

Enigmatic plant mesofossil from the Visean of the Kortgene-1 well (southern Netherlands)

by Stefan HELSEN, Muriel FAIRON-DEMARET & Pierre BULTYNCK

Abstract

An enigmatic microscopic plant fossil is described from Visean carbonates of the Kortgene-1 well (southern Netherlands). Showing morphological affinities with the young leaves of some Visean land plants, its presence may have palaeogeographical implications.

Key-words: plant fossil, Brabant-Campine Basin, Visean, The Netherlands

Resumé

Un fossile énigmatique microscopique d'origine végétale est décrit des roches carbonatées viséennes du sondage de Kortgene (Pays-Bas méridionaux). A cause des affinités morphologiques avec les jeunes feuilles de certaines plantes terrestres viséennes, sa présence peut avoir des implications paléogéographiques.

Mots-clefs: plante fossile, Bassin de Brabant-Campine, Viséen, Pays-Bas

Introduction

In 1993 the Geological Survey of the Netherlands provided the cores of a series of deep wells for conodont research, including the Kortgene-1 well (HELSEN, 1995). Located in Noord-Beveland (Zeeland), this hydrocarbon exploration well was drilled in 1982 for the Nederlandse Aardolie Maatschappij in the western extension of the Campine-Brabant Basin, immediately north of the Caledonian Anglo-Brabant Massif (Fig. 1). Coordinates of the Kortgene-1 well site are X: 47489.43, Y: 399317.00. The top of the Carboniferous, covered by thick Late Cretaceous and Cenozoic deposits, was reached at 946.90 m depth. Comprising Early Visean shallow marine to supratidal carbonates and Late Tournaisian siliciclastics (ages based on foraminifera and spores), Carboniferous strata are at least 619 m thick (946.90-1365.10 m). Likely, they blanket the siliciclastics attributed to the Frasnian and Givetian (1720.33-1900.00 m) (Nederlandse Aardolie Maatschappij, unpublished data).

Because only quarters of a core, weighing 150-400 g each, could be dissolved, several samples of a limited stratigraphical interval were processed together. Dissolution of the sampled limestones and dolomitic limestones in a 7-8% formic acid solution took 48 hours. The 2.5-0.075 mm fraction of the residue was concentrated using bromoform. All of the five 'combined' samples, taken in between 946.90 and 982 m depth,

were devoid of conodont elements. However, in the 952-959 m sample (a dolomitised packstone-grainstone) a small structure of botanical nature was discovered. In the present paper the affinities of this structure and its possible palaeogeographical implications are discussed.

Description

The specimen has a bilateral symmetry and is composed of two, more or less opposite structures held together by a common basal part. The specimen is replaced by iron oxides and is well preserved, showing no fissures, nor indications of corrosion of the surface. Yet, dolomite from the surrounding sediment is attached at various parts of the structure. The maximum diameter, measured between the outer tips of the two elements, is about 1.36 mm.

Both elements are considered as young dorso-ventrally flattened leaves (Plate 1: Figs 1-2). They are relatively thick, which is not unusual for young leaves growing close to the apical meristem. None of them shows a tendency to curl up. Regarding this specimen only, it is, however, delicate to deduce the shape of the leaves or the size of the attachment zone at the adult stage. Especially on the abaxial side of the leaves several stomata of 10-20 μm across are observed, some of them showing a thick conspicuous rim above the surrounding guard cells (Pl. 1: Figs 4-5). At the terminal part of the short axis two small bumps, positioned in between, but perpendicular to the young leaves, likely correspond to the meristematic bulges of a next pair of leaves (Pl. 1: Figs 1-2). Usually located in between these bulges, the apical meristem is, however, not observed. As a result, the leaves on the small stalk are inserted following an opposite-decussate phyllotaxis. The short axis consists of a resistant, external cortex, an internal cortex of likely parenchymatous tissue forming a depression on the specimen, and a vascular bundle (Pl. 1: Fig. 3). The latter is relatively narrow, as compared to the total diameter of the axis. Unfortunately, the stalk is not well enough preserved to obtain more detailed anatomical information on its internal structure.

Discussion

The presence of leaves allows to eliminate comparisons of the specimen with the Devonian Psilophyta, Cladoxylopsida and Aneurophytalean Progymnosperms, which do not have

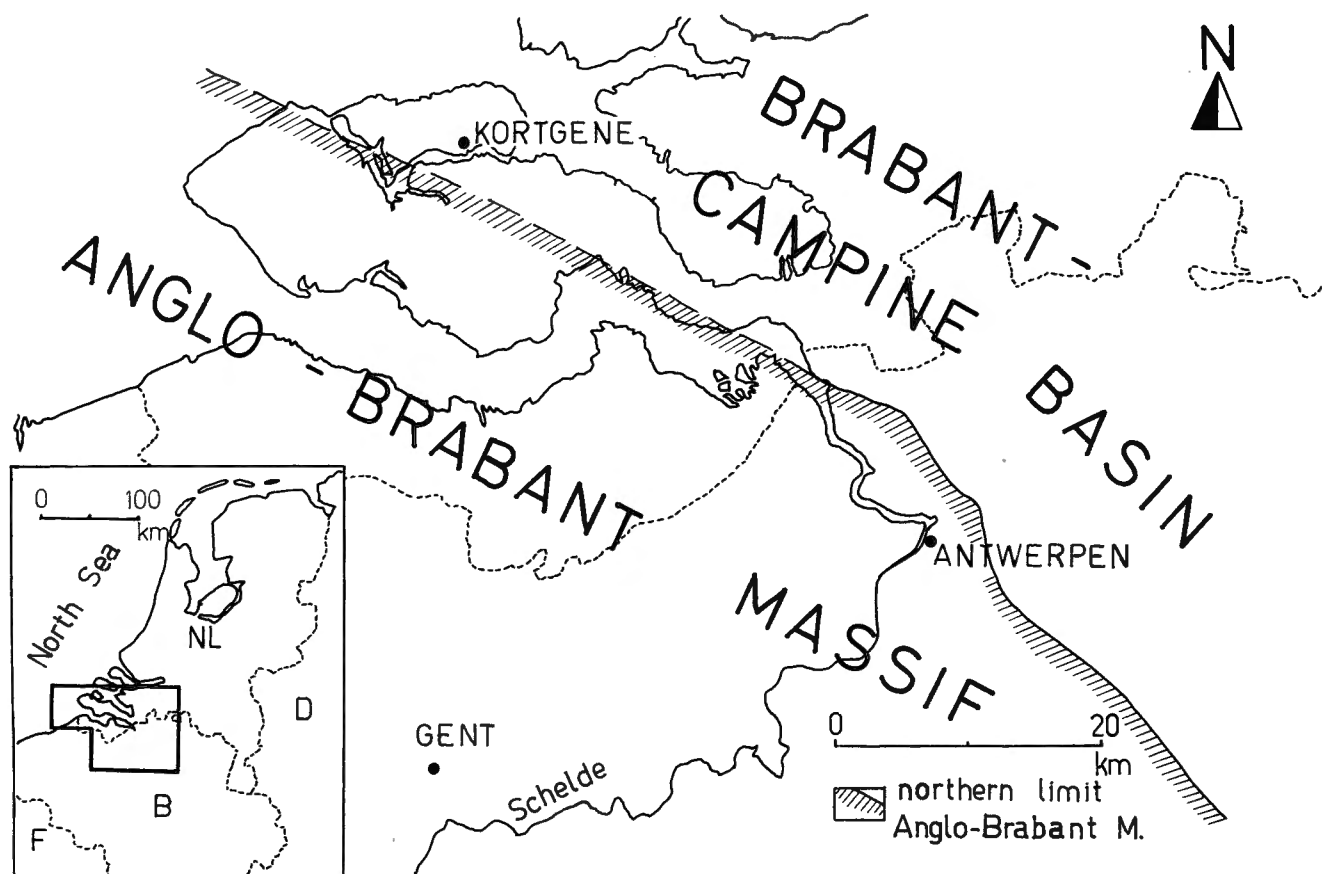


Fig. 1 — Location of the Kortgene-1 well. The outline of the Anglo-Brabant Massif is partly after LANGENAEKER & DUSAR (1992).

such organs. Only a few members of the Lycopsidea are known to possess such a phyllotaxis in Devonian-Carboniferous times. The occurrence of an opposite-decussate arrangement of the leaves may also imply a bilaterally symmetrical vascular bundle in the centre of the stem, as is the case in several contemporaneous ferns (Stauropteridaceae) or pteridosperms (e.g. *Tetrastichia*). Characterised by a filicoid type of foliage, the two last groups of plants probably had young developing leaves showing circinate vernation. Lacking any indication of unrolling of the young leaves the Kortgene specimen thus most likely abscised from a lycophyte. In addition, the morphology of the stomata and the few indications on the internal structure agree with the observations on the few Lycopsidea known from the Visean, i.e., *Selaginellites resimus* from the Late Visean of the Forest of Dean, U.K. (ROWE, 1988) and of Visé, eastern Belgium (FAIRON-DEMARET, 1989), and *Chwydia decussata* from the Early Carboniferous of North Wales (LACEY, 1962). Visean lycophytes are considered as herbaceous, indicating nearby emerged lands. As a result, the Kortgene specimen may have abscised from its mother-plant in Visean times and transported by wind or washed from a nearby emerged and vegetated area into shallow marine environments. Reworking from older rocks is less obvious, considering the preservation of various delicate structures of the specimen. According to the palaeogeographical reconstructions of ZIEGLER (1990), among others, such an emerged

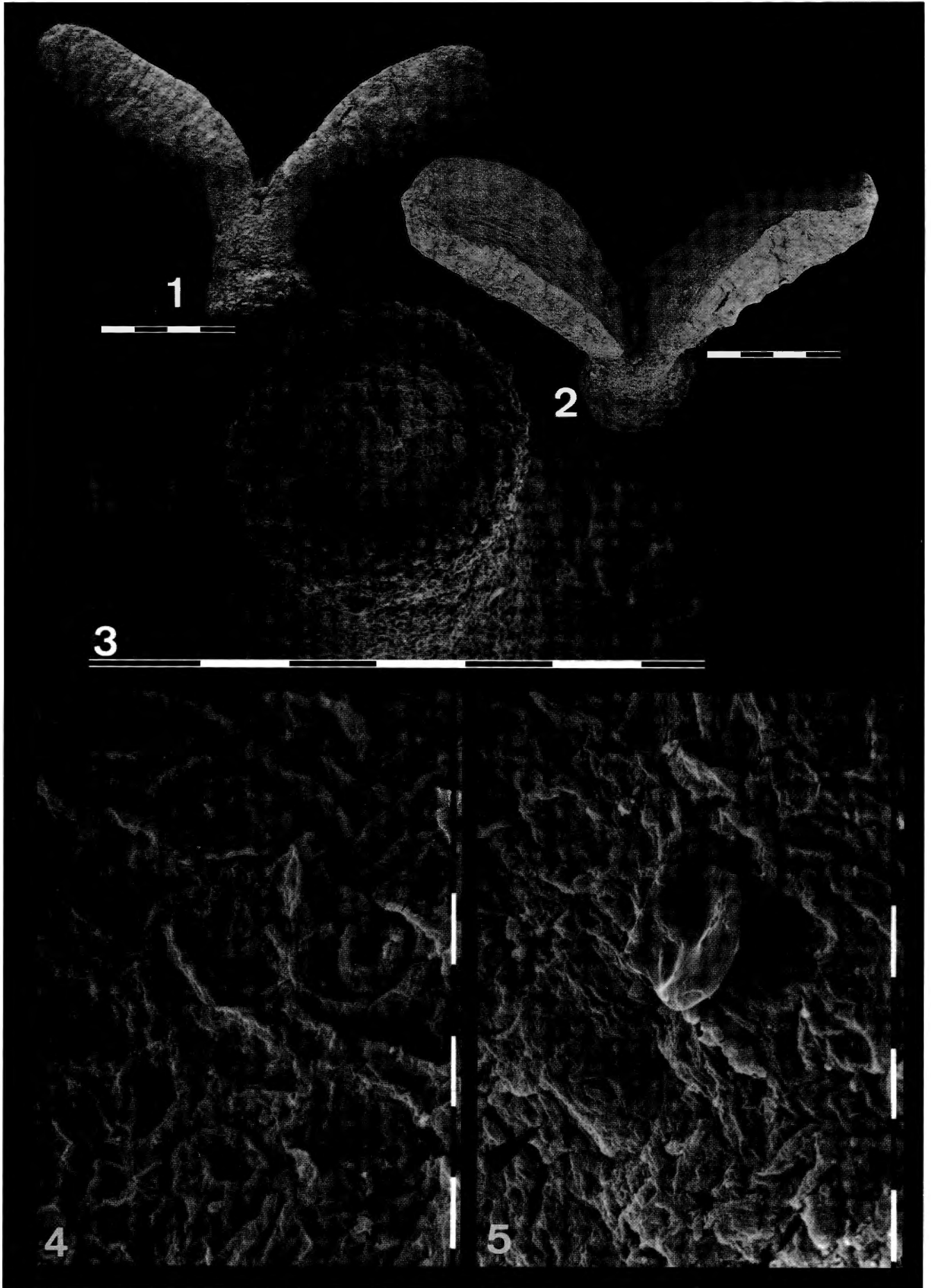
area should have been a part of the southerly Anglo-Brabant Massif.

Conclusions

1. The described plant fossil, recovered from Early Visean carbonates in the Kortgene-1 well (southern Netherlands) is composed of two young leaves, and two meristematic bulges positioned perpendicular to the young leaves.
2. Probably abscised from a lycophyte, the specimen indicates the vicinity of an at least episodically emerged area nearby the southwestern Brabant-Campine Basin, colonised by a land flora during the Visean. This area may have formed part of the Anglo-Brabant Massif.

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Explanation of Plate 1

Enigmatic plant fossil from the Kortgene-1 well (KTG1 952-959). Specimen deposited in the collections of the I.R.Sc.N.B.-K.B.I.N., section Micropalaeontology-Palaeobotany, n° b3134.

Fig. 1 — lateral view (scale bar = 100 µm); Fig. 2: lateral view (scale bar = 100 µm); Fig. 3: basal part (scale bar = 100 µm); Fig. 4: detail surface (arrows point to stomata) (scale bar = 10 µm); Fig. 5: detail surface (arrow points to stoma) (scale bar = 10 µm)