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Research papers

The conifer *Glenrosa falcata* sp. nov. from the Lower Cretaceous of Spain and its palaeoecology

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ABSTRACT

Based on short shoots and isolated leaves collected from the upper Barremian coaly clays of the La Huérguina Formation (Uña–Las Hoyas basin, Iberian Ranges, Spain) a new species of the fossil conifer genus *Glenrosa* Watson et Fisher emend. Srinivasan is here described for the first time in Europe. *Glenrosa falcata* sp. nov. displays the characteristic stomatal crypts and papillae projecting into the crypt neck, however it is differentiated from other *Glenrosa* species by its falcate leaf morphology with a long free part (over 50% of the leaf length), an acute and recurved leaf tip and robust epidermal cell papillae. Based on comparisons with living angiosperms possessing stomatal crypts (*Nerium* Linnaeus (Apocynaceae) and *Blossfeldia* Werdermann (Cactaceae)) and an assessment of the palaeoenvironment we conclude that *G. falcata* was a xerophytic shrub, that grew on well drained substrates in a seasonally dry and warm climate and formed a minor part of a vegetation dominated by the Cheirolepid *Frenelopsis* (Schenk) emend. Watson. This habitat was alkaline and oligohaline and therefore expands the previously reported environmental tolerances of *Glenrosa*.

1. Introduction

Fossil conifer foliage is frequently found disarticulated, due to transport and preservation processes. This, along with the frequent close similarities in gross shoot morphology between many unrelated fossil conifer taxa, in particular scale-like leaves arranged spirally or in opposition along an axis, has resulted in palaeobotanists developing a taxonomy based on leaf cuticular features, especially the structure of the stomatal apparatus (Harris, 1979).

In recognition of this, the genus *Glenrosa* was erected by Watson and Fisher (1984) to include two species of fossil conifer leaves with a gross morphology similar to *Brachyphyllum* Brongniart emend. Harris or *Pagiophyllum* Heer emend. Harris but which display 'communal stomatal pit' (herein referred to as stomatal crypts); a unique character within gymnosperms. These stomatal crypts contain several stomata grouped at the bottom of a large, ampulla-shaped pit that is sunken into the mesophyll, covered by cuticle and displaying numerous interdigitating, finger-like processes projecting into the crypt neck. The epidermis of *Glenrosa* can therefore be differentiated from other scale-leaved conifers as they lack stomata on the exposed leaf surface between crypts. Srinivasan (1992) described a further two new species from the middle Albian of the Potomac Group at Puddledock, Virginia, USA and also emended the description to include reproductive organs. More recently, Zhou et al. (2000) described a fifth species from the Lower Cretaceous (Albian?) of Nanjing, Eastern China. Gomez et al. (2001) mentioned the presence of a new species of *Glenrosa* from the Barremian of Spain but did not officially describe it. It is the full description of this material which forms part of this paper.

The affinities of *Glenrosa* remain unresolved. Watson and Fisher (1984) initially suggested the genus was part of the Cheirolepidiaceae on the basis that the fossils were found in association with other genera firmly assigned to this family and that the cuticle was thick, possessed characters such as papillae around the crypt margin and within the neck of the stomatal crypt which are similar to papillate stomatal pits seen in other Cheirolepidiaceae genera. However, based on the morphology of reproductive organs and attached pollen Srinivasan (1992) suggested that they displayed a closer resemblance to the Cupressaceae (including Taxodiaceae) although she did not rule out a relationship with the Cheirolepidiaceae.

It has been noted by all the authors of the various *Glenrosa* species that they are frequently found in association with other xerophytic conifers, particularly *Frenelopsis* (Schenk) emend. Watson and *Pseudofrenelopsis* Nathorst emend. Watson, of the Cheirolepidiaceae. Watson and Fisher (1984) pointed out that *Glenrosa texensis* (Fontaine) Watson et Fisher (the type-species) and *Glenrosa pagiophylloides* (Fontaine) Watson et Fisher were found in association with *Pseudofrenelopsis parceramosa* (Fontaine) Watson from the Barremian–Aptian of Trent's Reach (Virginia, USA); and *Frenelopsis alata* (K. Feistmantel) Knobloch and *P. varians* (Fontaine) Watson from the upper Aptian–lowest Albian limestones of Glen Rose (Texas, USA) respectively. Srinivasan (1992)

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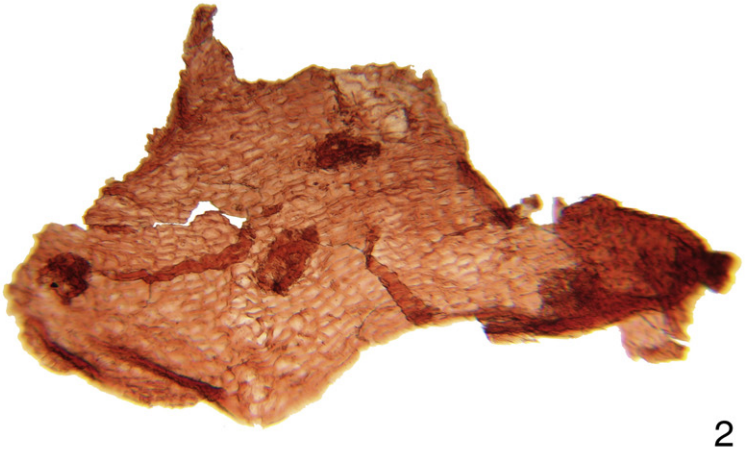

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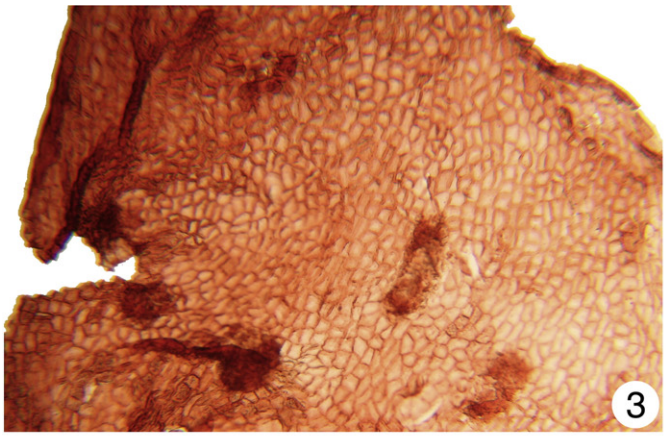

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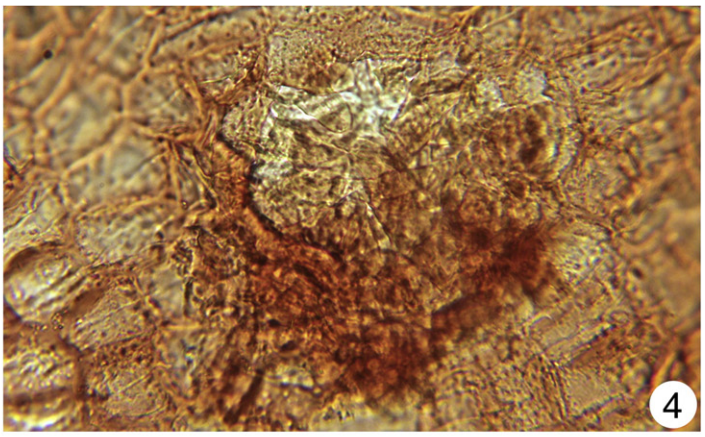

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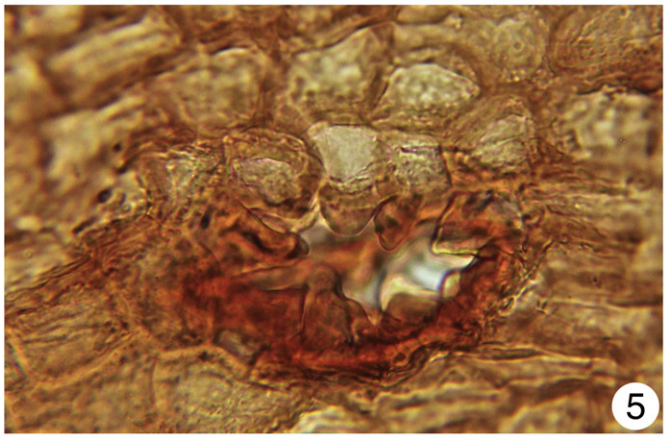

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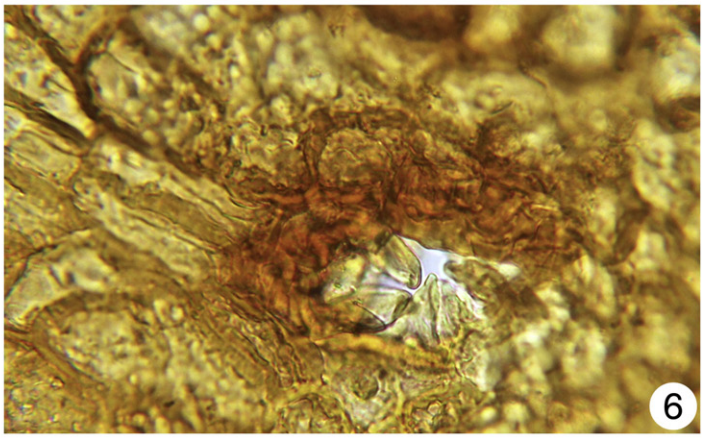

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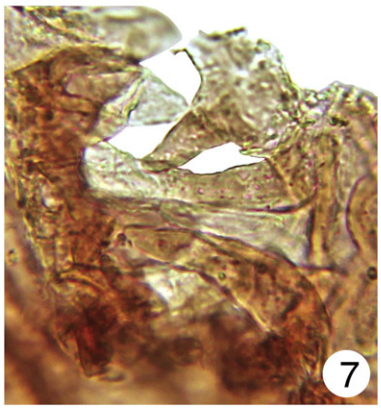

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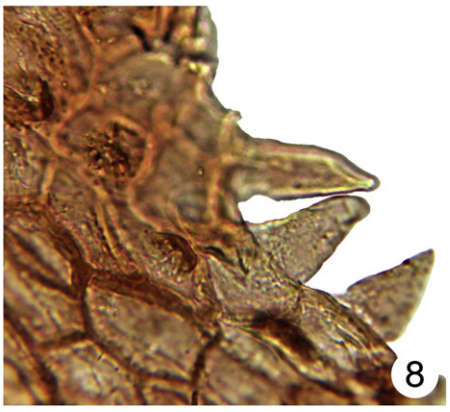

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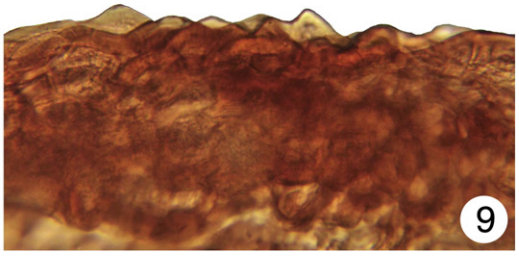

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