PALAEOBOTANY OF THE MESOPHYTIC II

NEW AND NOTEWORTHY JURASSIC FERNS FROM YORKSHIRE

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Cladophlebis harrisii sp.n. Plate I, fig. A, B, C; text-fig. 1

DIAGNOSIS: Frond at least bipinnate. Rachis up to 2 mm broad, longitudinally grooved. Pinnae alternate or subopposite, up to 1,5 cm broad (normally 1 cm), longest one 5 cm long but without apex. Pinnae arising at intervals of 1–2,5 cm, and at an angle of 30–60°. Pinna-rachis thin. Pinnules arising at an angle of 45° at intervals of 1–6 mm, alternate, katadromic. Pinnules always united basally. Pinnules in the lower (or middle) part of the leaf linear, up to 1,5 cm long (normally 1 cm) and up to 4 mm broad (normally 2 mm). Apex obtuse, margin entire, slightly narrowed near the base, basal margin decurrent as a narrow wing along the pinna-rachis. In the upper part of the leaf pinnules smaller, 4 mm broad, 6 mm long, deltoid and slightly falcate. Proximally the pinnae are pinnulate, the pinnules becoming first laterally fused and then forming an entire pinna.

Venation: Midrib arising at a small angle near the basal edge of the pinnule and bending outwards or, sometimes, straight to the apex. Lateral veins arising in katadromic order or nearly opposite, at intervals of 1–2 mm and at an angle of 40°, simple or once forked half-way towards the margin; branches diverging.

Substance of lamina fairly thick, margins flat.

No fertile material found until now.

DISTRIBUTION: Most of the material is from Hasty Bank, but there are some specimens from Esklets Cragg, Westerdale and Roseberry Topping. All three localties are from the base of the Lower Deltaic Series.

HOLOTYPE: V. 52136 in the British Museum (Natural History) London.

Description of the material: There are two cotypes, one of the lower (or middle) part of a leaf, and one with long, narrow pinnules, which might be a very basal part of a leaf. And there are numerous small fragments.

COMPARISON: Although there are already numerous *Cladophlebis* species, the Yorkshire material, in my opinion, belongs to a new one.

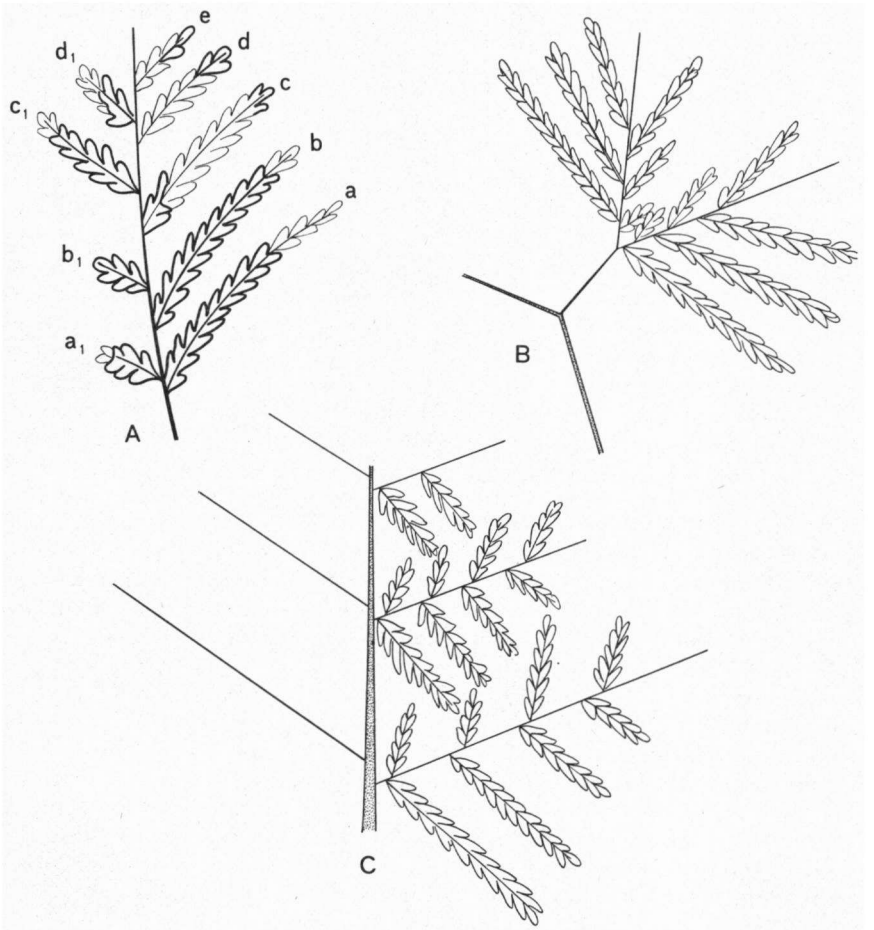

Fig. 1. *Cladophlebis harrisii* sp.n.
A. Drawing of the specimen from Plate I Fig. C, missing parts in weak lines.
B, C. Possible reconstructions of the frond.

There are some species that resemble this one in one or more aspects, but I do not think that anyone of them is conspecific with it.

Cladophlebis koraiensis Yabe (1905): Pinnules have the same variation in form but are unmistakeably smaller and they do not have the contraction at the base and the wing. Furthermore they are slightly dentate. The pinnae normally arise at a larger angle than in our specimens. The venation however is the same.

Cladophlebis zeylanica Sitholey (in: SAHNI, 1942), SITHOLEY (1944): Again without the contracted base and the wing. In this case the pinnules are opposite. There are also many more lateral veins than in our specimens.

Cladophlebis tenue Oishi et Huzioka (1938), OISHI (1940): Pinnules

more falcate and not so parallel-sided as in our specimens. Primary rachis much thinner, margin not exactly entire. Lateral veins always once forked, in our specimens seldom. The midrib always runs straight from close to the basal edge of the pinnule to the apex.

Cladophlebis spec. α cf. *Thinfeldia arctica* (Heer) Seward (1907): Pinnules much larger and more apiculate, not so parallel-sided as in our material and without the contraction and wing. Midrib exactly in the middle of the pinnule. Lateral veins once forked and slightly sinous.

Cladophlebis denticalata Brgt. forma *atherstonei* (Tate) Seward (1903), TATE (1867): Pinnules arising at a much larger angle than in our specimens and also longer. Again without the contraction. Midrib exactly in the middle.

Cladophlebis parva Font. (1890), BERRY (1911 a et b): Pinnae shorter and arising at a larger angle. Pinnules much shorter falcate and apiculate, separated to the base. The same variation in form of the pinnules as that in the new species.

Cladophlebis browniana (Dunker) Seward (1894), DUNKER (1846), SEWARD (1903), BERRY (1911), YABE (1922): Rachis thinner. No contraction and wing. Pinnules often separated to the base. Lateral veins normally once forked, but sometimes twice or thrice and arising at a larger angle than in our material. Pinnules smaller and sometimes opposite. Lower pinnules lobed and falcate, which never occurs in our specimens.

Cladophlebis nebbensis (Brgt) Nathorst (1875), NATHORST (1878), MÖLLER (1902), YOKOYAMA (1905), SEWARD (1907), OISHI (1940): Pinnules often dentate, broader than in the new species. Lateral veins sometimes twice forked, and arising at a larger angle. The bifurcation here is near the midrib and the midrib is in the middle of the pinnule.

Cladophlebis pseudodenticulata Oishi (1932), OISHI (1940): Pinnarachis very thin. Pinnules at right angles to the rachis, no contraction and wing. The venation is the same as in our specimens.

DISCUSSION: In one of the specimens the pinnae on one side of the rachis become distally progressively smaller while those on the other side, originally smaller, increase in size until the pinnae on both sides of the rachis are of equal length. Subsequently they both become smaller. This specimen contains the lowest part of a leaf we have found until now (Plate I, Fig. C). This made us think about some possible reconstructions as shown in text-fig. 1. In both cases the fragments must belong to quite a large frond.

NOTE: In the present author's opinion the specimens listed by HARRIS (1961) under *Selenocarpus muensterianus* (Presl) Schenk also belong to this species.

Marattia anglica (Thomas) Harris Plate II, Fig. A

1913 *Marattiopsis anglica* Thomas p. 228, pl. 23 figs. 1–5, t. fig. 1
1961 *Marattia anglica* Harris 1 p. 72 text-fig. 23

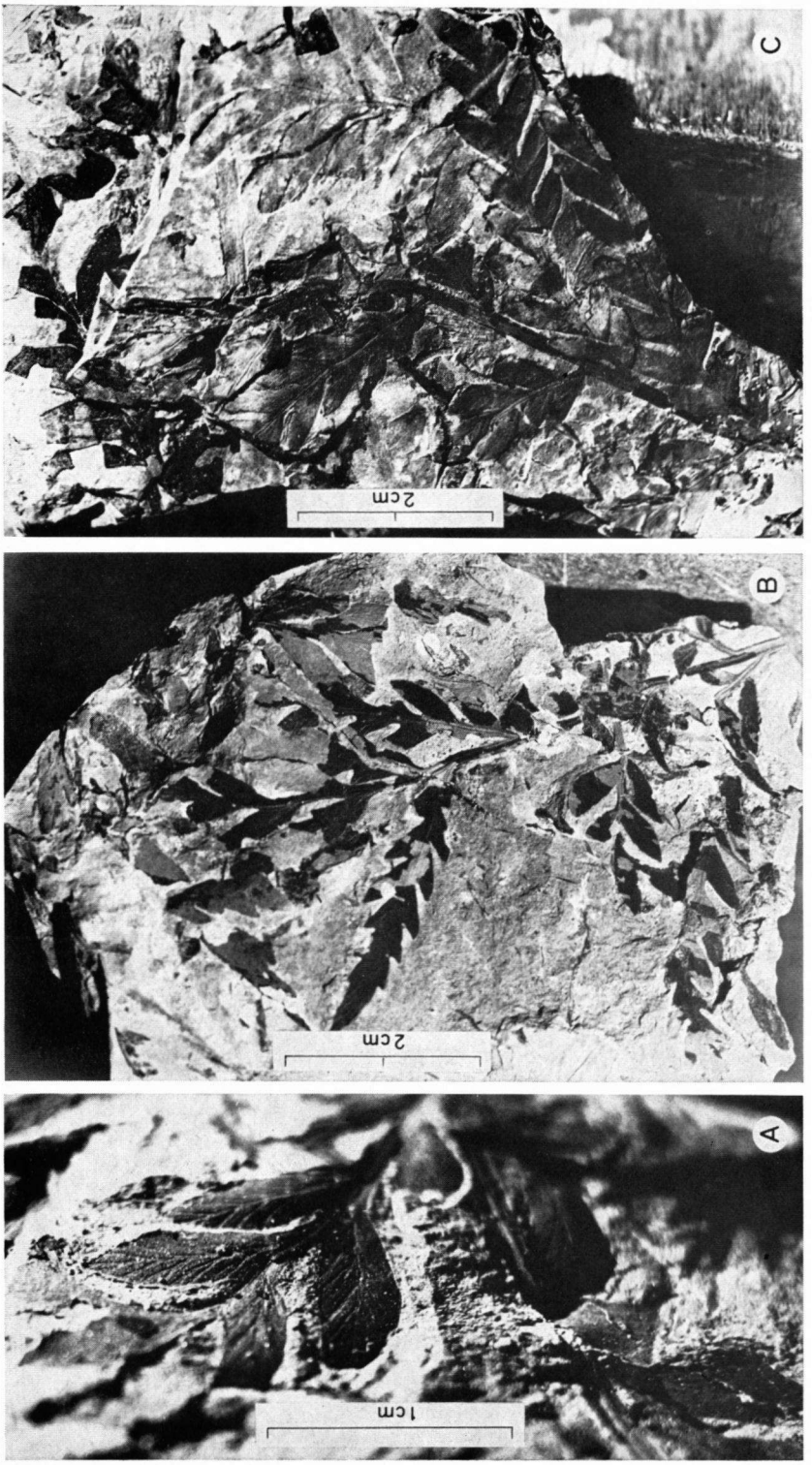

PLATE I

Cladophlebis harrisii sp.n.

A. pinnules of the middle part of the frond. V. 52136 B. holotype V. 52136

C. cotype van Cittert no. 1623 in Palaeobotany Division, Botanical Museum and Herbarium, Utrecht (*Photo F. de Vries*)

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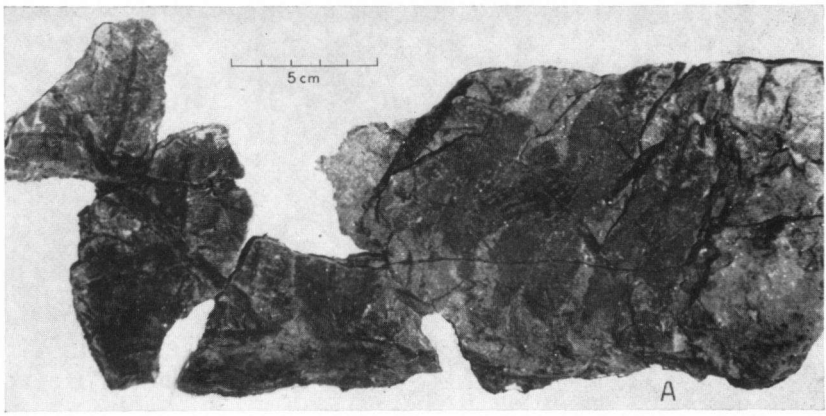

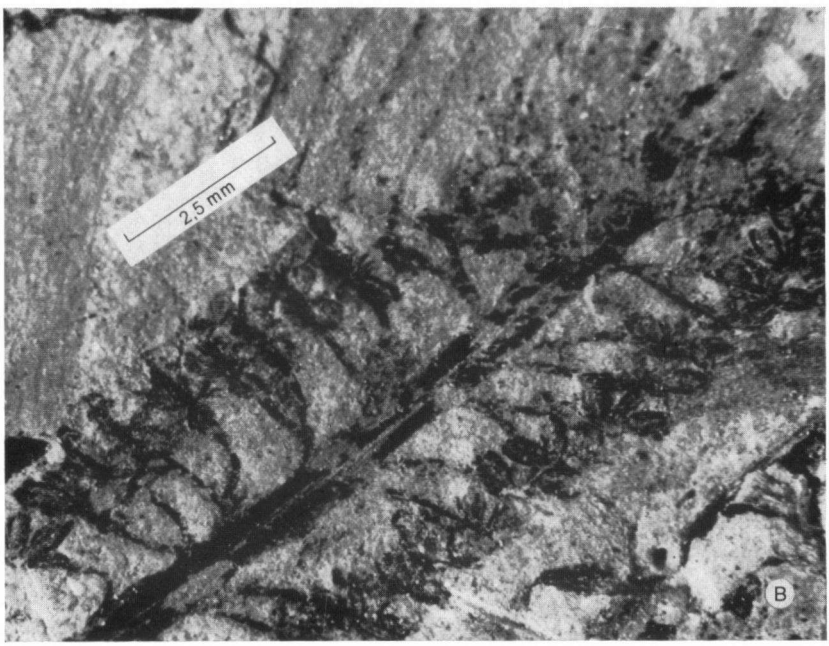

A. *Marattia anglica* (Thomas) Harris: part of frond with primary and secondary rachis (Ash, Harris and van Cittert no. 1615a in Palaeobotany Division, Botanical Museum and Herbarium Utrecht).
B. *Angiopteris neglecta* sp.n.: holotype no. 1371 in Palaeobotany Division, Botanical Museum and Herbarium, Utrecht. (*Photo F. de Vries*)

PLATE II

SUPPLEMENTARY DIAGNOSIS: Primary rachis at least 1½ cm thick, with irregular longitudinal ridges (striate), no hairs seen. Secondary rachis 5 mm thick, arising at an angle of 40° (no basal swelling observed, no hairs seen on the rachis). Ultimate divisions of lamina arising both on primary rachis between secondary rachises and on secondary rachises. Base of pinnae on the primary rachis contracted, midrib arising at an angle of 30° from the rachis, very soon bending outwards till 90° or more. Pinna-base on the secondary rachis contracted, midrib arising at an angle of 50° and going straight on.

DISCUSSION: From some recent *Angiopteris* and *Marattia* species it is known that, sometimes, one or more pinnae divide into a secondary rachis with pinnae. And this could be the same in our specimen. I know of no other explanation for the fact that there are pinnae on the primary rachis too. It is a pity that the fossil is broken just above the secondary rachis, so that one can not see if there are pinnae above it or not.

The pinna-base and part of rachis found by H. H. THOMAS (1913) would be, according to the data mentioned above, a secondary rachis and pinna. The present specimen differs from that one in that the pinna arises at a much larger angle: 75°, but this, I think, may be possible within one species.

DISTRIBUTION: The specimen figured (Plate II, Fig. A) and described above was collected at Hasty Bank, Lower Deltaic by Ash, Harris and van Cittert, and is preserved in the Division of Palaeobotany of the Botanical Museum and Herbarium, Utrecht (no. 1615).

Angiopteris neglecta sp.n. Plate II, Fig. B.

DIAGNOSIS: Fertile pinna 6 mm wide. Midrib 1 mm wide, longitudinally grooved. Lateral veins arising at an angle of about 60° and bending outwards to 90°, mostly forking once near the midrib; free ends not curving forwards; concentration at margin about 13 per cm. Venuli recurrentes apparently absent. Every branch bearing at its end a sorus, of about 6 sporangia. Sorus oval, 1½ mm long and so occupying half of the width of the lamina. Sporangia ovoid, up to 1 mm long.

TYPE SPECIMEN: no. 1371 in the Division of Palaeobotany of the Botanical Museum and Herbarium, Utrecht.

OCCURRENCE: Hasty Bank-Lower Deltaic.

DISCUSSION: There is only a single fragment of a fertile pinna.The specimen however looks so different from anything else found at Hasty Bank, that I feel entitled to describe it as a new species. It occurs in the same layer as *Marattia anglica* (Thomas) Harris 1961, THOMAS 1913, but instead of having synangia this specimen has sori

composed of separate sporangia which are loose enough to be displaced. And in *Marattia anglica* most of the veins appear simple, but in *Angiopteris* each one forks. The sporangia appear to be empty and there is so little material that I did not try to get spores out of it.

While fossils fairly close to *Marattia* are familiar we know very little indeed about the Mesozoic allies of *Angiopteris*. There is Schimper's genus *Angiopteridium*, with its type species *A. muensteri* (Goeppert) Schimper 1869. Schimper changed his mind about it, for he based his genus *Marattiopsis* on this species. Most of the other species of *Angiopteridium* fall into two groups: Several, like *A. angustifolium* (Schenk) Schimper 1869, *A. ensis* Oldham 1862, *A. spathulum* (McClelland) Schimper 1869, were previous to Schimper considered to belong to *Taeniopteris*. As there is no evidence of Marattiaceous sori, later authors have restored them to *Taeniopteris*. On the other hand the second group of species – like the type species *A. muensteri*, and *A. hoerense* Schimper 1869 –, which most authors consider closely related to *Marattia* with regard to the sori, are included in *Marattia* or its fossil equivalent *Marattiopsis*.

Whether *A. californicum* Fontaine (1896, 1900) from the Jurassic, which does appear to have Marattiaceous sori, has separate sporangia as in the present fern is yet to be made clear. FONTAINE gives no details. Until *Angiopteris*-like sori in Fontaine's species are established, *Angiopteris neglecta* is the only fossil *Angiopteris* known.

In my opinion this species must be classified with *Angiopteris* and not with *Angiopteridium* as it agrees in all known characters with *Angiopteris* whereas the status of *Angiopteridium* is not at all clear.

NOTE: Dr. K. U. Kramer suggested the relationship between this Jurassic fern specimen and the recent genus *Angiopteris*.

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REFERENCES

BERRY, E. W. 1911. Lower Cretaceous. Maryland Geological Survey: 250.
————. 1911. Revision fossil ferns from the Potomacgroup. Proc. U.S. Nation. Mus. **41**: 312, 316.
CAMPBELL. 1911. The Eusporangiatae (Ophioglossales et Marattiales).
DUNKER. 1846. Monogr. d. nordd. Wealdenbild.: 5.
ENGLER-PRANTL. Natürliche Pflanzenfamilien **1**, teil 4: 438.
FONTAINE, W. M. 1890. Potomac or younger mesozoic flora. Monogr. U.S. Geol. Survey **15**: 73.
————. 1896. Mesozoic plants from near Oroville, California. Amerc. Journ. of Science **4**, ser. 2: 274.
————. 1900. In Ward: Status Mesozoic Flora. 20 Ann. Rept. U.S. Geol. Survey **2**: 351.
HARRIS, T. M. 1961. The Yorkshire Jurassic Flora. 1. British Museum (Nat. Hist.) London.

MÖLLER, H. 1902. Bornholms fossila flora, Pteridofyter. Acta Univ. Lunds **38**: 29.
NATHORST, A. G. 1875. Foss. växter Palsjö. Geol. Fören i Stockholm Förhandl. **2**, 10: 379.
————. 1878. Beitr. z. foss. Flora Schwedens. Stuttgart: 10.
OISHI, S. 1932. The Rhaetic Plants from the Nariwa district. Journ. Fac. Sc. Hokkaido Imp. Univ. (4), **I** 3,4
————. 1940. The mesozoic floras of Japan. Journ. Fac. Sc. Hokkaido Imp. Univ. (4) **V**, 2-4: 277, 281, 290.
———— and K. HUZIOKA. 1938. Fossil Plants from the Nariwa, suppl. Journ. Fac. Sc. Hokkaido Imp. Univ. (4) **V**, 1, 2: 74.
OLDHAM, T. and J. MORRIS. 1863. Fossil Flora of the Rajmahal series in the Rajmahal Hills. Palaeontologica indica 2, vol. **1**: 35.
SAHNI, B. 1942. Palaeobotany in India, 3. Journ. Ind, Bot. Soc. **21**: 220.
SCHIMPER. 1869. Traité de paléontologie végétale **1**. Paris: 602.
SEWARD, A. C. 1894. Catalogue mesozoic plants, Wealden Flora **1**: 99.
————. 1903. Fossil Floras of the Cape Colony. Ann. South-African Museum **4**: 10, 14.
————. 1907. Jurassic Plants from Caucasia and Turkestan. Mém. Com. Géol. St.-Pétersbourg. N.S. **38**: 23, 38, 64, 66.
SITHOLEY, R. V. 1944. Jurassic plants from the Tabbowa series in Ceylon. Spolia zeylanica **24** part 1: 6.
TATE, R. 1867. South-African fossils. Q.J. Geol. Soc. London **32**: 145.
THOMAS, H. H. 1913. The fossil flora of the Cleveland district of Yorkshire. 1 The flora of the Marske Quarry. Q.J. Geol. Soc. London **69**: 228.
YABE, H. 1905. Mesozoic plants from Korea. Journ. Imp. Univ. Tokyo **20**: 33.
————. 1922. Notes on some mesozoic plants from Japan, Korea, China. Sci. Rep. Tohoku Imp. Univ. (2) Geol. **VII**, 1: 5.
YOKOYAMA, M. 1905. Mesozoic plants from Nagato and Bitchu. Journ. Imp. Univ. Tokyo **20**: 3.