

Pridoli (Silurian) Graptolites in association with *Baragwanathia* (Lycophytina)

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A locality at Ghin Ghin (Yea, Victoria, Australia) has yielded *Monograptus* cf. *prognatus* Koren' from strata demonstrably lying between Ludlow (Silurian) and Devonian rocks, containing floras which include *Baragwanathia* in association with graptolites.

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Introduction

The debate surrounding the occurrences of the earliest *Baragwanathia* floras has been summarized by Garratt and Rickards (1984) and Garratt *et al.* (1984). Garratt has recently collected numerous graptolites, which form the subject of this paper. The locality is at the previously recorded site of Ghin Ghin; although stratigraphical and geographical details were given in the above papers, we have included in text figure 1 a precis of the section and an up-to-date summary of the finds. The new locality, B2, occurs stratigraphically between beds which we have previously shown to be of Ludlow age (B3: locality 1 of Garratt & Rickards, 1983) and beds above the Humevale Formation which have long been known to yield undoubted *Baragwanathia* floras in association with Devonian graptolites. The new (B2) locality has abundant specimens which we have identified as *Monograptus* cf. *prognatus* Koren' a species typical of Pridoli strata (Koren' 1983). It seems likely, therefore, that this level of the Humevale Formation, roughly just above the Rice's Hill Sandstone Member exposed elsewhere, is of Pridoli (Silurian) age and is underlain by Ludlow (B3) and overlain by Devonian (such as the *Baragwanathia* (upper) plant assemblages close to the Flowerdale Sandstone Member).

It will be noticed on the Ghin Ghin section log (text fig. 1) that two further graptolite horizons have been recorded (localities B4 and B1A). This material was only discovered as the present work

was completed for press and only preliminary results are to hand on quite large collections. The material, however, does seem to support the contention of this paper that this part of the Humevale Formation is of Pridoli age. The graptolites of B4 are once again in close association with *Baragwanathia* floras.

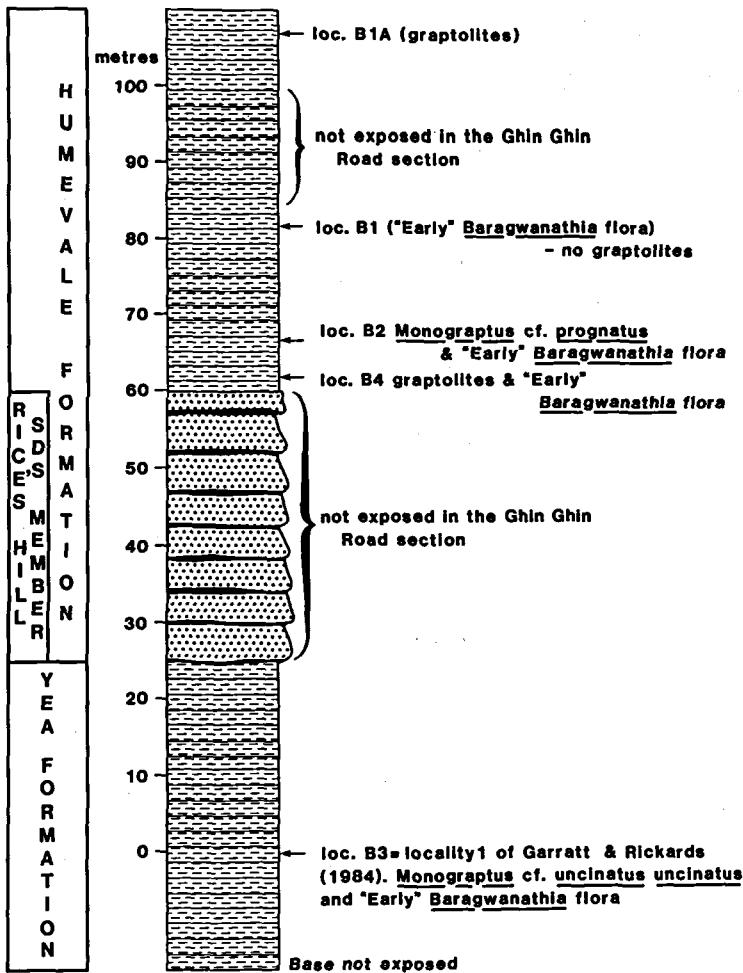
Thus the Pridoli plant graptolite associations established bridge the stratigraphical gap between earlier (Ludlow) and later (Devonian) *Baragwanathia*/graptolite associations.

Finally we should mention another possible Pridoli graptolite, *Monograptus* cf. *mironovi* Koren' from the Humevale Formation at Mooroolbark. In contrast to the above-mentioned localities we have here a single specimen, hence its correlative value is proportionately decreased. It is not found in association with plant material.

Systematic Descriptions
Suborder Monograptina Lapworth, 1880
Family Monograptidae Lapworth, 1873
Genus *Monograptus* Geinitz, 1852

Monograptus cf. *prognatus* Koren'

- ?1969 *Monograptus* aff. *angustidens* Přibyl; Jackson & Lenz, p. 21, pl. 3, figs 6–9, pl. 5, fig. 7
1975 *Monograptus angustidens* Přibyl; Mikhajlova (pars), p. 154, pl. 37, figs 23
1976 *Monograptus angustidens* Přibyl; Mikhajlova, pl. 1, fig. 21



Text figure 1. Stratigraphic log of Ghin Ghin section. Dashed ornament represents siltstone; black lines, claystone intervals; stipple, sandstones (all diagrammatic). Near Yea, Victoria, Australia.

1978 *Monograptus* aff. *angustidens* Přibyl; Jackson, Lenz and Pedder, p. 21, pl. 3, fig. 4

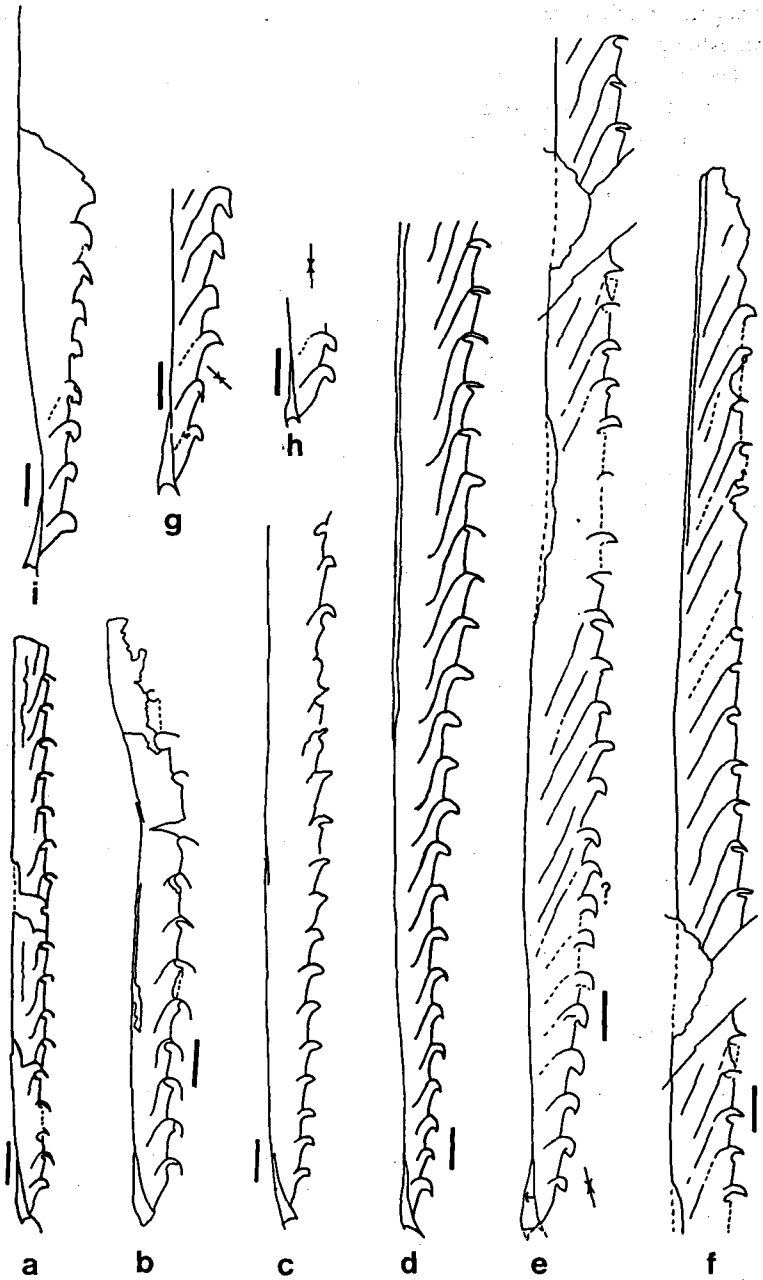
1983 *Monograptus prognatus* sp. nov.; Koren', pp. 424, 427, pl. 51, figs 8-14, pl. 52, figs 1-5, text fig. 6

Material and locality. About 70 specimens from locality B2 (text fig. 1) at Ghin Ghin, near Yea, Victoria, 67 m stratigraphically above the Ludlow locality described in detail by Garratt & Rickards (1984). All specimens deposited in the National Museum of Victoria collections.

Description. The rhabdosomes are up to 35 mm long, more or less straight, but with a characteristic gentle dorsal curvature at the proximal end involving th3-th6. The maximum dorso-ventral width, including thecal hoods, is 1.5-1.6 mm.

The sicula reaches almost to the level of the hook of the 2, and has a length of 1.3-1.7 mm and an apertural width of 0.2-0.3 mm. There is no trace of apertural flaring and the sicular shape varies from straight to, more commonly, slightly ventrally curved. This curvature, and its conspicuous position on the dorsal side of the stipe gives a very gentle double flexure to the proximal end of the colony, the extreme proximal end hinting at overall ventral curvature, th3-th6 with a slight dorsal curvature. In a few specimens the dorsal curvature is maintained to the proximal end. Most rhabdosomes are parallel-sided after about th15, but some show a very gradual increase in dorsoventral width throughout, whilst some show a slight diminution in width. The overall impression on the slabs is of a long,

Text figure 2. a, *Monograptus mironovi* Koren', after Koren' (1983); b, *Monograptus cf. mironovi* Koren', NMV P73515, Mooroolbark, Victoria, Humevale Formation, just below Lilydale Limestone; c, *Monograptus similis* Pfißyl, sketch of holotype; d, *Monograptus prognatus* Koren', after Koren' (1983); e, f, *Monograptus cf. prognatus* Koren' NMV P73516, locality B2 (text figure 1), Ghin Ghin, Victoria; g, h, proximal ends of *Monograptus cf. prognatus* Koren', NMV P73516, showing detectable though slight deformation; i, *Monograptus thomasi* Jaeger, after Garratt & Rickards (1984). All figures approximately 10; × 1 mm scale bar given with each specimen; arrows indicate direction of slight deformation.



portion of the dorso-ventral width (1/4–1/5). The height of the thecal hoods is about 0.2 mm – 0.3 mm and the maximum length, in distal thecae, perhaps 0.7 mm.

Thecal length ranges from about 1 mm, more the distal thecae the ventral apertural margin is often visible beneath the hood, even when the latter is very long, but in the proximal thecae the

dorsal hood usually overgrows and obscures the ventral apertural margin. When it is seen, however, it is a simple margin with little or no hook-like growth, so that the thecal hook in this species is truly a dorsal hood, uniformly developed along the length of the colony. The thecal hoods project 0.2–0.4 mm beyond the general ventral edge of the colony and thus occupy only a small pro-

straight, parallel-sided rhabdosome of average robustness.

The thecae are more or less uniform throughout the rhabdosome, long, overlapping tubes, weakly sigmoidal and with long dorsal hoods. In or less, at the proximal end to more than 3 mm distally. Thecal overlap is conspicuous and increases from slightly less than 1/2 proximally to 2/3 distally. At th5 a cross section to the stipe at the level of a thecal aperture might touch the base of one inter thecal septum: at th20 such a section cuts one intertheal septum and the base of the next one. The lateral width of the distal thecal tubes is around 0.3–0.4 mm when measured halfway along the thecal length. The angle of thecal inclination is not always very easy to measure because in the preservation of this material the intertheal septum has often become obscured: it seems to be of the order of 20°–25° in the mesial to distal thecae. Thecal spacing varies from 12 in 10 mm proximally to 9 or 10 in 10 mm distally.

Remarks. The Ghin Ghin specimens are very close to Koren's species from the Pridoli of the Aksaj Mountains (Koren', 1983). Like that species they have a more or less uniform hood throughout the length of the rhabdosome and in this regard can be distinguished from some later species such as *M. uniformis angustidens* Přibyl, *M. praehercynicus* Jaeger and *M. thomasi* Jaeger. The only real morphological difference between our present material and that described by Koren' is that the Yea specimens may have a slightly higher angle of thecal inclination, though less than in *M. birchensis* Berry for example. Otherwise most of the dimensions closely agree as well as the shape and curvature of the rhabdosome. Further contrast should be made with the not dissimilar species *M. thomasi* Jaeger because that occurs in the nearby Devonian strata (we illustrate a specimen from Eglinton Road Cutting for comparison; text fig. 2i). *M. thomasi* has a very characteristic narrowed, drawn out, proximal end and a resulting strong ventral projection of th1. Other features such as thecal spacing, thecal inclination and thecal overlap are different and the thecal hood in *M. thomasi* declines fairly quickly reaching a minimum at th12–th15 where it is usually little more than a flange about the aperture. An exception in this single respect is Jaeger's

(1966) plate 43 arrowed specimen. Koren' (1983) suggests that a lineage may have existed from *M. similis* Přibyl (holotype illustrated herein for comparison) to *M. prognatus* Koren'. We would support this and add that we suspect that our specimens may be fairly close to the bottom end of the total range of *M. prognatus*; in short, not far removed in time from Přibyl's species. We have no hard and fast evidence for this suggestion, but the extreme proximal end of our form does have similarity to that of *M. similis*. On other counts they differ significantly, especially on thecal overlap.

Monograptus cf. *mironovi* Koren'

1975 *Monograptus aequabilis* Přibyl; Mikhajlova (pars), pl. 38, figs. 1,2

1983 *Monograptus mironovi* sp. nov.; Koren', pp. 240, 423, pl. 51, figs 1–3, text fig. 5 a-e.

Material and locality. A single part and counterpart, preserved in low three dimensions from the Department of Mines locality M100 at Mooroolbark at the corner of Williams Road and Turners Road. NMV number P73515 a,b. Humevale Formation.

Remarks. A comparison of text figs 2a and b shows the great similarity between *M. mironovi* Koren' and our specimen. The thecal spacing; size, shape and position of the sicula; thecal type; nature of the apertural hood and thecal aperture; and free ventral wall are all very close. There are two interrelated differences: the dorsoventral width is greater in the Australian specimen, even allowing for the very slight difference in magnification, and, in consequence, the angle of inclination of the intertheal septum is slightly higher. However, we cannot yet know the range of variation in the Victorian species. *M. similis* Přibyl is also close to our specimen, but it seems usually to be more robust distally. The Victorian specimen does strongly suggest that it has reached a parallel-sided stage by as early as th5. There can be no doubt about the close relationship of the three forms and it is possible that at Mooroolbark, which can only be low in the Pridoli, that we are close to the divergence of *M. mironovi* from *M. similis*.

Dansk sammendrag

Lokaliteten Ghin Ghin ved Yea, Victoria, Australien har ydet eksemplarer af *Monograptus cf. prognatus* Koren' fra lag der kan vises at ligge mellem lag af ludlow alder (silur) og devone bjergarter. Lagene indeholder floraer der omfatter *Baragwanathia* sammen med graptolitterne.

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