FOSSIL GINKGOALEAN LEAVES FROM CANTERBURY

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INTRODUCTION

The order Gingoales was once almost world-wide, comprising many species and at least sixteen genera, but is now represented only by *Ginkgo biloba*. If this sole surviving species still occurs naturally anywhere, it is in a small and rather inaccessible region in south China. Sometimes called the Maidenhair Tree, it is widely cultivated in China and Japan for its edible seeds.

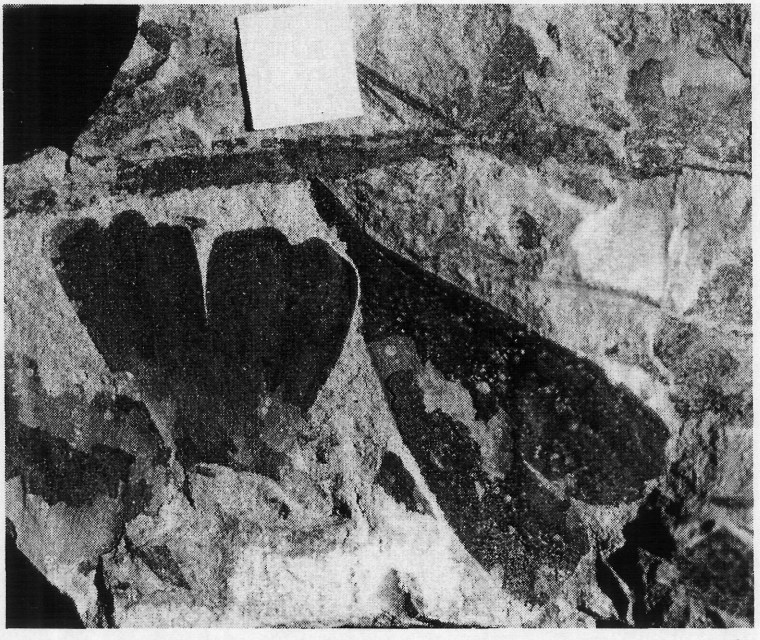

Fig. 1. Examples of fossil gingko leaves.

I became acquainted with extinct gingkos (Fig. 1) as part of the megaflora (collection of leaves *cf.* microflora/palynoflora) when I was doing my Ph.D. in the Clarence Valley, accompanied by my supervisor John D. Lovis. Subsequently, while Prof. Lovis was investigating Haast Stream in the Clent Hills, for a Masters student, I was the off-road driver and geologist exploring

Potato Stream, the next downstream tributary of the South Branch of the Ashburton River. Numerous samples of ginkgoalean fossils were found. In this paper, I describe the fossil gingkos from deposits of two geological stages.

ALBIAN (LOWER CRETACEOUS) MEGAFLORA OF THE MIDDLE CLARENCE VALLEY

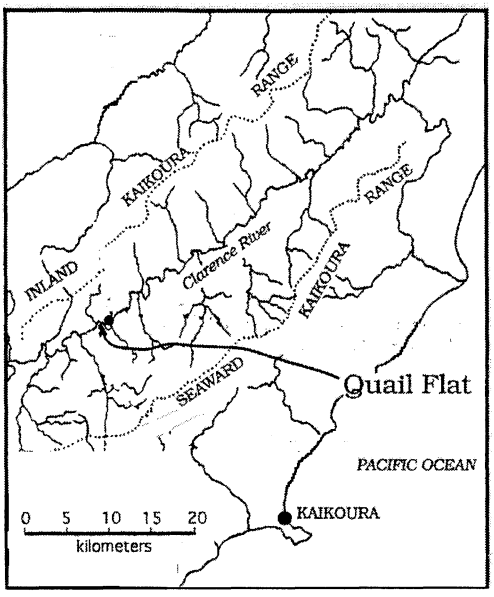

Fig. 2. Map of the middle Clarence River valley (Parrish *et. al.* 1989).

This megaflora, its setting, and the palaeoclimatic significance of the Clarence Valley were described in Parrish et al. (1998) (Fig. 2). One of the fossils is a simple bilobed leaf, 2.5 to 4.3 cm long by 1.0 to 2.9 cm wide, with varying subordinate indentations of the margin. Daniel (1989) described it as a deciduous leaf, confirmed its genus as *Gingko* by its cuticle and informally named it *G. cuneiformis*.

Another ginkgoalean leaf found at that time (330.62 Cl), was identified as *Ginkgoites australis* (McCoy) Florin, described in Douglas (1965), but it lacks cuticular analysis. It is distinctly different, having at least four lobes, some of which themselves have subordinate lobes. The longest lobe is >8 cm. long, with the widest part of the lobe >2 cm. wide. Though it lacks a base, the complete leaf is assumed to be bilobed, because of the parallel gap between the innermost pair of lobes, suggesting it has a petiole with two vascular strands. At West Quail Flat, numerous ginkgoalean leaves with several wide-angled lobes (*cf.* some Anderson & Anderson (1985) species) are apparently still attached to a stem, or the lobes are overlapping.

TRIASSIC MEGAFLORAS FROM POTATO STREAM AND POTATO FAULT

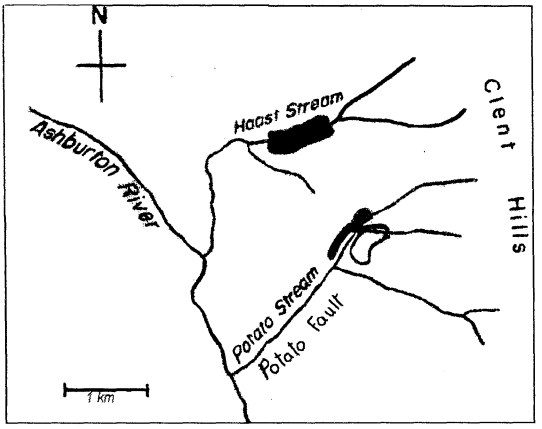

Fig. 3. Map showing the Clent Hills and Potato Stream (Lovis *et al.* 1988).

Triassic megafloras exist in Potato Stream in the Clent Hills, mid-Canterbury (Lovis, Daniel & Bradshaw, 1988) (Fig. 3). Definitive palaeofloral evidence has since placed them in the Anisian Stage (Etalian local Stage according to Retallack, 1977 p. 260). These megafloras are highly localised in a wide range of fossiliferous matrices, from coarse to very fine lithologies, and preservation is correspondingly very variable, from extremely poor to good with clear definition of secondary venation patterns. The majority of fossiliferous blocks have been recovered as float in the stream bed, or loose as pieces of scree, or in situ on the valley-sides, especially in a substantial zone in the upper reaches. All of these are above the main, lowest fork in the stream. Two distinct megafloras are recognised, Potato Stream & Potato Fault. The first lies on the right bank of the western main tributary, has 392 blocks and at least 16 genera. The second lies on the left (eastern) bank, has 91 blocks, and has at least 10 genera. They have been separated on both structural and floristic criteria.

The rock outcrops in the fossiliferous sector of Potato Stream are highly broken and heavily eroded. A strike of approximately due north and an angle of dip, varying from 72° to 84° E, has resulted in several places in pillars of rock, carrying weathered fossiliferous horizons on a near-vertical surface. The rock outcrops in the fossiliferous sector of Potato Fault are, by contrast, rarely outcropping, having a strike approximately NE and a dip of 58° to 77° SE. This is complicated by at least two minor faults parallel to the major fault along the stream bed which divides the two sectors.

Many gingoalean leaves of several species from both floras have been

obtained, especially a 4-lobed leaf which I believe to be a new species of *Ginkgoites*. This species is found in both Potato Stream (PS 481.190), and Potato Fault (PF 484.2). Three genera belong to the order Ginkgoales. *Ginkgoites* has a fan-shaped leaf with a solid petiole, a basal angle of lamina greater than 90°, deeply divided into 2, and then less deeply into 4 or more lobes, and dichotomising veins. *Ginkgophytopsis* is used for any fan-shaped leaf fragment lacking these identifiers, but with anastomosing as well as dichotomising veins, and woody, interveinal striae. *Sphenobaiera* has a broadly wedge shaped leaf, veins extending into an indistinct petiole, a lamina more or less deeply divided into at least 2 segments (rarely entire), and dichotomising veins.

COMMENT

While I recognise that picture-matching is not an ideal procedure, it is the only one available to me. Photos of a particular fossil may indicate that it belongs to more than one species, depending on the characters chosen. Even the genus may be in doubt, particularly for *Sphenobaiera* and *Ginkgoites,* if the petiole is lacking.

When I showed my photographs to Heidi Anderson-Holmes of Witwatersrand University, she commented that both the Potato Stream and the Potato Fault flora have a *Ginkgoites* sp. and a *Sphenobaiera* sp. that are distinct from any of the South African Triassic Molteno species. She does not agree with applying any specific name to any fossil based solely on morphology. Therefore, I compare some particular fossils simply to give some idea of what they look like.

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Above: leaves of *Ginkgo biloba.*
Photo: P.E. Horn