

Intertidal Karren at Sellicks Beach, South Australia

K.G. Grimes, field notes, August 2007.

Setting:

At Sellicks Beach, near the Willunga Scarp, on the coast south of Adelaide, SA.

The town is built above a line of cliffs which overlooks a wavecut platform about 500m long beneath the lookout at the end of Gulf View Road.

Tidal range here is about 2 m

A sandy beach buries the calcarenite of the platform, but this reappears in low cliffs (up to 4m high) behind the beach and beneath the main, softer, cliff (which is really a steep gullied badlands slope).

The intertidal runnels can be seen from the lookout at low tide [Photo C981520 was taken at about a 3/4 tide, and shows runnels at the inner edge of the platform - those runnels were buried by sea grass at the time of my second visit in 2007]. Access to the platform was via a diagonal foot ramp starting 300m north of the lookout (but that track is now closed), it is now reached by walking along the beach from the main boat-launch about 1km north of the lookout.

The platform is accessible at low tide and completely flooded at high tide.

At the time of my 2007 visit the contact between the platform and the sandy beach was largely concealed by extensive heaps of seagrass [but see photos **D071248, 49, 60, 61P, 63P, 67P, 70** for visible parts].

Hydrology

No obvious seepages or point springs were seen at the beach-platform contact. However, on the day of my visit, extensive piles of seagrass concealed much of the contact between the beach and the platform. Also, this was at the end of a major 8-year drought, so seepages may have been less than usual.

Water pooled within the runnels was quite salty in taste, apparently approximating sea water (my EC meter has an upper limit of 20 mS/cm, so is unsuitable for measuring very salty waters - sea water is about 50mS). However, one diffuse seepage area about 30m wide was found near the HWM in the sandy beach to the NE of the platform. This had an EC of 10.8 - 11.5 mS (about 7000-7500 ppm TDS) and a temperature of 20.6°C (air temperature was 19°C, at 11:30am. 15th July 2007).

A return visit is needed when the seagrass is absent to allow a proper assessment of the possible contribution of relatively fresh, and aggressive, seepage water to the intertidal runnels.

Geology:

The bulk of the cliffs (and badlands erosion) is on poorly consolidated Pliocene Parilla Fmtn = red-brown lateritised sand, mud & gravel. This locally overlies a small area about 500m long (with up to 4m high sea cliffs and a wavecut platform about 500m long) formed in Oligocene-Miocene Port Willunga Fmtn – a soft c-vc grained calcarenite similar to the Gambier Limestone [[see specimens](#)].

Photos: D071204-5,70,91 = cliffs; 1208, 60,65,98 = platform;

The calcarenite is vc-c grained [1247, 89-90], thin bedded and sub-horizontal (undulating) with one patch of small cross-beds [1259]

The calcarenite has scattered irregular vertical joints; the main set oriented roughly

perpendicular to the shore (ie ESE, $\sim 115^\circ$), with a cross-set parallel to the shore (NNE, $\sim 025^\circ$) [1265P, 63P, 66, 67P]. Some of these (the SE ones) have been cemented so that they weather out as low ridges [Photo 1231, **52-6**, **59**]. Others (both SE & NE) have been enlarged to form small grikes or chains of pans [Ph 1209].

The beach is sandy, with scattered pebbles and cobbles of hard lithologies – partly derived from the gravel beds of the Parilla sand, and partly from a headland of Paleozoic rocks further to the southwest. These hard cobbles are also found on the tidal platform and in the bottoms of the runnels.

Karren features

The wave-cut platform has a range of intertidal karren forms developed on the calcarenite. Straight to meandering runnels are the most obvious, but other karren types are: kamenitza (flat and round-bottomed), small pittings, clints between anastomosing runnels, and occasional grikes.

The runnels

The runnels are most common on the inner surfaces of the platform, within 30m of the beach. They are straight to sinuous and locally meandering, and trend perpendicular to the beach. Unfortunately the joints have a similar direction, but in one place I found cemented joints running at an oblique angle to the runnels [photos 52-56], which suggests that the runnels are not joint-controlled, but are following the drainage slope of the platform.

For the longer runnels, the width and depth tends to increase away from the beach [16-7, 48-9, 52, 60, 61P, 63P, 85, 92P]. The distal ends commonly feed into a tidal pool [18-9, 37, 41, **55**, 85, 92P,], but some ends (both distal and proximal) terminate abruptly at low (occasionally joint-controlled) scarps at the edge of pools or other hollows [63P, 67P]. For some runnels, the inner end commences as a shallow, narrow groove within the area of a flat platform and their width and depth enlarge seaward [85, 63P, 92P], others commence at the edge of the sandy beach [48-9, 60, 61P, 63P, 72P].

The runnels generally only branch occasionally (both divergently and convergently), but in some places they have an anastomosing pattern with diamond-shaped clints left between the channels [23-4, 37, 41, 71, 72P, 74-7].

Meandering patterns can involve the whole depth of a runnel [16-7, 27-8, 52-3, 92P,], but more commonly a mildly sinuose runnel with become more strongly meandering at the base of the channel, which has steep, or rarely undercut, walls on the outer edge of each meander [25-6, **29**, 32, 34-5, 38-41, 54-6, 72P, 75, 77-**80**, 81P, 84, 85, 96].

The bottoms of the runnels may contain hard cobbles and pebbles which can erode mechanical potholes that deepen and modify the form of the original runnel [18-19, 34, 38-41, 76, 96].

Morphometrics of the runnels

The runnels are generally 20-30cm wide and 10-20cm deep but can reach up to 50cm wide and 40cm deep. The longest runnels seen were about 20m, but most are only 10m or so before being truncated abruptly at a pool-edge. Smaller cross-sectional sizes occur at the inner, upflow, end, and the maximum dimensions are usually at the distal end. However, the deepest runnels seen were an unusually large anastomosing set about 80cm deep and up to 1m wide with pinnacles between them – these were found quite close to the beach [21-2, 86-7, 88]

Other karren forms

- * Kamenitza can be flat-floored [1209,15,20,26,28,31,37,51,54,60-1-2P-3P,81P,83-4, 96], or round bottomed basins (20 cm wide, 5-10cm deep [1208,10,13,31]) and there was one pair of deeper round-bottomed basins that were approaching "pipes" in form (40cm deep and 25cm diameter, [1288]);
- * Small pittings occur on the clints and ridges between the runnels (0.5-2cm wide & up to 1cm deep [18-9,29,32,30,37,39P,75,77-8,80,84,88,97]);
- * Joint-controlled Grikes are uncommon [1209, 50];
- * Diamond-shaped clints occur between anastomosing runnels [24,37,41,71,72P,74,76];
- * Two areas of 70-80cm high pinnacles were seen between unusually deep runnels [21-5, 86-7, 88] – both these were near the beach, and the tops of the pinnacles would have been close to the HWL.;
- * Undercuts at edges of some tidal pools [1208,98];
- * The outer platform has some areas of mainly smooth to undulating surfaces [1298] or is broken into rubble;
- * Swirl potholes with cobble & pebble tools have formed as secondary pits within the runnels, and elsewhere on the platform [19,23-4,26,30-1-2,34,37-8-9P. 81P, 96].

Since writing this, Andy Spate (pers comm) has reported intertidal runnels on calcarenites on Lord Howe Island, and Ian Household (pers comm) has reported them on Flinders Island, and elsewhere in Bass Strait.



C981520xk: Sellicks Beach, SA. K.G. Grimes 1998
Runnels on tidal flat. In Tertiary limestone.



Sellicks Beach, SA.au.
Tidal platform + beach + thick cover of seagrass.
Cliffs = Tpp snd & gvl / Tmw calcarenite
D071270: K.G. Grimes 2007



Sellicks Beach, SA.au. Tidal platform on calcarenite.
Intertidal runnels + beach [pan]
D071263P: K.G. Grimes 2007



Sellicks Beach, SA.au. Tidal platform on calcarenite.
Intertidal runnels + beach + less-regular runnels & pans (kams) to seaward
D071267P: K.G. Grimes 2007



Sellicks Beach, SA.au. Tidal platform on calcarenite.
Intertidal meandering runnels + seaward termination [Pan]
D071292P: K.G. Grimes 2007

Rod is 1m long



Sellicks Beach, SA.au. Tidal platform on calcarenite.
Deeply entrenched intertidal meandering runnel
D071280: K.G. Grimes 2007



Sellicks Beach, SA.au. Tidal platform on calcarenite.
Intertidal runnels & swirl-holes with cobbles & small pits
D071219: K.G. Grimes 2007



Sellicks Beach, SA.au. Tidal platform on calcarenite.
Intertidal anastomosing runnels & diamond clints (looking landward) [pan]
D071272P: K.G. Grimes 2007