The procurement of Rhum bloodstone and the Rhum bloodstone exchange network – a social territory in the Scottish Inner Hebrides?

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Abstract – The purpose of the present paper is to discuss Rhum bloodstone and the distribution of archaeological bloodstone throughout the Scottish Inner Hebrides. The main aim is to discuss the observed distribution patterns, bloodstone procurement and exchange, and the social territory defined by bloodstone distribution.

Key words – archaeology; Inner Hebrides; Scotland; Rhum bloodstone; exchange networks; social territories; lithic raw material procurement; lithic raw material terminology

Titel – Das Rohmaterial ‚Rhum Bloodstone': seine Beschaffung und sein Tausch-Netzwerk – Hinweis auf ein soziales Territorium auf den Inneren Hebriden (Schottland)?

Zusammenfassung – Der Zweck des vorliegenden Aufsatz ist die Diskussion von "Rhum bloodstone" und die Verbreitung archäologischer Artefakte aus 'bloodstone' auf den Schottischen Hebriden. Dabei richtet sich der Fokus besonders auf erkannte Verteilungsmuster, die Beschaffung und den Austausch von 'bloodstone' und das durch die Verbreitung von 'bloodstone' festgelegte Sozialterritorium.

Schlüsselwörter – Archäologie; Innere Hebriden; Schottland; Rhum bloodstone; Tauschnetzwerke; Sozialterritorien; Beschaffung von Steinrohmaterial; Terminologie von Steinrohmaterial

Introduction

Since the publication of Wickham-Jones' volume on the Kinloch site on the Isle of Rhum in the Scottish Inner Hebrides (1990), it has been obvious that Rhum bloodstone from an archaeological point of view is an interesting lithic raw material, and that the distribution of this raw material might potentially enlighten us on a number of points, such as lithic raw material procurement, exchange networks, and social territories. However, at the time only a small number of bloodstone-bearing sites were available (Clarke & Griffiths, 1990), and the distribution of these sites told us little more than that some bloodstone, once quarried or collected, was transported off Rhum.

Today, a quarter of a century later, many more bloodstone-bearing sites are known (see **fig. 14** and Appendix), and it is now possible to discuss the distribution of archaeological bloodstone in a more meaningful manner. The purpose of the present paper is therefore to, first, define bloodstone geologically; then, describe the geological and archaeological distribution of this raw material; and, finally, attempt to interpret the distribution patterns, to the degree the evidence allows this. The main questions relate to the character of the territory defined by the distribution of archaeological bloodstone, as well as the exchange network responsible for this distribution.

What is Bloodstone – the basic lithic raw material terminology

Inspection of the archaeological and geological literature shows that, in general, archaeologists and geologists agree on the basic notion that bloodstone is a form of jasper (chalcedony), and that as such it is a form of crypto- (or micro-) crystalline quartz, or silicon dioxide (eg, Heddle, 1901; Durant et al., 1990; Luedtke, 1992; Pellant, 1992). It may be discussed whether it is a form of chert, as the definitions of chert and flint vary from country to country (Luedtke, 1992, 5).

In general terms, two main sets of definitions of chert exist, namely 'American' and 'British' definitions, where American nomenclature perceives chert as more or less synonymous with the term 'crypto-crystalline quartz' and includes flint (Luedtke, 1992, 5), whereas British nomenclature defines flint and chert as two different forms of crypto-crystalline quartz, with flint having been formed in Cretaceous chalk formations and chert in all other formations. Chalcedony (and thereby bloodstone) is commonly (American nomenclature) seen as forming part of the chert family (eg, Luedtke, 1992, 5), whereas others (British nomenclature) see it as neither a chert nor a flint but a separate type of crypto-crystalline quartz, a mineral (eg, Pellant, 1992, 88).

In addition, there exists a third set of definitions of lithic raw materials, which has been al-

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most entirely overlooked in Anglo-American lithic research, namely the Central European definitions. Přichystal (2010; also see Götze, 2010) suggests the following terminology:

— *Siliceous sediments (silicites)* – originating from chemical, biochemical or diagenetic precipitation of SiO2, including chert, flint, radiolarites, spongolites, lydites, phtanites and limnic silicites; the decisive factor […] is finding fossils or microfossils […] in the silica substance.
— *Minerals of SiO2* – this group includes members of the quartz family (milky quartz, rock crystal, smoky quartz, citrine, etc.), members of the chalcedony family (chalcedony, agate, jasper, bloodstone, carnelian, etc.), and opal, and samples never contain fossils or microfossils.
— *Natural glasses* – this group includes obsidian, pitchstone, and tektites (eg, Moldavite and Libyan Desert Glass).
— *Clastic silica sediments* – chert, sandstone, etc.
— *Other rocks* – includes a number of altered rocks

The existence of these different sets of definitions occasionally makes archaeological discussions of assemblages based on crypto-crystalline quartz slightly confusing, not least in terms of procurement and exchange patterns. Some European archaeologists choose to apply American nomenclature whereas others apply British nomenclature, with a small number of archaeologists preferring the Central European nomenclature. In archaeological research, the problem is that analysts tend to apply one or the other of the main geological terminologies, not realizing that even geologists disagree amongst themselves on these matters, where we, as archaeologists, should consider *independently* which set of definitions may serve our *archaeological* purposes (discussions/interpretations) best.

This is not the place for a general discussion of flint and chert, or crypto-crystalline quartz, but it is suggested that, to discuss matters such as procurement and exchange patterns most sensibly, lithics specialists may be served best by following Přichystal (2010), who perceives chalcedony (and thereby bloodstone) as a form of crypto-crystalline quartz different to flint and chert (a mineral). Following Přichystal (2010), flint and chert are sedimentary rock forms ('silicites'), formed in sedimentary rock formations, and the silica tends to derive from organic sources. Chalcedony/bloodstone, on the other hand, is defined by Přichystal (2010), and also Pellant (1992, 88), as being a crypto-crystalline type of quartz, most commonly formed in lavas and related rock formations by the solidification of hydrothermal fluids not of organic origin. In Scotland, this choice of nomenclature is relevant to discussions of procurement and exchange patterns as it allows the various forms of crypto-crystalline quartzes to be grouped geographically and in relation to one or the other form of bedrock (see the following chapter).

The chalcedony family may be subdivided into a number of different sub-categories on the basis of colours and patterns, such as chalcedony proper (grey or bluish-grey), jasper (usually red), carnelian (brown), agate (characterized by concentric banding), and bloodstone/plasma (green jasper). Bloodstone is also called heliotrope, and heliotrope and plasma are frequently found in the same geological environments (Hall, 2000, 93), such as for example around the extinct volcanoes on the Isle of Rhum in the Scottish Inner Hebrides.

In terms of specific geological attributes and formation, chalcedony is generally defined in the following manner: *"A microcrystalline variety of silicon dioxide […] usually occurring as mammilary or botryodal masses. The colour is highly variable. This mineral forms in cavities in rocks of different types, especially lavas. Much chalcedony develops at relatively low temperatures as a precipitate from silica-rich solutions"* (Pellant, 1992, 88). Heddle (1901, 57) defines plasma as: *"Chalcedony stained bright green by the uniform admixture with Delesite or Celedonite. Lustre, greasy to horny."* He (ibid.) defines heliotrope in the following fashion: *"Chalcedony stained various shades of green, dark to leek-green, by admixtures with Celedonite, and, when sprinkled with red spots, becomes Bloodstone; when these from confluence, become blotches, it is Heliotrope"* (**fig. 1**).

Fig. 1 Flake of gem-quality bloodstone showing the characteristic red spots and filaments. Purchased in jewellery shop.

In their discussion of bloodstone from Rhum (in Wickham-Jones, 1990), Durant et al. (1990) states that *"… there is little agreement as to terminology in the geological literature, but technically the term bloodstone should be reserved for the fine-textured dark green nodules that are shot through with red."* However, they also conclude that: *"… prehistoric people apparently made no distinction between the formal varieties (ie, plasma or heliotrope [bloodstone])."* Furthermore, in terms of characterizing pieces of worked plasma/heliotrope in archaeological assemblages, it would be entirely unrealistic to attempt to distinguish between these two forms of green stone: 1) frequently, worked pieces of plasma/heliotrope are very small, and it is in most cases impossible to say whether the original nodules had any red spots or not, and 2) many pieces of plasma/heliotrope from archaeological sites in Scotland have weathered and become discoloured, and they are now as white as weathered flint, only recognizable as plasma/heliotrope due to their chalcedonic lustre and the presence of small characteristic globules (**fig. 2**). To the lithics specialist it is simply necessary to combine these two raw materials, and it is suggested to follow the going practice and refer to both (in an archaeological context) as bloodstone.

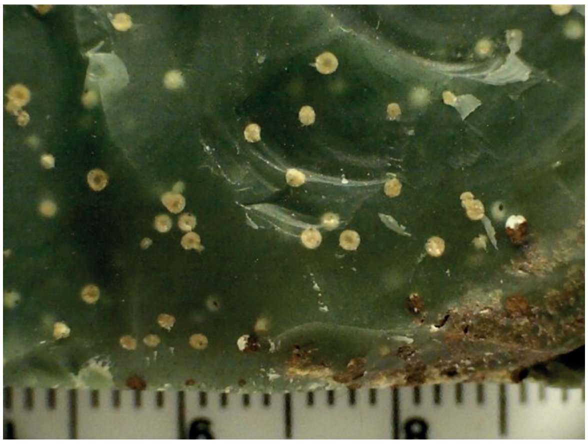
The globules (**figs. 3-4**) just mentioned (not to confuse with the above-mentioned red spots or filaments) are an important attribute of Rhum bloodstone, but it has not been possible for the present analyst to find references to this phenomenon in the geological literature. These globules may correspond to the spherulites encountered in some Arran pitchstones, which in Ballin & Faithfull (2009, 5) were defined as: *"Finely crystalline, usually radiating intergrowths of quartz and feldspar, indicating devitrification […]."* When the stone is fresh, these globules are usually pale, when weathered reddish-brown, and they are the most important identifier of discoloured archaeological bloodstone. Examination of bloodstone-bearing assemblages in National Museums Scotland showed that these collections included pieces with 'bloodstone globules', and that several of these pieces had other colours, such as light-green, brown and white, and it is highly likely that the bloodstone family may be more varied than generally thought, as the definitions were to a large extent defined by lapidarists searching for gem-quality stones. However, widening of the bloodstone definition would require more research to be carried out to build up a more statistically secure database of bloodstone finds and varieties.

Fig. 2 Heavily weathered bloodstone blade from Camas Daraich, Isle of Skye (photographed by Beverley Ballin Smith, GUARD Archaeology Ltd.; courtesy of Karen Hardy, ICREA, Universitat Autònoma de Barcelona). The globules towards the left, as well as towards the proximal end of the piece, clearly identify it as bloodstone and not flint.

The geological Distribution of Bloodstone in Scotland

Plasma and heliotrope have been found at several geological locations across Scotland, with the most notable location being the area around Bloodstone Hill in north-west Rhum, Inner Hebrides. However, Heddle (1901, 57) lists other bloodstone-yielding sites, such as: <u>plasma</u> – Scurr Hill near Balmerino in Fife; and Ballindean in Perthshire; <u>heliotrope</u> – Kinnoull Hill in Perthshire; the Scuir of Eigg; the south-end of Mull, as well as below Gribun, and at the Carsaig Arches; Galdrings near Machrihanish Bay on Kintyre; Kerrera in Argyll; Tod Head, Kincardineshire; and Lendalfoot in Ayrshire.

Griffiths (1990, 154) inspected the occurrences on Rhum, as well as other sources in the Inner Hebridean area, including locations on Mull and Kintyre. However, he found that: *"With the exception of Bloodstone Hill, none of the other locations yielded material at all similar to that used in prehistory"*, and *"… neither of*



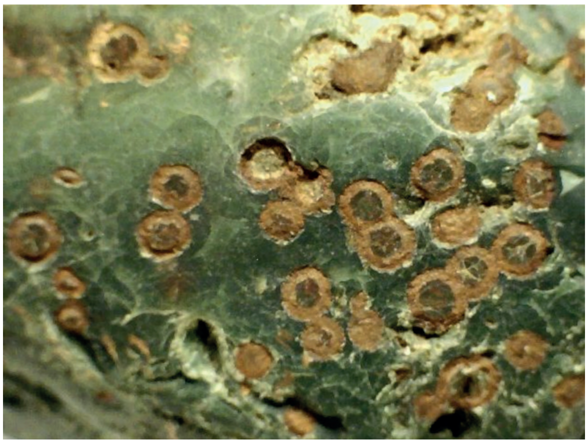


Fig. 3 Fresh inner surface showing white, unweathered globules. See fig 4. **Fig. 4** Weathered outer surface showing discoloured, rust-brown globules; several globules in this group have fallen out – the semi-spherical cavities left by detached globules are as geologically diagnostic as the globules themselves. Both pieces (fig. 3-4) of bloodstone were collected in Guirdil Bay, Rhum, by Steven Birch, West Coast Archaeological Services, and donated to the author's bloodstone research.

Fig. 5 Two medial microlith fragments in bloodstone from Camas Daraich, Isle of Skye (photographed by Beverley Ballin Smith, GUARD Archaeology Ltd.; courtesy of Karen Hardy, ICREA, Universitat Autònoma de Barcelona). Note the fine lateral retouch along the left and right lateral side, respectively.

these finds [ie, the locations on Mull and Kintyre] could be said to provide evidence for viable alternative sources of raw material in prehistory …." Although chalcedony and agate artefacts commonly form part of prehistoric lithic assemblages from volcanic areas throughout central and southern Scotland, and indeed notably characterize the well-known assemblage from Morton in Fife (46 % flint and 47 % 'Minerals from the Lower Old Red Sandstone lavas' [ie, silicas belonging to the chalcedony family]; Coles 1971, 295), bloodstone has not been reported from any archaeological sites in these parts.

The general conclusion amongst archaeologists and geologists dealing with bloodstone in Scotland is therefore, as Griffiths (1990, 154) puts it: "*… that Bloodstone Hill was indeed the only source of bloodstone exploited in prehistory.*" Rhum bloodstone is generally associated with the tholeiitic andesites of Bloodstone Hill (**fig. 14**), with the bloodstone from the lavas of Fionchra on Rhum being unlike that exploited at archaeological sites (Durant et al., 1990, 51). On Bloodstone Hill, amygdales of hydrothermally deposited bloodstone are quite common, although any major outcrops have been obliterated by the 19th century excavations for gem-quality material (Emeleus & Bell, 2005, 54, 68; Emeleus & Troll, 2008, 88), and today bloodstone is most easily collected in pebble form on the beaches near the Guirdil Bothy, just nort of Bloodstone Hill (Emeleus & Troll, 2008, 96).

However, in a recent report on lithic artefacts from a bloodstone-bearing site in Ardnamurchan (Ballin forthcoming a), the author wrote that "*… the fact that several of the bloodstone artefacts from Loch Doilean have rough, rather than abraded, cortex (eg, core CAT 143) indicates that pebbles may on occa-*

Figs. 6-8 Crested blade, conical core and bipolar core in bloodstone from Camas Daraich, Isle of Skye (photographed by Beverley Ballin Smith, GUARD Archaeology Ltd.; courtesy of Karen Hardy, ICREA, Universitat Autònoma de Barcelona).

sion have been collected from primary sources on Bloodstone Hill itself." This possibility ought to be tested in the future by surveying Bloodstone Hill, and the area around it, searching for quarried rock faces and quarry pits (cf. Ballin & Ward, 2013).

The Dating of the prehistoric Scottish Bloodstone Industry

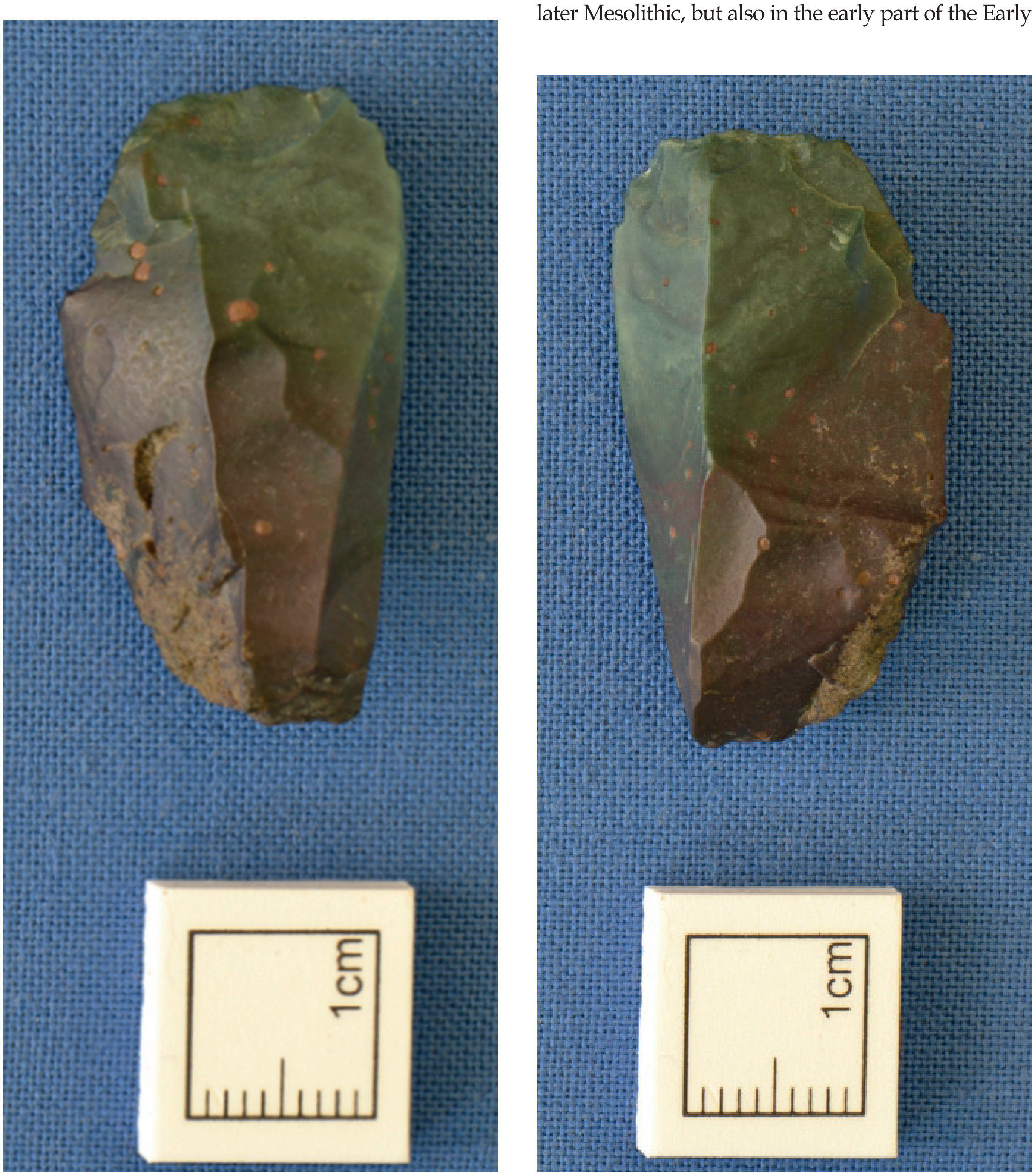
Following the publication of the lithic assemblage from the mainly later Mesolithic site Kinloch on Rhum (Wickham-Jones, 1990), bloodstone was widely associated with the lithic industries of the Scottish Mesolithic (eg, Saville, 1994, 62). This, however, is not entirely correct, as the evidence - including the finds from Kinloch itself – suggests use of this lithic raw material throughout Scottish prehistory. The following is a brief account of some of the diagnostic finds relating to the dating of Rhum bloodstone exploitation.

From later Mesolithic sites in the Hebridean area, as well as in western Scotland in general, diagnostic types in bloodstone have been recovered

Figs. 9-11 End-scraper, burin face 1 and same piece face 2 in bloodstone, from Camas Daraich, Isle of Skye (photographed by Beverley Ballin Smith, GUARD Archaeology Ltd.; courtesy of Karen Hardy, ICREA, Universitat Autònoma de Barcelona). Note the burin edge towards the top, right and left corner respectively.

(**figs. 5-11**), such as, scalene triangles, microburins, *meches de foret*, and burins. These sites include large settlements like Kinloch, Camas Daraich, Sand, and Shieldaig in the northern parts of the Inner Hebrides (Wickham-Jones, 1990; Wickham-Jones & Hardy, 2004; Hardy & Wickham-Jones, 2009; Ballin, 2002), but also smaller sites throughout the Hebridean area. Bloodstone has also been recovered from Early Mesolithic An Corran in the northern parts of Skye (Saville et al., 2012), but none of these pieces is diagnostic, and although it is likely that Rhum bloodstone was also used in the Early Mesolithic period, this is not yet certain.

Bloodstone microblades and microblade cores (eg, **fig. 7**) have been recovered throughout the Hebridean area, including the adjacent parts of western Scotland, but as shown in connection with the author's discussion of Arran pitchstone use (eg, Ballin, 2015), microblades were produced not only in the Scottish later Mesolithic, but also in the early part of the Early



Figs. 12-13 Bipolar core in bloodstone from Barabhas on Lewis (the Elliott Collection). Note the rust-brown globules.

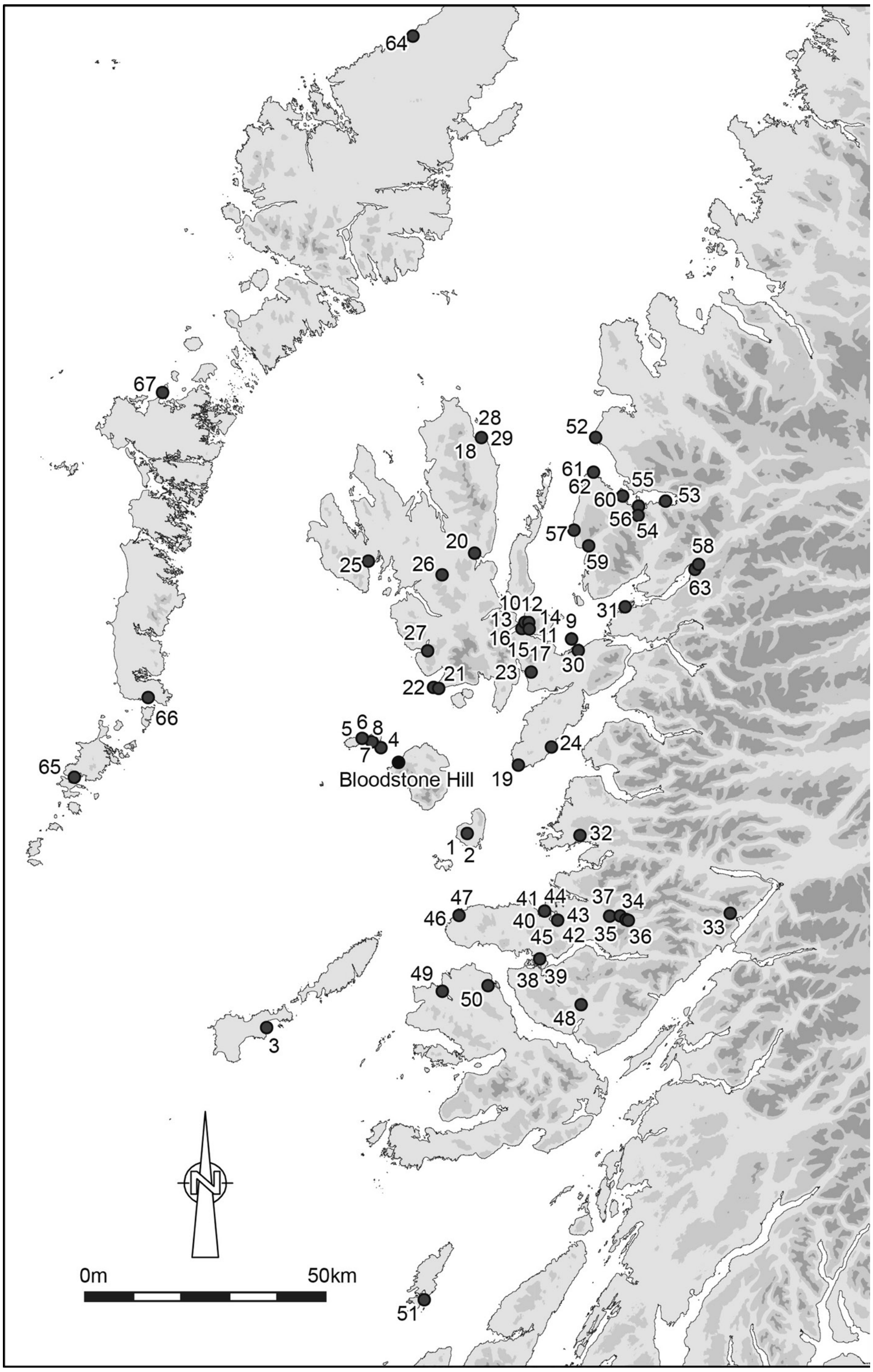


Fig. 14 The distribution of archaeological bloodstone throughout the Hebridean area and western Scotland (map produced by Fiona Jackson). The numbers refer to sites listed in the appendix of this paper.

Neolithic period. Early Neolithic leaf-shaped points in bloodstone have been retrieved from Kinloch on Rhum (Wickham-Jones, 1990), as well as from the Isle of Risga, Loch Sunart (Pollard et al., 1996).

Early Bronze Age use of Rhum bloodstone is suggested by barbed-and-tanged arrowheads, all of which have been found on Rhum itself. One was found at Hallival (illustrated as Ill. 59.14 in Wickham-Jones, 1990), two at Samhnan Insir (Mackie, 1967; Clarke, 1969; also see CANMORE), and one at Kinloch (Wickham-Jones, 1990). However, a highly regular, pressure-flaked thumbnail-scraper in bloodstone was recovered at Home Farm on Skye in connection with excavations by Headland Archaeology Ltd. (Ballin, 2008a), showing that Early Bronze Age exploitation of bloodstone also occurred outside Rhum. A bipolar core in bloodstone from Barabhas on Lewis, Western Isles (Ballin, 2014), most probably dates to the Early Bronze Age (**figs. 12-13**).

In summary, the use of Rhum bloodstone appears to have been common within the Hebridean and western Scottish region throughout the Mesolithic, Neolithic and Early Bronze Age periods.

The spatial distribution of worked bloodstone

Fig. 14 shows the distribution of Rhum bloodstone beyond the source island of Rhum. This map is based on cursory investigation of bloodstone-bearing assemblages mentioned in the archaeological literature, supplemented by bloodstone-bearing assemblages processed by the author but not yet published. It is quite possible that new sites could be added to this map if a more extensive search was carried out, including approaches to the archaeological units active in Scotland, as well as visits to the main Scottish museums, but it is thought that this map may – with a few caveats (below) – give a reasonably accurate picture of the general distribution of archaeological bloodstone.

The distribution of archaeological bloodstone (then c. 25 sites) was discussed by Clarke & Griffiths (1990) in connection with the publication of Kinloch on Rhum (Wickham-Jones, 1990), but since then many more bloodstone-bearing sites have been investigated in connection with work on Skye (Wickham-Jones & Hardy, 2004), in the Inner Sound (Hardy & Wickham-Jones, 2009), in Loch Torridon (Hardy et al., forthcoming), on the Western Isles (eg, Ballin, 2014; forthcoming b), as well as in the general Mull/Ardnamurchan area (eg, Ballin, forthcoming a) and elsewhere in the Hebridean region (see Appendix).

The sites shown in **fig. 14** appear to be found within a core area of c. 80 km, with a small number of 'outsiders' found within an outer ring, including sites as far away from Rhum as 151 km (Barabhas on Lewis; Ballin, 2014), 92 km (Udal RUX2, North Uist; Ballin, forthcoming b), and 112 km (Oronsay; the search engine of the Hunterian Museum, University of Glasgow, http://www.huntsearch.gla.ac.uk: apparently a bloodstone core – according to the Hunterian website, this piece "*… cannot be located at present*") (**fig. 15**).

The bloodstone exchange network and other lithic exchange networks in Western Scotland

In some of his other papers (eg, Ballin, 2009; 2011; 2012), the author suggested that the production of fall-off curves (eg, Hodder, 1974; Renfrew, 1977) might be a potentially fruitful approach in terms of defining the type of exchange network responsible for the distribution of a given archaeologically relevant lithic raw material, with different types of fall-off curves characterizing different types of prehistoric territories. However, although many new bloodstone-bearing sites have been made available over the past quarter of a century, these sites and their lithic assemblages are not all directly comparable.

One of the main problems is the fact that only a small proportion of the sites listed in the appendix, and included in the map **fig. 14**, have been properly excavated and published, whereas many where found as strays or in connection with field surveys. Other problems relate to the fact that some of these finds and their assemblages have not been published yet, or the finds may presently be missing (such as the Oronsay piece). It has been reported (Finlayson pers. comm. in Clarke & Griffiths, 1990) that bloodstone may be present in one or more of Mercer's mostly Mesolithic assemblages from Jura – that is, within **fig. 15**'s Outer Ring – but this needs corroboration. Re-examination of Mercer's assemblages (published in Proceedings of the Society of Antiquaries of Scotland 1968-1980) would be a time-consuming task as most of his assemblages include tens of thousands of tiny chips.

The extent of the bloodstone exchange network towards the north is presently uncertain, as the area between Loch Torridon and Cape Wrath is, in archaeological terms, *terra incognita* – close to nothing is known about the prehistory in this region of Scotland, as it is thinly populated and, as a consequence, little development takes place here. Similarly, little is known as to how far inland the bloodstone exchange reached, and for roughly the same reason.

However, the available information does allow a number of conclusions to be made regarding the nature of the bloodstone distribution. Following Plog's approach (1977; Ballin, 2009, Table 16), it is possible to characterize the Rhum bloodstone exchange network in the following basic manner:

Analytical focal point: The main element of this network may have been bloodstone procured from Bloodstone Hill and its surroundings on the Isle of Rhum. Baked mudstone from Staffin Bay in northern Skye seems to have an at least partially overlapping distribution (Saville et al., 2012), but this raw material is less unequivocally identified and more research needs to be invested in the procurement, exchange, use and deposition of Staffin baked mudstone. It is uncertain which other goods (for example less durable materials) may have been traded within this network.

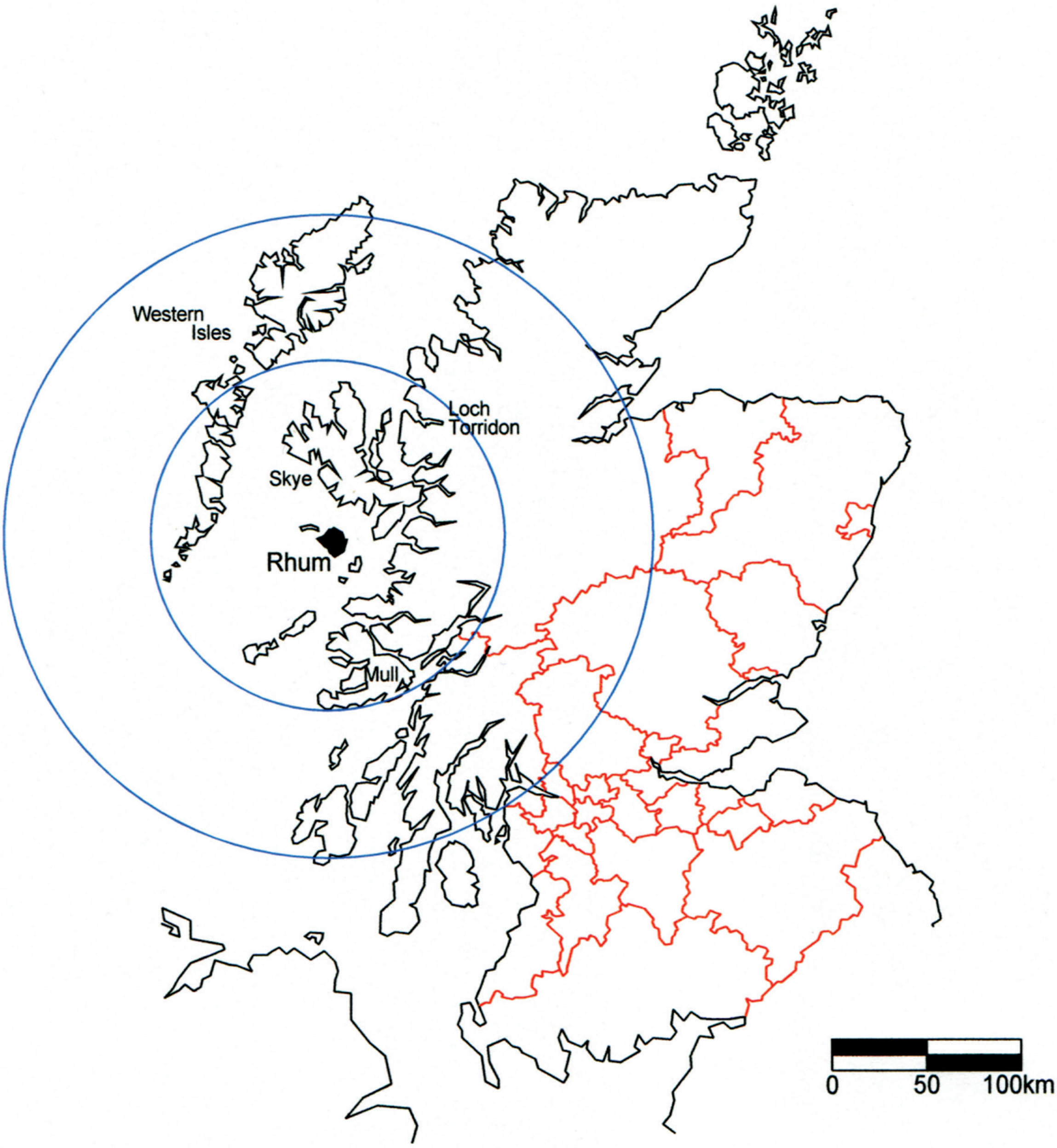


Fig. 15 Impressionistic interpretation of the distribution of archaeological bloodstone (based on fig. 14), including an inner core area with a radius of c. 80 km, and an outer ring adding an extra c. 70 km.

Duration: As mentioned above, Rhum bloodstone appears to have been traded during the Mesolithic, Neolithic, and Early Bronze Age periods, although it is presently uncertain exactly when this trade network was established and when it was shut down.

Magnitude: Compared to other lithic exchange networks (eg, Arran pitchstone and Yorkshire flint; Ballin, 2009; 2011), Rhum bloodstone was *generally* exchanged in relatively small amounts, although the amounts varied notably within the network: 1) On Rhum itself many assemblages are completely dominated by bloodstone (Wickham-Jones, 1990); 2) Off Rhum, two sites stand out, namely Camas Daraich on Skye (immediately opposite from Rhum; Site 19 in **fig. 14**) with 1,607 pieces of bloodstone (one-third of the assemblage), and Sand a bit further away in Skye's Inner Sound (Site 57 in **fig. 14**) with 1,061 pieces (c. 7%); 3) within the rest of the territory

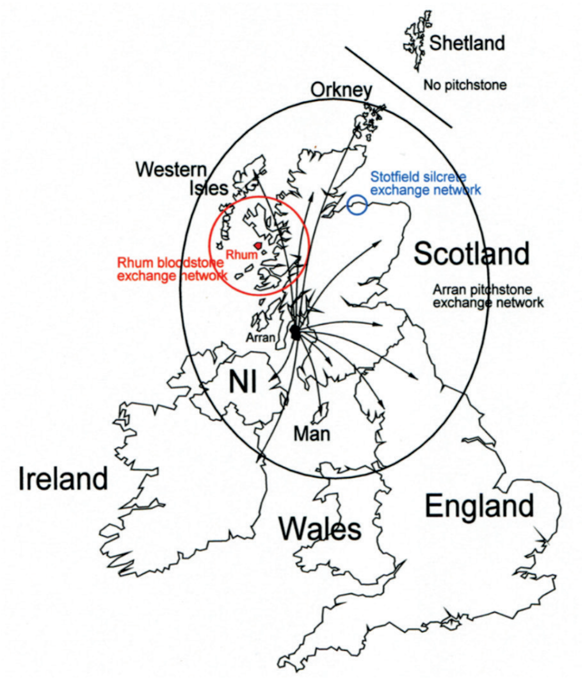


Fig. 16 The boundaries of three different lithic exchange networks. Red: bloodstone; blue: Stotfield silcrete; and black: Arran pitchstone.

covered by this network, bloodstone-bearing assemblages usually have between 1 and c. 70 pieces of worked bloodstone, representing from a few percent of the lithic assemblage to fractions of a percent. However, as mentioned above, it is presently difficult to compare these sites and assemblages and their bloodstone numbers and ratios.

Boundaries: As mentioned above, the sites in **fig. 14** appear to represent a core area with a radius of c. 80 km, surrounded by an outer ring of more scattered bloodstone-bearing sites with low bloodstone ratios (**fig. 15**). The site furthest from Rhum is Barabhas in northern Lewis (Ballin, 2014), situated approximately 150 km from the bloodstone sources on Rhum. The bloodstone ratio of this particular assemblage (ibid.) is 0.0001%.

The interpretation of the distribution of archaeological bloodstone is dealt with in the following discussion section.

Discussion

The main questions relating to the distribution of this particular lithic raw material are of a social nature, namely 1) what kind of territory does the Rhum bloodstone exchange network represent, that is, who does it serve; and 2) by which mechanisms was bloodstone exchanged? A number of concepts relevant to this discussion were defined in connection with the author's discussion of Arran pitchstone exchange (Ballin, 2009).

Territorial concepts largely follow Clark (1975), whereas the distinction between local, regional and exotic resources largely follows Fisher & Eriksen (2002, 31, 71), although with a slight redefinition of the involved distances; the following definitions are suggested: local) procurement in the immediate vicinity of a site (within the site's catchment area; for definition see Higgs & Vita-Finzi, 1972, 28) – up to 10 km; regional) procurement within a given social territory – in the case of Rhum bloodstone raw material was exchanged up to c. 80 km from the source (this paper); and exotic) procurement through an inter-regional exchange network – in the case of Arran pitchstone (Ballin, 2009) raw material was exchanged up to c. 600 km from the source, and in the case of Yorkshire flint (Ballin, 2011) c. 900 km.

The distinction between indirect, direct and embedded procurement is based on Morrow & Jefferies work (1989), which was inspired partly by Binford (1976; 1978): *Indirect* procurement generally corresponds to exchange or trade; *direct* procurement to the acquisition of raw materials or goods by special purpose trips to the sources; and *embedded* procurement is defined as the acquisition of raw materials or goods within seasonal movements through the various economic territories (the catchment area and the annual territory).

In **fig. 16**, the area covered by the Rhum bloodstone exchange network is compared to the areas covered by the Stotfield silcrete network and the Arran pitchstone network. The size differences are notable: The Arran pitchstone exchange network appears to have had a radius of approximately 600 km (Ballin, 2009); the Rhum bloodstone exchange network c. 80km (this paper); and the silcrete network c. 25 km (Ballin & Faithfull, forthcoming).

Table 1 gives an overview of the most common Scottish lithic raw materials and their perceived distribution patterns and associated type of territory (according to Clark, 1975).

1.	techno-complexes	local flint, quartz, chert
2.	inter-regional social networks	Arran pitchstone, Yorkshire flint, Antrim flint
3.	social territories	Staffin baked mudstone, Rhum bloodstone, Lewisian mylonite
4.	local importance (annual territories?)	agate/chalcedony, flint-like chert, quartzite
5.	local ad hoc supplements (annual territories?)	Stotfield (Moray) silcrete, jasper, basalt/dolerite

Table 1 Overview of the most common lithic raw materials exchanged through Scottish prehistory and their distribution.

Some raw materials, such as those characterizing techno-complexes (**tab. 1.1**) and locally used raw materials (**tab. 1.4-5**), may generally have been perceived in a functional light and used where they could be obtained at an acceptably low cost, and in sufficient quantities. The raw materials listed in **Table 1.2-3** (Arran pitchstone, Yorkshire flint and Antrim flint, as well as Staffin baked mudstone, Rhum bloodstone and Lewisian mylonite) were probably all perceived in a symbolic light, in the sense that they had a value in prehistoric society that went beyond shere practical or subsistence-related concerns.

The raw materials listed in **Table 1.2** (Arran pitchstone, Yorkshire flint, Antrim flint) cover extensive geographical areas, and for example Arran pitchstone was traded up to 600 km from its source (Arran-Orkney; Ballin, 2009); Yorkshire flint was traded up to 900 km from its source (Flamborough Head-Orkney; Ballin, 2011); and Antrim flint was traded from Northern Ireland and well into southern Scotland (eg, Saville, 1999a; 1999b), but more research is needed to characterize this exchange network in greater detail and gain a fuller understanding of it. The author has suggested that these exchange patterns may represent inter-regional social networks, and they probably extend across a number of social territories.

The distribution patterns of these three raw materials suggest that the raw materials may have been perceived differently within different parts of the network. The Arran pitchstone exchange network was discussed in Ballin (2009), and in a 'spin-off paper' (Ballin, 2008b) it was concluded that:

"The frequency of pitchstone clearly declines with growing distance to the sources on Arran, and it is possible to suggest a zonation of Scotland / northern Britain based on this fact: Arran itself represents one zone, characterised by very high proportions of pitchstone and use of volcanic glass throughout the Mesolithic, Neolithic and Early Bronze Age periods (outwith Arran, pitchstone use is largely an Early Neolithic phenomenon); a zone around Arran – involving the western half of southern Scotland and Northern Ireland – is characterised by the presence of large centres, each counting more than 500 pieces within one 10x10 km square; in a third zone – SE Scotland and the area around the Firth of Forth – pitchstone is still relatively common, but it does not occur in these exceptional numbers; and in a peripheral zone (up to 600 km from Arran), pitchstone-bearing sites are characterised by the presence of, at most, one or two pieces."

It is quite likely that, within the Arran social territory, pitchstone was perceived in an emblematic light (sensu Wiessner, 1983; 1984), in a sense defining people on Arran as a social group, ie. *"those who use – and control access to – pitchstone."* In the social territories surrounding Arran, pitchstone may have been perceived in a semi-emblematic sense, defining groups with close (kinship?) ties to people on Arran. And further afield, where pitchstone occurred in ones and twos on sites (if at all) it would have been valued as 'exotic (Ballin, 2009, 73): *"… a commodity (for example a raw material) must be appreciated for its functionality, its striking appearance, and/or its association with parts of tribal mythology; and secondly, distance – more or less automatically – adds a premium to the value as a consequence of the time/labour invested in acquiring it, combined with a less measurable extra value determined by rarity in itself"* (an added 'mysterious' aspect; Beck & Shennan, 1991, 138).

As the area of Rhum is considerably smaller than that of for example Arran, it is uncertain whether Rhum would in prehistory have formed one (very small) social territory or part of a larger social territory. Following Wobst's (1974) suggestion that a minimum equilibrium size of breeding populations of hunter-gatherers falls between c. 175 and 475 individuals, Rhum as a social territory would have been teetering on the brink of Wobst's suggested minimum population size. In some respects, the distribution of Rhum bloodstone resembles the two lower levels of the Arran pitchstone network, with the source island itself being almost entirely supplied by its abundant local resource, and with 'allied' groups around the source island receiving small numbers of this visually spectacular and probably precious resource, indicating through their possession of bloodstone their kinship ties to people on Rhum?

The distribution of bloodstone-bearing sites in **fig. 14** is relatively discrete, and it is the author's view that this distribution most likely represents a social territory of some kind. However, a social terri-

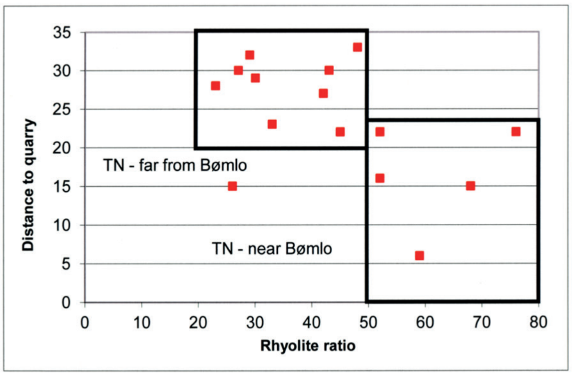


Fig. 17 The distribution of worked rhyolite in relation to the Bømlo quarry complex, SW Norway. "TN" ('tidlignolitisk') means Early neolithic.

tory is not necessarily one territorial size or level (no matter the impression given in Clark, 1975), and it is quite likely that some larger social territories may be conglomerates of smaller social territories (possibly representing different kinship levels, such as lineages, clans, tribes and tribal federations). This is for example suggested by the distribution of rhyolite in Early Neolithic south-west Norway (Ballin, 2012), where the rhyolite ratio of sites close to the central rhyolite quarry have exceptionally high rhyolite ratios (50-80 %), whereas sites slightly further away have slightly lower, ratios (20-50 %) (**fig. 17**).

Another similarity between the distribution of Rhum bloodstone and that of Norwegian Bømlo rhyolite, is the apparent definition of the larger social territory by notable topographical markers. Where the Norwegian rhyolite territory is defined by the presence at either end of broad fiords, the Rhum bloodstone network seems to be defined topographically by, in the north (with the caveat that the Scottish north-west still represents a form of archaeological *terra incognita*), Loch Torridon, and, in the south, the Firth of Lorne/Loch Linnhe fiord system.

As mentioned above, it is difficult at present to compare the different bloodstone-bearing assemblages, their numerical sizes, bloodstone ratios, and general composition, but there is clearly a difference, in terms of numerical size and bloodstone ratio, between assemblages recovered from Rhum itself and assemblages recovered off Rhum. It is difficult to say whether these differences reflect 'ownership', with some groups being in control of the outcrops and others not, or whether they simply reflect logistics, with some groups having easy access to the bloodstone sources (those living on Rhum), whereas others had to travel far to access the sources.

Given some of the distances involved (for example in terms of supplying groups based in the Mull/Ardnamurchan area at the southern end of the bloodstone exchange network), and the fact that groups based on Rhum might have had either 'ownership' of the sources, or been the guardians of these sources, it is highly unlikely that groups on the mainland or other Hebridean islands (whether they in kinship terms were organised as Mesolithic bands or Neolithic/Bronze Age tribes) acquired their bloodstone through embedded procurement. An effort would have to be made to move bloodstone from Rhum to other parts of the territory defined by the distribution of archaeological bloodstone through either direct or indirect procurement.

The distribution of Arran pitchstone (Ballin, 2009) suggests that the distribution patterns changed over time, with the exchange of pitchstone in Mesolithic times largely being confined to Arran itself (embedded or direct procurement), and with the extensive pitchstone exchange network (including most of northern Britain) mainly being an Early Neolithic phenomenon (indirect procurement). At the present time, the evidence (relatively few bloodstone-bearing sites, and assemblages covering most of the Mesolithic-Early Bronze Age period) does not allow any discussion of this question to be carried out, and it is uncertain whether bloodstone was exchanged through different mechanisms at different times.

Basically, more bloodstone-bearing sites and assemblages are needed to allow these questions to be dealt with, and research into the prehistoric settlement of north-west Scotland and the Highland interior would also be helpful.

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References

Ballin, T. B. (2002). *The flint and bloodstone assemblage from Shieldaig, Wester Ross, Highland.* Unpublished report commissioned by Historic Scotland/National Museums Scotland.

Ballin, T. B. (2008a). *The lithic assemblage from Home Farm, Portree, Isle of Skye and Lochalsh, Highland.* Unpublished report commissioned by Headland Archaeology, Ltd.

Ballin, T. B. (2008b). Scottish Archaeological Pitchstone. *Archaeology Scotland 1*, 6-7.

Ballin, T. B. (2009). *Archaeological Pitchstone in Northern Britain. Characterization and interpretation of an important prehistoric source* (British Archaeological Reports British Series 476). Oxford: Archaeopress.

Ballin, T. B. (2011). *Overhowden and Airhouse, Scottish Borders. Characterization and interpretation of two spectacular lithic assemblages from sites near the Overhowden Henge* (British Archaeological Reports British Series 539). Oxford: Archaeopress.

Ballin, T. B. (2012). The distribution of worked felsite – within and outwith Neolithic Shetland. In D. L. Mahler (ed.), *The Border of Farming and the Cultural Markers* (62-78). Copenhagen: National Museum of Denmark. http://nordligeverdener.natmus.dk/fileadmin/user_upload/temasites/nordlige_verdener/nordlige_verdener/Ditlev_L_Mahler/The_Border_of_Farming.pdf [14.5.2018].

Ballin, T. B. (2014). *Flint and stone artefacts collected from the Barabhas Machair, Isle of Lewis, Western Isles – the Elliott Collection.* Unpublished report commissioned by the Barabhas Machair Project.

Ballin, T. B. (2015). Arran pitchstone (Scottish volcanic glass): New dating evidence. *Journal of Lithic Studies 2*(1), 5-16. http://journals.ed.ac.uk/lithicstudies/article/view/1166 [14.5.2018].

Ballin, T. B. (forthcoming a). The lithic assemblage. In C. Ellis: *Loch Doilean, Ardnamurchan, Highland*. Archaeological Reports Online (to be published 2016).

Ballin, T. B. (forthcoming b). The quartz assemblage from RUX6, the Udal, North Uist, Western Isles. In B. Ballin Smith: *RUX6, the Udal, North Uist, Western Isles.*

Ballin, T. B., & Faithfull, J. (2009). Gazetteer of Arran Pitchstone Sources. Presentation of exposed pitchstone dykes and sills across the Isle of Arran, and discussion of the possible archaeological relevance of these outcrops. *Scottish Archaeological Internet Reports (SAIR) 38.* http://archaeologydataservice.ac.uk/archiveDS/archiveDownload?t=arch-310-1/dissemination/pdf/sair38.pdf [14.5.2018].

Ballin, T. B. & Faithfull, J. (forthcoming). The Stotfield silcrete (or 'Stotfield Cherty Rock'). Characterization and discussion of an archaeologically important lithic raw material. In R. Wragg Sykes & M. Will (eds.), *Proceedings from silcrete session at the 10th International Symposium on Knappable Materials, Barcelona 2015. Journal of Archaeological Science: Reports.*

Ballin, T. B. & Ward, T. (2013). Burnetland Hill Chert Quarry: A Mesolithic extraction site in The Scottish Borders. The Quarry. *The e-Newsletter of the SAA's Prehistoric Quarries & Early Mines Interest Group 9*, 3-23. http://www.saa.org/Portals/0/SAA/ABOUTSAA/interestgroups/prehistquarry/Quarry 9 Jan13.pdf [14.5.2018].

Beck, C. & Shennan, S. (1991). *Amber in Prehistoric Britain.* Oxbow Monograph 8. Oxford: Oxbow Books.

Binford, L. R. (1976). Forty-seven trips: a case study in the character of some formation processes of the archaeological record. In Hall, E. S. (ed.): *Contributions to Anthropology: The Interior Peoples of Northern Alaska* (National Museum of Man, Mercury Series 49) (299-351). Ottawa.

Binford, L. R. (1978). Dimensional Analysis of Behaviour and Site Structure: Learning from an Eskimo Hunting Stand. *American Antiquity 43* (3), 330-361.

CANMORE. *The online catalogue to Scotland's archaeology, buildings, industrial and maritime heritage.* Edinburgh: Historic Environment Scotland. https://canmore.org.uk [14.5.2018].

Clark, J. G. D. (1975). *The Earlier Stone Age Settlement of Scandinavia.* Cambridge: Cambridge University Press.

Clarke, D. V. (1969). Two jadeite axes and two arrowheads of Antrim porcellanite and Rhum bloodstone from Scotland. *Proceedings of the Society of Antiquaries of Scotland 100* (1967-1968), 187-8.

Clarke, A. & Griffiths, D. (1990). The use of bloodstone as a raw material for flaked stone tools in the west of Scotland. In C.R. Wickham-Jones 1990: *Rhum. Mesolithic and Later Sites at Kinloch. Excavations 1984-86* (Society of Antiquaries of Scotland Monograph Series 7) (149-156). Edinburgh: Society of Antiquaries of Scotland.

Coles, J. M. (1971). The Early Settlement of Scotland: Excavations at Morton, Fife. *Proceedings of the Prehistoric Society 37*, 284-366.

Durant, G., Griffiths, D. & Sutherland, D. (1990) Bloodstone. In C.R. Wickham-Jones 1990: *Rhum. Mesolithic and Later Sites at Kinloch. Excavations 1984-86* (Society of Antiquaries of Scotland Monograph Series 7) (51-52). Edinburgh: Society of Antiquaries of Scotland.

Emeleus, C. H. & Bell, B. R. (2005). *The Palaeogene volcanic districts of Scotland* (British Regional Geology 3). Nottingham: British Geological Survey.

Emeleus, C. H. & Troll, V. R. (2008). *A Geological Excursion Guide to Rum. The Palaeocene Igneous Rocks of the Isle of Rum, Inner Hebrides.* Edinburgh: Edinburgh Geological Society/National Museums Scotland.

Fisher, L. E. & Eriksen, B. V. (eds.) (2002). *Lithic Raw Material Economies in Late Glacial and Early Postglacial Europe* (British Archaeological Reports International Series 1093). Oxford: British Archaeological Reports.

Götze, J. (2010). Origin, mineralogy, nomenclature and provenance of silica and SiO2 rocks. *Archeometriai Mühely 3*, 163-175.

Griffiths, D. (1990). The location and examination of sources. In C. R. Wickham-Jones, *Rhum. Mesolithic and Later Sites at Kinloch. Excavations 1984-86* (Society of Antiquaries of Scotland Monograph Series 7) (p. 154). Edinburgh: Society of Antiquaries of Scotland.

Hall, C. (2000). *Gemstones.* Dorling Kindersley Handbooks. London: Dorling Kindersley Ltd.

Hardy, K. & Wickham-Jones, C. R. (2009). Mesolithic and later sites around the Inner Sound, Scotland: the work of the Scotland's First Settlers project 1998-2004. *Scottish Archaeological Internet Reports 31.* http://archaeologydataservice.ac.uk/archiveDS/archiveDownload?t=arch-310-1/dissemination/pdf/sair31.pdf [14.5.2018].

Hardy, K., Benjamin, J., Bickett, A. & Ballin, T. B. (forthcoming). Scotland's Intertidal Prehistory: Lub Dubh Aird, a raw material and knapping site in Upper Loch Torridon. *Proceedings of the Society of Antiquaries of Scotland.*

Heddle, M. F. (1901). *The Mineralogy of Scotland.* Edinburgh: David Douglas.

Higgs, E. S. & Vita-Finzi, C. (1972): Prehistoric economies: a territorial approach. In E. S. Higgs (ed.): *Papers in economic prehistory* (27-36). Cambridge: Cambridge University Press.

Hodder, I. (1974). Regression analysis of some trade marketing patterns. *World Archaeology 6* (1), 172-189.

Luedke, B. E. (1992). *An Archaeologist's Guide to Chert and Flint.* Los Angeles: Institute of Archaeology, University of California.

Mackie, E. (1967). Samhnan Insir. *Discovery and Excavation 1967*, 29.

Morrow, C. A. & Jefferies, R. W. (1989). Trade or embedded procurement? A test case from southern Illinois. In R. Torrence (ed.), *Time, Energy and Stone Tools* (27-33). Cambridge: Cambridge University Press.

Pellant, C. (1992). *Rocks and Minerals. The visual guide to over 500 rock and mineral specimens from around the world.* Eyewitness Handbooks. London: Dorling Kindersley.

Plog, F. (1977). Modeling Economic Exchange. In T. K. Earle, & J. E. Ericson (eds.), *Exchange Systems in Prehistory* (Studies in Archaeology) (127-140). New York: Academic Press.

Pollard, T., Atkinson, J. & Banks, I. (1994). It is the technical side of the work which is my stumbling block. A shell midden site on Risga reconsidered. In T. Pollard & A. Morrison (eds.), *The Early Prehistory of Scotland* (165–182). Edinburgh: Edinburgh University Press.

Prichystal, A. (2010). Classification of lithic raw materials used for prehistoric chipped artefacts in general and siliceous sediments (silicites) in particular: the Czech proposal. *Archeometriai Mühely 3*, 177-182.

Renfrew, C. (1977). Alternative Models for Exchange and Spatial Distribution. In T. K. Earle & J. E. Ericson (eds.), *Exchange Systems in Prehistory* (Studies in Archaeology) (71-90). New York: Academic Press.

Saville, A. (1994). Exploitation of Lithic Resources for Stone Tools in Earlier Prehistoric Scotland. In Ashton, N. & David, A. (eds.), *Stories in Stone* (Lithic Studies Society, Occasional Paper 4) (57-70). London.

Saville, A. (1999a). A Cache of Flint Axeheads and Other Flint Artefacts from Auchenhoan, near Campbelltown, Kintyre, Scotland. *Proceedings of the Prehistoric Society 65*, 83-114.

Saville, A. (1999b). The Portpatrick flint caches. *Proceedings of the Prehistoric Society 65*, 117-123.

Saville, A., Hardy, K., Miket, R. & Ballin, T. B. (2012). An Corran, Staffin, Skye: A Rockshelter with Mesolithic and Later Occupation. *Scottish Archaeological Internet Reports (SAIR) 51.* http://archaeologydataservice.ac.uk/archiveDS/archiveDownload?t=arch-310-1/dissemination/pdf/sair51.pdf (https://doi.org/10.5284/1017938) [14.5.2018].

Wickham-Jones, C. R. (1990). *Rhum. Mesolithic and Later Sites at Kinloch. Excavations 1984-86* (Society of Antiquaries of Scotland Monograph Series 7) Edinburgh: Society of Antiquaries of Scotland.

Wickham-Jones, C. R. & Hardy, K. (2004). Camas Daraich: A Mesolithic site at the Point of Sleat, Skye. *Scottish Archaeological Internet Reports (SAIR) 12.* http://archaeologydataservice.ac.uk/archiveDS/archiveDownload?t=arch-310-1/dissemination/pdf/sair12.pdf [14.5.2018].

Wiessner, P. (1983). Style and Social Information in Kalahari San Projectile Points. *American Antiquity 48* (2), 225-276.

Wiessner, P. (1984). Reconsidering the Behavioral Basis for Style: A Case Study among the Kalahari San. *Journal of Anthropological Archaeology 3*, 190-234.

Wobst, H. M. (1974). Boundary Conditions for Palaeolithic Social Systems: A Simulation Approach. *American Antiquity 39* (2), 147-178.

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Note: The Appendix with a *"list of bloodstone-bearing sites in the Hebridean/western Scottish region"* is given as additional material in a separate file.

Appendix

List of bloodstone-bearing sites in the Hebridean/western Scottish region. The site numbers relate to the distribution map Figure 14; SFS = Scotland's First Settlers (Hardy & Wickham-Jones, 2009).