*, which that author has figured from the Middle Jurassic of Southland, New Zealand,[29] is distinct from the present species. The Bacchus Marsh specimens have the pinnae rather long, slender, and acuminate towards the tip. Unlike those of *P. acutifolium*, they are rather crowded and parallel-sided for quite two-thirds of their length.

Dimensions of figured specimen.—Width of frond, 28 mm. ; length of frond, as figured, 66 mm. Length of longest pinna, 2 mm.

No evidence was obtained from the present series of specimens of the floral elements with microsporophylls. It may be noted, however, that occasional ovoid bodies like small nuts, enclosed in siliceous mudstone, when broken open, show a distinct cortex and within a mass of little seed-like bodies (see *postea*).

Distribution.—Previously known from the Jurassic of England, Germany, India, Graham Land, and Queensland ; and from the Lower Cretaceous of Greenland.

CYCADACEOUS FRUIT.

Plate XII., figs. 40, 40A

Description.—Several specimens of large, apparently ovoid or subcylindrical fruits, containing small seed-like bodies, are found in the present series. From their more or less distorted form, they must have been of soft texture when buried in the sediment. There appears to have been a fairly thick, spongy cortex, within which are crowded innumerable spherical bodies. These fruits remind one of the ovulate strobils of the Cycadoidea. The enclosed seeds closely resemble the megasporophylls seen in the figure of *Cycadeoidea* (*Bennettites*) *Gibsoniana* figured by Seward.[30] They measure about 1 mm. in diameter and are subspherical or polygonal. What appears to be a central vascular strand is present, as also the thick cortex shown in Seward's figure. The strobil measures 23 × 30 mm.

29 Arber, 1917, p. 53, pl. XI., figs. 1, 2, 5.

30 Seward, 1917, p. 392, fig. 521B.

Class—GINKGOALES.

Genus GINKGOITES Seward, 1919.

GINKGOITES DIGITATA Brongniart sp.

Plate XI., fig. 29.

Cyclopteris digitata Brongniart, 1828, Hist. Veg. Foss., p. 219, pl. LXI. bis, figs. 2, 3. Lindley and Hutton, 1883, Foss. Flora, vol. I., pl. LXIV. Dunker, 1846, Wealdenbildung, p. 9, pl. I., fig. 8 ; pl. V., figs. 5, 6. ; pl. VI., fig. 11.

Ginkgo digitata Brongn. sp. Heer, 1877, Fossil Flora Arct., vol. IV. (1), p. 40, pl. VIII.. fig. 1*a* ; pl. X., figs. 1–6.

Salisburia digitata Brongn. sp. Saporta, 1884, Pal. Franc., vol. III., p. 294, pl. CLX., figs. 1–5.

Ginkgo digitata Brongn. sp. Seward, 1900, Jurassic Flora, Yorkshire (Brit. Mus.), part 1, p. 254, pl. IX., figs. 1, 2, 9, 10 ; text-fig. 45. Walkom, 1917, Queensland Geol. Surv. Publ. No. 259, pt. 1., concl. p. 8, pl. I., figs. 3, 4, 5.

Ginkgoites digitata Brongn. sp. Seward, 1919, Foss. Plants, vol. IV., p. 14, text-figs. 634, 639. Walkom, 1925, Papers and Proc. Roy. Soc., Tasmania, for 1924, p. 84.

Observations.—One of the leaf-fragments in the present series is clearly referable to the above species. It represents about one-third of a leaf, together with the petiole. The venation is characteristic in its simple dichotomy, the veins being spaced about 6 in 4mm. near the middle of the leaf. The margin is deeply divided. The type of leaf is exactly matched by Seward's figure 9 on pl. IX. of his Jurassic Flora, pt. 1.

Ginkgoites digitata is represented in the Ipswich beds (Trias), Queensland, by a good series, figured by Walkom.

Distribution.—The remains of leaves of the *G.digitata* type are of world-wide distribution, and they range from the Trias to the Jurassic. They are more commonly found in Jurassic strata, as in the floras of Yorkshire, Franz-Josef Land, Turkestan, India, Mongolia, Japan, and Victoria (Aust.).

Genus BAIERA Braun, 1843.

BAIERA DARLEYENSIS sp. nov.

Plate XII., figs. 32–34.

Description.—Leaf deeply incised, the extremities widely forked, either sharply truncated, as in *B. ipsviciensis* Shirley,[31] or outspread and laciniate. One specimen figured (fig. 34) shows a marked flexuosity or flaccidity of the lamina, but otherwise this agrees with the remaining types. The venation is rather close, about 5 to the lamina in the terminal portion. There is some resemblance to the Queensland species already mentioned, but the small size, about one-half to one-third the width, as well as the laciniate character of the terminations, separate this species from those previously described.

Dimensions.—Length of leaf, circ. 13mm. Width of incised portion of lamina, 1.5mm. to 2mm. and 3mm. at the apices. Divergence of tips, circ. 10mm. from point to point.

Observations.—The above species is in some respects an extreme form of the genus, and recalls Zalessky's genus *Ginkgopsis*.[32]

Remains of *B. darleyensis* are fairly abundant in the Trias of Bacchus-Marsh. Our specimens are suggestive of the *B. ipsviciensis* figured by Shirley and Walkom from Queensland, but differ in important details which seem to be specific, as set forth above. The related *B. ipsviciensis* has only been found in Queensand, in the Trias (Ipswich Series) of Denmark Hill.

Genus—STACHYOPITYS Schenk, 1867.

(? Male Flowers of Ginkgoales.)

STACHYOPITYS cf. ANNULARIOIDES Shirley.

Plate XI., fig. 25.

Stachyopitys annularioides Shirley, 1898, Queensland Geological Survey, Bull. No. 7, p. 13, pl. XVII., fig. 1. Walkom, 1917, ibid., Publ. No. 259, p. 13, pl. IV., fig. 6.

Observations.—In fig. 25 is represented an annulate arrangement of bracteate leaves, which is in all probability related to Shirley's *Stachyopitys annularioides*. These remains, in isolated fragments, are quite common on the slabs with *Ginkgo* and *Baiera*; this association would seem to be more than a coincidence.

31 Shirley, 1898, p. 12, pl. III., fig. 2. Also Walkom, 1917, p. 11, p. IV., figs. 1 and 2.

32 Seward, 1919, p. 77.

Genus—ANTHOLITHUS Heer, 1882.

(? Male Flowers of Ginkgoales.)

ANTHOLITHUS sp.

Plate XI., figs. 22, 23, 26.

cf. *Antholithus*, sp. Seward, 1919, Fossil Plants, vol. IV., p. 52, fig. 654.

Observations.—The specimen above referred to is from the English Jurassic Series of Yorkshire.[33] These forms were noted as "pollen sacs of *Ginkgo*" by Seward in the earlier, British Museum, monograph ; the leaflets are more regularly ovate than those now figured, the latter being more or less truncated and arranged with some regularity along a straight axis and are often petiolate.

DOUBTFUL GINKGOALES.

Genus—PHOENICOPSIS Heer, 1877.

PHOENICOPSIS ELONGATUS Morris sp.

Plate XI., fig. 27.

Zeugophyllites elongatus Morris, 1845, in Strzlecki's Phys. Descr. of New South Wales and Van Dieman's Land, p. 250, pl. VI., figs. 5, 5A.

Phoenicopsis elongatus Morris sp. Seward, 1903, Ann. S. African Mus., vol. IV., p. 67, pl. IX., figs. 1, 9, 10 Walkom, 1917, Queensland Geol. Surv., Publ. No. 259, p. 27, pl. IX., figs. 2, 3. Seward, 1919, Victorian Naturalist, vol. XXXV., No. 10, pp. 151, 153. Walkom, 1925, Papers and Proc. Roy. Soc. Tasmania for 1924, p. 87.

Observations.—The long linear leaves of *Phoenicopsis* are represented in the present series by poorly developed but undoubted examples, mostly fragmentary. An unusually complete one is that here figured.

In passing, one may note that, in revising and placing the palaeontological collections at the National Museum, it was interesting to see that the former Director, Sir Fredk. McCoy, had labelled some Tasmanian examples of typical leaves of the above species as "*Zeugophylites*," for we remember that in 1847 he had confused the leaves of *Noeggerathiopsis Hislopi* with Morris' *Zeugophyllites*, as it was then termed.

Dimensions.—The figured specimen from Bacchus Marsh has a length of 32 mm., whilst its greatest width is 4.5 mm.

33 Seward, 1900, p. 260, fig. 45.

Distribution.—Trias: Tasmania (Morris). Rhaetic: Stormberg (Seward), and South America (Szajnocha and Kurtz). Jurassic: Walloon Series: Queensland (Walkom); also Tasmania.[34]

PHOENICOPSIS FEISTMANTELI, nom. mut.

Plate XII., figs., 31, 31*a*.

Podozamites lanceolatus (non Lindley and Hutton sp.), Feistmantel, 1877, Palaeontologia Indica, ser. XI., vol. II., pt. 2, p. 91, pl. III., figs. 7–14; pl. IV., figs. 1–10.

Observations.—The above form, described by Feistmantel as *Podozamites lanceolatus*, Lindley and Hutton sp. cannot be referred to that species, as already pointed out by Prof. Seward,[35] who further suggests its relationship to *Phoenicopsis*, in the following words:—"The specimens figured by Feistmantel from Upper Gondwana rocks in India as *P. lanceolatus* (fig. 813), should, I am inclined to think, be assigned to *Phoenicopsis*."

Feistmantel records the species as pretty frequent in the Jabalpur group of India (equivalent of Upper Lias to Lower Oolite).

The leaves are slenderer than in *P. elongata*. The apex is acuminate, and the venation parallel and rather closely spaced. In some instances there is a median ridging which is merely a longitudinal folding of the leaf.

Fragments fairly abundant in the present series.

Genus—PSYGMOPHYLLUM Schimper, 1870.

PSYGMOPHYLLUM FERGUSONI, sp. nov.

Plate XII., fig. 39; plate XIII., figs. 44, 45.

Description.—The remains of these leaves are not complete, but there is sufficient to show that it was flabellate, with crenate to wavy margin. The veins are parallel for the most part, with occasional distinct anastomosing and also dichotomous branching. The veins are stout, and are seen in the negative condition as deeply incised lines with a ridge between. The lamina itself was finely lineated with secondary or merely superficial veins.

Dimensions.—The veins are about ·5 mm. to 1 mm. apart. Width of lamina preserved, 21 mm.; length, 31 mm.

Comparisons and Observations.—The "*Cyclopteris*" *crenata* of Brauns,[36] which was described from the Rhaetic of Brunswick, Germany, is a somewhat similarly flabellate leaf to ours, but the

34 In a letter received in 1912, the late Mr. W. H. Twelvetrees wrote me that *Phoenicopsis elongatus* is found abundantly throughout the Mesozoic in Tasmania.

35 Seward, 1919, p. 455.

36 Brauns 1862, p. 52, pl. XIII., fig. 8. ? *Psygmophyllum crenatum*, Brauns, sp., Seward, 1919, p. 88.

edge is more distinctly crenate and the veins are nearly 3 mm. apart. Otherwise it approaches the present species more closely than any other described form.

The leaves are distinct from those of *Ginkgoites* and *Ginkgophyllum*, which have divergent and dichotomous veins and do not anastomose. The type species of *Psygmophyllum* is "*Noeggerathiopsis*" *flabellata* Lindley and Hutton.[37]

The rigidity of the leaf and veins in the above specimens, and the acute dichotomy of the venation are strong evidence in favour of its relationship with the Ginkgoales and not with *Chiropteris*, to which genus Newell Arber[38] has referred a New Zealand species almost identical with the above. In the same report Newell Arber has named the South Australian (Leigh's Creek) specimen, which Etheridge, jun., described as *Anthyopsis* sp.,[39] *Chiropteris Etheridgei* sp. nov.

Another form somewhat related to *P. Fergusoni*, from the Trias (Ipswich Series) of Queensland, was described by Carruthers[40] as *Sphenopteris cuneata*. This has a shorter and broader leaf, as the name denotes.

Psygmophyllum is known from rocks as early as the Devonian, and the genus persists into the Rhaetic, if Brauns and Newell Arber's species are included.

CONIFERALES.

Fam. Cupressineae.

Genus—BRACHYPHYLLUM Brongniart, 1828.

BRACHYPHYLLUM CRASSUM T. Woods.

Plate XIII., fig. 47.

Brachyphyllum australe, var. *crassum* T. Woods, 1883. Proc. Linn. Soc. N.S. Wales, vol. VII., pt. I., p. 159, pl. V.

Brachyphyllum crassum T. Woods, R. Etheridge jun., 1892, Geol. and Pal. Queensland, p. 385, pl. XVIII., fig. 2.

(?) *Palissya australis* McCoy, Chapman, 1908, Rec. Geol. Surv. Vict., vol. II., pt. IV., p. 218, pl. XXXV., fig. 2.

Brachyphyllum crassum T. Woods, Walkom, 1917, Queensland Geol. Surv., Publ. No. 259, p. 25, pl. IX., fig. 1.

Observations.—The specimen now figured appears to be a terminal shoot, which bears short, cordate leaves with acuminate

37 Lindley and Hutton, 1832, pls., XXVIII., XXIX.
38 Newell Arber, 1917, p. 27, pl., III., fig. 8.
39 Idem, 1917, p. 28.
40 Carruthers, 1872, p. 355, pl. XXVII., fig. 5, Shirley, 1898, p. 24, pl. XXIII.

and sometimes spinose apices. Fragments of leaves in the surrounding matrix suggests *Elatocladus*, but these may or may not represent the leaves of the basal part of this branchlet. The acuminate leaflets show a close resemblance to the shape of the cone-scales of *Araucarites*, but are minute in comparison. On the whole it seems more advisable to regard it as a terminal branch of the *Brachyphyllum* type, of which the Jurrassic *B. gippslandicum* McCoy, is another closely related form. The material of all our Australian Mesozoic examples of this and allied genera is too meagre for an accurate description, but in the advent of a more complete series, this would form an interesting group of fossil plants to decipher.

On examining the figured type of T. Woods' *B. crassum*, Mr. R. Etheridge, jun., found the leaves "terminated upwards in a short mucro".[41] In this character it agrees with the present specimen.

Distribution.—Tenison Woods records *B. crassum* from the Ipswich Series (Triassic); Tivoli Mine. It also occurs in the Walloon Series (Jurassic) of Clifton Colliery, Walloon and Rosewood (Etheridge, jun. and Walkom).

CONIFERALES, incertae sedes.

Genus Elatocladus Halle, 1913.

Elatocladus conferta Oldham and Morris sp.

Plate XII., fig. 37; Plate XIII., fig. 46.

Cunninghamites confertus Oldham and Morris, 1863, Palaeontologia Indica, vol. I., pt. I., pl. XXXII., fig. 10.

Palissya conferta Old. and Morr. sp., Feistmantel, 1877, Ibid., ser. II., vol. II., pt. II., p. 137, pl. XLV., figs. 4–8, 8*a*; pl. XLVIII., fig. 4.

Palissya australis McCoy, in Stirling, 1900, Notes on the Fossil Flora of South Gippsland. Rep. on Vict. Coal-fields, No. 7., Dept. of Mines, Vict., pl. III., figs. 8, 9. Chapman, 1908, Rec. Geol. Surv. Vict., vol. II., pt. 4, p. 218, pl. XXXV., figs, 4, 5.

Elatocladus conferta Old. and Morr. sp., Newell Arber, 1917, New Zealand Geol. Surv., Pal. Bull. No. 6, p. 58., pl. L., figs., 1, 3; pl. VI., fig. 4; pl. VIII., fig. 6.

Description.—The present examples include a stem with three leaflets attached to one side (fig. 37), found in the red ironstone of the trench at Bacchus Marsh; and also a detached leaflet, highly carbonized, found on the softer, whitish pipe-clay bed. In fig. 37 the stem is thick and slightly imbricated as though the foliage had been stripped off, whilst there are three leaves still remaining, which

41 Etheridge, jun., 1892, p. 385.

compare closely with those from the Rajmahal beds of India, referred by Oldham and Morris to *Cunninghamites confertus.* Feistmantel has described further Indian specimens as follows:—" Branches distichous, alternate, furnished with leaves; leaves broader, shorter, at the base constricted, acuminated, on a decurrent cushion, sessile, spirally disposed, but imitating the form of a comb (fructification unknown)."

Observations.—The generic name of *Elatocladus* was given by Halle to include sterile shoots of conifers like that of *Palissya* and *Taxites.* Halle included *Palissya australis* of McCoy in the same genus, as a synonym of *Elatocladus conferta* Oldham and Morris.

Distribution.—The Victorian forms referred to occur in the Jurassic of South Gippsland. Arber's specimens are from the Rhaetic to Middle Jurassic of New Zealand.

Genus—Raritania Hollick and Jeffrey, 1909.

(?) Raritania victoriae, sp. nov.

Plate XIII., figs. 49, 50.

Description.—These examples consist of slender, dichotomously branched axes, which are gracefully curved, and at first sight resemble the remains of *Baiera* (*Jeanpaulia*) *Lindleyana* of Schimper. The edges of the axes are seen, however, to carry what appear to be minute prickle-leaves. The distinguishing feature of the present species is the graceful curvature of the branches and axis, which in *Raritania gracilis*, of the Cretaceous of New Jersey and Kreischerville, consist of straight, divergent branches thrown off from the main axis at an acute angle.

The shoot here figured is about 11mm. in length and the axis is .5mm. in width. The stem is very finely striate.

Observations.—On account of the uniqueness of the above species, the reference to the North American genus, *Raritania*, is here regarded as provisional. Further examples may prove its relationship with *Baiera* rather than with *Raritania.*

SEEDS, incertae sedis.

Genus—Microtesta, nov.

Microtesta triassica, gen. et. sp. nov.

Plate XII., fig. 38.

General Characters.—The minuteness, the ovate to subspherical form, and absence of keels or salient points of attachment prevents the reference of this fossil seed to any genus or group of uncertain position already described.

Description.—This type of small seed-like body is quite abundant in the red ironstone shale of the *Schizoneura* bed. On one slab, from which the figure was taken, I counted eight separate specimens. This seed must have had a thin but evidently tenacious covering, and the shrinkage of the mud during its consolidation caused the seeds to be now easily detached. Remains of *Schizoneura* are commonly associated in the slab examined. The seeds are very minute and average about .5mm. in their longest diameter. They are sub-ovate, depressed and slightly hollowed on one side, as if indicating a place of slight attachment. The surface is finely reticulated with a polygonal meshwork.

FOSSIL WOOD, indeterminate.

Plate XIII., fig. 42.

An interesting, though rather unsatisfactory specimen as regards preservation, is found in this series. It has a wrinkled and fibrous structure, and the exposed surface is seen to be partially covered with small barnacle-like bodies. After sifting the evidence, one has to conclude that this latter structure is inorganic and may be referred to the cone-in-cone structure so often found in mudstones originally rich in calcareous matter. In this specimen the weathering of the cones, gives the further illusion of separate valves closely fitting together.

The specimen of fossil wood measures about 12cm. in length and 4cm. in the widest part. The cones have a height of about 7mm.

IV.—LIST OF PLANTS HEREIN RECORDED; WITH THE RANGE IN TIME OF GENERA AND SPECIES.

Genus.	Species.	Range.
PHYLLOTHECA	.. .. ..	Permian (India, South Africa, South America, Australia) Triassic (Australia)
	P. indica Bunbury	Permian (India) Triassic (Australia—Victoria)
	P. australis Brongn.	Permian (Australia—New South Wales and Tasmania Triassic (Australia—New South Wales, Queensland and Tasmania)
SCHIZONEURA	.. .. ..	Base of Permian (India) Top of Permian (South Africa, Australia—New South Wales) Triassic (Australia—New South Wales, Queensland and Victoria) Rhaetic (South Africa)

IV.—List of Plants—*continued.*

Genus.	Species.	Range.
	S. microphylla sp. nov.	Triassic (Australia—Victoria)
Coniopteris	.. .. ..	Triassic (Germany, Australia—Queensland and Victoria) Jurassic (England, Australia and New Zealand Cretaceous (North America and Greenland)
	C. delicatula Shirley sp.	Triassic (Australia—Queensland and Victoria)
Thinnfeldia	.. .. ..	Triassic (Australia—New South Wales, South Australia, Tasmania, Queensland and Victoria ; South Africa, India, and South America) Rhaetic (New Zealand) Lias (Hungary) Jurassic (England, France, Germany, India, Italy, Australia—New South Wales and Victoria)
	T. Feistmantelli Johnston	Triassic (Australia—Queensland, Tasmania, South Australia and Victoria Rhaetic (Argentina and New Zealand) Jurassic (New Zealand, Australia—Queensland and Victoria)
	T. lancifolia Morris sp.	Triassic (Australia—Queensland, and Victoria) Rhaetic (New Zealand and Argentina) Mesozoic (Australia—Tasmania) Jurassic (Australia—Queensland)
	T. odontopteroides Morris sp.	Triassic (Australia—Queensland, New South Wales, South Australia, and Victoria ; India) Rhaetic (Argentina, China, South Africa, America and Europe) Jurassic (Australia—Victoria and New South Wales)
Taeniopteris	.. .. ..	Upper Carboniferous (France) Permian (Thuringia, Lebach, Alsace, Virginia) Triassic and Rhaetic (Germany, South Africa, Argentina, China, Australia and New Zealand) Jurassic (England, Arctic Region, Poland, India, Japan, China, New Zealand and Australia) Wealden (North Germany and England)
	T. wianamattae, Feistm	Triassic (Australia, South Australia, Queensland, New South Wales and Victoria)
Ptilophyllum	.. .. ..	Triassic (Australia—Queensland [flowers], and Victoria [leaves])

IV.—List of Plants—*continued.*

Genus.	Species.	Range.
Ptilophyllum (*continued*)	.. .. ..	Jurassic (England, India, Grahamland, New Zealand, Australia—Queensland and Victoria [leaves]) Wealden (North Germany). Cretaceous (Greenland)
	P. pecten Phillips sp.	Triassic (Australia—Victoria) Jurassic (England, India, Australia—Queensland and Grahamland) Lower Cretaceous (Greenland)
Ginkgoites	.. .. ..	Trias and Rhaetic (South Africa, Australia—Queensland and Victoria) Jurassic (England, Scotland, Spitzbergen, North Germany, Turkestan, Japan, Oregon, Australia—Victoria) Cretaceous (Greenland) Tertiary-Eocene, Miocene and later. (I. of Mull, Greenland, North Italy, France, North America)
	G. digitata, Brongn. sp.	Triassic (Australia—Queensland) Jurassic (Great Britain, Franz Josef Land, Oregon, Japan, Australia—Victoria) Mesozoic (Australia—Tasmania) Up. Jurassic or Wealden (Spitzbergen)
Baiera ..	.. .. ..	Permian (France) Triassic (Switzerland, Sweden, Australia—Queensland) Rhaetic (Japan and New Zealand) Jurassic (England, Spitzbergen, China, Australia—Victoria) Lower Cretaceous (Dakota)
	B. darleyensis sp. nov.	Triassic (Australia—Victoria)
Stachyopitys	.. .. ..	Triassic (Australia—Queensland and Victoria) Rhaetic (Franconia, South America, and South Africa)
	S. annularioides, Shirley	Triassic (Australia—Queensland and Victoria) Jurassic (Grahamland)
Antholithus	.. .. ..	Triassic (Australia—Victoria) Rhaetic (Scania) Jurassic (England)
Phoenicopsis	.. .. ..	Triassic (Australia) Rhaetic (South Africa) Jurassic (North Germany, Franz Josef Land, Siberia, India and Australia)
	P. elongatus Morris sp.	Triassic (Australia—Victoria and Tasmania) Rhaetic (South Africa)

IV.—List of Plants—*continued.*

Genus.	Species.	Range.
PHOENICOPSIS (*continued*)	.. .. ..	Jurassic (Australia—Queensland and Tasmania)
	P. Feistmanteli sp. nov.	Triassic (Australia—Victoria)
		Jurassic (India)
PSYGMOPHYLLUM	.. .. ..	Devonian (Ireland, Norway, and Newfoundland)
		Carboniferous (England and Spitzbergen)
		Permian (France, Russia, Germany, South Africa, Australia—New South Wales)
		Triassic (Australia—Victoria)
	P. Fergusoni sp. nov.	Triassic (Australia—Victoria)
BRACHYPHYLLUM	.. .. ..	Triassic (Australia—Victoria)
		Rhaetic (New Zealand)
		Jurassic (England, France, India, Australia—Victoria)
		Lower Cretaceous (Portugal and North America)
	B. crassum T. Woods	Triassic (Australia—Queensland and Victoria)
ELATOCLADUS	.. .. ..	Triassic (Australia—Victoria)
		Rhaetic (Scania and New Zealand)
		Jurassic (England, India, Australia, Grahamland and New Zealand)
		Cretaceous (Westphalia, Moravia, Bohemia, Bulgaria, Greenland and North America
	E. conferta Oldh. and Morr. sp.	Triassic (Australia—Victoria)
		Rhaetic (New Zealand)
		Jurassic (New Zealand, Australia—Victoria)
RARITANIA	.. .. ..	Cretaceous (New Jersey)
	Raritania victoriae sp. nov.	Triassic (Australia—Victoria)

In digesting the foregoing summary of occurrences, we find that, amongst genera older than the Trias, there are five counts.

Of the Trias and Rhaetic, there are thirteen counts.

The genera younger than the Trias have eleven counts (excluding a doubtful record).

Thus, the balance of evidence as to the age of the flora removes it conclusively from the *Gangamopteris* horizon, and places it in the Trias, with a strong leaning towards the Jurassic facies.

V.—GEOGRAPHICAL RELATIONSHIPS OF THE FOSSILS.

A brief examination of our knowledge of the distribution of the various kinds of plants comprised in the present series, shows some striking points worthy of notice.

The equisetaleans, *Schizoneura* and *Phyllotheca* are apparently confined to the old Gondwana continent. Thus, *Schizoneura* appeared in Permian times in both South Africa and Australia, and persisted into the Triassic and Rhaetic in South Africa and Australia (New South Wales, Queensland and Victoria).

Phyllotheca had a similar and even wider distribution, but still over the tract of Gondwanaland. Its habitats in Permian time extended from India and Australia to South Africa and South America. In the Triassic period it was apparently confined to Australia (New South Wales, Queensland, Victoria and Tasmania): whilst the Rhaetic occurrence in New Zealand shows a later penetration into that area. Although not found in this series, we may note that the related *Equisetites* is known from beds as old as the Trias in Europe, the older Permian and Carboniferous records being more or less doubtful calamiteans. The appearance of *Equisetites* in the Australian flora as early as the Triassic (Ipswich series) shows its universal distribution in the early Mesozoic; though after remaining as a fairly abundant constituent of the southern flora until Jurassic times, it seems to have suddenly retreated to Europe, with the exception of the remnants still found living in Java, the West Indies and South America (Buenos Aires and Chili).

The ferns include *Coniopteris* (presumably a tree-fern), which is a genus known to have lived in Europe during Triassic times; in England, Australia and New Zealand during Jurassic times; and in North America and Greenland, probably, in Cretaceous times; *Thinnfeldia* was a late Gondwanaland development, as it is well distributed throughout the Trias and Rhaetic of India, Australia, New Zealand, South Africa and South America. In Jurassic times it extended its range into Europe, and it also doubtfully lived on in the North American Cretaceous.

Unlike many other Australian types of fossil plants, *Taeniopteris* had already established itself in the European and North American floras in Upper Carboniferous times, occurring in France and in Missouri. In the Permian it still flourished in those areas; persisting in England, Europe and the Arctic regions, through Jurassic times and even into the Wealden. During the Triasso-Rhaetic period *Taeniopteris* was well established in the later Gondwana flora in India, Australia, New Zealand, South Africa, China and South America. It is a prominent genus in most southern Jurassic floras, in which period it suddenly dies out, though still persisting in Europe into the Wealden.

The only representative of the Cycadales, *Ptilophyllum*, is another well-distributed genus, and appears first in the Southern Hemisphere, in Queensland, and now in Victoria. In New Zealand it is found in later, Jurassic, rocks, similar in its time occurrence in

England, Graham Land and India. It persists also in southern areas in Jurassic times, as it is found in the Walloon series in Queensland, as well as in New Zealand. Its latest appearance is in the Wealden of Upper Germany and the Cretaceous of Greenland. This fluctuating distribution is at least puzzling and suggests some curious palaeogeographical questions.

The Ginkgoales, represented by *Baiera* as the older type, and *Ginkgo* or *Ginkgoites*, range from the Permian till to-day. *Baiera* itself occurs in the Permian of France. In the Trias-Rhaetic it is found both in Europe and the later Gondwana areas. The Jurassic period saw it extending to North America, where it persisted till Lower Cretaceous times.

The type of the living *Ginkgo* dates from the Trias of Victoria and the Rhaetic of South Africa.

Amongst the genera of uncertain position, but allied to the Cycadales or Ginkgoales, are *Phoenicopsis* and *Psygmophyllum*. The genus *Phoenicopsis*, like several other generic types enumerated here, appears to have commenced its existence in the Southern Hemisphere, as it occurs in the present Triassic series and also in the Rhaetic of South Africa. It later made its appearance in Europe, in the Jurassic, at which time it was also a well known component of the Australo-Indian series.

Psygmophyllum. The range of this genus (in a less restricted form), is given as from Devonian to Permian. It is interesting to note the geographical distribution of the genus, which in Devonian and Carboniferous times was confined to Europe and North America. It then apparently spread to Gondwanaland in the Permian, where it is found in the South African and probably Australia (New South Wales) series of rocks. This present occurrence, in the Trias of Victoria, of examples quite typical of Lindley and Hutton's Carboniferous fossils from the English Newcastle Coal Measures, is therefore highly interesting as a record of persistence into the Mesozoic.

Of the Coniferales, *Brachyphyllum* has hitherto been confined almost entirely to the Jurassic rocks of England, France, India and Australia: but it has survived into the Lower Cretaceous of Portugal and the Dakota Group of North America. The oldest record, that of the present, Triassic occurrence at Bacchus Marsh, is further confirmed by the discovery of the genus by Newell Arber in probable Rhaetic rocks of Otago, New Zealand.

In *Elatocladus*, which according to Halle[42] should include "sterile Coniferous branches of the radial or dorsi-ventral type, which do not show any characters which permit them to be included in one of the genera instituted for more peculiar forms," we have a generic type similarly found in the Rhaetic of New Zealand as

42 Halle, 1913, vol. III., pt. XIV., p. 83.

well as in Sweden. The present occurrence extends the time range to the Trias. In Jurassic times it was a most important component of the later Gondwana flora of India, Australia, New Zealand and Graham Land, and also persisted in the European flora of that time. In the Cretaceous period it seems to have been restricted to North America and Europe.

The genus *Raritania*, only provisionally recorded here, in the Trias, is a North American Cretaceous type. Any further discoveries of this particular form in Australia will be awaited with interest.

VI. CONCLUSIONS.

From a consideration of the foregoing descriptions of plant remains from the *Schizoneura* bed of the trench in the Council Paddock at Bald Hill, it will be seen that the evidence is in favour of a Triassic age for this horizon.

It is interesting to note McCoy's close determination of the age of the bed, in spite of meagre data, for he recognised its Triassic affinities, even in the face of the inverted field relations as misunderstood at the time, that is to say, as regards the supposition of these beds occurring *under* the *Gangamopteris* Sandstone of Bacchus Marsh. One of the greatest triumphs of palaeontology is the fixing of exact horizons by an accurate valuation of the fossil remains; and in this direction McCoy not only did pioneering work, but drew lasting conclusions carried out on what one would now consider only poor material. As Dr. T. S. Hall more than once remarked to me, regarding modern criticisms, "I should not wonder if McCoy's earlier determinations came out right after all."

There still remains much to be done, however, in the way of collecting the plant remains of this Triassic bed. This series of specimens, though interesting, cannot be regarded as complete, for much might still be gathered as to essential structural portions of the plants discussed, fragments only of which are represented in the present collection.

What has already been discovered, as set forth here, is sufficient to show how important an horizon it is, for many unique kinds of plants have been brought to light since the record of McCoy's *Schizoneura* and *Ptilophyllum*.

Looking at the subject broadly, the Triassic period was a kind of "trying-out" time when the Upper Palaeozoic Flora or Lower Gondwana Series still struggled on, until it became a mere skeleton of its former self, to be absorbed by the incoming richer Jurassic or Upper Gondwana Flora.

The recent exhaustive work of Dr. A. B. Walkom on the Mesozoic Flora of Queensland, the classic volumes on Fossil Plants by Professor A. C. Seward, and the Monograph of Mesozoic Plants of New Zealand by the late Dr. Newell Arber, have all proved of the greatest value to aid in the comparison of types and structure found in the present series. Thanks to the foresight of Sir Fredk. McCoy, the Library of the National Museum contains many otherwise inaccessible works of the older authors, without reference to which a full comparison of the Bacchus Marsh Triassic plants could scarcely have been made.

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NOTE.

Since this paper went to press the present writer, in conjunction with Miss Cookson, B. Sc., has published "A Revision of the 'Sweet' Collection of Triassic Plant Remains from Leigh's Creek, South Australia". Trans. Roy. Soc. S. Australia, vol. L. 1926, pp. 163-178, pls. XIX-XXIV. The species in common between the two localities (Leigh's Creek and Bacchus Marsh) are as follows:—

Thinnfeldia Feistmantelli Johnst.

Thinnfeldia lancifolia Morris sp.

Taeniopteris wianamattae Feistm. sp.

Although the two floras have little in common, they both give the same chronological result, viz., Bacchus (upper flora), "Triassic, with a strong leaning towards the Jurassic facies", and Leigh's Creek, "Triassic, the flora having a fair proportion of precocious Jurassic types."

EXPLANATION TO PLATES.

Plate X.

Fig. 1.—*Schizoneura microphylla* sp. nov. Cast of stem, with traces of leaves. Paratype. Natural size.

Fig. 2.—*S. microphylla* sp. nov. External surface with attached leaflets. Paratype. Natural size.

Fig. 3.—*S. microphylla* sp. nov. A slender stem, showing nodes and leaflets. Paratype. Natural size.

Fig. 4.—*Phyllotheca indica* Bunbury. Stem with closely set joints and remains of whorled leaflets. × 3.

Fig. 5.—*Schizoneura microphylla* sp. nov. Nodal diaphragm. Paratype. × 2.

Fig. 6.—(?) *Phyllotheca indica* Bunbury. Rhizome with attached tubers. × 3.

Fig. 7.—*Schizoneura microphylla* sp. nov. Pith cast of stem, to the margin of which, at a node, remains of attached leaves are seen. Cotype. Natural size.

Fig. 8.—*S. microphylla* sp. nov. Pith cast, with traces of foliage at the nodes. Paratype. × 2.

Fig. 9.—(?) *Phyllotheca indica* Bunbury. Rhizome with attached tubers. × 3.

Fig. 10.—*Schizoneura microphylla* sp. nov. Stem and part of two nodal diaphragms. Paratype. × 2.

Fig. 11.—*S. microphylla* sp. nov. Leaflet from slab, near specimen figure 10. Paratype. × 2.

Fig. 12.—*S. microphylla* sp. nov. Short joint showing grooved and interlineated stem, with leaves attached. Paratype. × 2.

Plate XI.

Fig. 13.—*Schizoneura microphylla* sp. nov. Part of a cyclet of leaves. Paratype. × 2.

Fig. 14.—*S. microphylla* sp. nov. External surface of stem, with node and basal leaf imprints. Paratype. × 2.

Fig. 15.—*Phyllotheca indica* Bunbury. Stem with displaced nodes. × 4.

Fig. 16.—*Phyllotheca australis* Brongniart. Base of joint and leaf-sheath. Natural size.

Fig. 17.—*Schizoneura microphylla,* sp. nov. Leaves attached to nodal diaphragm. Paratype. × 2.

Fig. 18.—cf. *Schizoneura.* Epidermis of (?) rhizome, showing pits of rootlet attachment. × 2.

Fig. 19.—*Thinnfeldia odontopteroides* Morris sp. Rachis with three pinnules. × 2.

Fig. 20.—*Thinnfeldia lancifolia* Morris sp. A characteristic pinnule. X 2.

Fig. 21.—*T. lancifolia* Morris sp. A pinnule. × 2.

Fig. 22.—*Antholithus* sp. × 2.

Fig. 23.—*Antholithus* sp. × 2.

Fig. 24.—(?) *Coniopteris delicatula* Shirley sp. × 2½.

Fig. 25.—*Stachyopitys cf. annularioides* Shirley. × 2.

Fig. 26.—*Antholithus* sp. × 2.

Fig. 27.—*Phoenicopsis elongatus* Morris sp. × 2.

Fig. 28.—*Coniopteris delicatula* Shirley sp. Apex of frond. × 2½.

Fig. 29.—*Ginkgoites digitata* Brongniart sp. × 2.

EXPLANATION TO PLATES—*continued.*

PLATE XII.

Fig. 30.—*Thinnfeldia Feistmantelli* Johnston. (T. S. Hall coll.) Rachis and pinnules, showing venation. × 2.

Fig. 31.—*Phœnicopsis Feistmanteli* sp. nov. (Types as figured by Feistmantel, Pal. Ind., 1877). Two fragmentary leaves. × 2.

Fig. 31A.—*P. Feistmanteli* sp. nov. Apical portion of leaf. × 2.

Fig. 32.—*Baiera darleyensis* sp. nov. × 2. Paratype.

Fig. 33.—*B. darleyensis* sp. nov. × 2. Paratype.

Fig. 34.—*B. darleyensis* sp. nov. × 3. Holotype.

Fig. 35.—*Schizoneura microphylla* sp. nov. Strobil at terminal of a shoot. Cotype. × 6.

Fig. 36.—*Ptilophyllum* (*Williamsonia*) *pecten* Phillips sp. A frond; the original of McCoy's *Ptilophyllum Oficeri*. × 2½.

Fig. 37.—*Elatocladus conferta* Oldham and Morris, sp. Axis with three leaflets. × 6.

Fig. 38.—*Microtesta triassica* gen. et sp. nov. Holotype. × 52.

Fig. 39.—*Psygmophyllum Fergusoni* sp. nov. An imperfect leaf. × 2.

Fig. 40.—(?) Cycadaceous fruit. Natural size.

Fig. 40A.—Cycadaceous fruit. Enlarged view of one of the enclosed megaspores. × 4.

PLATE XIII.

Fig. 41.—(?) Cycadaceous fruit in matrix. Photograph. Natural size.

Fig. 42.—Wood, indeterminate. Encrusted with concretionary cone-in-cone structure. Photograph. Natural size.

Fig. 43.—*Schizoneura microphylla* sp. nov. Photograph of pith cast. Paratype. Natural size.

Fig. 44.—*Psygmophyllum Fergusoni* sp. nov. Photograph of Holotype. Natural size.

Fig. 45.—*P. Fergusoni* sp. nov. Enlarged drawing of holotype, to show venation. × 2.

Fig. 46. (?) *Elatocladus conferta* Oldham and Morris sp. Leaflet. × 4.

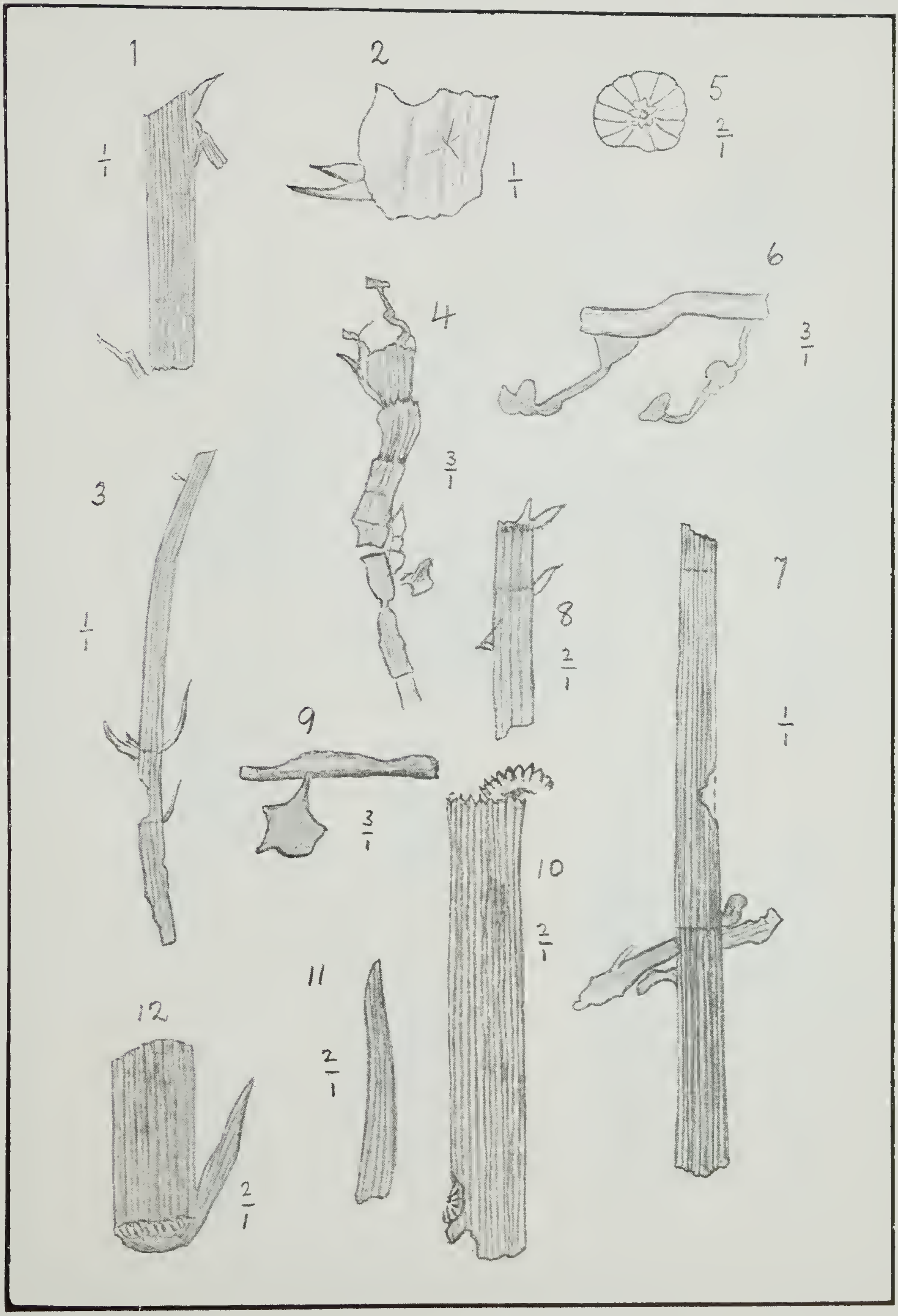
Fig. 47.—*Brachyphyllum crassum* T. Woods. Terminal shoot. × 4.

Fig. 48.—*Schizoneura microphylla* sp. nov. Slender stem with leaflets. Paratype. × 4.

Fig. 49.—(?) *Raritania victoriae*, sp. nov. Enlarged drawing to show the character of the foliage. × 4.

Fig. 50.—(?) *Raritania victoriae*, sp. nov. Photograph of holotype. On the same slab are associated remains of *Schizoneura*. × ⅗.

Fig 51.—*Taeniopteris wianamattae*, Fiestmantel. Type of *Taeniopteris Sweeti*, McCoy. Natural size.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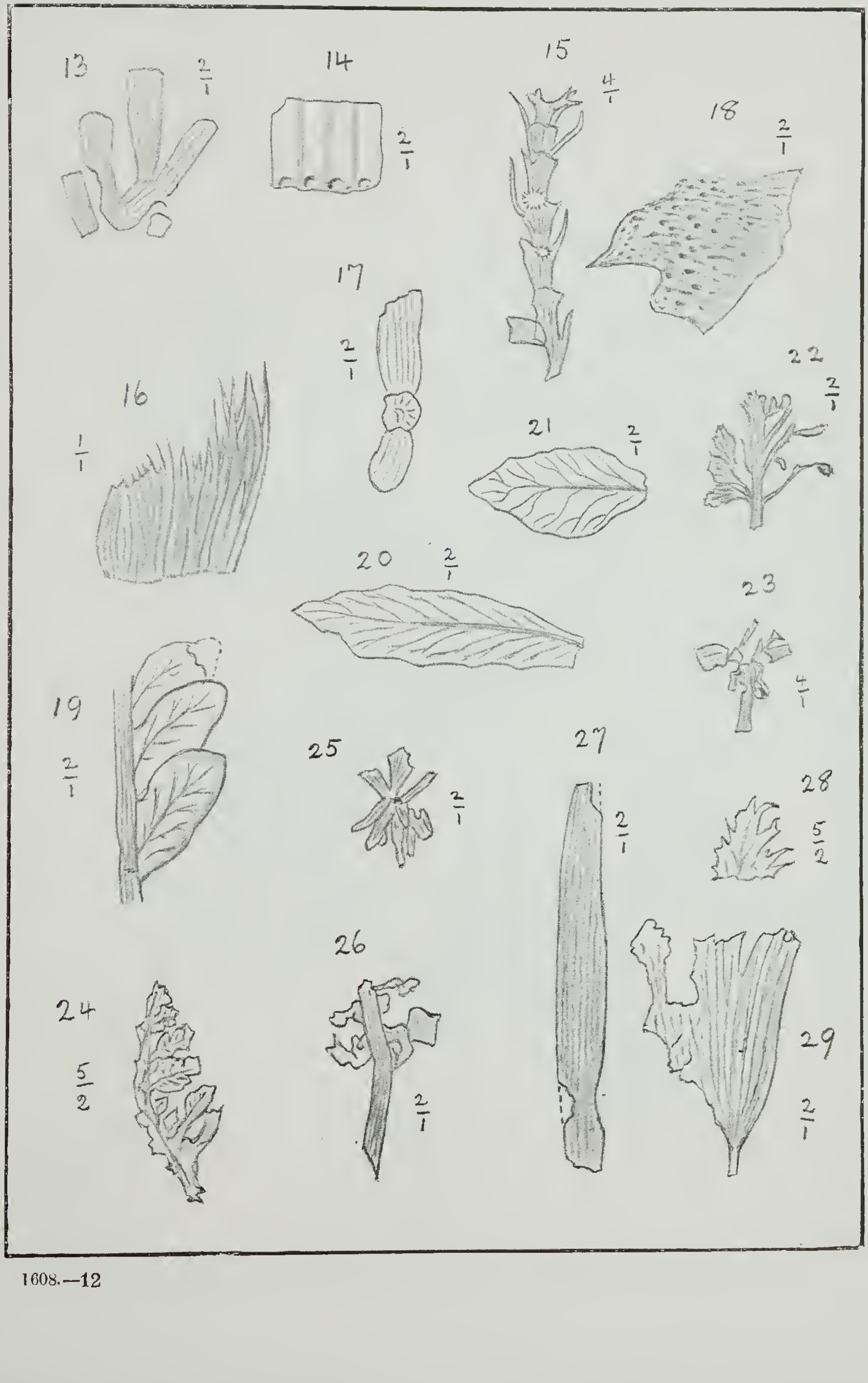
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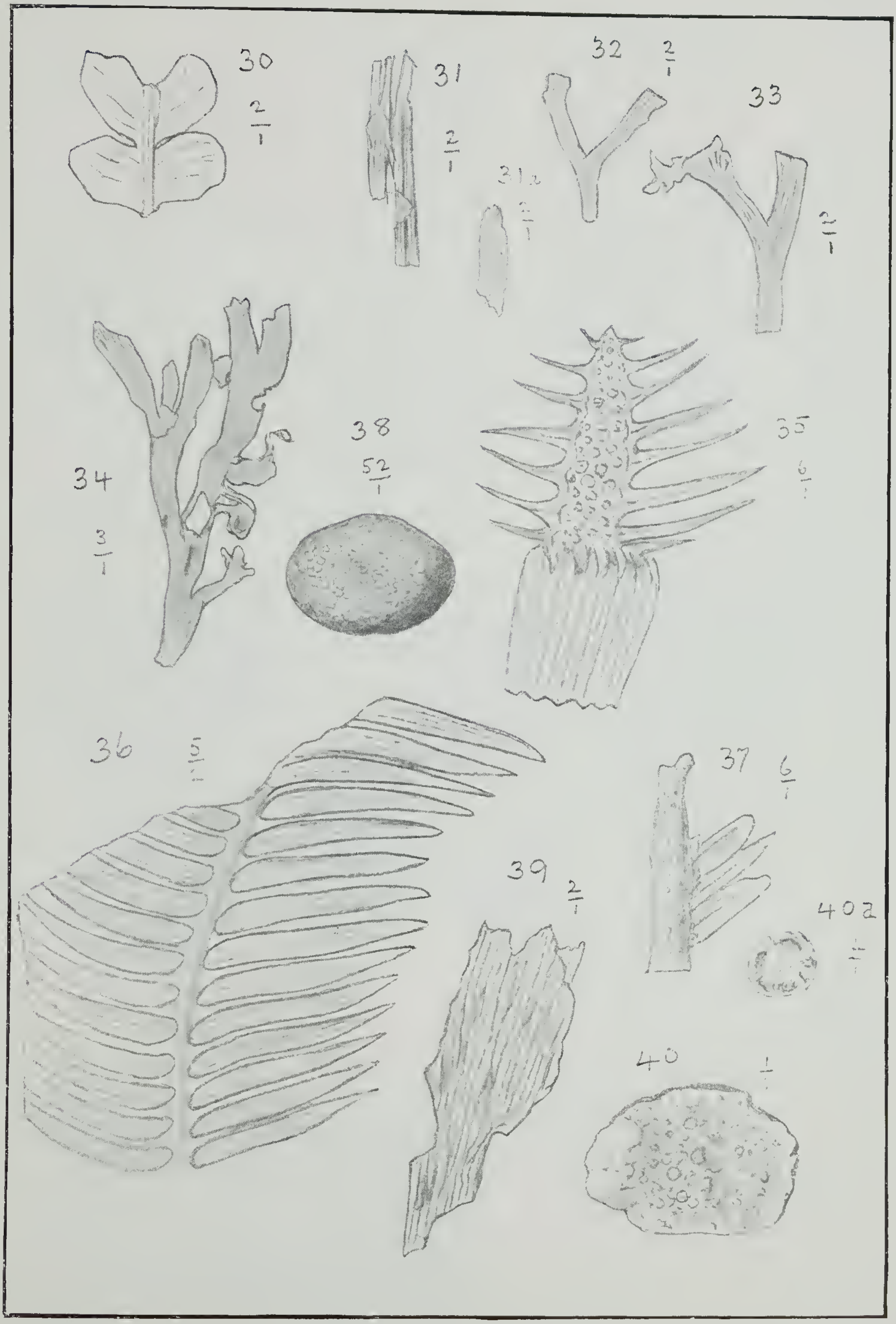
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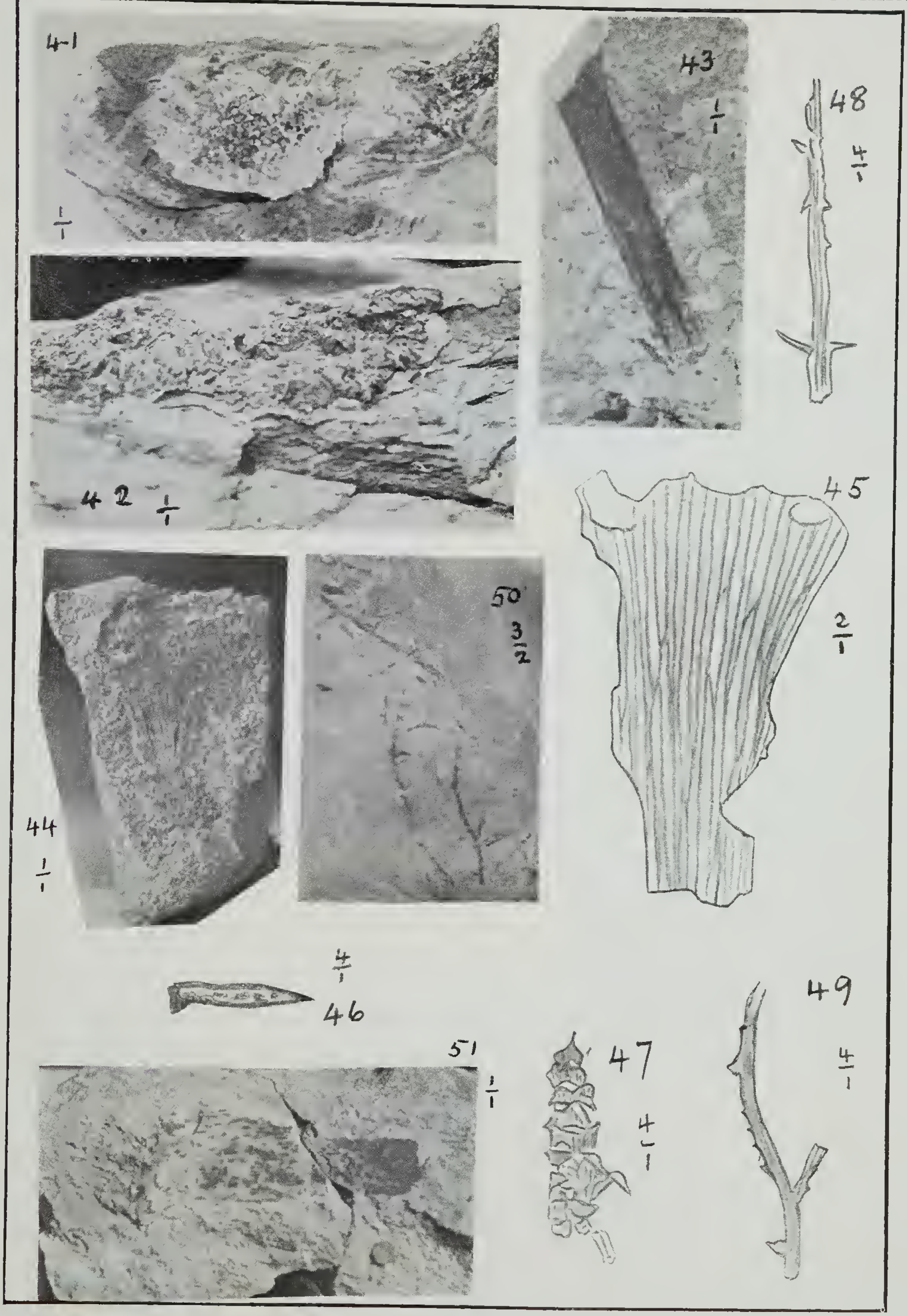
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