5 The Archaeological Distribution

5.1 Geographical distribution

Throughout Scotland, quartz assemblages are mainly recovered from prehistoric sites in the north and west of the country. This is shown in the distribution map (illus 1), in which substantial quartz-bearing sites are displayed in relation to the major geological regions. Apart from one area, the selected regions correspond to the geological divisions used by the British Geological Survey in their series British Regional Geology (eg Johnstone & Mykura 1989). The region referred to in illus 1 as 'Sedimentary Cover' has been added, as the geological realities of this area is thought to have some importance to the use of quartz (or not, as it is) in north-east mainland Scotland.

At the present stage of Scottish quartz research, the general distribution pattern is as follows (illus 1 and Table 18): Shetland, the Western Isles and some sites in western mainland Scotland are heavily dominated by quartz; the Southern Hebrides, in and south of the Tertiary Volcanic Districts, as well as some sites in western mainland Scotland, are characterized by mixed exploitation of quartz sources and sources of flint and flint-like silica (parts of this area are heavily dominated by flint-use, for example, Islay: McCullagh 1989); some quartz-bearing sites have been investigated in the various Highland regions; and the north-east and south of Scotland (the Sedimentary Cover, the Midland Valley and the Southern Uplands) are practically devoid of archaeological quartz. A number of relatively small areas are characterized by the preference for locally available silica, such as, Rhum (bloodstone; Wickham-Jones 1990), Arran (pitchstone; Ness & Ward 2001), Skye (baked mudstone; Saville & Miket 1994) and Angus (chalcedony/agate; Warren no date). In general, sites in the coastal zone of mainland Scotland are dominated by flint.

5.1.1 Shetland

The northernmost geological region of Scotland, the Shetland Isles, is heavily dominated by quartz-use, with flint either being absent or making up at most 1% (eg Sumburgh; Finlayson 2000). The large assemblage from Scord of Brouster included only one per thousand flint, and the Kebister assemblage included two per thousand flint. In general, other lithic raw materials are extremely rare. The Burland assemblage, for example, includes the fragment of a leaf-shaped arrowhead in jasper; the collection of Catpund, a felsite knife; and at Scord of Brouster a small expedient scraper was based on the fragment of an abandoned felsite axe.

Felsite is not a general substitute for the main silica varieties, as it was almost exclusively used in the production of a particular type of polished knife, as well as for polished axes, but occasionally it was used for arrowheads and scrapers. However, in connection with the examination of felsite objects in the Shetland Museum, the author found that most felsite scrapers had polished 'ventral' faces, suggesting that this raw material was only used for more mundane tool types when a damaged knife or axe was recycled.

Most of the quartz from Shetland is milky quartz, but some assemblages also contain saccharoidal quartz (eg Scord of Brouster and Cruester). The very dense, steel-grey to purple quartz variety from Cruester is probably a quartzite. In general, the prehistoric people of Shetland procured quartz from several sources, and many assemblages contain vein quartz as well as pebble quartz. The material from Bayanne, however, appears to be mainly vein quartz, and several conjoining parts of quarried quartz 'plates' were found. The assemblage from Cruester is primarily based on rolled beach pebbles, with approximately two-thirds of all pieces having smooth, abraded cortication.

Apart from the finds from Neolithic Scord of Brouster, and possibly a proportion of Calder's finds (Calder 1956), Shetland quartz assemblages apparently mainly date to the Bronze Age or the Early Iron Age. A minority of the involved sites were dated to the Early Bronze Age, such as Tougs Phase 1 (Hedges 1986, 12), but the vast majority of quartz-bearing sites are of Later Bronze Age dates (eg Bayanne, Cruester, Sumburgh). Stratigraphical evidence, in conjunction with technological comparison, suggest that the quartz finds from Kebister and Burland may largely be from the Iron Age.

5.1.2 The Western Isles

The Western Isles region is also dominated by quartz use, though not as exclusively as Shetland. As indicated in Table 18, the proportion of quartz usually varies between 75% and 100%, with flint varying between 0% and 14%, and mylonite between 0% and 11%. Barvas 2 represents the only analysed assemblage of a number of excavated lithic assemblages from the Barvas area, and, with only 46 lithic finds, the raw material information presented in Table 18 should be used with caution (67% quartz; 33% flint; no other silica). The collection from Berie Sands was published (Lacaille 1937), though not in

Table 18 Quartz and other raw material frequencies in the various Scottish regions

	Assemblages	Quartz/flint/other silica	Other silica
1	Bayanne	100:00:00	
2	Scord of Brouster	999:001:000	
3	Kebister	998:002:000	
4	Cruester	99:01:00	
5	Burland	100:00:00	1 piece of jasper of 515 pieces
6	Tougs	100:00:00	
7	Catpund	100:00:00	
8	Sumburgh	99:01:00	
9	Jarlshof	Not quantified in publ.	
10	Barvas 2 [i)]	67:33:00	
11	Dalmore	93:4:3	Mylonite, dolerite/basalt
12	Olcote	98:01:01	Mylonite
13	Calanais	74:14:11	Mylonite
14	Cnoc Dubh (quarry)	N.A.	N.A.
15	Berie Sands	Not quantified in publ.	Mylonite, other igneous rock types
16	Northton	Not quantified in publ.	Few lithics: quartz, flint, mylonite, basalt
17	Udal	100:00:00	
18	Eilean Domhnuill	???	Awaiting publication
19	Rosinish	99:01:00	
20	Redpoint	80:03:17	Bloodstone, mudstone
21	Shieldaig	87:12:1	Bloodstone
22	Kinloch [ii)]	Approx. 0.5% quartz	Mostly bloodstone, some flint, and other silica
23	Camas Daraich [ii)]	19:c.46:c.35	Other silica is mainly bloodstone, some mudstone
24	Rudha'n Achaidh Mhòir	Not quantified in publ.	Some flint
25	Risga	Not quantified in publ.	Some flint
26	Carding Mill Bay	99:01:00	
27	Kilmelfort Cave	45:55:00	
28	North Carn Bay	28:72:00	1 piece of pitchstone
29	Lealt Bay	24:76:??	43 pieces of pitchstone
30	Lussa River	89:11:00	
31	Lussa Wood	20:80:??	28 ?silicified siltstone, 71 pitchstone
32	Ellary Boulder Cave	86:13:01	75 pieces of pitchstone
33	Auchategan	33:20:47	92 pieces of pitchstone, two flakes in agate and sandstone
34	Lairg	99:01:00	
35	FERG Sites 4-5	68:31:01	Dolerite
36	Ben Lawers	Mostly quartz:some flint	Awaiting publication

(i) At Barvas, only the numerically less important Barvas 2 assemblage has been analysed and quantified;
(ii) in the published reports, flint was counted as part of a more general raw material group, 'chalcedonic silica', which includes, inter alia, flint, chert and chalcedony

quantified form, and the composition of this material is only known in general terms: the finds from Berie Sands are dominated by quartz, with mylonite and various igneous raw materials being present.

The composition of the Northton settlement site is not entirely clear (Simpson 1976; Murphy & Simpson 2003). Apparently, only small amounts of lithic material was reduced at this site, including quartz, flint, shale and basalt. A resource referred to in the 1976 preliminary report as mylonite, with a reference to the existence of a mylonite source in the site's vicinity, is not mentioned in the 2003 paper and may have been re-interpreted as shale – but what happened to the local mylonite source?

Table 19 A number of Neolithic and Bronze Age settlement and ritual sites along the Lewisian west coast, their individual distances, and dominating quartz types

Assemblage	Reference	Approximate distance	Dominating quartz variety
Barvas 2	Ballin 2003a		Fine-grained and milky quartz, pebble source
		14.5 km	
Dalmore	Ballin forthcoming g		Coarse-grained quartz, pebble source
		10.0 km	
Olcote	Neighbour 2005		Fine-grained and milky quartz, vein and pebble sources
		2.0 km	
Calanais	Ballin forthcoming a		Milky quartz, vein source
		3.5 km	
Cnoc Dubh	Ballin 2004e		Milky quartz, vein (quarry)
		16.0 km	
Berie Sands	Lacaille 1937		Fine-grained quartz, vein source

Mylonite is distinctly layered, with some layers being brownish grey and some bluish grey or white/grey. It is very fine-grained and most pieces from sites on the Western Isles are slightly or severely weathered. In the archaeological literature, this raw material has been defined as either mylonite (Lacaille 1937; Ballin forthcoming a), baked mudstone (Wickham-Jones 1986), or baked shale (Neighbour 2005), but in connection with the examination of similar pieces from the Calanais ritual complex (Ballin forthcoming a) one sample was classified as a typical mylonite, possibly a 'tectonised amphibole', whereas others could only be defined as 'either fine-grained sedimentary rock, hornfels or mylonite' (report by Geologist Dr Allan Hall, Department of Archaeology, University of Glasgow). For this reason the author has chosen to classify these pieces as mylonite, until a more detailed geological study of this raw material can be carried out. At present, the provenance of the mylonite is uncertain: if it is, in fact, mylonite, it may be local and derive from eastern Lewis (see geological map of Western Isles in Smith & Fettes 1979, illus 3).

The quartzes exploited in the Western Isles form a wide spectrum, including milky quartz, fine-grained quartz and coarse-grained quartz. Rock crystal is practically absent. Milky quartz and fine-grained quartz are equally common, whereas coarse-grained quartz has only been exploited regularly at the Dalmore site. As shown in Table 19, most assemblages appear to be clearly dominated by either pebble quartz or vein quartz, rather than including an even mixture of the two. The fact that the assemblages from these closely situated sites differ, in terms of quartz type, indicates that the quartz sources may have been extremely local and probably only supplied individual sites and families. All the sites in Table 19 are situated close to the coast, and the pebble sources of Barvas 2, Dalmore and Breasclete are most likely the beaches immediately next to these sites. The exact distance between settlement and quarry, in the cases of the vein quartz dominated sites of Calanais, Cnoc Dubh (quarry) and Berie Sands, is unknown, but the distances between the individual locations suggests that it may be as much as 10km (though the author expects it to be much less).

On Lewis, one form of quartz appears to have been preferred for, for example, arrowheads, namely the so-called 'greasy' quartz. As shown in Table 19, the Calanais ritual complex is dominated by homogeneous milky quartz (also Ballin forthcoming a), and the Dalmore site by coarse-grained material (Ballin forthcoming g), but the sites' barbed-and-tanged arrowheads are mainly in quartz with a 'greasy' lustre. No Lewisian sites are dominated by 'greasy' quartz, and only one site on mainland Scotland is known for the presence of greater quantities of this material – Shieldaig in Wester Ross (Ballin *et al* forthcoming). Given the distances across which pitchstone, for example, was traded (Williams Thorpe & Thorpe 1984; Ness & Ward 2001), it is quite possible that Shieldaig is the main source of 'greasy' quartz. As the crow flies, the distance from Shieldaig to the Lewisian west coast sites is approximately 100km.

Most of the quartz assemblages from the Western Isles date to the period Late Neolithic/Early Bronze Age. Association with pottery suggests that Rosinish may be a Beaker period settlement, and the Kilmarnock points of the Dalmore site indicate a date in the later part of the Early Bronze Age (Kilmarnock points are generally associated with Collared Urns, Secondary Series; Green 1980, various tables; also discussed in Ballin forthcoming a). The quartz from Calanais can only be dated approximately to the Late Neolithic/Early Bronze Age, and the quartz assemblage from Barvas 2, devoid of any diagnostic lithic elements, may date to this same general period. The stratigraphy of the Northton site included Neolithic and Beaker levels, and associated diagnostic pottery. In the latest report on the finds (Murphy & Simpson 2003), the sparse lithic material is compared to the

assemblages from Eilean Domhnuill (Finlayson forthcoming) and Alt Chrysal (Foster 1993, 5), which are equally small and associated with substantial collections of pottery. It appears that, on the Western Isles, much pottery/few lithics is a distinct Neolithic feature.

5.1.3 The Southern Hebrides and the western part of mainland Scotland

This region embraces the Tertiary Volcanic Districts, the islands immediately south of this area (including Arran), as well as the immediately adjacent parts of western mainland Scotland. In the Southern Hebrides/western mainland Scotland raw material preferences were extremely varied. Some assemblages only contain a variety of quartzes (eg Carding Mill Bay: Finlayson 1993) or flint (eg Newton, Islay: McCullagh 1989), most are mixed collections of quartz, flint and other silica (eg Camas Daraich: Wickham-Jones & Hardy 2004; Shieldaig: Ballin *et al* forthcoming), whereas a third group of assemblages are heavily dominated by locally abundant resources, such as bloodstone (Kinloch, Rhum: Wickham-Jones 1990), baked mudstone (An Corran, Skye: Saville & Miket 1994) and pitchstone (Arran: Ness & Ward 2001).

The most wide-spread use of quartz is encountered on the coastal strip of western mainland Scotland, from Auchategan in Bute (Marshall 1978) to Redpoint in Wester Ross (Gray 1960), as well as in connection with individual sites on the east-coast of Jura (eg Lussa River: Mercer 1971; Ballin 2002b); the use of quartz as an important minority resource characterizes sites throughout the region, on the mainland as well as on many individual islands; and the preference for non-quartz raw materials is usually associated with more discrete zones, possibly defining prehistoric territories. Bloodstone only dominates the source island itself, Rhum, but is found as important sub-assemblages or individual pieces on sites within a 70km radius from the bloodstone quarries and beaches (Clarke & Griffiths 1990, 154). The main outcrop of (Staffin) baked mudstone may be a seam near the An Corran rock shelter, on the north-eastern coast of Skye; the distribution pattern of this material corresponds well with, and overlaps, that of bloodstone, and covers an approximately equal area (from Redpoint, Wester Ross, in the north, to Acharn, Morvern, in the south; Clarke & Griffiths 1990, 155). The distribution of pitchstone is unique, with dominant pitchstone use characterizing Arran itself throughout prehistory, in conjunction with restricted use of flint and quartz, whereas limited exploitation of this resource is seen on the Scottish mainland through the Early Neolithic period, and possibly into the later prehistoric periods (cf Ness & Ward 2001).

Most of the quartz procured within this region is milky quartz. In connection with the author's characterization of assemblages from the Southern Hebrides and western mainland Scotland, many pieces were described as grainy or saccharoidal. Most of these samples had a dull lustre and loose texture, and after experimentation with the exposure of quartz to fire, the author now assumes that most of the dull, loose-textured, grainy quartz is burnt quartz at various stages of disintegration. The burnt quartz from this region is rarely yellow-brown as the burnt quartz from the Western Isles and Shetland (Ballin forthcoming k).

The archaeologically relevant quartzes of this region includes varieties which are relatively rare in, for example, Shetland and the Western Isles, such as rock crystal and 'greasy' quartz. Though rock crystal may be encountered as individual pieces on most prehistoric quartz sites, only on Jura is it a significant resource: the collection from Lussa River includes *c* 1.5% of the quartz sub-assemblage (Ballin 2002b), and the collection from Lealt Bay *c* 11% (Ballin 2001b). Remaining dorsal crystal facets on flakes and cores suggest procurement of this raw material in the form of large crystals. A small number of flakes and bipolar cores have series of dorsal crystal facets, allowing estimation of the original size of the crystals; most probably, the majority of collected crystals had diameters of approximately 2.5–4.5cm. Rock crystal has excellent flaking properties, and it is suitable for production of microblades (cf Ballin 1998a). This, however, was not attempted at the Jura sites. The general approach in Scottish rock crystal reduction was by the application of bipolar technique, disregarding the possibilities of the raw material. It may have been collected for its appearance (symbolic value) more than for its utilitarian value. Mercer located a source of 1-inch crystals half a mile south of the Lealt Bay site (Mercer 1968, 20), whilst the local people's 'Glittering Rock' at Carn, further to the north, owes its name to a covering of variously sized pink or white specimens.

The so-called 'greasy' quartz is mostly grey, but it is also found in white, light brown, red or green colours. As mentioned above, it was used throughout the Western Isles, the Southern Hebrides and western mainland Scotland for the production of arrowheads and other 'finer' pieces, but it only makes up a significant proportion of one assemblage – that of Shieldaig in Wester Ross (52%; Ballin *et al* forthcoming). This resource has markedly better flaking properties than most other quartzes. If 'greasy' quartz was mainly procured from sources in the vicinity of Shieldaig, the recovery on Lewis of tools in this material indicates the presence of an exchange network somewhat more extensive than those of Rhum bloodstone and Staffin baked mudstone. Throughout the region, other silica found limited use, but particularly small sub-assemblages of grey chalcedony are common (particularly in Ardnamurchan and its immediate hinterland; Clarke & Griffiths 1990, 155).

Analysis of the surfaces of the quartz forms demonstrates how some assemblages are dominated by vein quartz (characterized by the presence of red, brown

and yellow coated surfaces; cf Ballin 2004e), and some by pebble quartz (abraded surfaces). Mainland sites seem to have favoured vein quartz, and the milky quartz and 'greasy' quartz recovered from, for example, Shieldaig (Ballin *et al* forthcoming) and Kilmelfort Cave (Saville & Ballin forthcoming) were quarried from bedrock sources. The various quartzes from sites on Jura, on the other hand, appear to be largely pebble quartz (Ballin 2001b; Ballin 2002b), as are assemblages from other Southern Hebrides islands (eg Camas Daraich on Skye: Wickham-Jones & Hardy 2004, 21).

Contrary to the mainly later prehistoric material from sites in Shetland and the Western Isles, the quartz assemblages from the present region are heavily dominated by early prehistoric activity. Though most sites include the occasional Neolithic and/or Bronze Age element, the majority of sites are Mesolithic, with one possibly dating to the Final Palaeolithic (Kilmelfort Cave; see discussion in Saville 2003a), one to the Mesolithic–Neolithic transition (Carding Mill Bay: Finlayson 1993), and two may mainly be Early Neolithic (Ellary Bould Cave: Tolan-Smith 2001; Auchategan: Marshall 1978). Collections dominated by finds from the Late Neolithic or Bronze Age are absent.

5.1.4 The Highlands

The Northern Highlands and the Grampian Highlands are characterized by the discovery of a limited number of quartz assemblages. At present, only three quartz assemblages of some quantity or importance are known from the two main Highland regions, namely Lairg, Highland (Finlayson 1996), FERG Sites 4–5, Aberdeenshire (Ballin forthcoming c), and Ben Lawers, Perth & Kinross (Atkinson *et al* 1998). They differ on several accounts.

With approximately 10,000 pieces, the assemblage from the settlement site of Lairg is the larger of the three (Finlayson 1996). It is heavily dominated by quartz (99%), with flint also being present (1%). The assemblage appears to include milky quartz as well as saccharoidal quartz, and the vast majority of the resource was procured in the form of pebbles. The lithic artefacts were deposited during the Late Neolithic, Early Bronze Age and Late Bronze Age periods.

Mixed quartz–flint collections were recovered in connection with excavations along the St Fergus to Aberdeen Natural Gas Pipeline (FERG) in Aberdeenshire. Two sites, FERG Sites 4 and 5 (Ballin forthcoming c), yielded assemblages composed of approximately two-thirds quartz and one-third flint, supplemented by a single artefact in dolerite. Almost all of the quartz is milky quartz, and, as roughly two-thirds of the pieces have abraded cortex, it is most likely that this resource was procured from one or more pebble sources. Some of these artefacts may be from river or beach gravels, but the slightly frosted appearance of the cortication, combined with the frequently angular shape of the parent pieces, suggests that the quartz may have been collected mainly in the form of erratic blocks or nodules (cf the description of quartz from the deflation zones of the Western Isles machair; Ballin 2003a; Ballin forthcoming h). Both assemblages include pieces struck off large crystals. FERG Sites 4 and 5 are both multi-occupation sites, including material from various parts of the Neolithic, Bronze Age and possibly Early Iron Age periods.

During excavations carried out as part of the Ben Lawers Historic Landscape Project, Perth and Kinross (Atkinson *et al* 1997), a Mesolithic hunting camp was investigated. From this site an assemblage of predominantly quartz was recovered, but a small number of flint artefacts were also found. The preliminary notes on the assemblage (Atkinson *et al* 1997, 63; Anonymous 2001; Donnelly 2003) do not define the quartz in any detail, but Donnelly does reveal that different types of quartz were retrieved, some 'low-quality' and some better varieties which '... split with a conchoidal fracture, as opposed to tabular' (Donnelly 2003). It is thought that the quartz is local, whereas the flint may have been brought to the site.

5.1.5 The various sedimentary regions

Three of the eight geological regions in illus 1 are characterized by sedimentary rocks. In the north-east of mainland Scotland, and on Orkney, the bedrock is dominated by Middle and Upper Old Red sandstone formations (Johnstone & Mykura 1989, 118), whereas the Midland Valley (Cameron & Stephenson 1985) and the Southern Uplands (Greig 1971) are dominated by sandstone of Devonian age (north), Carboniferous limestone (the Central Belt) and Ordovician and Silurian sediments (south).

Though quartz in some parts of the world is common in a number of sandstones and shales (Neumann 1985; Howard & Howard 2000), it is relatively scarce in Scottish sedimentary rock formations, and no major quartz assemblages have been recovered from the sedimentary rocks of the north-east and south. From the Mesolithic site of Oliclett in Caithness (Pannett 2002) more than 1100 lithic artefacts were recovered, but only 50 pieces of worked quartzite. The excavator assumes that quartzite pebbles formed part of the glacial till (Pannett 2002, 16).

Some milky quartz (*c* 8%) was found in connection with the excavation of Fordhouse Barrow in Angus (Ballin forthcoming f), and it was encountered in roughly equal proportions through the barrow's various layers. It was collected in the form of relatively small pebbles, probably deriving mainly from river or beach gravels. In addition, the assemblage includes eight pieces of rock crystal/smoky quartz, also collected from pebble sources, as well as *c* 16% of quartzite. The quartzite is similar to the dense saccharoidal quartz variety from Cruester in

Shetland (Ballin forthcoming e), and it may have been collected as large cobbles in the vicinity of the site, deposited in the mainly sedimentary Montrose area by either Lower Devonian streams (Cameron & Stephenson 1985, 18–21) or more recent glacial activity. Sources of milky quartz were probably exploited in the various Neolithic and Bronze Age periods represented at Fordhouse Barrow, whereas the quartzite is thought to represent mainly Later Bronze Age post-barrow activity.

In general, the three sedimentary regions are characterized by the use of flint (the north-east and the coastal zone of the south), and chert (the central parts of the Midland Valley and the Southern Uplands; cf Saville 1994).

5.2 Explaining the observed distribution patterns

As demonstrated by illus 1, the distribution of quartz-bearing sites throughout prehistoric Scotland is fairly uneven: two geological regions are characterized by a marked preference for quartz (Shetland and the Western Isles); one area is characterized by frequent use of quartz, but with assemblages occasionally being supplemented, or even dominated, by other silica (Southern Hebrides and west mainland Scotland); from the two larger Highland regions (the Northern Highlands and the Grampian Highlands) only a small number of quartz assemblages are presently known; and from the various sedimentary regions (Sedimentary Cover, Midland Valley and Southern Uplands) no substantial quartz assemblages, or quartz sub-assemblages, have been recovered.

This distribution pattern is only partly accurate, as it has been affected by various forms of research bias. First of all, there are areas with no or little human settlement, such as the Highlands (not least the inner parts of this area), and the north-west corner of the Scottish mainland. Secondly, some areas are characterized by development of society's infrastructure, even though few people may live there, such as the construction of roads, railways, hydroelectric development and pipelines. And thirdly, there are areas which enjoy preferential status in the archaeological community, either because the actual archaeology is more relevant or better preserved (eg the Western Isles and the Scottish west coast), or because some locations are socially more attractive ('cosier' – this may explain why Orkney is well-surveyed and well-excavated, whereas Caithness, which has just as much to offer in terms of relevant and well-preserved archaeology, has, until recently, been shown little interest).

Two questions need to be addressed in this section, namely: (i) why are quartz-bearing sites located where they are (including: why are quartz-bearing sites absent in some regions) (illlus 1), and (ii) why are quartz-assemblages from different regions composed differently (Table 18)? Possible answers include:

(a) geological availability, that is, the presence or absence of quartz (different quartz types) and alternative lithic raw materials
(b) quality of flaking properties of the available lithic resources ('knappability')
(c) higher or lower use value of the available lithic resources (how do they perform in relation to specific tasks, or in specific contexts?)
(d) the attachment of ideological ('symbolic') values to different types of stone.

In general terms, the use of specific raw materials reflects either function (a–c), or style (d). In the present paper style is defined as '...formal variation in material culture that transmits information about personal and social identity' (Wiessner 1983, 256; for a general discussion of the concept of style, see Ballin 2007b).

Raw-material preference as an expression of function usually results in a gradually declining *fall-off curve* (Renfrew 1977, 73) with growing distance to the outcrop, whereas raw-material preference as an expression of style is characterized by a marked drop in frequency at the borders of the social territory in question (Hodder 1979, 447). Stylistic use of a raw material is demonstrated by the almost exclusive use of rhyolite in Early Neolithic south-west Norway, with the raw material deriving from one central locality (the Bømlo Quarry: Alsaker 1987), and with a marked drop in the rhyolite frequency at the borders of that territory (Ballin 2007b).

5.2.1 Shetland

There is no doubt that the geological realities, that is, availability, plays a major part in the formation of the observed distribution patterns (illus 1). The total dominance of quartz on Shetland sites, and the lack of flint, probably relates to the fact that, on these islands, quartz sources are abundant, and flint sources almost completely absent. Only one source of pebble flint is presently known, namely beach deposits on the island of Yell (Whittle 1986, 72). Few alternative lithic raw materials are known on Shetland, such as jasper and felsite, with the former being a relatively poor substitute, usually flawed by impurities, and the latter obviously associated with some ideologically based regulation.

Jasper is not common in Shetland, but it is available in a number of locations, such as Papa Stour, and the fragment of a leaf-shaped arrowhead in jasper was recovered from the Burland site (Ballin forthcoming d). This fragment demonstrates the problems relating to the reduction and use of Shetland jasper, as the presence of specks of quartz and chalcedony makes it brittle, and it breaks easily. Felsite was quarried and worked in the northern parts of mainland Shetland, and examination of felsite artefacts in the Shetland Museum shows how this material was reserved for the production of polished knives and axes. A number of kite-shaped arrowheads in felsite suggests that

Table 20 The assemblage from Sharples' excavation. The distribution of the main raw materials by artefact categories

	Numbers				%			
	Quartz	**Flint**	**Mylonite**	**Total**	**Quartz**	**Flint**	**Mylonite**	**Total**
Debitage	2344	86	59	2489	98	87	93	98
Cores	24	5	1	30	1	5	2	1
Tools	20	8	3	31	1	8	5	1
Total	2388	99	63	2550	100	100	100	100

Table 21 The assemblage from Rosinish. The distribution of the main raw materials by artefact categories

	Numbers			%		
	Quartz	**Flint**	**Total**	**Quartz**	**Flint**	**Total**
Debitage	3447	6	3453	97.3	22.2	96.8
Cores	73	4	77	2.1	14.8	2.2
Tools	21	17	38	0.6	63.0	1.0
Total	3541	27	3568	100.0	100.0	100.0

points were occasionally manufactured in this material. The museum's felsite scrapers generally have polished 'ventral' faces, indicating that mundane tool forms were only produced in this resource when the more prestigious objects broke. The kite-shape of the points implies that the use of felsite may have started earlier than previously thought (Fojut 1986, 17–18). These points are usually associated with the later part of the Early Neolithic (in northern England, the Towthorpe Burial Tradition, Green 1980, 85; or Early Individual Burials, Clarke *et al* 1985, 63–7), and with artefacts, such as Seamer/Duggleby axes and polished flint knives. The Scord of Brouster assemblage (Ballin 2007a) combines an expedient felsite scraper with kite-shaped quartz arrowheads.

5.2.2 The Western Isles

The Western Isles are characterized by approximately the same lithic raw material availability as Shetland. Quartz is abundant throughout the island group, whereas suitable lithic alternatives are scarce. Flint occurs on some Western Isles beaches (James Crawford, pers comm), and it is present in most assemblages from the region. Mylonite may have been quarried in the eastern parts of Lewis and South Uist, where it is associated with the Outer Hebrides Thrust Zone (Smith & Fettes 1979, fig 3); mylonite artefacts have been found on most of the main quartz-bearing sites on Lewis (eg Dalmore, Olcote, Calanais and Berie Sands). In addition, most of the discussed assemblages include individual specimens, or handfuls of pieces, of various igneous rock types, mainly locally available dolerite (see distribution of dykes in Woodland 1979).

None of the available lithic alternatives is characterized by the same exclusive uses as Shetland felsite. Though mylonite had to be quarried and traded from outcrops in the eastern parts of the island group to sites on the west coast, there is no evidence that this resource was applied differently to quartz: the same forms of tools were manufactured (arrowheads, scrapers, knives and edge-retouched pieces; eg Ballin forthcoming a; Ballin forthcoming g), and mylonite artefacts are found in the same parts of the sites as quartz artefacts. However, the distinct appearance of this raw material (colour and patterning), in conjunction with the fact that it had to be procured from distant parts of the island group, suggest that other than functional values may have been behind the wish to exploit this resource – even if it is not presently possible to prove this hypothesis.

Though some of the flint from the Western Isles is relatively poor, in the sense that it may be coarse-grained and impure, it was possible to flake it in a controlled manner. Due to the small sizes of the collected flint pebbles (probably between 4cm and 6cm), tools in this material tend to be small, but well-executed pieces. Apparently, flint tools were easier to produce, due to the homogeneous nature of the raw material, and their edges were more regular than edges in quartz, and definitely more durable than edges in mylonite. The preference for this good, but scarce, resource is demonstrated by the professionally excavated sub-assemblage from Dalmore (Ballin forthcoming g) and the raw material composition within the categories debitage, cores and tools (Table 20): where only 1% of the quartz artefacts are tools, 8% of the flint artefacts are tools and 5% of the mylonite pieces. At Rosinish (Ballin forthcoming h), this trend is even more distinct (Table 21).

The various igneous raw materials appear sporadically, such as, dolerite (eg Dalmore; Johnstone & Mykura 1989, 140–3) and biotite-granite (eg Berie

Table 22 The assemblage from Shieldaig.
The distribution of the main raw materials by artefact categories

	Numbers					%				
	Quartz	'Greasy' quartz	Blood-stone	Flint	Total	Quartz	'Greasy' quartz	Blood-stone	Flint	Total
Debitage	2295	2523	55	565	4873	98.4	96.7	87.3	82.6	97.4
Cores	22	41	6	27	69	0.9	1.6	9.5	3.9	1.4
Tools	16	44	2	92	62	0.7	1.7	3.2	13.5	1.2
Total	2333	2608	63	684	5004	100.0	100.0	100.0	100.0	100.0

Sands: Lacaille 1937). Being much more coarse-grained than any of the above raw materials, it was not possible to control the reduction process as well, and most of the tools manufactured in igneous rock types are relatively large and crude. Most probably, these raw materials represent expedient local resources.

5.2.3 The Southern Hebrides and the western part of mainland Scotland

The raw material distribution of this region differs considerably from that of Shetland and the Western Isles. Though some assemblages are almost exclusively in quartz (eg Carding Mill Bay: Finlayson 1993), most include substantial proportions of flint, in conjunction with other important silica. 'Ordinary' quartz was apparently used in the same manner as in the most northerly and westerly regions, but exchange in alternative silica was widespread. The majority of the alternative resources were procured from restricted sources, with bloodstone being quarried or collected on Rhum (Clarke & Griffiths 1990), baked mudstone on Skye (Wickham-Jones 1986, 7), 'greasy' quartz possibly from the Shieldaig area (though this outcrop has not yet been located), and pitchstone from Arran (Williams Thorpe & Thorpe 1984).

All of the above have first-class flaking properties and they are all distinctly coloured an/or patterned. Most likely, each resource was associated with some symbolic value, but the different distribution patterns, and thereby exchange mechanisms, indicate that these values may have differed considerably. The distribution of Rhum bloodstone and Staffin baked mudstone appears to be approximately the same, in the sense that the area in the immediate vicinity of the main source is dominated by the raw material, with small sub-assemblages occurring up to *c* 70km from the location of procurement. It is by no means certain that all 'greasy' quartz was acquired from Shieldaig, but if this was the case, the exchange network of this resource would have been somewhat larger, with a distance from Shieldaig to the find-spots on the west coast of Lewis of *c* 100km.

The largest, and seemingly most complex, of the prehistoric exchange networks is that of Arran pitchstone: Arran itself was dominated by the use of pitchstone throughout prehistory, but the remainder of Scotland is characterized by two different distribution patterns. Pitchstone knapping debris has been recovered from mainly Early Neolithic sites in southern Scotland and southern Argyll (Ness & Ward 2001; Tolan-Smith 2001), but on most contemporary sites outside this area pitchstone appears as individual, or at most a handful, of pieces. Warren points out that these specimens are usually high quality pieces of unmodified debitage (Warren forthcoming), and they were probably not intended for practical use [a small pitchstone nodule from the site of Achnahaird Sands in north-west Sutherland (Ballin forthcoming b), does not fit this picture]. The fact that these four raw material zones overlap means that they do not precisely define the specific outlines of four separate social territories. It is, however, possible that these raw materials were used in prehistory to maintain, or identify, tribal alliances (cf Clemmer 1990) involving four social groups in the Southern Hebrides/western mainland Scotland, with Lewisian mylonite functioning in very much the same way in the Western Isles.

It is possible that, within this region, flint may have been a mainly functional resource, as it may have been on the Western Isles. This is demonstrated in Table 22, where flint has a much higher tool ratio than any of the other raw materials used on that site. On some islands, such as Mull and Islay, flint beach pebbles remain common (Wickham-Jones & Collins 1978; Marshall 2000a; Marshall 2000b).

The use of rock crystal on Jura is somewhat puzzling. Though this form of quartz flakes well (cf Ballin 1998a), it was reduced ('smashed') entirely by the application of bipolar technique. This may be an indication that the raw material was valued more for its light-reflecting appearance than for its practical use-value.

5.2.4 The Highlands

Only three substantial quartz assemblages are known from the two main Highland regions – at the time of writing, only Lairg (Highland) has been published (Finlayson 1996), with the other two being in the process of publication (FERG Sites 4–5: Ballin

forthcoming c; Ben Lawers: Atkinson *et al* forthcoming). Due to the low number of available assemblages, and their recovery from vastly different local environments, few general conclusions can be reached on the distribution of quartz-bearing sites in these regions, and the assemblages are most appropriately discussed on an individual basis.

As indicated by Table 18, the composition of the Lairg assemblage mirrors that of Shetland assemblages. It consists almost entirely of quartz with a minor proportion of flint. The background to this composition is most likely raw material availability, with quartz being locally abundant, whereas flint had to be imported from the nearby North Sea beaches (Saville 1994, fig 1). No other raw materials seem to have been exploited at Lairg.

Although located at approximately the same distance to the coastal flint resources as the Lairg site, the two quartz-bearing settlements from Aberdeenshire, FERG Sites 4 and 5 (Ballin forthcoming c), yielded much higher proportions of flint. This may be due to a number of factors, such as: (i) proximity to the inland flint mines of the Buchan Ridge Gravels (Saville 1995; Saville 2005); and (ii) differences in the perception of the various raw materials and their non-utilitarian values.

The presently available evidence suggests that intensive exploitation of the Aberdeenshire gravel-flint deposits commenced in Late Neolithic times and continued through the Bronze Age periods. In the immediate vicinity of the deposits (eg at Stoneyhill Farm: Ballin forthcoming i), Neolithic and Bronze Age assemblages are almost exclusively in flint, and it is quite likely that the lower (though still relatively high) flint ratios of the FERG sites represent a rapidly declining fall-off curve. This would imply that flint was perceived as a largely utilitarian resource.

However, the composition of most known lithic assemblages from East Scotland (cf Ballin 2004a) indicates that, in this region, flint was perceived as more than a purely utilitarian raw material. Where, on the inland site of Ben Lawers on Loch Tay, flint had been more or less completely substituted by local quartz, an almost exclusive use of North Sea flint characterizes sites along the Aberdeenshire rivers, and well into the mountainous areas of the Aberdeenshire hinterland. The explanation may be a combination of the two, with flint possibly possessing some symbolic value in Aberdeenshire – and thereby rarely dropping to the low proportions experienced in other regions, but, nevertheless, with falling ratios at growing distances to the flint sources, when sites were not situated immediately on the main watercourses. The FERG sites are not riverine settlements, and transportation of flint would have posed a logistical problem, favouring at least partial substitution of flint by locally available resources, such as erratic quartz. An additional factor is probably the generally low quality of the Buchan Ridge flint, which made it even less attractive to invest resources in the transportation of this resource.

As mentioned above, the Ben Lawers assemblage is heavily dominated by quartz, with some use of flint. The available information (eg Atkinson 1997; Anonymous 2001; Donnelly 2003) suggests that it may be composed approximately like the collection from Lairg. Both raw materials appear to have been perceived as utilitarian resources, with local quartz substituting flint, as the distance to the coastal flint sources grow, but with small amounts of flint being transported inland for the production of tools which require regular sharp edges (the typological composition of the geologically mixed west coast sites indicates that, in the Mesolithic period, flint was preferred for the production of acutely pointed, sharp-edged microliths – at Shieldaig, microliths make up 4% of the total flint sub-assemblage, but only 0.5% of the quartz sub-assemblage).

5.2.5 The various sedimentary regions

As mentioned above, no substantial quartz assemblages are known from the various sedimentary regions, and whenever quartz is encountered, it forms very small sub-assemblages, such as at Fordhouse Barrow in Angus (*c* 8%; Ballin forthcoming f). This probably reflects the geological realities of these regions, with Scotland's Old Red Sandstone formations, as well as its formations of limestone and shale, containing little quartz.

5.2.6 Summary

Though 'symbolic values' can be difficult to detect, it appears that, in Scottish prehistory in general, quartz was mainly perceived as a utilitarian resource. The main trend in Scotland is that quartz dominates assemblages where other 'better' (more flakable) raw materials are absent or scarce, and the more abundant these other resources are, the more quartz is substituted by them, or even fully replaced (like on Islay, where flint dominates completely; McCullagh 1989).

Only one form of quartz, the so-called 'greasy' quartz, may have been perceived differently. If Lewisian artefacts in this material are in fact based on material quarried in the Shieldaig area, the only site where 'greasy' quartz is an abundant resource, this implies the existence of a relatively extensive exchange network. The distribution of other quartz varieties on Lewis indicates that ordinary quartz forms may have been procured exceedingly locally, with beach deposits and veins representing a form of 'back-yard supplies' for individual families. Rock crystal was procured in the same ultra-local fashion, and only the assemblage from Lealt Bay (Ballin 2001b) included noticeable amounts of this material. This material, however, may have been associated with some symbolic value, based on its tendency to 'glitter'.

Several of the alternatives to quartz found wide-spread use, and Lewisian mylonite, Rhum bloodstone, Staffin baked mudstone and Arran pitchstone were exchanged across relatively large distances. Mylonite was only exchanged within the Western Isles; bloodstone and baked mudstone supplied overlapping parts of the Southern Hebrides; and Arran pitchstone was traded throughout Scotland (though presently not encountered on Shetland). It is thought that these overlapping exchange networks may indicate a web of criss-crossing tribal alliances in prehistoric western Scotland. All these materials are distinct, in terms of colour and patterning, which may explain the possible symbolic values attached to them. It may be that the equally distinctive 'greasy' quartz, which also seems to have been attributed with symbolic values, was experienced as a separate resource and not as a variant of the more dull-looking milky quartz and saccharoidal quartzes (cf the discussion of 'emic' and 'etic' classification; Hayden 1984).

next section