

The southernmost record of tropical pollen grains in the mid-Cretaceous of Patagonia, Argentina

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Abstract

Pollen grains characteristic of tropical Northern Gondwana (*Schrankipollis*, *Brenneripollis* and *Pennipollis peroreticulatus*) have been recorded from the Cretaceous of Patagonia. They were recovered from the Late Albian–Cenomanian Kachaike Formation in Santa Cruz Province, southern Argentina. The palynological assemblages are dominated by gymnosperm pollen and bryophyte-pteridophyte spores, whereas angiosperms are poorly represented. The angiospermoid type *Schrankipollis* has not been reported previously from Argentina, and a new species *S. kachaikensis* is described. Two species of *Brenneripollis* (of uncertain affinity) and *Pennipollis peroreticulatus* (related to the Alismatales) are also reported. The first appearances of *Pennipollis peroreticulatus* are clearly diachronous from north to south, ranging from the Barremian in tropical regions to the Coniacian–Santonian in Antarctica. *S. kachaikensis* and *P. peroreticulatus* show restricted stratigraphic distributions through the Kachaike Formation and may be stratigraphically useful markers. A tetrad of *Walkeripollis* (related to modern Winteraceae) is also recognized. This is the oldest record of Winteraceae in the southern temperate region where the family lives today. Evidence for migration of Winteraceae from tropical Gondwana to Antarctica and Australia throughout South America, is provided by this new finding. The presence of tropical elements in the austral margin of South America gives support to previous studies on the expansion of warm temperatures towards high latitudes during the mid Cretaceous.

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1. Introduction

Angiosperm radiation in high palaeolatitudes began later than in the equatorial region where this group probably originated (Raven and Axelrod, 1974; Brenner, 1996). In Patagonia the oldest angiosperm records, based on both micro- and megafossils, are Early Aptian (Archangelsky and Gamero, 1967; Romero and Archangelsky, 1986; Corbella, 2001), coinciding with the earliest findings in most temperate zones. Archangelsky et al. (2004) made a first attempt at reconstructing the different steps in angiosperm evolution in the Patagonian region.

The first of these, in the Early Aptian, was characterized by the appearance of *Clavatipollenites* species, followed by the *Asteropollis* complex. The next phase, close to the Aptian/Albian boundary, was represented by the first eudicots (tricolpate microreticulate pollen grains). Later, during Late Albian–Cenomanian times, an important angiosperm diversification occurred, with pollen having varied apertures and sculptures. This pattern of evolution followed the general trend recognized all over the world, from morphologically simple forms to others of more complex structure.

Studies of early angiosperms in Argentina are scarce. Most previous publications on Early Cretaceous sequences have been focused on stratigraphy (Volkheimer and Salas, 1975; Archangelsky et al., 1984, 1994). Detailed morphological and systematic angiosperm analyses are still scanty.

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The material described herein was recovered from the Bajo Comisión section of the Kachaike Formation, in the southwest of Santa Cruz Province (Fig. 1). Basal levels of this unit include sediments of a near-shore marine environment grading to deltaic and fluvial facies towards the middle–upper sector (Cladera and Limarino, in prep.; Fig. 2). Age determinations of the Kachaike Formation indicate a Late Albian–Cenomanian time interval based on marine palynomorphs (dinocysts) and ammonites (Guler and Archangelsky, 2002; Aguirre Urreta, 2002).

The main goals of this contribution are to: (1) record the presence of morphotypes characteristic of tropical regions in the austral tip of South America, together with a winteraceous tetrad; (2) present a detailed systematic analysis of these pollen types; (3) evaluate the potential of some species as good stratigraphic markers; and (4) analyze the main factors that may have been responsible for the southward migration of some of these types.

2. Methods

Our samples were treated following standard palynological techniques. The resulting slides are housed at the Palaeopalynological Collection of the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, BA Pal., under catalogue numbers: 5860–5876. Coordinates of the illustrated specimens are given as England Finder references.

3. General results

The palynological assemblages recovered from the Bajo Comisión section of the Kachaike Formation are well-preserved and diverse, with low numbers of marine dinocysts in the lower levels. Spore-pollen assemblages are dominated by conifer and fern products with no significant changes in composition through the formation. Among the conifers, representatives of the Cheirolepidiaceae (*Classopollis*) are by far the most abundant, followed by Podocarpaceae (*Callialasporites*,

bisaccate and trisaccate pollen) and Araucariaceae (including *Cyclusphaera*). Ferns are mainly represented by Schizaeaceae (*Cicatricosisporites*, *Contignisporites*), Gleicheniaceae (*Gleicheniidites*), Lophosoriaceae (*Cyatheidites*) and Pteridaceae (*Polypodiaceoisporites*). Angiosperms are scarce but show a progressive increase in both abundance and diversity upward through this section. Basal levels include chloranthaceous pollen (*Clavatipollenites* and *Asteropollis*), while middle and upper samples provide varied eudicots (represented by *Cupuliferoidapollis*, *Retitricolporites* and *Tricolporoidites*, among others), together with alismatales (*Pennipollis*), the *Schrankipollis* group and winteraceous tetrads (*Walkeripollis*), which are considered in this paper.

4. Systematic descriptions

Genus *Schrankipollis* Doyle, Hotton and Ward, 1990

Type species. *Schrankipollis mawhoubensis* (Schrank) Doyle, Hotton and Ward, 1990

Remarks. *Schrankipollis* was defined to include reticulate, zonasulcate pollen grains similar to *Afropollis zonatus* but with elliptical (bilateral) rather than spheroidal (radial) symmetry. Moreover, the reticulum in *Schrankipollis* is finer than that in *Afropollis* (Doyle et al., 1990a), although this feature was not included in the diagnosis. The Patagonian material was assigned to *Schrankipollis* rather than *Afropollis* based on their oval shape and fine reticulum.

Botanical affinity. The affinity of *Schrankipollis* is still unresolved. Doyle et al. (1990a, b) suggested a winteraceous affinity for both *Afropollis* and *Schrankipollis*. However, Friis et al. (1999) recovered *Afropollis* grains in pollen sacs with no evident angiosperm features. Moreover *Afropollis* has a thick endexine, which may also suggest a non-angiospermous affinity (Doyle, 2000). *Schrankipollis* has endexine only under the apertures as in most angiosperms, but as Doyle (2000)

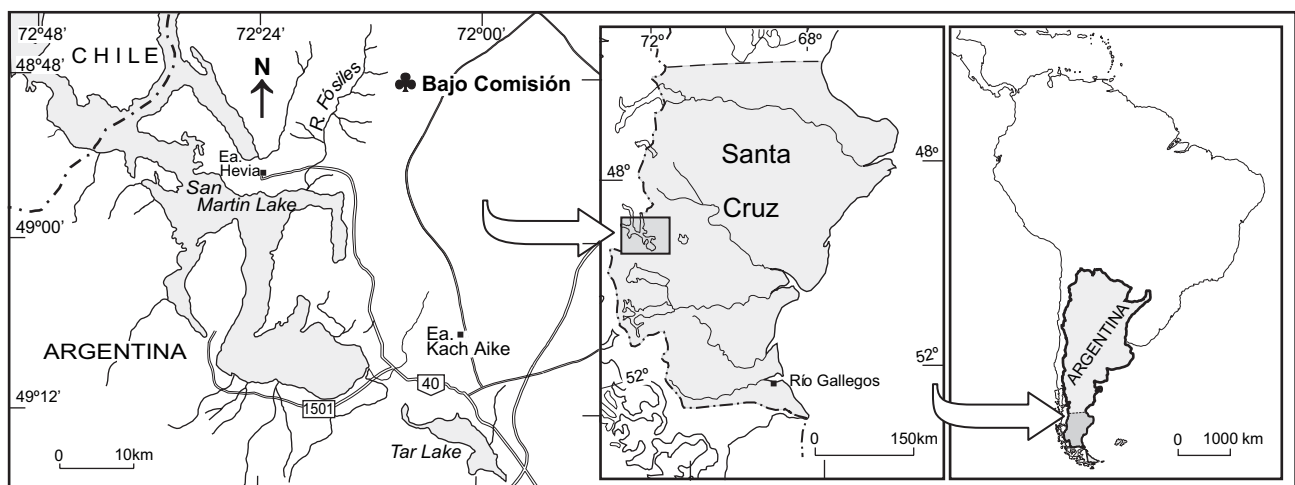


Fig. 1. Location map of the Bajo Comisión fossil locality.

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