

Alethopteris lancifolia WAGNER, A RARE ELEMENT OF THE LOWER WESTPHALIAN “FERN LEDGES” OF ATLANTIC CANADA

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ABSTRACT

Description of a plant impression from the lower Westphalian (Langsettian) “Fern Ledges” at Saint John, New Brunswick, and identification with *Alethopteris lancifolia* Wagner, a European species of the same general age. Comparison is made with similar species.

Keywords: “Fern Ledges”, New Brunswick, Langsettian, *Alethopteris*.

RESUMEN

Se describe una impresión vegetal del Westfaliense inferior (Langsettiense) de los “Fern Ledges”, cerca de Saint John, Nueva Brunswick, identificándola como *Alethopteris lancifolia* Wagner, una especie europea de la misma edad. Por último, se comparan varias especies similares al ejemplar estudiado.

Palabras clave: “Fern Ledges”, New Brunswick, Langsettiense, *Alethopteris*.

INTRODUCTION

The classical locality known as the “Fern Ledges” at Saint John, New Brunswick, has yielded plant impressions from slaty shales intercalated between sheet sandstones. These constitute a varied assemblage which has been documented in detail by Stopes (1914), whose excellent work has not been used to the extent it deserves. Stopes referred to the assemblage as belonging to the “lowest zone of the middle Westphalian”, an appraisal which needs to be modified to lower Westphalian Langsettian (sub)stage. The floral remains from the “Fern Ledges” constitute a drifted assemblage of diverse origin, as Stopes (1914: 123) correctly observed. As such, the assemblage is of considerable stratigraphic interest. Its importance is enhanced by the fact that members of the Natural History Society of New Brunswick assiduously collected from the “Fern Ledges” locality in the coastal exposures near Saint John as well as from the same beds at Duck Cove, further along the coast. A large, well curated collection of this flora is found at the New Brunswick Museum, and additional specimens, obtained by personnel of the Geological Survey of Canada,

are stored in the Geological Survey collections at Ottawa. These are all historical collections made around the turn of the 19th and 20th centuries. Indeed, the thin layers of shale intercalated between the sandstones in the classical exposures of “Fern Ledges” have been worked so extensively in the past that present collectors find it difficult to obtain additional specimens.

Among the long list of species recorded by Stopes (1914) there is only one *Alethopteris*, viz. *Alethopteris discrepans* Dawson 1862, which Stopes identified with *Alethopteris lonchitica* (Schlotheim 1820) Sternberg 1825. Recent work by Zodrow & Cleal (1998), which includes a refiguration of the type specimen of Schlotheim’s species, has allowed a reappraisal of the different forms recorded as *Alethopteris lonchitica* in the literature. Zodrow & Cleal (1998) have corroborated the suspicion that practically all the published records of this species are spurious, and that different specific names will have to be applied. One of the taxa to be reexamined for this purpose is *Alethopteris discrepans*. This involves not only material from the “Fern Ledges”, but also samples from coeval strata in the Joggins section of the Cumberland Basin in Nova Scotia. A reap-

praisal of *Alethopteris discrepans* Dawson 1862 will be the subject of a separate paper. At present, a special form published under the name of *Johannophyton discrepans* (Dawson 1862) by Matthew (1910) will be documented on the basis of a well preserved specimen from the "Fern Ledges", this being the same as that figured by Matthew (1910) and, more recently, by Miller (1987) and Miller & Buhay (1988), this time as *Alethopteris discrepans latus* Matthew. This is a manuscript name which appears on a museum label and which cannot be regarded as validly introduced. The specimen in question is well preserved, and consists of part and counterpart. The latter is refigured in the present paper where it is identified with *Alethopteris lancifolia* Wagner 1961, of the lower Westphalian in Netherlands Limburg.

SYSTEMATIC DESCRIPTION

Genus *Alethopteris* Sternberg 1825

Alethopteris lancifolia Wagner 1961

Fig. 1

- 1910 *Johannophyton discrepans* (Dawson) - Matthew, 83-85, pl. II, fig. 7, non figs 8-9 (sporangia), non pl. III, figs 1-7 (= *Alethopteris discrepans* Dawson), non figs 8, 10 (sporangiate structures).
- 1953 *Alethopteris lonchitica* (Schlotheim) Unger forma *Serli pars* - Gothan, 16-18, Taf. 4, fig. 1 (non fig. 4) (non Taf. 6, fig. 1).
- 1955 *Alethopteris lonchitica* (Schlotheim) Unger *pars* - Crookall, 22-26, Pl. V, fig. 1 (non fig. 2 = *Alethopteris urophylla* (Brongniart) Goeppert) (non pl. X, figs 1, 3 = *Alethopteris urophylla* (Brongniart) Goeppert).
- * 1961 *Alethopteris lancifolia* Wagner - Wagner, 6-8, pls 1-4.
- ? 1983 *Alethopteris lonchitica* (Schlotheim) Sternberg - Josten, 128-129, Taf. 47, figs 1, 1a.
- 1987 *Alethopteris discrepans latus* Matthew ex Miller, 20, fig. 19.
- 1988 *Alethopteris discrepans latus* Matthew - Miller & Buhay, 223, fig. 5 (same as in Miller 1987).
- ? 2003 *Alethopteris lonchitica* (Schlotheim) Sternberg *pars* - Josten und Van Amerom, Taf. 93, fig. 1.

Material: A single impression (part and counterpart) of part of a pinna of the last order on dark grey slaty shale. Provenance: "Fern Ledges". Cat. n° NBMG 3397.

Description: A thin rachis with widely spaced, large pinnules which are connected by a narrow band of sloping base; acroscopic side markedly constricted. Pinnules long, ribbon-shaped, with bluntly acuminate apices. Length 55 mm at 10-12 mm width. Insertion at c. 60°. Midrib well marked but relatively thin, straight, almost imperceptibly sloping at the extreme base. Lateral veins close, parallel, and at right angles to both midrib and pinnule margin, once forked near the midrib or further away

from the midrib. Vein density around 45 to 50 veins per cm on the pinnule border.

Comparisons: Another species with large pinnules is *Alethopteris jankii* Laveine 1978, of the upper Westphalian of northern France. Pinnule size in this species is even larger than that found in the specimen from the "Fern Ledges", whereas pinnule morphology is very similar, as is the type of venation. However, the vein density is markedly lower in *Alethopteris jankii*, i.e. around 25 veins per cm.

Alethopteris bertrandii Bouroz 1956 is yet another species with large pinnules, but its vein density is much lower, less than 25 veins/cm, as follows from the vein diagram published by Bouroz. It is also noted that the type specimens from the Bolsovian of northern France show the narrow pinnules which are characteristic of *Alethopteris urophylla* Brongniart 1834. The latter species is usually recorded under the name of *Alethopteris lonchitica* (Schlotheim) Sternberg, but the photographic reproduction of the type specimen of Schlotheim's species by Zodrow & Cleal (1998) has shown these two species to be rather different.

Remarks: *Alethopteris discrepans* is a species introduced by Dawson (1862), but his diagrammatic drawings did not allow this species to be recognised beyond its type area in Atlantic Canada. Stopes (1914) referred it to *Alethopteris lonchitica*, an identification which can no longer be regarded as valid, since Zodrow & Cleal (1998) figured the type of *Alethopteris lonchitica* which is rather different from *Alethopteris lonchitica auctorum*.

Matthew (1910) referred *Alethopteris discrepans* Dawson to a new genus, *Johannophyton*, on the basis of apparent seed capsules (cupulae) which were found associated. The connection is nowhere visible and Stopes (1914) rightly rejected this genus. Together with the representation of these apparent fructifications, Matthew (1910) refigured Dawson's original illustrations and added drawings of some additional specimens including a pinna fragment (his pl. II, fig. 7) with large pinnules showing a dense venation. A photograph of this specimen was published subsequently by Miller (1987) and Miller & Buhay (1988) as *Alethopteris discrepans latus* Matthew, this being a manuscript name which appeared on the label with this specimen. The partial counterpart of the same specimen is figured in the present paper in which the identification with *Alethopteris lancifolia* Wagner is suggested. The latter is a species described from the upper Langsettian of the South Limburg Coalfield in the Netherlands (Wagner, 1961). This is one of the few species of *Alethopteris* known to possess a comparable vein pattern of the same density, i.e. around 50 veins/cm. The size of the pinnules of *Alethopteris lancifolia*, as represented by the types, is smaller than that shown by Matthew's specimen from the "Fern Ledges"



Figure 1. *Alethopteris lancifolia* Wagner 1961. Provenance: “Fern Ledges” at Saint John, New Brunswick. Cat. n° NBMG 3397 (New Brunswick Museum Geology collections). **a**, Pinna fragment showing elongate, ribbon-shaped pinnules with a very dense nervation, x 3. Counterpart of specimen figured by Miller (1987). **b**, The same, x 1.

which are more elongate. Correspondingly, the pinnules of this specimen from the “Fern Ledges” are more ribbon-shaped than the smaller size pinnules represented in the types of *Alethopteris lancifolia*. It is likely that this falls within the range of variation of pinnules within the frond. Indeed, when the photographs of the types of this species are examined, it would appear that the specimen from the “Fern Ledges” might fit at the end of a range which includes already a fragment with pinnules of 33 mm length as figured on plate 4 figures 13, 13a in Wagner (1961). In every other respect Matthew’s specimen from the “Fern Ledges” conforms to *Alethopteris lancifolia*, including the pinnule attachment, with a narrow band connecting adjacent pinnules, the narrow, straight midrib, and densely arranged, once forked lateral veins, hardly at all curved at the midrib and standing perpendicular to both midrib and the pinnule margin.

Wagner (1961) included in the synonymy of *Alethopteris lancifolia* some specimens figured by Gothan (1953) and Crookall (1955) from the Ruhr District in western Germany and Yorkshire in England, respectively. The specimen figured by Gothan (1953: Taf. 4 fig. 1) as *Alethopteris lonchitica* forma *serlii*, is clearly the same as *Alethopteris lancifolia*, and quite comparable to the form figured as *Alethopteris discrepans latus* by Matthew (1910) and Miller (1987) which is refigured as *Alethopteris lancifolia* in the present paper. Although Zодrow & Cleal (1998: 81) agreed with the list of *Specimina Excludenda* of *Alethopteris serlii* (Brongniart 1833) Goeppert as given in Wagner (1968: 139), they did not refer specifically to *Alethopteris lancifolia*. On the other hand, the monograph of Carboniferous plant fossils from the Ruhr District by Josten (1990) failed to refer to *Alethopteris lancifolia*, while continuing to include Gothan’s (1953) *A. lonchitica* forma *serlii* in the general synonymy of *Alethopteris lonchitica* (Schlotheim) Sternberg. A very similar specimen, possibly belonging to *Alethopteris lancifolia* Wagner, was recently figured from the middle Namurian of Westphalia by Josten & Van Amerom (2003: Taf. 93 fig. 1) under the name of *Alethopteris lonchitica*. In the absence of a well preserved venation, the attribution of this specimen to *A. lancifolia* must remain doubtful. However, the earlier figuration of a similar specimen from the same locality, Vorhalle, a suburb of Hagen, by Josten (1983: Taf. 47 figs 1, 1a) seemingly allows a vein count of c. 40 veins/cm. These specimens are clearly not to be attributed to *Alethopteris lonchitica* as redescribed by Zодrow & Cleal (1998), being quite different from Schlotheim’s type (Zодrow & Cleal, 1998: pl. 1 figs 1-4, pl. 2 figs 1-2).

The specimen figured by Crookall (1955: pl. V fig. 1) as *Alethopteris lonchitica* (Schlotheim), and which Wagner (1961) included with *Alethopteris lancifolia*, is a tripinnate fragment showing the transition from large, somewhat acuminate pinnules to pinnae with shorter pinnules. It displays

very well the size variation in large pinnae of *Alethopteris*. Although the attribution of this specimen to *Alethopteris lancifolia* Wagner is probably correct, the illustration at natural size does not permit a proper vein count. An alternative determination would be *Alethopteris urophylla* Brongniart, a species which Crookall refers to as identical to *Alethopteris lonchitica*. Unfortunately, Crookall (1955: 24) only refers to the veins being fairly close together and very fine, and this appreciation appears in the general description of his concept of *Alethopteris lonchitica*.

Another species with a high vein density (40-50 veins/cm) is *Alethopteris densinervosa* Wagner 1968, as described from the Bolsovian of northern France (Wagner, 1968: 59-61, pl. 15; see also Buisine 1961, under *Alethopteris serlii*). However, the biconvex shape of the smaller pinnules and the broadly confluent bases of the larger pinnules provide discriminating characters. It is noted that Zодrow & Cleal (1998: 72) included *Alethopteris densinervosa* in the synonymy of *Alethopteris lonchitica* (Schlotheim), but they did not argue the point beyond mentioning that this species might be the same as *Alethopteris westphalensis* Wagner and *Alethopteris missouriensis* White. They based the assumption of specific identity on a morphometric study of an assemblage from Pennsylvania by Scheihing & Pfefferkorn (1980). The attribution to *Alethopteris lonchitica* (Schlotheim) seems difficult to sustain.

It is noted that the proper discrimination of species in fragmentary remains of pteridosperm foliage will always be subjective to a greater or lesser extent, particularly where the paucity of specimens does not permit the morphological variation to be established. A morphometric study of pinnule characters, as carried out by Scheihing & Pfefferkorn (1980), is too restrictive in the selection of measurable characters, even where care is taken to record only standard lateral pinnules. There is no substitute for large specimens in which the transition from elongate pinnules to last order pinnae can be observed. This transition is usually quite abrupt in *Alethopteris*, and the lengthening of pinnules is correspondingly quite extreme. Pinnule sizes are therefore quite often rather variable within a single species, and this may also be the case in *Alethopteris lancifolia*. The single specimen recorded here from the “Fern Ledges” shows pinnule sizes which are apparently at the end of the range which may be admitted for *A. lancifolia*.

Occurrence: Canada: “Fern Ledges” at Saint John, New Brunswick; - Netherlands: South Limburg, Emma Mine, about 2 m above seam XI, upper Langsettian (types), Oranje-Nassau II Mine, at 8-10 m above seam III, upper Langsettian; - Germany: Ruhr District, exact locality unknown; - Britain: Stanley Main Seam, Yorkshire, Duckmantian.

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