Excursion 17 Stanley and Campsie Linn

Mike Browne

Purpose: To look at the sedimentary rocks of the Scone Sandstone Formation and the Cromlix Mudstone Formation, paying particular attention to calcretes (the concretionary Stanley Limestone) in the former and sandy mudstones in the latter; to examine the quartz-dolerite dyke at Campsie Linn, associated with James Hutton and John Clerk of Eldin.

Logistics: From Perth, follow the A9 northwards to the junction with the B9099 at Luncarty [NO 0930 2910]. Follow this road to Stanley and, following the signs, park at the Historic Scotland Stanley Mills visitor centre [NO 1150 3290]. Access is suited to cars and small coaches. Suitable waterproof footwear with good grip is required. Basic safety measures should be observed next to what can be a fast-flowing and fast-rising river. However the Campsie Linn area is popular for sunbathing, swimming, fishing and canoeing.

Maps: OS 1:50,000 Sheet 53 Blairgowrie, OS 1:25,000 Sheet 379 Dunkeld, Aberfeldy & Glen Almond; BGS 1:50,000 Sheet 48W Perth; locality map (Figure 17.1).

In its course between Campsie Linn and Stanley, the River Tay encounters Lower Devonian sedimentary rocks in the upper part of the sequence as developed in the Perth district. The uppermost part of the Arbuthnott– Garvock Group (Scone Sandstone Formation) and the lowest part of the succeeding Strathmore Group (Cromlix Mudstone Formation) are present in the riverside exposures. Latest Carboniferous quartz-dolerite dykes cross the Tay at Campsie Linn, following a roughly easterly trend through the Cromlix Mudstone Formation, which is thermally metamorphosed near the contacts.

Locality 17.1 [NO 1150 3290] Stanley Mills: Scone Sandstone and Cromlix Mudstone formations

From the car park, take the track along the edge of an old higher terrace of the Tay northwards from the conspicuous buildings of the mills. This track leads eastwards, past the former site of Stanley House and a more modern house. The track is partly private and walkers are diverted onto a path in the trees for a short way. The track continues to the north-western extremity of the long peninsula enclosed by the sharp bend in the river. Access to the start of the section is by steps [NO 1214 3277]. Here the Cromlix Mudstone Formation is exposed; the very silty mudstones are poorly bedded and display blocky jointing, including close-spaced decompaction stress-relief fractures. In places the strata are green rather than red or green spotted. Locally, ripple bedding may be seen and also desiccation cracks (Plate 17.1). The exposure hereabouts is subject to rapid weathering and shifting river sediments. As a result, what can be seen changes between visits. Farther east and upstream [NO 1227 3278], two nodular beds of calcrete (concretionary pedogenic limestone, (Plate 17.2)) may be examined within feldspathic and lithic sandstones of the top part of the Scone Sandstone Formation in small rock reefs in the river bed. Note that these representatives of the Stanley Limestone cannot be seen if the river is in moderately high flow and the remaining part of the section is very dangerous if the river is in flood. Farther along [NO 1230 2280] to [NO 1234 2283], the formation includes conglomerates that are visible forming a ledge above the river at the east end of this part of the section (Plate 17.3). These cross-bedded reddish brown sandstones contain pebble- and gravel-sized clasts of lava, perhaps derived from the erosion of the Ochil Volcanic Formation or from lavas in the Craighall Conglomerate Formation, and quartzite and other 'Highland' lithologies.

From here the section is complicated by a series of three small faults trending approximately NW and the strata are much broken and show variable dip and strike. In the river bed the faults coalesce into a single dislocation as they cross the river to the east bank. The overall throw is down to the north. At the tip of the meander peninsula, the strata dip northwestwards at 20° and are accessible on the banks of the river only when the water level is low. The upper part of the Scone Sandstone Formation, comprising alternations of sandstone and mudstone, dips below the purple-brown mudstones of the Cromlix Mudstone Formation. A fault crush and folded rocks at the contact between the two formations may be seen at [NO 1233 3290].

The lowest part of the formation, comprising conglomerates with associated sandstones and concretionary limestones, is visible in exposures on the opposite bank of the Tay, in the Tay Bank Geological Conservation Review (GCR) site (Barclay *et al*., 2005). These east-bank exposures are more difficult to access (Locality 17.4). They are approached from the neighbourhood of Campsie (Locality 17.3). However the rather thicker beds of white calcrete (Stanley Limestone) present locally in the succession are clearly visible in the cliff across the river. Upstream of Locality 17.1, the track runs at the foot of a cliff in the Cromlix Mudstone Formation for about 500 m from their junction with the underlying Scone Sandstone. About 200 m from the junction, the mudstones are cut by a basaltic dyke, 0.5 m wide and trending 85°. Thin irregular basaltic intrusions in the mudstones a little farther east are up to 30cm thick.

Continuing upstream and farther west, these exposures are replaced in the cliff by ones in the overlying glacial till. The steep wooded slopes above the River Tay show evidence of small landslips in this material and exposures of landslipped sticky brown stony clay are encountered at river level. A lade carrying water to power the mills was tunnelled through the peninsula, the intake being situated a short distance upstream from the adjacent weir. It seems probable that much of the tunnelling was through till, and that there is a great thickness of till in the area between the weir and Burnmouth Ferry upstream. The absence of bedrock in the river here is consistent with this conclusion. Upstream from Stanley, the Tay is deeply incised into the eastern edge of a drumlin field and it is probable that the post-glaciation course of the river was initiated along inter-drumlin depressions, and that the peninsula enclosed by the sharp bend east of the village represents an erosion-modified drumlin. From here return to Stanley Mills car park.

Locality 17.2 [NO 1225 3400] Campsie Linn, west bank: quartz-dolerite dykes

Make the short journey by car to the informal beach on the west bank of the river almost opposite Burnmouth Ferry and its active Salmon Bothy on the east bank. It is reached by heading NW on Mill Street through the village to the right turn [NO 1100 3325] for Shielhill Farm. This narrow lane (Linn Road) leads down to the beach where parking can be difficult on good days (fishing, canoeing, paddling, etc.). **2024 note: Due to recent parking restrictions in Linn Road, it is now suggested that visitors park in Stanley village.** The west bank of the river north of the beach is where the course of the river splits into a number of channels and where Campsie Linn comes into view. The exposures from here on require that visitors island hop in the channels of the river, but only if these are dry. Reddish- and purplish-brown mudstones of the Cromlix Mudstone Formation are visible on the opposite bank. Beyond a sharp change in the course of the river bank, mudstones are exposed and a basalt dyke, 0.6 m wide and trending 245°, traverses them. In contact with the dyke the mudstones are changed from purple-brown to grey owing to the thermal effects of the intrusion. A 4 m-wide dolerite dyke is also seen at [NO 1210 3384]. It is a short distance from here to the outcrop of the large Campsie Linn Dyke [NO 1225 3400].

At Campsie Linn the quartz-dolerite dyke, associated with James Hutton and John Clerk of Eldin (Craig *et al*., 1978), is about 15–18 m wide (Plate 17.4). It trends approximately E–W but its course is affected at intervals by small but distinct and abrupt right-lateral shifts, which can be seen to offset the line of the dyke progressively farther south as it crosses the Tay. At the linn, four such shifts occur within a distance of 250 m. If the water is low the mid-river outcrops may be accessible. Two explanations are possible for these shifts. The first is that the dyke was intruded and then faulted (right-lateral movement) at a later date or, more likely, that the original fracture opened under a dextral tectonic regime and the magma occupied an already stepped feature. The metamorphic effects in the Cromlix Mudstone close to the dyke can also be seen in these west-bank exposures.

Locality 17.3 [NO 1242 3400] Campsie Linn, east bank: dolerite dyke and baked mudstones

From Stanley drive northwards for a short distance along the B9099 but turn right at a Y junction about 800 m north of the village. Follow this minor road, past Ballathie House Hotel, until a T junction at Ballathie and turn right to cross the Tay at Kinclaven Bridge. Where this road meets the A93 turn right and drive south to the minor turn on the right [NO 1290 3354] to Campsie Farm. On the lane at the farm, turn right to park for Campsie Linn in the limited space at the cottage. Once on the river side (by path or track), only a short walk from the parking spot, the Cromlix Mudstone [NO 1242 3384] may be examined and also its hornfelsed contact [NO 1243 3393] with the quartz-dolerite dyke. The colour change in the mudstones from purplish-brown to grey is well seen here. A ready appreciation of the stepped nature of this contact and

of the dyke is to be had from immediately above the cliff that the dyke makes on the east bank. From here, especially when the leaves are off the trees, photogenic images may be taken (Plate S.10). This particular view is associated with James Hutton and John Clerk of Eldin, but note that the house on the opposite bank is artistically substituted in Eldin's drawing.

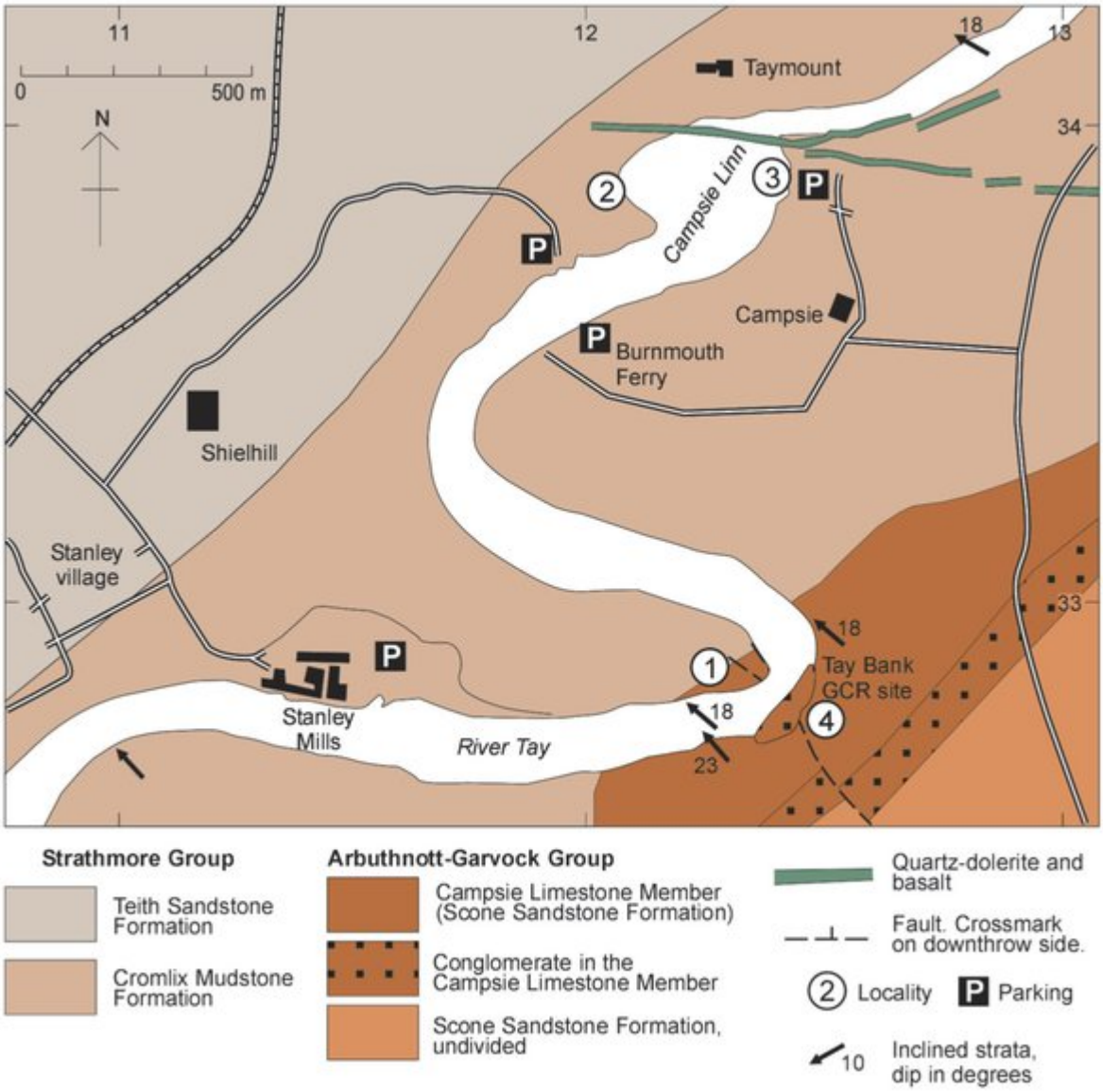
Locality 17.4 [NO 1248 3290] Tay Bank: Scone Sandstone Formation, Campsie Limestone Member, including Stanley Limestone

Return to Campsie Farm, drive straight on at the junction and then turn right to park in the limited area available at the Salmon Bothy at Burnmouth Ferry to visit the Tay Bank GCR locality. From the Salmon Bothy follow the riverside path downstream and eventually descend onto the river bed at wooden steps. From here the walk is subject to the vagaries of river flow and, at the far end, to navigating obstacles provided by fallen vegetation including tree trunks. The Cromlix Mudstone is well exposed in low cliffs [NO 1217 3312 to NO 1223 3310], displaying weak bedding and curved and blocky jointing. The river reefs and cliffs that form the core of the GCR site are accessed with care. The first exposures reached, at [NO 1247 3292], are of sandstone and pebbly sandstone, within the Campsie Limestone Member near the top of the Scone Sandstone Formation. The clasts in these are mainly of metasedimentary rocks, including rounded quartzite up to 15cm across. Trough cross-bedding in the sandstone infers a current direction towards 145°. Imbrication of clasts confirms a southern direction of transport for the river that laid down these rocks. The Stanley Limestone is exposed in the river cliff between [NO 1244 3280 and NO 1247 3284] in a small faulted anticline. This concentration of mature calcretes may have marked a time when the Early Devonian rivers were down-cutting to a lower base level, the floodplain was stable and less sediment was being transported. The following is the complete section seen at the top of the Scone Sandstone Formation in and around the river at Tay Bank (Armstrong *et al*., 1985).

	Thickness (m)
Mudstone, purple-brown (base of Cromlix Mudstone Formation)	30.00+
Sandstone and mudstone alternations	16.00
Mudstone with interbedded sandstone, purple-brown with small calcareous concretions	1.20
Sandstone	0.45
Sandstone with two lenses of concretionary limestone	0.45
Sandstone and mudstone	1.00
Sandstone, fine-grained, grey and pale-purple, cross-bedded, with mudstone clasts	1.20
Sandstone, purple-brown, fine-grained in top 2 m, coarser below with pebbles, mudstone and limestone clasts in lower part	20.00
Conglomerate and pebbly sandstone	3.00+
Limestone, concretionary	0.30
Sandstone	0.25
Limestone, concretionary	0.45
Sandstone	0.60
Limestone, concretionary	0.55
Sandstone	2.00
Limestone, concretionary	0.40–0.60
Sandstone, coarse-grained	1.10
Limestone, concretionary	0.30
Conglomerate with limestone concretions near base	7.50
Sandstone, cross-bedded	1.00+

The limestone clasts and nodules in the lowest conglomerate bed are usually 8–10cm across, but the largest are 20cm.

[References](#)



(Figure 17.1) Geological map of the area around the River Tay at Stanley, showing localities for Excursion 17.

(Plate 17.1) Locality 17.1. Desiccation cracks in Cromlix Mudstone Formation, River Tay, Stanley Mills.

(Plate 17.2) Locality 17.1. Beds of nodular calcrete in Stanley Limestone Member at top of Scone Sandstone Formation, River Tay, Stanley Mills.

(Plate 17.3) Locality 17.1. Conglomerate in Campsie Limestone Member of Scone Sandstone Formation, River Tay, Stanley Mills.

(Plate 17.4) Locality 17.2. Late Carboniferous quartz-dolerite dyke, showing right-lateral stepped contact with discoloured baked Cromlix Mudstone (right), River Tay west bank, Campsie Linn.

(Plate S.10) (opposite page, below) Late Carboniferous quartz-dolerite dyke, showing right-lateral stepped contact and horizontal columnar joints, River Tay east bank, Campsie Linn. See Excursion 17.