MARIOPTERIS FROM THE STEPHANIAN OF NORTH-WEST SPAIN

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ABSTRACT. Three species of Mariopteris are described from Stephanian B-C rocks in North-west Spain. The record is based only on five specimens, but it proves that Mariopteris was by no means extinct by Lower Stephanian times, as so often has been stated in the literature. The validity of the genus Pseudomariopteris is questioned.

When collecting in the Tineo coalfield of Asturias, North-west Spain, one of the present writers (C. A.-R.) discovered and identified a few specimens of well-preserved Mariopteris among numerous remains of a well-characterized assemblage of Stephanian B-C flora, probably representing lower Stephanian C (compare Zeiller 1882; Meléndez 1943; Menéndez Amor and Jongmans 1952, 1954; Alvarez-Ramis 1964; Doubinger and Alvarez-Ramis 1963, 1964; de la Vega Rollán 1964; Wagner 1964, 1966). The occurrence of Mariopteris in such a Late Carboniferous assemblage seemed most unusual, since it has been repeatedly stated in the literature that Stephanian floras are characterized by the absence of Mariopteris, which would be restricted to Namurian and Westphalian strata (Jongmans and Pruvost 1950, p. 343; Gothan and Weyland 1954, p. 438). Such a negative characteristic is obviously unreliable and it has been known for a long time (Huth 1912) that the range of Mariopteris extended into Lower Stephanian. However, the record of Mariopteris zeilleri Huth is based on a single specimen only, so that it might still be regarded as generally true that Mariopteris would not be an element of Stephanian floras. Also records provided by one of the present authors (Wagner in Kanis 1956; and Wagner 1964, 1966), relating to the presence of Mariopteris nervosa (Bronngniart) and Mariopteris sp. (cf. rotundata Huth) in basal Stephanian rocks of North-west Spain (viz. strata assigned to the newly proposed 'Cantabrian' Stage), do not materially alter the general statement of an absence of Mariopteris in the Stephanian proper (i.e. in strata of equivalent age to that of the Stephanian in Central France). An obviously different case is presented by the specimens described in the present paper. Not only have these specimens been found in rocks of fairly late Stephanian age, but they also show considerable diversification. Although the actual number of specimens collected is very small (only four specimens having been recovered from the Tineo coalfield), they are judged to belong to two different species. One more specimen, representing an additional species, has been determined from a collection made by Dr. W. F. M. Kimpe from upper Stephanian B rocks in the eastern part of the Villablino coalfield (province of León). A list of fossils dating this locality is given on p. 702 of the present paper. Only one of the specimens found in Stephanian B-C strata of North-west Spain has been completely identified with a known species of Westphalian age. The other specimens are considered to belong to new species. However, they show a close similarity with some Westphalian species recorded in the literature.

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numerous other plant remains collected in the course of his investigations on the coalfield of Villa-bino (León). They are also grateful for facilities in the Department of Geology, University of Sheffield, where Mr. B. Pigott took the photographs illustrating this paper.

DESCRIPTION OF SPECIES

*Mariopteris cantabrica* sp. nov.

Pl. 104, figs. 1, 2; Pl. 105, fig. 1; text-fig. 1

1964  *Mariopteris cf. latifolia* Alvarez-Ramis (nov Brongniart), p. 73, lám. III, fig. 4.

*Material.* Only one reasonably well-preserved specimen (holotype) and a more fragmentary remnant of this plant are available for description. The holotype is a negative.

*Description.* Pinnae of the penultimate order with alternate side pinnae inserted at wide angles, varying probably from 70° to 80° (60–90° on the holotype, due to tectonic deformation). Rachides of the penultimate order winged and somewhat grooved longitudinally; 3–4 mm. wide. Pinnae of the last order closely spaced and even partly overlapping; both catadromous and anadromous basal pinnules clearly bilobate in pinnae of average position in the frond. Rachides of the last order rounded, with irregular small costae; rachides up to 1 mm. wide. Pinnules inserted at 60–70° angles; adhering to the radius with almost the entire basal width in the upper parts of pinnae, and generally becoming more sphenopteroid in the lower parts, though almost retaining a relatively broad insertion (never inserted by the midvein only). Pinnules in the upper parts of pinnae probably entire (conjectural because of the fragmentary condition of the holotype), for those in the middle parts possess only slightly undulate margins. Lower pinnules clearly lobed, and basal pinnules clearly bilobate. Pinnules approximately 2½–3 times as long as broad. Lobes rounded, relatively wide, generally about twice as long as broad, and rather steeply inclined to the midvein (approximately 60°). Pinnule lamina apparently rather thin, though not so thin as to appear flat on the rock surface. Midvein decurrent, generally straight, sometimes slightly flexuous. Nervules steeply inclined (approximately 30° to the midvein), repeatedly bifurcate, thin and fairly numerous (approximately 35 veins per cm. on the pinnule border). Fructifications unknown.


*Derivatio nominis.* The Cordillera Cantábrica in North-west Spain.

*Diagnosis.* Winged rachides with closely spaced, partly overlapping pinnae; both catadromous and anadromous basal pinnules clearly bilobate. Ordinary pinnules entire to lobate, with rounded, rather steeply inclined lobes; insertion fairly broad; lamina thin. Midvein decurrent; nervules thin, steeply inclined, fairly numerous.

*Comparison.* The Westphalian species *Mariopteris guthoerli* Lutz is closely similar in the shape and dimensions as well as the insertion of the pinnules which are also rounded lobed to entire as in *Mariopteris cantabrica* sp. nov. However, the two species differ in
the apparently somewhat thicker lamina of *M. guthoerli* which may also possess rather less steeply inclined nerves. Lutz (1938) observed that the rachides of *M. guthoerli* possessed faintly marked transverse bars, additional to more clearly expressed longitudinal grooves. Such transverse bars have not been found on the rachides of *M. cantabrica*.

M. *witleri* Corsin is also characterized by little lobed, broadly based pinnules, but there the resemblance ends, for this species is further characterized by rachides with strongly marked transverse bars and massive looking, confluent pinnules with a thick lamina. Its basal pinnules are not very strongly bilobate.

*M. sauveuri* (Brongniart) Stur has more widely spaced pinnules with relatively broader and more sturdily looking pinnules than those occurring in *Mariopteris*

EXPLANATION OF PLATE 104

Figs. 1, 2. *Mariopteris cantabrica* sp. nov.: from tip of the seam Purita, lower Stephanian C, Tineo coalfield in Asturias, North-west Spain. 1. Holotype, × 1, showing bilobate catadromous and anadromous pinnules; and well-developed ordinary pinnules in probably the lower middle part of pinnae of the penultimate order. 2. Enlargement (× 3) of some lobing pinnules in lower part of specimen. Fig. 3. *Mariopteris melendezii* sp. nov.: from tip of the seam Purita, lower Stephanian C, Tineo coalfield in Asturias, North-west Spain. Holotype, × 1, showing fragments of pinnule with fairly small pinnules characterized by a semi-perpendicular insertion and rounded lobes. 4. *Mariopteris collicioris* D. White; from tip of seam 6, Carrascante coal group, upper Stephanian B, Villablino coalfield, province of León, North-west Spain. 4. Specimen (× 1) showing typically sphenopteroid pinnules with convex, rounded lobes; on the same slab are *Peraeopteris fongiausti* Wagner and *Sphenophyllum oblongifolium* Germer and Kaulfuss. 5. Enlargement (× 3) of main part of pinnule fragment on left side of specimen.
cantabrica sp. nov. The former species also appears to be characterized by a rather thick pinnule lamina. Its pinnules are even more generally entire than those of *M. cantabrica*.

*Mariopteris muricata* (von Schlotheim) sensu Zeiller has generally smaller, more rigid pinnules which are also narrower than those of *Mariopteris cantabrica* sp. nov. They also appear to be generally more entire than those of the latter. The pinnae of *M. muricata* may be less closely spaced than those of *M. cantabrica*.

Remarks. The holotype of *Mariopteris cantabrica* (Pl. 104, fig. 1) shows fragments of pinnae which probably belong to the lower middle parts of pinnae of the penultimate order. Only the lower parts of side pinnae (of the last order) are preserved, but it appears evident that a rather large proportion of the pinnules in the frond were either entire or nearly entire. Lobed pinnules show rather short, rounded lobes of a similar shape to those visible on the type specimen of *Mariopteris gutheoeri* Lutz (see Lutz 1938, Taf. XIX, figs. 4, 4a). On the whole, Lutz’s specimen possesses more entire pinnules, but this feature may well be ascribed to a slightly higher position within a pinna of the penultimate order than that occupied by the holotype of *Mariopteris cantabrica* sp. nov. This impression is strengthened by the fact that the unlobed pinnules of the latter show exactly the same proportions (i.e. approximately 10 × 4 mm) as those of the former, whereas the lobed pinnules of *M. cantabrica* are larger and relatively longer (as can be expected for lobing segments). It would therefore be quite possible to identify *M. cantabrica* with *M. gutheoeri*, if it did not appear that *M. cantabrica* possessed a relatively thinner pinnule lamina as well as apparently more widely spaced nerves than *M. gutheoeri*. Moreover, Lutz recorded that *M. gutheoeri* possessed faint transverse bars on the rachides. Although this feature is hardly visible on the illustration of the holotype of this species (Lutz 1938, Taf. XIX, figs. 4, 4a), it should be an important characteristic, since Danzé-Corsin (1953, p. 53) decided that the subdivision of *Mariopteris* could be to a large extent based on this characteristic. She noted that most of the species of *Mariopteris* were characterized by the presence of transverse bars on the rachides (i.e. the group *Linoecae*), whilst only a few species showed only longitudinal striae or grooves on the rachides and climbing stem (group *Alinaecae*). *M. cantabrica* apparently belongs to the *Alinaecae* and therefore has to be considered as quite different from *M. gutheoeri* (of the *Linoecae*), even though the pinnules of both species are rather similar. It may, however, be noted as well that the basal pinnules of *M. cantabrica* are more strongly bilobate than those of *M. gutheoeri*, thus adding another means of differentiation.

There is an appreciable difference in stratigraphic age between these two species, for *Mariopteris gutheoeri* Lutz has been recorded from the Westphalian C (Saar-Lorraine area), whilst *Mariopteris cantabrica* sp. nov. has been found in lower Stephanian C rocks. Both species are known from single specimens only, however.

As far as known to the present authors, there is only one record in the literature which may point to a wider range for *M. cantabrica*. It deals with a rather fragmentary specimen from upper Westphalian D rocks in northern Portugal, which has been figured under the name of *Mariopteris* cf. *muricata* (von Schlotheim) by Teixeira (1942, Est. IV, figs. 2–3). Unfortunately, this specimen, which shows a marked resemblance to *Mariopteris cantabrica*, appears too fragmentary to be identified with certainty.

Occurrence. Lower Stephanian C, tip of the seam Purita, Tineo coalfield, Asturias, North-west Spain.
Mariopteris melendezii sp. nov.

Plate 104, fig. 3; Plate 105, fig. 2; text-fig. 2.

1964 Mariopteris sp. Alvarez-Ramis, p. 73, pl. III, fig. 5.

Material. The description is based on two specimens, one of which is a negative (holotype). The second specimen is too fragmentary to be figured.

Description. Rachis of the penultimate order slightly winged, irregularly grooved in longitudinal direction, relatively wide (2 mm.). Pinnae of the last order inserted at angles of approximately 60°; alternating, closely spaced, and partly somewhat overlapping; apparently rather quickly tapering in the apical portions. Rachides of the last order fairly thin (0.5 mm. wide) and irregularly grooved in longitudinal direction. Pinnules small, completely adherent to the rachis, and even decurrent on the basiscopic side; inserted slightly obliquely though nearly perpendicular in the lower parts of pinnae; approximately 2½ times longer than they are broad. Pinnules always lobate, with shallow sinuses. Lobes rounded to somewhat denticulate. Basal catadromous pinnules bilobate. Pinnule lamina probably of average thickness. Midvein almost as thin as the nervules; generally non-decurrent, sometimes rather flexuous. Nervules widely spaced (approximately 10–12 veins per cm. on the pinnule border), repeatedly forked at fairly wide angles; generally not very steeply inclined. Fructifications unknown.


Derivation nominis. Professor B. Meléndez, University of Madrid, who has consistently furthered research on the Carboniferous of Spain.

Diagnosis. Pinnae probably rather short, and tapering rapidly in the apical part. Pinnules small, inserted at wide angles; adherent with the entire base, and decurrent on the basiscopic side; always lobate, with rounded to slightly denticulate lobes. Only basal catadromous pinnules are bilobate. Nervation wide, with thin, often flexuous midvein and repeatedly forking laterals.

Comparisons. Mariopteris zelleri Huth appears to have more clearly winged and probably stronger rachides than those occurring in Mariopteris melendezii sp. nov. It also possesses bilobate basal pinnules on both the catadromous and the anadromous sides of pinnae, and shows rather strong midveins. M. melendezii has apparently only bilobate basal pinnules on the catadromous side, and possesses thin midveins. The shape

EXPLANATION OF PLATE 105

Fig. 1. Mariopteris castaibricea sp. nov. Enlargement (×3) of upper right part of holotype, showing bilobate basal pinnules.

Fig. 2. Mariopteris melendezii sp. nov. Enlargement (×3) of holotype showing fairly thin pinnule lamina and rounded lobes of pinnules.

Fig. 3. Mariopteris officinaris D. White. Enlargement (×3) of lower right part of specimen figured on Plate 104, fig. 4, showing typically sphenopteroid pinnules with convex lobes.

Localities are given in the explanation of Plate 104.
of the pinnules is fairly similar in both species, particularly with regard to the somewhat denticulate lobes (which are perhaps somewhat more strongly expressed in M. zelleri).

Mariopteris guillaumel Corin shows some similarity to Mariopteris melendezi sp. nov. in the general aspect and insertion of the pinnules which are also characterized by rounded lobes. However, its pinnules appear to be generally larger, somewhat more obliquely inserted and, on the whole, more entire than those of M. melendezi. It is also noted that the rachides of M. guillaumel possess strongly marked, closely set transverse bars.

Mariopteris daviesi Kidston possesses larger pinnules with more clearly pointed lobes, and thus differs markedly from Mariopteris melendezi sp. nov., even though in both species the pinnules tend towards a perpendicular insertion. The rachides of M. daviesi possess widely spaced transverse bars, a characteristic which has not been observed in M. melendezi.

Mariopteris temnis Bell shows a faint resemblance to Mariopteris melendezi sp. nov., but possesses larger pinnules with probably a somewhat thinner lamina than that occurring in the latter.

Mariopteris beneckei Huth possesses somewhat larger, more obliquely inserted pinnules which are also more sphenopteroid than those of Mariopteris melendezi sp. nov. Both the cutadromous and the anadromous basal pinnules of M. beneckei are clearly bilobate.

A comparison with Mariopteris hirsuta Corsin shows the presence of more roundly lobed pinnules in Mariopteris melendezi sp. nov., as well as the absence of hairs on the underside of pinnules (which is a characteristic feature of M. hirsuta).

Remarks. The two specimens available for the description of Mariopteris melendezi sp. nov. are both fragments of the middle parts of pinnules; thus showing the average type of pinnules occurring in this species. One of the most striking characteristics found is the broad insertion of the pinnules which are even decurrent on the basiscopic side and which appear to be mainly confluent. This insertion is comparable to that of pinnules in the genus Dicksonites which also belongs to the Mariopteridaceae (see Corsin 1961; Danzé-Corsin 1953). A comparison with Dicksonites is strengthened by the tendency towards an almost perpendicular position of the pinnules in M. melendezi. On the other hand, the clearly bilobate basal pinnules, a characteristic which is unfortunately not very well brought out by the photograph on Plates 104, 105, definitely preclude an attribution to Dicksonites. The species discussed here also lacks the strong rachides which form one of the salient features of Dicksonites.

The occurrence of Mariopteris cantabrica sp. nov. and Mariopteris melendezi sp. nov. together in the same locality naturally invites speculation on the possibility that they might be conspecific. Both species belong to the same group of Mariopteris, viz. the Alicate Danzé-Corsin which are characterized by the absence of transverse bars on the
rachides. Furthermore, both species possess rounded lobes, although these tend to be slightly pointed in *M. melendezii*. There the comparison ends however. *M. cantabrica* has relatively larger, more obliquely inserted pinnules with more closely spaced nervules; the nervation being clearly wider in *M. melendezii*. Pinnules of equivalent size in *M. melendezii* are more lobate than those of *M. cantabrica*, which tend to be more entire. Moreover, the basal pinnules of *M. cantabrica* are more distinctly bilobate than those of *M. melendezii*.

**Occurrence.** Lower Stephanian C, tip of the seam Purita, Tineo coalfield, Asturias, North-west Spain.

**Mariopteris colliciarlis** D. White

Plate 104, figs. 4, 5; Plate 105, fig. 3

1943 *Mariopteris paddocki* var. colliciarlis D. White, p. 87, pl. 12, figs. 1–2, pl. 13, figs. 1–9.

cf. 1955 *Mariopteris sphenopteroides* Daber (non Lesquereux), p. 18, Taf. IV, fig. 3, Taf. XVI, figs. 1–3.

**Material.** Only a single specimen (positive) is available for description.

**Description.** Rachides of the penultimate order rather thin (up to 1 mm. wide), grooved and provided with somewhat indistinct transverse bars. Pinnae of the last order short and composed of 5–7 pinnules; pinnules inserted at approximately 50° angle to the rachis. Rachides of the last order thin. Pinnules inserted by part of the basal width only; decurrent on the basiscopic side and often tending towards insertion by the midvein only (sphenopteroid insertion); approximately as long as wide or only a little longer than wide, and rather small; entire or shallowly lobed, with rounded, somewhat oval lobes. Both the catadromous and the anadromous basal pinnules bilobate. Pinnule lamina apparently rather sturdy, since the pinnules are rather markedly convex (vaulted). Midvein little marked or virtually absent. Nervules thin, rather inconspicuous, and repeatedly forked.


**Diagnosis.** Thin rachides, longitudinally grooved with faint transverse markings; bearing short pinnae of the last order consisting of sphenopteroid, shallowly lobed pinnules with rounded, somewhat oval lobes. Midvein virtually absent; lateral veins thin, repeatedly forked.

**Comparisons.** *Mariopteris colliciarlis* D. White is closely similar to *Mariopteris paddocki* D. White, to which it has been supposed to stand in a varietal relationship (D. White 1943). The pinnules of *M. paddocki* are more slender than those of *M. colliciarlis*, however.

There is also a close similarity with *Mariopteris sphenopteroides* Daber which is only marginally different from *Mariopteris colliciarlis* D. White by the presence of somewhat larger pinnae and a more slender aspect of the pinnule lobes. It should be
WAGNER AND ALVAREZ-RAMIS: MARIOPTERIS FROM NORTH-WEST SPAIN

noted that M. sphenopteroides Daber is a younger homonym of M. sphenopteroides Lesquereux.

Mariopteris beneckei Huth is also characterized by markedly sphenopteroid pinnules and thus shows a certain resemblance to Mariopteris collicilarius D. White. However, M. beneckei has relatively longer pinnules with more angular, sometimes rather pointed lobes which differ clearly from the rounded lobes in M. collicilarius.

Mariopteris sphenopteroides Lesquereux (see White 1899) shows relatively broad pinnules with pointed lobes and does not seem nearly as sphenopteroid as Mariopteris collicilarius D. White.

Mariopteris lishi (Bronniart) Huth possesses characteristically ovate pinnules (or lobes) which appear somewhat pointed, and thus differ from the more rounded lobes of Mariopteris collicilarius D. White.

Remarks. The species described here has been originally recorded as Mariopteris paddocki var. collicilarius by D. White (1943) in a posthumous work edited by C. B. Read. This paper only contained descriptions and no comparisons. Neither did it state the reasons why Mariopteris collicilarius was to be considered a variety of M. paddocki, described in the same paper. In the absence of a recorded progression of forms linking M. paddocki and M. collicilarius, and having regard to the difficulty of determining a varietal relationship in fossil plants, it seems better for the time being to consider both Mariopterids mentioned as separate species.

D. White (1943) figured several well-preserved specimens of Mariopteris collicilarius from the Lower Pennsylvanian of West Virginia. Especially his plate 13, fig. 5 is directly comparable with the specimen recorded here from the Stephanian B of North-west Spain (Pl. 104, figs. 4, 5; Pl. 105, fig. 3). Despite the great difference in age, as well as the widely separate geographic occurrence, there is such a complete correspondence in morphological features that identification of the Spanish material with the American species is inevitable.

White (1943) noted in the plate explanation (pl. 13) that ‘except for the common heteromorphy of the basal pinnules, this form’ (Mariopteris paddocki var. collicilarius) ‘is similar to species here described under the genus Diplothemena’. This is undoubtedly a reference to the group of Sphenopteris obtusiloba Bronniart which is recorded in White’s paper under the name of Diplothemena, together with other Sphenopterid species. It is a fact that the rather stiff, rounded lobes of Mariopteris collicilarius evoke the image of certain species of the alliance of S. obtusiloba, in particular Sphenopteris rotundiloba Nèmeje (non Danzé) and Sphenopteris whitii Bell. Also the grooved, slender rachides of M. collicilarius are characteristically found in this group of Sphenopteris. On the other hand, the presence of transverse bars on the rachides (indistinct though they may be) is a characteristic trait of Mariopteris of the group of the Lineae (Danzé-Corsin 1953). The presence of bilobate basal pinnules is an even more convincing argument in favour of attributing this species to Mariopteris rather than to Sphenopteris.

Among the various figures of Mariopteris recorded in the literature, two fragments illustrated by P. Corsin (1932, pl. CVII, figs. 1–2) under the name of Mariopteris rotundata Huth appear rather similar to Mariopteris collicilarius D. White. The pinnules of Corsin’s specimens are sphenopteroid to a high degree and thus apparently differ from the predominantly pecopteroid pinnules of the type M. rotundata as figured by
Huth (1912, figs. 1–3). Corsin also observed that his specimens appeared more sphenopteroid than the types. Furthermore, it is noted that Huth described the rudiholes of *M. rotundata* as finely punctate, whereas Corsin described them as possessing faintly marked transverse bars. These differences seem to make Corsin’s identification of *M. rotundata* Huth somewhat doubtful. With regard to *M. colliciaris*, it seems that Corsin’s specimens show relatively larger pinnules which may be almost twice the size of those belonging to D. White’s species.


DISCUSSION ON THE PRESENCE OF MARIOPTERIS IN STEPHANIAN STRATA

The description of three species of *Mariopteris* from rocks of upper Stephanian B and lower Stephanian C ages in North-west Spain clearly disproves the notion that this genus became extinct at the end of Westphalian or, at the latest, at the beginning of Stephanian times. Of particular interest is the fact that the specimens described here are either identifiable with or closely comparable to Westphalian species of *Mariopteris*. Although the paucity of material (only five specimens among the many thousands collected) indicates that a formerly abundant element of Upper Carboniferous floras has become exceedingly scarce during Stephanian times, the presence of three different species proves its comparative diversity at a time considerably later than that represented by the main occurrence of this group of pteridosperm foliage.

The often repeated statement that *Mariopteris* would be absent from Stephanian strata has thus been proved incorrect. It may, however, be worth while to explore the inadequacy of this statement a little further. In his famous description of the Stephanian flora of Commeny, in Central France, Zeiller (1888) recorded three species of Mariopterid characteristics, viz. 'Diplomema' ribeyroni, 'Diplomema' busqueti, and 'Diplomema' pauleri. These species were assigned to *Diplomema* by Zeiller because they apparently possessed bipartite fronds. However, Danzé-Corsin (1953) observed that the frond was probably quadrifoliate in *D. pauleri*, as was generally the case for *Mariopteris*. She also drew attention to the relatively entire, little lobed pinnules of these three species, and mentioned the presence of bilobate basal pinnules which is a characteristic feature of *Mariopteris*. The foliage of *Diplomema* in the more restricted sense (Danzé-Corsin 1953) is more highly dissected. Previously, Bell (1938) had already referred 'Diplomema' ribeyroni Zeiller to *Mariopteris* (with an interrogation mark), whilst Teixeira (1939) described a species of the same alliance under the name of *Mariopteris corsini* Teixeira. Furthermore, Stockmans and Mathieu (1939), when describing an East Asian species closely similar to 'Diplomema' busqueti Zeiller, assigned it to *Mariopteris? halley* Stockmans et Mathieu.

As the result of the considerations mentioned above, Danzé-Corsin (1953) decided to receive the three species described by Zeiller in a special genus called 'Pseudomariopteris'. This genus would be characterized by bipartite or quadrifoliate fronds with longitudinally striate axes and generally little lobed, almost entire pinnules, as well as bilobate basal pinnules to the pinnules of the last order. Only the presumed predominance of bipartite, instead of quadrifoliate fronds in *Pseudomariopteris* would distinguish this genus from real *Mariopteris*. The question automatically arises whether such a difference would be adequate to warrant the recognition of a special genus. However, Danzé-Corsin (1953) did include *Pseudomariopteris* with the family of the Mariopteridaceae (altered to Mariopteridaceae by P. Corsin 1961).

The genus *Pseudomariopteris* gained almost immediate acceptance in the literature and, in fact, provided a most convenient heading for Mariopterids of Stephanian age. Apart from the three species originally described by Zeiller, the more recently described
Mariopteris corsini Teixeira was referred to Pseudomariopteris by Wagner (1962, pl. 33) and, ultimately, Alvarez-Ramis and Doubinger (1965) introduced still another species, Pseudomariopteris villalbinensis. It is to be noted that Pseudomariopteris riebeironi and, to a somewhat lesser extent, Pseudomariopteris busqueti are common elements of Stephanian B and C floras. Pseudomariopteris riebeironi has its first occurrence in Westphalian D strata, but does not really become common before Stephanian B.

Stockmans and Mathieu (1957, p. 17) expressed doubt as to the wisdom of recognizing Pseudomariopteris as a genus separate from Mariopteris, and it may perhaps be considered an open question whether or not Pseudomariopteris should be incorporated with the latter. However, there can be no doubt that Mariopteridaceae of a type closely similar to ordinary Mariopteris are among the common constituents of Stephanian floras. The general persistence of this group of Pteridosperms is further underlined by the find of three undescribed species of Mariopteris in Stephanian B-C rocks, as reported in the present paper.

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WAGNER AND ALVAREZ-RAMIS: MARIOPTERIS FROM NORTH-WEST SPAIN  705


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