40. *On the* FRUCTIFICATION *of* ZEILLERIA (SPHENOPTERIS) DELICATULA, Sternb., sp.; *with Remarks on* URNATOPTERIS (SPHENOPTERIS) TENELLA, Brongt., *and* HYMENOPHYLLITES (SPHENOPTERIS) QUADRIDACTYLITES, Gutbier, sp. By ROBERT KIDSTON, Esq., F.G.S. (Read May 28, 1884.)

[PLATE XXV.]

So much confusion has arisen between *Sphenopteris delicatula*, Sternb., *Sphenopteris tenella*, Brongt., and *Sphenopteris quadridactylites*, Gutbier, that in dealing with *Sphenopteris delicatula*, Sternb., it is also necessary to give a list of the synonyms of the two other species, which, in the barren condition, approach it somewhat closely.

The small-pinnuled members of the genus *Sphenopteris*, Brongt., are, under the most favourable circumstances, from the delicate nature of their fronds, extremely difficult to determine. As they usually occur in a very fragmentary condition, and the segmentation of their pinnules varies considerably according to the position held by the pinnæ on the frond (the pinnules of the upper pinnæ being generally more simple than those on the lower pinnæ), the difficulty of discriminating the species is considerably increased.

When the specimens have suffered any lengthened maceration, the limb of the pinnules usually disappears entirely, and there is nothing but the veins left. In this state, the specific identification of these delicate Sphenopteroids is very unsatisfactory, if not quite useless.

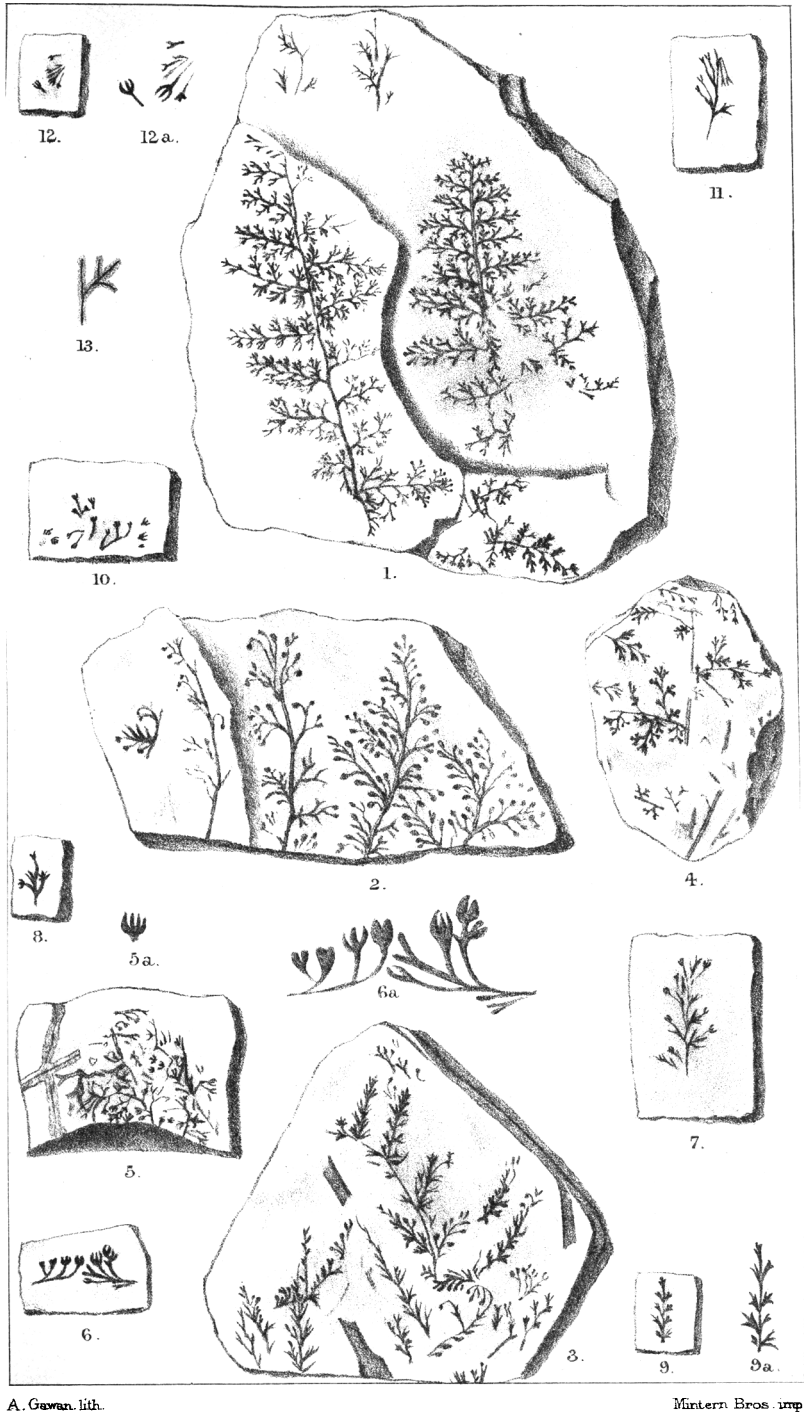
Fortunately the fruit of *Sphenopteris delicatula*, Sternb., *Sphenopteris tenella*, Brongt., and *Sphenopteris quadridactylites*, Gutbier, is known; and though their barren fronds may possess a considerable likeness, their fructification is very distinct; but even the barren fronds, when well preserved, are sufficiently marked to enable one to determine the species with absolute certainty.

ZEILLERIA, nov. gen.

Involucres borne at the extremities of the pinnule-segments, which are more or less produced to form a pedicel; in the earlier condition the involucres are globular, but at maturity they split into four valves.

The ferns for which this genus is proposed have been included by Stur, in his last work on the classification of Carboniferous Fossil Ferns*, in his genus *Calymmatotheca*; but from the ferns originally placed by him in this genus they differ so materially in certain structural points that it is necessary to place them in a new genus.

* Stur, "Zur Morph. u. Syst. der Culm- u. Carbonfarne," Sitzb. der k. Akad. d. Wiss. in Wien, vol. lxxxviii. Abth. i. p. 799 (1883).



A. Gawan. lith. Mintern Bros. imp.

ZEILLERIA DELICATULA.

The fructifications originally included in *Calymmatotheca* are composed of a number of elongated sporangia, arranged in a circle round a common point of attachment. In the fossil state the sporangia more commonly appear as if they radiated in a fan-like manner from their common support; but this is due to the circle having been broken, as many specimens I have seen show them to radiate from a central point, and some in this state have been figured by Mr. C. W. Peach*, under the name of *Staphylopteris Peachii*, Eth. and Balfour, and later by Zeiller†. The explanation of the true structure of the fruit of *Calymmatotheca* was first pointed out by Renault‡, and has been corroborated and more fully explained by Zeiller. Stur, indeed, regards these sporangia as the split-up remains of an involucre or indusium. This view, however, from the explanation of the structure given by Renault and Zeiller, and the figures of the last-mentioned author, as also from the specimens I have seen, appears to me to be quite untenable.

In the ferns for which I propose the genus *Zeilleria*, we have an indusium which is, whilst immature, globular, but at maturity splits into four valves. On the specimens of *Zeilleria* (*Sphen.*) *delicatula*, in the British Museum, one is able to trace the several stages of development. In this new genus must also be placed the two species lately described by Stur, *C. avoldensis* and *C. Frenzli* §.

There is still another difference between *Calymmatotheca* and *Zeilleria*. In the former genus the fructifying portions are entirely destitute of foliage-pinnules, whereas in the latter genus the fructifying fronds differ little in appearance from the barren, the fruiting segments being only slightly produced to form a pedicel on which the indusia are supported.

Calymmatotheca, as here restricted, is probably related to the *Marattiaceæ*; whereas *Zeilleria* appears to have affinities with the *Hymenophyllaceæ*.

* C. W. Peach, "On the Circinate Vernation, Fructification, and Varieties of *Sphenopteris affinis*, and on *Staphylopteris? Peachii* of Etheridge and Balfour," Quart. Journ. Geol. Soc. vol. xxxiv. pl. vii. viii.

Mr. Peach has kindly allowed me to examine the specimens from which most of his figures were drawn. What he regards as the fruit of *S. affinis*, L. & H. (pl. vii. f. 2.), is, I believe, merely a roughness on the back of the pinnules, but not of organic origin. The real fruit of this fern is *Staphylopteris Peachii*, which was regarded by Mr. Peach as a parasite; but from abundant evidence it is proved beyond all doubt that the supposed parasite is the fruit of *S. affinis*, which must now be placed in *Calymmatotheca*, as originally used by Stur. I have also seen a Calymmatothecous fruit attached to the stem of *Calymmatotheca* (*Sphenopteris*) *bifida*, L. & H., sp. Mr. Peach's fig. 4, pl. viii. probably belongs to *C. bifida*, L. & H., sp., which has a much greater number of elongated sporangia than *C. affinis*, L. & H.

† Zeiller, "Fructifications de Fougères du terrain houiller," Ann. des Sci. Nat. 6e sér. Bot., tome xvi. p. 182, pl. ix. f. 10, 11.

I have great pleasure in naming this genus after M. R. Zeiller, who has done much to elucidate the fructification of the Carboniferous Ferns. I am also personally indebted to him for kind assistance given me in regard to the synonymy mentioned in this communication.

‡ Renault, 'Cours de Botan.' vol. iii. p. 198 (1883).

§ Stur, *l. c.* pp. 171, 172.

ZEILLERIA DELICATULA, Sternb., sp.

Sphenopteris delicatula, Sternb. Versuch, i. fasc. 2, p. 30, pl. xxvi. fig. 5, fasc. 4, p. xvi.; Brongt. Prodrome, p. 50.

Sphenopteris meifolia, Sternb. Versuch, ii. p. 56, pl. xx. f. 5; Unger, Syn. Plant. Foss. p. 61; id. Genera et Species, p. 112; Giebel, Deutschl. Petrefacten, p. 40; Schimper, Traité de Paléont. Végét. vol. i. p. 383; Stur, Jahrb. d. k.-k. geol. Reichsanstalt, vol. xii. p. 143, 1861–62. Feistmantel, Steinkohl. u. Perm-Ablager. p. 74.

Cheilanthites meifolius, Göpp. Syst. Fil. Foss. p. 241; var. *trifidus*, Göpp. Syst. Fil. Foss. p. 241, pl. xv. f. 3, 4; ? Ettingsh. Steinkohlenflora von Radnitz, p. 36, f. 3. pl. xviii.

Description.—Frond tripinnate, pinnæ alternate, pinnules opposite or alternate. Barren pinnules deeply divided into 3–6 narrow segments with retuse apices, each segment having a single vein.

Segments of fertile pinnules slightly produced to form a pedicel, on which the involucres are borne. Involucres globular in the early state, but split up into four valves towards maturity.

Rachis flexuous and slightly winged.

Remarks.—Two tolerably perfect primary (?) pinnæ are shown in Pl. XXV. fig. 1; from the position they hold to each other, they in all likelihood spring from a common rachis. At several points of this specimen indications of the fruit are shown; but the involucres have been removed, and the point to which they were attached is only indicated by a small dark spot.

The ordinary form of the barren frond undergoes but little alteration in the fertile condition.

The fertile segments of the pinnules become slightly elongated, to form, as it were, a little pedicel for the involucres, as seen in Pl. XXV. figs. 2, 3, 5, 6, 7, 8, 10, 11, & 12.

The young state of the fruit is shown in Pl. XXV. fig. 2, where it appears as a little globular involucre placed upon a short stalk. Several of the pinnules in this figure are barren; thus it shows one of the generic differences between *Zeilleria* and *Calymmatotheca*, as the last-mentioned genus is restricted in this communication.

The same character is seen in figs. 3, 6, 7 of the same Plate.

Figures 3 & 9, Pl. XXV., show the form which has been distinguished as *Cheilanthites meifolius*, var. *trifidus*, Göpp.

In fig. 3 many of the segments of the pinnules are produced in a setaceous manner. These were probably soriferous, as the involucres shown in Pl. XXV. figs. 2, 6, 7, 8, 10, 11, & 12 are supported on stalk-like pedicels.

The involucres, split into four valves, are shown in Pl. XXV. figs. 5, 5 *a*, 6, 7, 12, 12 *a*. Generally, only three valves are visible; but one capsule, which has been split and flattened out, shows distinctly the four segments (fig. 5 *a*). This figure is an enlarged view of an involucre on the small slab, fig. 5.

The barren pinnules consist of a narrow border of delicate tissue on each side of the midrib; but it is only in well-preserved specimens

that any trace of this is seen (fig. 13). The rachis of the primary and secondary pinnæ appears to be slightly winged.

The pinnules towards the middle of the specimen in Pl. XXV. fig. 1, have 6–7 approximated segments; but on the lower pinnæ of the same figure, as well as in fig. 4, the segments of the pinnules are placed further apart and almost appear as bifid or trifid pinnules on a tertiary rachis.

It will also be observed, that the pinnules are opposite in fig. 9, Pl. XXV., and alternate in most of the other specimens.

Remarks.

HYMENOPHYLLITES DELICATULUS, Zeiller.

The plant figured by Zeiller as *Hymenophyllites delicatulus*, in the Ann. d. Sciences Nat. vol. xvi. pl. x. figs. 22–32, is referable to *S. quadridactylites*, Gutbier, which this author has regarded as a synonym of *Zeilleria delicatula*, Sternb., sp. Though the barren fronds of the two species have considerable resemblance, they are, however, essentially distinct.

In *Hymenophyllites quadridactylites*, Gutbier, sp., the pinnules are rounder and the lobes not so narrow. The fructification also is of a different type. In *H. quadridactylites* the sporangia appear in the fossils to have been situated *beyond* the apparent margin of the pinnule, and M. Zeiller informs me that he has observed what he believes to be traces of a column in the middle of some of the groups of sporangia of this fern, to which they were probably attached; but owing to the indistinctness of this structure he refrained in his descriptions from affirming its presence, although he believes the appearance could not have been accidentally produced*.

In the figure of *Sphenopteris meifolia* given by Ettingshausen in his 'Steinkohlenflora von Radnitz,' the pinnules appear to be rounder than represented in Sternberg's original figure; but the specimen from which Ettingshausen's figure has been taken seems to have been indifferently preserved, so it cannot be critically considered.

Sphenopteris meifolia, Ludwig†, is not Sternberg's plant, but is probably only a small form of the fern he has identified as *Asplenites lindsœoides*, Ett., from which, however, it also seems specifically distinct.

The specific identification of the specimen figured by Gutbier as *S. delicatula*‡, owing to the imperfect state of its preservation, is also subject to doubt.

The specimens from which my figures are taken are in the collection of the British Museum, and my thanks are due to Dr. H. Woodward, F. R. S., for permission to figure and describe them.

Position. Upper (?) Coal-measures.
Locality Forest of Wyre, Worcestershire.

* Letter dated Paris, 30 Sept. 1883.
† Bull. de la Soc. Impér. de Nat. de Moscou (1876, p. 21), pl. i. f. 6.
‡ Gutbier, 'Verst. d. Zwick. Schwarzk.' p. 38, pl. v. f. 22.

URNATOPTERIS, nov. gen.

Barren and fructifying fronds dissimilar. Pinnæ of fructifying fronds bear two rows of alternate urceolate sporangia, which open at the apex by a small circular pore.

This genus is formed for the reception of *S. tenella*, Brongt., which, from the peculiar structure of its fruit, cannot be referred to any existing genus.

URNATOPTERIS TENELLA, Brongt., sp.

Sphenopteris tenella, Brongt., Hist. d. Végét. Foss. p. 186, pl. xlix. f. i.; Unger, Syn. Plant. Foss. p. 61 (excl. syn. *S. cysteoides*, L. & H.); Genera et Species, p. 112 (excl. syn. *S. cysteoides*, L. & H.); Weiss, Flora d. jüng. Stk. u. d. Roth. p. 56; Catalogue of Hutton collection, p. 108, Newcastle-on-Tyne; Sternberg, Versuch, ii. p. 60; Lesquereux, Geol. of Pennsyl. vol. ii. p. 861; Weiss, Verhandl. d. naturh. Vereines d. preuss. Rheinl. u. Westph. p. 79, 1868.

Cheilanthites tenellus, Göppert, Syst. Fil. Foss. p. 240.

Sphenopteris lanceolata *, Williamson, "Anomalous Oolitic and Palæozoic Forms of Vegetation." Royal Institution of Great Britain, Feb. 16, 1883.

Sphenopteris multifida, L. & H., Foss. Flora, vol. ii. pl. cxxiii; Morris, in "Geol. of Coalbrook Dale," Trans. Geol. Soc. 2nd Ser. vol. v. p. 488; Sauveur, 'Végét. Foss. de la Belgique,' pl. xxiii. f. 3, 4.

Sphenopteris delicatula, Brongt., Hist. d. Végét. Foss. p. 185, pl. lviii. f. 4; Sauveur, Végét. Foss. de la Belgique, pl. xxiii. f. 5, pl. xxv. f. 2; Schimper, Traité d. Paléont. Végét. vol. i. p. 415.

Trichomanites delicatulus, Göpp. Syst. Fil. Foss. p. 267; Unger, Syn. Plant. Foss. p. 72; Unger, Genera et Species, p. 134; Giebel, Deutschl. Petref. p. 47.

Hymenophyllites delicatulus, Lesqx. Geol. Survey of Illin. vol. iv. p. 412 (gives as ref. Brongt. Hist. pl. lviii. f. 4).

* In a letter to Prof. Williamson on the subject of the fruit of this fern, I stated that I regarded *S. lanceolata*, Gutbier, and *S. tenella*, Brongt., as the same plant. Since then I have seen an authentic specimen of *S. lanceolata* from Zwickau, and notwithstanding the great similarity of the figures of Gutbier and Brongniart, when actual specimens are examined, the plants are seen to be quite distinct. Fig. 18, pl. v. of Gutbier's work (Verst. d. Zwick. Schwarzk. p. 34), is almost undistinguishable from Brongniart's figure of *S. tenella*, and it was on this figure that I proposed their union. Some continental botanists, with good reason, unite the beautiful figure given as *S. acutiloba*, Andræ (not Sternb.), with *S. lanceolata*, Gutbier. This figure shows the real differences between *S. lanceolata* and *S. tenella*. Gutbier's fig. 4, pl. iv., gives the form of *S. lanceolata*, which Andræ had identified as *S. acutiloba*, Sternb., in error.

To distinguish the *S. acutiloba*, Andræ, from the true *S. acutiloba*, Sternb., Andræ's plate (Vorweltl. Pflanzen, pl. vi.) has been designated *S. Coemansii*, which name must now be suppressed (Crépin, "Notes Paléophytologiques," Soc. Roy. d. Bot. de Belgique, vol. xix. p. 16). (*S. tenella* = *S. lanceolata*. See also Neues Jahrbuch, 1884, part ii. p. 295.)

Rhodea delicatula, Sternberg, Versuch, ii. p. 111.

Eusphenopteris tenella, Kidston, Trans. Roy. Phys. Soc. Ed. vol. vii. p. 129, pl. i. f. 1–6; *Id.* Annals & Mag. Nat. Hist. Ser. 5. vol. x. p. 7, pl. i. f. 1–6.

Sphenopteris, sp., Lebour, 'Illustrations of Fossil Plants,' p. 79, pl. xxxix.

Description.—Barren fronds tripinnate or decompound; pinnæ and pinnules alternate, linear-lanceolate; pinnules divided into narrow segments, which end in a blunt point; those on the basal part of the pinnule bifid or trifid, those on the upper portion undivided. Fertile fronds: pinnæ reduced to a rachis having two alternate rows of urceolate indusia, which open at their apex by a small circular pore.

Remarks.—Since writing my previous paper on the fructification of *S.* (*Eusphenopteris*) *tenella*, Brongt., I have had many opportunities of examining numerous specimens of this fern, both in the barren and fertile condition, from the Coal-measures, Furnace Bank, near Sauchie, Alloa.

The plant figured as *S. delicatula* by Brongniart is only one of the forms of *S. tenella* of the same author. That it is not the *S. delicatula*, Sternberg, has long been recognized*. This variety was not uncommon at Furnace Bank.

I have been enabled to examine the specimens of *S. multifida*, L. & H., in the Hutton collection, Newcastle-on-Tyne, and to compare them with the type of *S. tenella*, Brongt., which is fortunately preserved in the collection of the British Museum, and I find the two plants are identical and in all probability from the same neighbourhood.

It has been suspected for some time that *S. multifida*, L. & H., and *S. tenella*, Brongt., were the same fern, and a comparison of Brongniart's type with Lindley and Hutton's plants, affirmatively settles this point; hence *S. multifida*, L. & H., must be eliminated from our lists of fossil plants, and *S. tenella*, Brongt., substituted as being the earliest name of the species.

This plant has been figured as *S. delicatula* by Sauveur. That on his plate xxiii. fig. 5 corresponds to *S. delicatula*, Brongt. (not Sternb.), and that on his plate xxv. fig. 2 to the form figured by Lindley and Hutton as *S. multifida*.

Notwithstanding the great similarity between certain forms of the barren fronds of *Urnatopteris tenella*, Brongt., sp., and *Zeilleria delicatula*, Sternb., sp., which has frequently given rise to errors of identification, their fruit is quite distinct. In *U. tenella*, Brongt., sp., the urceolate sporangia are borne upon modified fronds, the spores escaping through a small pore at their apex; whereas in *Zeilleria delicatula*, Sternb., sp., the globular involucres are borne upon fronds of the ordinary type, and at maturity split into four valves for the distribution of the spores.

In my former paper describing the fruit of *S. tenella*, I indicated

* Göpp. Syst. Fil. Foss. p. 267.

that the affinities of this fern were probably Hymenophyllaceous; but Prof. Williamson, referring to my remarks in his lecture on 'Anomalous Oolitic and Palæozoic Forms of Vegetation,' has pointed out the identity of the sporangia of *U.* (*Sphenopteris*) *tenella* in all essential features with those of recent *Danæa*, and my further investigations have led me to adopt this view and to regard the fern as undoubtedly Marattiaceous.

Sphenopteris tenella, Heer, Vorweltl. Flora d. Schweiz. p. 16, pl. i. f. 9, 10.—Judging from the figure, there is no evidence to show that this specimen belongs to *S. tenella*. The fossil appears to me to have been too imperfect for any satisfactory determination.

Sphenopteris linearis, var., Lebour, 'Illustrations of Fossil Plants,' p. 65, pl. xxxii.—This is probably only an indifferently preserved example of *S. tenella*, Brongt.

S. delicatula (Brongt.), Boulay, Terr. houill. du Nord de la France, p. 28.—Abbé Boulay includes this species in his list of fossil plants from the Coal-measures of the north of France; but as it does not appear in a later publication by Zeiller (Fougères du terr. houill. du Nord de la France), it is likely that Boulay's plant is the *Hymenophyllites quadridactylites*, which occurs in that coal-basin. This is the more probable, as Zeiller, to whom I submitted specimens of *S. tenella*, Brongt., informed me that he had not met with it in the north of France.

Position.—Coal-measures.

Localities.—Scotland: Furnace Bank, near Sauchie, Alloa, Clackmannan; roof of the Kiltongue Coal; Bailieston, Lanark.

England: Bensham Horizon, Jarrow Coll.; Gosforth.

Hymenophyllites, Göppert, 1841.

Gattungen der fossilen Pflanzen, p. 53.

Hymenophyllites quadridactylites, Gutbier, sp.

Sphenopteris quadridactylites, Gutbier, Verst. d. Zwick. Schwarzk. p. 36, pl. xi. f. 5.

Sphenopteris tetradactyla, Unger, Syn. Plant. Foss. p. 66; Genera et Species, p. 121; Giebel, Deutschl. Petref. p. 43.

Sphenopteris tridactylites, Geinitz (not Brongt.), Verst. d. Steink. in Sachsen, p. 15, pl. xxiii. f. 13, 14.

Sphenopteris opposita, Giebel, Deutschl. Petrefacten, p. 40; Gutbier, Verst. d. Zwick. Schwarzk. p. 36, pl. xi. f. 6; Unger, Syn. Plant. Foss. p. 62; Genera et Species, p. 113; Gutbier, Gaea v. Sachsen, p. 75; Sternberg, Versuch, ii. p. 128.

Sphenopteris minuta, Giebel, Deutschl. Petrefacten, p. 40; Gutbier, Verst. d. Zwick. Schwarzk. p. 39, pl. iv. f. 9, pl. vi. f. 10; Unger, Genera et Species, p. 114; *Id.* Syn. Plant. Foss. p. 62; Gutbier, Gaea v. Sachsen, p. 75; Sternberg, Versuch, ii. p. 128.

Sphenopteris delicatula, Zeiller, Princip. Végét. Foss. de la France, p. 42; Zeiller, Bull. de la Soc. Géol. de France, 3e ser. vol. xii. p. 193.

Hymenophyllites delicatulus, Zeiller, "Fruct. d. Fougères Houill." Ann. d. Sci. 6e ser. vol. xvi. p. 196, pl. x. f. 22–32.

?*Sphenopteris laciniata*, Gutbier, Verst. d. Zwick. Schwarzk. p. 76, pl. xi. f. 4; ? Unger, Syn. Plant. Foss. p. 66; *Id.* Genera et Species, p. 122.

Description.—Frond tripinnate; pinnæ alternate or opposite; rachis flexuous, winged; barren fronds, pinnules divided into 4–7 obovate lobes, which have 3–6 rounded lappets, each having a simple vein; fruit borne at the extremity of the lobes; but placed beyond the limb. Sporangia provided with an annulus.

Remarks.—I have already, while making a comparison between this species and *Zeilleria delicatula*, Sternb., sp., entered into all the details of the structure of the fruit of this fern, so far as is at present known, so need not repeat here what has already been said on that point.

Sphenopteris tridactylites, Geinitz (not Brongt.).—M. Zeiller has pointed out* that the *S. quadridactylites*, Geinitz, is essentially distinct from Brongniart's plant of that name, and is to be referred to *S. quadridactylites*, Gutbier. The true *S. tridactylites* of Brongniart is a much more robust plant, with a firmer texture.

That Geinitz's figure of *S. tridactylites* is not Brongniart's plant of that name, but is *S. quadridactylites*, Gutbier, will be admitted by any one who may examine into the subject.

There are two other species which seem to be identical with *S. quadridactylites*, Gutbier. These are *S. opposita*, Gutbier, and *S. minuta* of the same author.

Sphenopteris minuta, Gutbier.—This I believe to be only the upper portion of a specimen of *S. opposita*.

Sphenopteris opposita, Gutbier.—This I am inclined to regard as only a form of *S. quadridactylites*. It is true that in the figures of these two plants, the pinnæ are alternate in *S. quadridactylites* and opposite in *S. opposita*; but in many species, the pinnæ are opposite or alternate according to the position they hold on the frond, and, as numerous examples show, little or no value can be placed in such characters as "pinnæ opposite" or "pinnæ alternate"†.

The differences between the large drawings of these two species (*S. minuta* and *S. opposita*), as given by Gutbier, seem to me to be *individual*, not *specific*.

After a careful examination of the descriptions and figures to which I have referred, I can only regard *S. opposita*, *S. minuta*, Gutbier, *S. tridactylites*, Geinitz (not Brongt.), and *Hymenophyllites delicatulus*, Zeiller, as belonging to *Hymenophyllites* (*Sph.*) *quadridactylites*, Gutbier.

* *l. c.* 'Fructifications de Fougères,' p. 196.

† Compare *S. Höninghausi*, Andræ, Vorw. pl. iv. & pl. v. f. 1; *S. acutiloba*, Andræ, Vorw. pl. vi; *S. artemisiæfolia*, Brongt. Hist. d. Végét. Foss. pl. xlvi., xlvii; *S. Gravenhorstii*, Brongt. Hist. pl. lv. f. 3 *b*; *Neur. gigantea*, Brongt. Hist. pl. lxix.; *Pecopteris Davreuxii*, Brongt. Hist. pl. lxxviii.; *Pec. arborescens* (*P. cyathea*), Brongt. Hist. pl. ci. f. 1–2; *Pec. arborescens*, Brongt. Hist. pl. cii. &c.

Hymenophyllites quadridactylites has not, so far as I am aware, been yet discovered in Britain.

In concluding these somewhat lengthy notes, I have only to express the hope that those who have the opportunity of collecting fossil plants, will avail themselves of it, as at present our knowledge of the British fossil flora is very imperfect.

EXPLANATION OF PLATE XXV.

Zeilleria delicatula, Sternberg, sp.

Fig. 1. Two pinnæ, mostly barren, but showing places from which sporangia have fallen, which were indicated on the fossil as darker points.
2. Portion of frond, showing the fruit in an early state of development. They occur here as closed globular involucres.
3. Portion of another frond, bearing barren and fructifying pinnules mixed with each other on the same pinnæ.
4. Small portion of a barren frond.
5. A small specimen, showing the opened indusia.
5 *a*. A split indusium, showing the four segments: enlarged.
6. A few open indusia.
6 *a*. The same enlarged, showing the valves into which the indusia split.
7, 8. Small specimens, showing mature and split indusia.
9. Barren pinna. The form named var. *trifida*, Göpp.
9 *a*. The same, enlarged.
10. Small specimen, showing the split indusia.
11, 12. A few indusia supported on their elongated pedicels.
12 *a*. The same, enlarged.

Discussion.

Mr. Carruthers remarked that the discovery of fructification in fossil ferns was of great importance, the characters presented by the fronds in both recent and fossil forms being so similar. Generic distinctions to be of value must be founded mainly upon the fructification, and without it the classification was to some extent mere guesswork. He said that he had formed rather different opinions from the author on some of the points referred to, but the subject required much caution. *Calymmatotheca* was probably a Hymenophyllaceous fern, like *Cyclopteris hibernica*. About *Zeilleria* and *Urnatopteris* it was more difficult to decide.

Dr. Murie congratulated the author upon the interesting nature of his communication.

Mr. Kidston, in reply, pointed out the distinction between the sporangia of the different forms referred to in the paper, and said that he was sure, if Mr. Carruthers would examine the specimens, he would recognize the importance of these distinctions.