5 Evidence of exploitation

During the initial inspection of the vein, it soon became clear that it had been exploited by prehistoric people. The main revealing attributes are:

- 'stepping'
- circular impact scars, and
- denticulated 'platform-edges'

5.1 Stepping

This attribute is based on the fact that vein quartz develops so-called 'planes of weakness' along three axes, which together form an approximately cubic, three-dimensional breakage pattern. It is tempting to call these planes 'cleavage planes', but a cleavage plane is a specific attribute associated with the crystal and atomic structures of a mineral, and quartz, as a mineral, is defined as having none (Pellant 1992, 86–7). It is a well-known fact that smaller pieces of quartz fracture in an irregular or conchoidal manner, and not along cleavage planes (contrary to, for example, feldspar), whereas larger bodies of quartz (eg, veins) tend to split along the planes of weakness described in the text. These planes may be products of the way hydrothermal silicious fluids solidify.

At Cnoc Dubh, the most prominent of the three planes is the plane running parallel to the surface (Plane 1), with the other two planes (Planes 2 and 3) being less well developed and running either vertically or horizontally from the surface and into the vein. In practice, Plane 1 separates the quartz vein into a number of relatively thin (2–15 cm), vertical, layers. In his presentation of the quartz quarry at Samp Mortar Reservoir, Connecticut, Bernard Powell suggests that, to prehistoric knappers, this tendency to form natural layers was a desired attribute in quartz:

> 'because of the flat-sided nature of quartz [. . .], the quarriers were able to secure a wide range of pieces having roughly parallel sides. These constituted natural cores, with ready-made striking and anvil platforms. It was a simple matter to set such pieces down on a nearby ledge, and begin at once to detach flakes through either direct or indirect percussion. Analysis of the refuse leaves little doubt that this was one of the main activities of the quarriers' (Powell 1965).

Between the various layers of quartz, the adjoining surfaces frequently develop a coating, probably deposited by fluids. In the local area, this coating varies between yellow, orange, red and brown (probably iron compounds), and the presence of coated surfaces in an

Illus 6 The vein's stepped appearance.

Illus 7 Stepping developed due to exploitation of a novaculite resource in the Ouachita Mountains (Ouachita National Forest), Hot Springs, Arkansas (Etchieson 2000).

assemblage usually defines quartz artefacts as being based on vein quartz, and not pebble quartz. In previous papers, the author has referred to these surfaces as 'contact faces' (Ballin 2002), as they were – erroneously – interpreted as representing the contact zone between the vein and the rock matrix. This contact zone is, instead, characterized by the intermixing of quartz and rock (in the present case, mainly feldspar from the gneiss; at Scord of Brouster on Shetland the quartz from the contact zone is mixed with sandstone [Ballin in prep. d]).

As particularly the south-western half of the vein has been exploited, the stepped appearance is most pronounced in this part (Illus 6). The main reason for the occurrence of stepping is the division of the vein into vertical layers, combined with the fact that the use of a hammerstone makes it impossible to detach blocks of quartz any closer to an edge of a previous layer than the radius of a hammerstone in a clenched fist (probably approximately 50–100 mm; see Illus 14). Parallels to this phenomenon are known from other lithic quarry sites, for example the jasper quarry at Valle Lagorara in northern Italy (Negrino 1998), and novaculite quarries in the Ouachita National Forest in Arkansas, USA (Etchieson 2000: Illus 7 here).

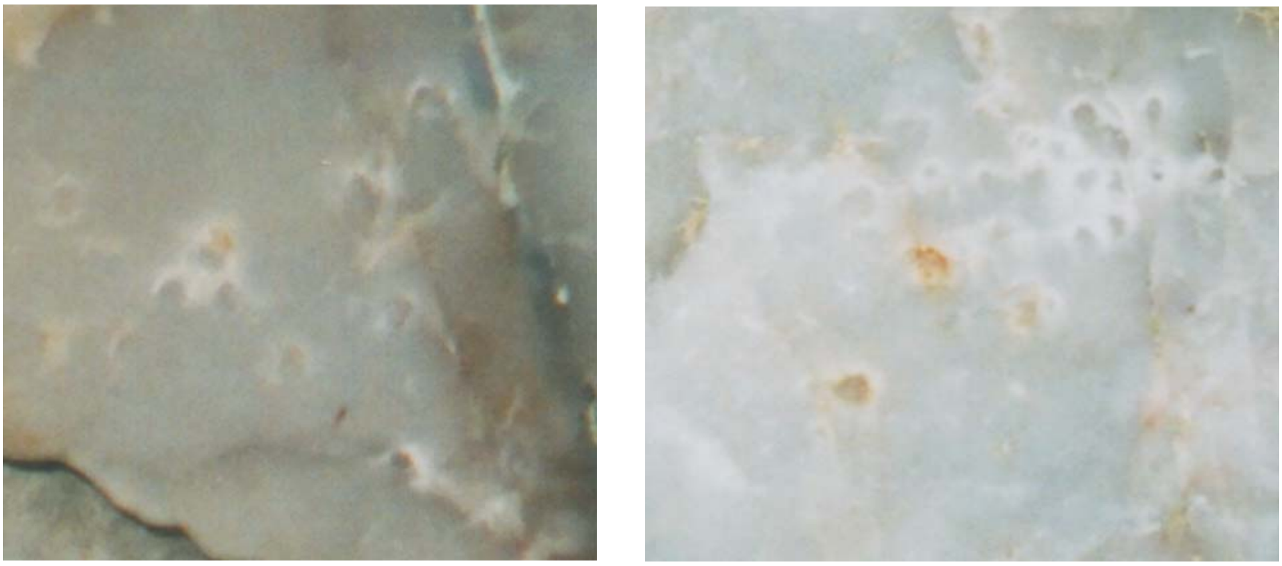
5.2 Attributes associated with the reduction of the vein

On several points, the quarrying of quartz – or any other lithic raw material – from bedrock outcrops (that is, *not* pebble sources) corresponds to the reduction of lithic cores. In principle, a quartz vein is a large, irregular core which is being gradually reduced. As the purpose of this process is to remove large blocks, or plates, of raw material for further reduction in front of the vein or elsewhere, and not to form delicate blanks or tools, the main approach is hard direct percussion. As a consequence, the reduced vein displays attributes similar to the characteristics associated with hard-hammer core reduction, such as, circular impact scars (incipient cones) and denticulated edges ('platform-edges').

Reduction of cores is based on the principle that lithic raw materials, like glass, break in a conchoidal (that is, 'shell-like') fashion when struck. If, for example, a slab of glass or flint is struck perpendicular to the surface, this may detach a solid Hertzian cone (resembling a shell), whereas an oblique blow to the edge of a lithic raw material slab (or core, or vein) releases a flake. The parent piece shows a concave fracture, and the flake's ventral face (where it was attached to the parent object) is convex (Oakley 1967, 9; Inizan *et al.* 1992, 33; Whittaker 1994, 12).

5.2.1 *Circular impact scars*

Circular impact scars, or incipient Hertzian cones, are found at numerous spots on the vein surface. They can be sub-divided into two groups, namely 1) impact scars in the centre of surfaces (Illus 8, 9), and 2) impact scars near worked edges (Illus 10, 11 & 12).



Illus 8–9 Impact scars of Type 1.

Illus 10–11 Impact scars of Type 2. Illus 10 illustrates how an unsuccessful attempt was made at detaching a large plate (a corner).

Those two groups represent different functions relating to the reduction of the vein.

The former group is the by-product of attempts at 'breaking through' one of the natural quartz layers described in Section 5.1, thus forming an edge from which the reduction of that particular layer could continue in a structured manner. The fact that these scars, or incipient cones, are still present at the centre of an unbroken quartz surface testifies to unsuccessful penetration of the layer being targeted.

The latter group is the by-product of the actual procurement of quartz blocks or plates, which would, at a later stage, be shaped into cores for the primary (blank) production. These impact scars are associated with the denticulated edges discussed in Section 5.2.2. Though a denticulated edge is the product of successful reduction of the vein, each circular impact scar associated with it represents a failure to detach a specific part of the targeted layer.

5.2.2 Denticulated edges

The denticulated edges (Illus 11, 12 & 13), forming the 'flaking front' of each individual quartz layer, owe their general delineation to the fact that reduction of quartz veins is based on rather crude, hard percussion techniques, contrary to the techniques generally associated with the reduction of lithic cores. In many cases, the detachment of flakes from a core involves sophisticated details, such as general preparation of the platform-edge (trimming or abrasion) or preparation of individual flakes or blades (platform isolation) (Whittaker 1994, 104–

Illus 12–13 Denticulated edges.

05). The general preparation of a platform-edge usually removes salient points along the edge, which subsequently acquires an either rectilinear or regularly convex shape. The worked edges of a quartz vein layer correspond to the platform-edges of plain, unprepared quartz cores reduced by the application of direct, hard percussion: they are wavy or denticulated.