

Microkarren in Australia – a request for information

Ken G. Grimes

RRN 795 Morgiana Rd., Hamilton, Vic 3300, Australia. Regmap1@ozemail.com.au



Abstract

Microkarren are the smallest class of visible karren. They are finely-sculptured solutional forms, typically recognisable within a one centimetre grid. They come in a variety of patterns, of which fields of moderately to strongly sinuous microrills about 1mm wide and several decimetres long are the most conspicuous type. A descriptive terminology is suggested. Their genesis is uncertain, but appears to involve solution by thin films of water (dew, sea-spray or light rain) with surface-tension effects. In Australia their best development seems to be in the tropical monsoon (seasonally dry) and arid areas. However, these cryptic forms are poorly recorded and it is too early to make definite statements about their distribution. This note is a request for people to watch for them and report any sightings.

Introduction

Microkarren are the smallest class of visible karren. They are finely-sculptured solutional forms, typically recognisable within a one cm grid. These fascinating little rills, spikes and pits could provide a clue to the behaviour of surface-tension films.

I will summarise the published ideas on their genesis, but make no attempt to add to that debate. Given that these small-scale features are poorly recorded, and probably more extensive than supposed, the first step is to determine their distribution and compare that to lithologies, climates and other environmental factors. The purpose of this paper is to stimulate interest, and provide and illustrate a terminology for field use.

Previous reports

Laudermilk & Woodford (1932) reviewed earlier work, provided detailed descriptions and a classification of microrills and did some experimental work on limestone slabs. More recent descriptions appear in Davies, 1957; Ford & Lundberg, 1987; Ginés, 2004 and Ford & Williams, 2007, p.323-4.

The global distribution of microkarren is varied, but most records are from dry climates – both hot and cold (e.g. Greenland, Davies, 1957). However, Ford & Lundberg (1987) described microrills from Vancouver Island in a rainfall of over 2500mm, but they were restricted to very fine grained limestones, and to bare surfaces in a supra-littoral setting where sea spray would have been a factor. The only published descriptions from Australia are from Chillagoe (Jennings, 1982; Dunkerley, 1983).

Theories of genesis generally involve solution by thin films of water (dew, sea-spray or light rain) with surface-tension effects (Ford & Lundberg, 1987). Some forms, e.g. micro-pits, may be polygenetic and not always associated with other types of microkarren.

Types of Microkarren

Angel Ginés (pers comm, 2005) suggests the following size divisions of karren:

Macrokarren: Large-sized karren – recognisable within a 10 m grid (pinnacles, giant grikes, etc).

Mesokarren: Normal-sized karren – recognisable within a 1m grid (rillenkarren, kamenitza, etc).

Microkarren: Small-sized karren – recognisable within a 1cm grid.

Nanokarren: Minute features – recognisable under magnification within a 1mm grid.

Laudermilk & Woodford (1932) described four types of Rillensteine (another name for the most conspicuous types of microkarren):

Type 1: low-sinuosity, shallow & mildly dendritic unpolished microrills,

Type 2: higher sinuosity and deeper rills.

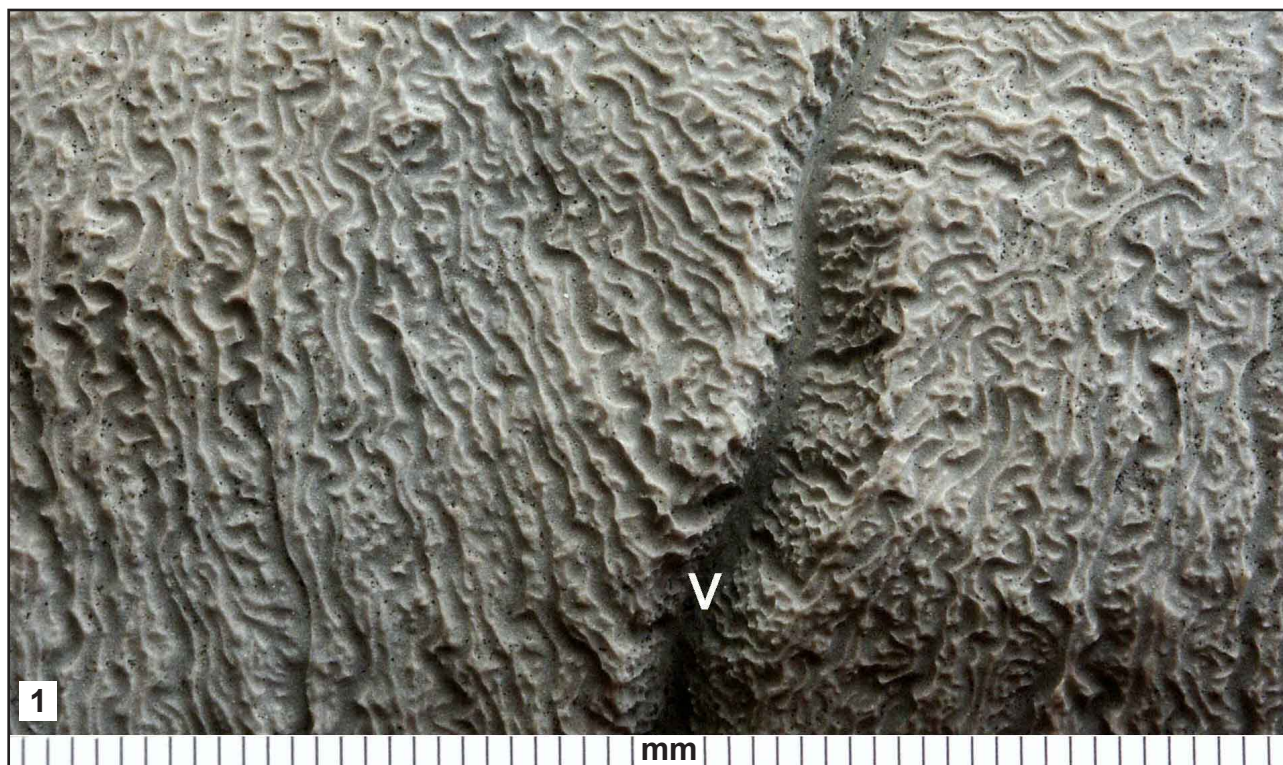
Type 3: possibly corresponds to my micro-teeth & micro-networks?

Type 4: broader and shallow rills, smooth and frosted (but with patterns similar to types 1, 2 & 3).

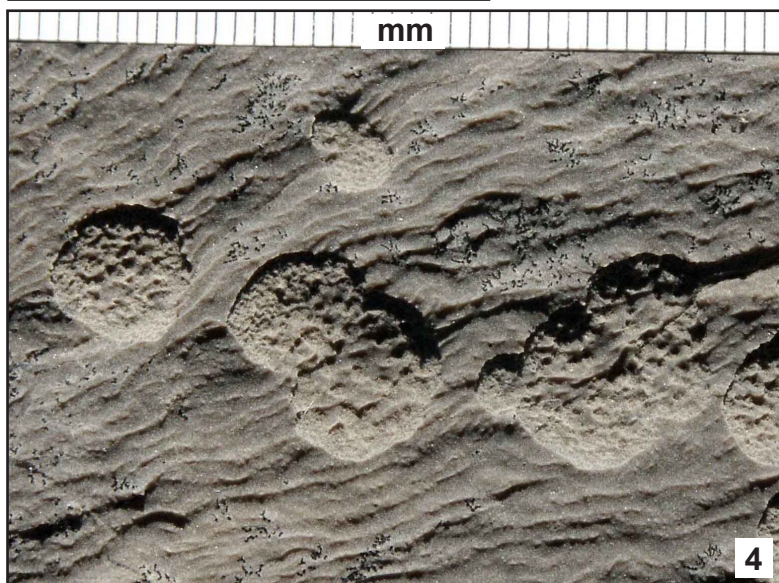
However, I found that classification difficult to apply and there are many other types of microkarren not mentioned by Laudermilk & Woodford (1932). A broader descriptive classification is suggested below for use in field reporting. As we gather information this can be refined and possibly expanded.

Microrills: Narrow grooves, running down gentle slopes. Typically 1 mm wide, and less than 1 mm deep, and a few decimetres long (up to 60cm long in the Gregory Karst). They vary from straight, to sinuous to tightly meandering. There may be some branching, both contributory and distributary depending on whether the slope is spreading or focussing the rills. As the density of branching increases microrills grade to micro-networks (see below). The surfaces can be polished, dull or frosted. The ridges between the rills can be sharp or rounded, and some may be bleached.

There are (at least) two sub-types of rill: The most common type are regular in width, sharp-ridged, with parallel sides, and can be straight, sinuous or meandering (Photos 1 & 4). A less common type, mainly found on the gently domed surfaces of cobbles, is variable in width (fanning out and widening downslope) with either sharp



- Photos**
- 1: Sharp, moderately-branching, and sinuous to meandering microrills. Partly superimposed on a larger splitkarren notch (V)
 - 2: Rasp-like micro-teeth
 - 3: Micro-tessellations cutting a field of micro-teeth.
 - 4: Micro-pans superimposed on low-sinuosity microrills
 - 5: A cobble with micro-pits on top (left) grading to variable-width microrills.



or rounded ridges (Photo 5). These might correspond to Laudermilk & Woodford's type 4. Occasionally, microrills can be superimposed on rillenkarren and may modify their form.

Micro-networks: Are similar to microrills, but more densely branched to form an irregular or elongate network rather than long linear runs (see top corners of Photo 1). Laudermilk & Woodford's type 3 could include this type. With decreasing branching they grade to microrills. With increasing branching they may grade to micro-teeth.

Micro-teeth: In these the network of grooves has become so densely branched that the interflues have been reduced to isolated sharp, rasp-like, conical or faceted teeth about 1 mm wide and less than 1mm high (Photo 2). At Buchan, some teeth were in rows that seemed to be forming by the breakup of the sharp crest between microrills into chains of elongated "hills", rather than as an extreme case of networks.

Micro-pits: Hemispherical to conical pits occur in a wide range of sizes from 1mm wide and deep up to 20 mm (i.e. to normal "rain-pits"). A broad range of sizes can occur within a single outcrop. Possibly there are several modes of formation for these and only some would be related to other microkarren. On gently-domed surfaces there is a tendency for micro-pits to occur on the crest and grade to microrills on the slopes (Photo 5).

Micro-pans: Shallow pits, 5-10 mm wide, but only 1-2 mm deep. They have flat to slightly concave floors with fine micro-pits or teeth. They are commonly superimposed as scattered clusters on other microkarren (Photo 4) – which suggests that they formed later. A possible, but unconfirmed, origin might be concentrated solution beneath pellets of wallaby dung.

Micro-notches: Irregular V-section notches that follow cracks in the rock (a micro- version of splitkarren). They have a broad range of sizes.

Micro-tessellation: Networks of U-section notches (Photo 3). They commonly disrupt other pre-existing microkarren and appear to be following a cracking or crazing pattern which is superficial, not deep as in joints. Shallow, barely recognisable, versions are also seen.

Micro-decantation rills: These run down the vertical sides of a cobble, becoming smaller as they descend – implying a loss of aggressiveness as they descend from their source at the top.

Etched rock structures: Various structures of fossils, crystals, joints, cracks or bedding may be etched out; negatively or positively and sharply or more rounded. These effects may be unrelated to other microkarren.

"Solution-morel pebbles": See Scott (1947). The name refers to their fungoid appearance. A deep pattern of anastomosing ridges, furrows and a few pinnacles. They are somewhat larger than typical microkarren, and microrills may be superimposed on them. They have not yet been reported in Australia.

Distribution in Australia (so far)

There is limited data at present – hence this request for observations. Well-developed microkarren have been recorded at four sites in tropical Australia (black dots on location map): at Chillagoe (Jennings, 1982; Dunkerley, 1983; Grimes, in prep), two separate parts of the Barkly Karst Region (R. Zollinger, pers comm; Grimes, in prep) and the Gregory Karst where they are particularly widespread (Grimes, in prep). In temperate Australia, so far, I have looked only at Buchan and Wee Jasper (open dots on map) where microkarren do occur but are less common and not as strongly developed – it took an hour of searching to find a few poorly-developed teeth and rills at Wee Jasper.

Microkarren seem most common on smooth, gently sloping, outcrops, including those recently exposed from beneath soil. They do not compete well with meso-karren, but have been seen superimposed on shallow rillenkarren.

Data Collection

Please contact the author if you wish to help search for and record these features, or if you see any in your travels. I can supply additional notes, photos and suggestions as to what features need to be noted. I can measure parameters such as sinuosity and branching from digital photos, so most useful would be photos (with a scale) of all types seen and an estimate of their relative abundance, together with notes on the setting, climate and limestone character.

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