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THE NORTH MULL PROJECT (3): PROMINENT HILL SUMMITS AND THEIR ASTRONOMICAL POTENTIAL

CLIVE L. N. RUGGLES, University of Leicester, and
ROGER D. MARTLEW, University of Leeds

The aim of the North Mull Project is to examine the apparent lunar significance of the orientations of the short stone rows of northern Mull in its fuller archaeological context through an integrated program of excavation, locational analysis, horizon survey, and statistical investigation. This is the third in a series of papers describing the progress of the project. In Part Two (*Archaeoastronomy*, no. 16, S51–76) we examined the wider astronomical potential of the seven sites as evidenced by the distribution of horizon distance with azimuth. In this paper we consider the presence and astronomical potential of prominent hills.

6. THE PRESENCE AND ASTRONOMICAL POTENTIAL OF PROMINENT HILLS

The preceding discussion leaves open the question of whether particular horizon features were of significance, astronomical or otherwise. In particular, if it was a general consideration to have a reasonably distant profile in the S and SSW, possibly containing a number of conspicuous features such as hill peaks, were the positions of these peaks themselves of any special significance? If this was the case, then the constraints upon site location may have been even tighter than the preceding discussion has postulated. In order to address this question we need to consider the visibility and astronomical potential of distant horizon features. The following discussion concentrates upon prominent hill summits.

6.1. *Inter-site Comparison*

The inter-site comparison is performed in two stages. First, we examine horizon features in the direction of southern alignment of the sites. This leads on to a specific discussion about the significance of Ben More. We then proceed to consider features in the entire horizon, regardless of site orientation.

6.1.1. Horizon Features in the Alignment of the Sites

The situation at Glengorm has been discussed in Part One.⁶⁰ In brief, the southern indication is upon a nearby spur on the east side of Glen Gorm some 500m distant. However, Ben More, the highest mountain on Mull some 25km away to the south, lies on the alignment of the site, and comes into view as one walks back along this alignment to the NNW, up rising ground. It is not clear

whether Ben More would be visible from the site itself if the intervening ridge, currently afforested, were clear of trees. The summit of Ben More, determined by offset from a point 130m along the alignment to the north, yields $A = 156^\circ.0$, $h = 2^\circ.0$, $\delta = -28^\circ.6$. These values are not critically dependent upon the observing position, the declination altering by less than $0^\circ.05$ as the observer moves 150m back along the alignment to the north until the ground falls away again.

Horizon profiles in the alignment of the remaining sites have been considered in previous work. The data, backed up in some cases by new survey measurements, are as follows:

Quinish. Thom⁶¹ considered the indicated profile to be centred to the right of the summit of Carn Mór ($A = 189^\circ.9$, $h = 2^\circ.7$, $\delta = -30^\circ.4$), apparently taking the orientation of the alignment as around 192° . However, only one stone is standing at the site, and the most likely orientation⁶² is $168^\circ \pm 2^\circ$, centred near to the summit of Beinn na Clach Corra ($A = 167^\circ.1$, $h = 1^\circ.9$, $\delta = -30^\circ.9$).⁶³

Maol Mor. Although it was assumed in 1981 that local ground some 300m to the SE of the site would obscure the more distant horizon in the direction of the alignment,⁶⁴ this conclusion was cast into doubt by a later survey.⁶⁵ The relevant part of the distant profile, if visible, falls between the peaks of Beinn Bhuidhe (1462 7438) and Cnoc an da Chinn. Despite Forestry clearance for a radius of some 20m around the site since 1987, it is still not possible to say for certain whether the local ground will intervene.

Dervaig N. Although the horizon directly in the alignment, whose azimuth is estimated as $150^\circ \pm 1^\circ$,⁶⁶ is formed by Cnoc Daithte, a mere 600m away, Ben More appears just to the right of this, yielding $A = 151^\circ.9$, $h = 2^\circ.2$, $\delta = -27^\circ.2$.

Dervaig S. The horizon directly in the alignment, whose azimuth is estimated as $157^\circ \pm 1^\circ$, falls between the peaks of Beinn na Drise and Beinn Bhuidhe (1462 7438).⁶⁷

Balliscate. The indicated horizon is a featureless part of Meall Doire nan Damh, a little over 1km distant.⁶⁸

Ardnacross. The indicated horizons are featureless parts of Meall na Caorach, some 2km distant.⁶⁹

There is little in these data to suggest that the rows were consistently and accurately aligned upon prominent hill peaks. While Ben More appears in or near to the alignment at Glengorm and Dervaig N, and Beinn na Clach Corra in the estimated alignment at Quinish, the remaining five rows (including both at Ardnacross) either indicate featureless stretches of horizon or stretches that fall between peaks.

If, however, the requirement for precise alignment is relaxed, a trait does become evident. This is that all five sites in the northern group are oriented

TABLE 9. Visibility and astronomical potential of Ben More from the five sites in the 'northern group'.

Column headings

- 1 Site name
- 2 Mean site orientation in degrees (for notes see Table 3 on p. S60 of Part Two)
- 3 Azimuth in degrees of the summit of Ben More
- 4 Altitude in degrees of the summit of Ben More
- 5 Declination in degrees of the summit of Ben More
- 6 Notes

1	2	3	4	5	6
Glengorm	156	156.0	2.0	-28.6	<i>o</i>
Quinish	168	149.6	2.0	-26.7	<i>c</i>
Maol Mor	162	152.3	2.1	-27.5	<i>c</i>
Dervaig N	150	151.9	2.2	-27.2	<i>c</i>
Dervaig S	157	151.3	2.3	-26.9	<i>c</i>

Notes

- o* The values for Ben More have been obtained by offset from a point 130m to the north of the site on the alignment. Calculation from map data gives $A = 155^\circ.8$, $h = 2^\circ.0$, $\delta = -28^\circ.5$.
- c* The values for Ben More have been obtained by calculation from map data.

roughly in the direction of Ben More. By 'roughly' we mean to within about 10° , or, in the case of the estimated site orientation at Quinish, some 20° . This is the more remarkable in that all five sites are situated 'critically' for sighting upon Ben More. In each case, there is a location within a mere (say) 20m of the site from which Ben More is clearly visible, and another from which it is totally obscured by nearby land. In the majority of cases, owing to modern afforestation either around the site or upon intervening land, it is not possible to say definitively whether Ben More is visible from the stones themselves.

The situation at Glengorm has already been described. From 10m to the SW of the site Ben More is clearly visible; from 10m to the NE it is obscured by the eastern flank of Glen Gorm. The situation of Quinish is remarkably similar, with Ben More just being obscured by the southern tip of nearby hills forming the eastern horizon. From 15m to the W of the site Ben More is clearly visible. At Maol Mor the tip of Ben More would just have appeared behind local ground 300m to the SE. Moving away from the site towards the profile, this would soon cease to be the case. The situation at Dervaig N is similar to that at Glengorm and Quinish. From 10m to the SW of the site Ben More would be clearly visible, but from 10m to the NE it would be obscured by the slopes of Cnoc Daithte. While the site is surrounded by forest, this can be verified by moving along the edge of the forestry plantation some 50m to the SE of the site. Finally, from the stones at Dervaig S, Ben More appears to the right of the cliffs of Creag Mhór.

The data from the five sites are summarized in Table 9. It is noteworthy that the only site at which the difference between the site orientation and the azimuth of Ben More exceeds 10° is Quinish, where the original orientation is in most doubt. Furthermore, at Glengorm, the only site where an exact orientation is known as a result of excavation, the alignment upon Ben More is precise. The evidence certainly supports the idea that the northern group of sites in Mull

were, intentionally, roughly oriented upon Ben More. This in turn focuses attention on the question of whether rough alignments upon prominent horizon features (or, indeed, upon astronomical phenomena) may only have been achieved to a precision of several degrees, or, even if the original orientations were more precise, whether the current state of the site may often only reveal the intended orientation to an accuracy of this order. But before this can be accepted, we must ask whether the fact that Ben More is actually visible from all five sites is itself significant, or whether it could have arisen purely as a consequence of the general location of the sites for other reasons entirely. This question will be examined in Section 6.2.

The declination of the summit varies from $-28^{\circ}.6$ at Glengorm to $-26^{\circ}.7$ at Quinish. The fact that these figures lie between about $-1^{\circ}.5$ and $-3^{\circ}.5$ above -30° may indicate an association with the rising moon near to the major standstill. This may in turn imply an awareness of the 18.6-year cycle, without the precise and organized system of observations that would be necessary to pinpoint the extreme rising position. But it may also imply that a closer association between Ben More and the most southerly rising moon was not possible within the constraints upon site location, or else was not important. The question must also be addressed of whether the observed declinations could have arisen through factors unrelated to astronomy. This, again, will be postponed until Section 6.2.

6.1.2. Horizon Features in All Directions

In this section, we attempt to identify the most prominent hill summits at each site (up to a limit of about ten) and to examine their declinations. The process of identification is admittedly subjective, but was undertaken prior to survey and without regard for the astronomical possibilities. For the purposes of this analysis, the orientations of the sites concerned are disregarded. The aim is to shed light on the question of whether sites were preferentially placed so as to associate prominent peaks with particular astronomical phenomena, regardless of their orientation. The most prominent peaks at each site are identified, and their declinations listed, in the descriptions that follow.

Glengorm. The entire eastern horizon consists of local ground no more than 500m distant, round to the direction of the alignment of the stones, where Ben More ($A = 156^{\circ}.0$, $h = 2^{\circ}.0$, $\delta = -28^{\circ}.6$) may just have been visible behind an intervening spur. To the right, over a sweep of some 70° , hill summits on the southern part of north Mull (to the SW of Loch Frisa), between 7km and 15km away, appear at intervals behind the much nearer ridge along the Quinish peninsula. The most prominent summits (by a subjective assessment) are Beinn na Drise ($A = 161^{\circ}.7$, $h = 1^{\circ}.7$, $\delta = -30^{\circ}.1$), Beinn nan Clach Corra ($A = 180^{\circ}.9$, $h = 1^{\circ}.5$, $\delta = -32^{\circ}.2$), Beinn Chreagach ($A = 192^{\circ}.1$, $h = 1^{\circ}.7$, $\delta = -31^{\circ}.2$), Carn Mór ($A = 200^{\circ}.3$, $h = 1^{\circ}.9$, $\delta = -29^{\circ}.5$) and Beinn Bhuidhe (1375 7493) ($A = 213.7^{\circ}$, $h = 1^{\circ}.4$, $\delta = -26.2^{\circ}$). From SW round to N the horizon is mainly local, apart from a window between azimuths 267° and 288° where the sea

appears with part of the Island of Coll beyond. This stretch lacks any prominent peaks.

Quinish. Here, as at Glengorm, the northern and eastern horizon are formed by local ground. The summit of Ben More ($A = 149^\circ.6$, $h = 2^\circ.0$, $\delta = -26^\circ.7$) is on the limit of visibility, the summit of Beinn na Drise being almost exactly below it. The horizon to the S and E is formed by the line of hills on the SW half of northern Mull, as at Glengorm, but without intervening ground. The most prominent summits (by a subjective assessment) are Cnoc an da Chinn ($A = 161^\circ.5$, $h = 1^\circ.8$, $\delta = -29^\circ.9$), Beinn nan Clach Corra ($A = 167^\circ.1$, $h = 1^\circ.9$, $\delta = -30^\circ.9$), Beinn Chreagach ($A = 175^\circ.2$, $h = 2^\circ.3$, $\delta = -31^\circ.2$), Carn Mór ($A = 189^\circ.9$, $h = 2^\circ.7$, $\delta = -30^\circ.4$) and Beinn Bhuidhe (1375 7493) ($A = 209^\circ.4$, $h = 2^\circ.0$, $\delta = -27^\circ.1$). The sea is visible to the right of Caillaich Point, between azimuths of approximately 260° and 330° , beyond which local ground intervenes. On the horizon to the right of the tip of Coll are the tops of several distant peaks in South Uist: Triuirebheinn (89 km; $A = 314^\circ.2$, $h = -0^\circ.1$, $\delta = +21^\circ.9$), Stulaval (92 km; $A = 315^\circ.1$, $h = -0^\circ.2$, $\delta = +22^\circ.2$), Beinn Mhor (97 km; $A = 317^\circ.9$, $h = 0^\circ.0$, $\delta = +23^\circ.5$), Ben Corodale (98 km; $A = 319^\circ.0$, $h = -0^\circ.1$, $\delta = +23^\circ.9$) and Hecla (99 km; $A = 319^\circ.9$, $h = 0^\circ.0$, $\delta = +24^\circ.3$).

Maol Mor. The northern horizon consists of Ardnamurchan with distant hills showing behind, of which the most prominent are judged to be the twin peaks of Ainsival ($A = 348^\circ.6$, $h = 0^\circ.7$, $\delta = +32^\circ.9$) and Askival ($A = 350^\circ.8$, $h = 0^\circ.8$, $\delta = +33^\circ.2$) on Rhum. Most prominent on Ardnamurchan itself are Meall nan Con ($A = 20^\circ.6$, $h = 1^\circ.0$, $\delta = +31^\circ.6$) and Ben Hiant ($A = 41^\circ.7$, $h = 1^\circ.5$, $\delta = +25^\circ.3$). To the right are the hills of Aros, behind which the mountains of southern Mull start to appear at around azimuth 120° . The most prominent of these are Ben Talaidh ($A = 130^\circ.7$, $h = 1^\circ.3$, $\delta = -20^\circ.3$) and Ben More ($A = 152^\circ.3$, $h = 2^\circ.1$, $\delta = -27^\circ.5$), appearing on either side of local ground (as far as can be estimated from offset surveys). The southern horizon and western horizons, formed by hills in north Mull, contain less prominent peaks. Sea forms the horizon between azimuths 275° and 345° , except where this is obscured by the rocky knoll immediately to the NW of the site. Unfortunately this cuts out the South Uist peaks visible from Quinish.

Dervaig N. The horizon to the NE is dominated by the main ridge of the Quinish peninsula, a mere 400m distant, and that to the SE by Cnoc Daithte, 600m distant. The summit of Cruachan Druim na Croise ($A = 141^\circ.0$, $h = 3^\circ.0$, $\delta = -22^\circ.7$) appears in a small gap in the latter. More distant hills appear to the right of azimuth 150° , with Ben More ($A = 151^\circ.9$, $h = 2^\circ.2$, $\delta = -27^\circ.2$), Beinn na Drise ($A = 155^\circ.3$, $h = 1^\circ.7$, $\delta = -28^\circ.7$) and Beinn Bhuidhe ($A = 160^\circ.7$, $h = 1^\circ.7$, $\delta = -29^\circ.9$) close together on the left of the more distant profile. In the absence of local trees there would be a clear view over Loch a'Chumainn to the west. Local horizon dominates again between about 290° and 315° and to the right of 332° . In the gap it may be possible to see the sea and the island of Canna beyond.⁷⁰

Dervaig S. The horizon to the W, N and E is local. Only between azimuths of

approximately 150° and 240° is this not the case. Three distant peaks appear at the extreme left of this interval: Beinn Fhada ($A = 145^\circ.3$, $h = 1^\circ.7$, $\delta = -25^\circ.7$), A'Chioch ($A = 148^\circ.8$, $h = 2^\circ.0$, $\delta = -26^\circ.4$) and Ben More ($A = 151^\circ.3$, $h = 2^\circ.3$, $\delta = -26^\circ.9$). Further to the right, the profile is formed by hills on the opposite side of Glen Bellart, coming progressively closer. None is especially prominent.

Balliscate. To the N, the peaks of Ardnamurchan poke out at intervals above the hills 2km away to the north of Tobermory, giving a spectacular effect. The most prominent summits, by a subjective judgement, are Beinn na Seilg ($A = 334^\circ.2$, $h = 1^\circ.3$, $\delta = +30^\circ.6$), Meall an Tarmachain ($A = 353^\circ.1$, $h = 1^\circ.4$, $\delta = +34^\circ.2$), Meall nan Con ($A = 358^\circ.3$, $h = 1^\circ.3$, $\delta = +34^\circ.3$), Beinn an Leathaid ($A = 4^\circ.1$, $h = 1^\circ.3$, $\delta = +34^\circ.2$) and Ben Hiant ($A = 19^\circ.2$, $h = 2^\circ.5$, $\delta = +33^\circ.5$). To the right of Ben Hiant there is a clear view of more distant hills in eastern Ardnamurchan at a distance of around 15 km. Although these hills contain no particularly prominent peak, three peaks in the vicinity of Rois-Bheinn in Moidart (35 km; $A = 43^\circ.1$, $h = 1^\circ.2$, $\delta = +24^\circ.4$; $A = 43^\circ.8$, $h = 1^\circ.2$, $\delta = +24^\circ.1$; and $A = 45^\circ.5$, $h = 1^\circ.1$, $\delta = +23^\circ.3$) show behind, the latter two being separated by a deep notch ($A = 44^\circ.7$, $h = 0^\circ.9$, $\delta = +23^\circ.5$). To the right of azimuth 60° the horizon is formed by the hills of Morvern, with prominent peaks at Beinn Bhuidhe (1601 7532) (10.1 km; $A = 92^\circ.4$, $h = 2^\circ.0$, $\delta = +0^\circ.1$) and Sidhean na Raplaich (13.7 km; $A = 96^\circ.8$, $h = 1^\circ.8$, $\delta = -2^\circ.5$). At the left end of this range the distant peak of Beinn Resipol on Sunart (29 km; $A = 63^\circ.6$, $h = 1^\circ.4$, $\delta = +15^\circ.0$) is just visible. To the S and W, local ground about 500m distant obscures the more distant horizon, except where the peak of Speinne Mór (4.3 km; $A = 176^\circ.9$, $h = 4^\circ.6$, $\delta = -28^\circ.9$) just shows through.

Ardnacross. The horizon here can be categorized into four basic parts: to the NW it is predominantly formed by the local hill rising up from the site; to the NE by the foothills of Morvern a few km away across the Sound of Mull; to the SW by the ridge of Speinne Beag little more than 1 km away across the valley of the Ardnacross stream; and to the SE there are panoramic views along the Sound of Mull towards Oban and the mainland beyond. The first three of these parts contain no notable peaks, apart from Ben Hiant in the N (14 km; $A = 354^\circ.9$, $h = 1^\circ.8$, $\delta = +34^\circ.8$), which shows prominently in a gap between the more local hills on either side. In the east, as the hills fall away towards distant mainland visible between azimuths 110° and 125° , the peak of Ben Cruachan (56 km; $A = 106^\circ.2$, $h = 0^\circ.9$, $\delta = -8^\circ.5$) just shows behind the slopes of Glass Bheinn (19 km; $A = 101^\circ.2$, $h = 1^\circ.0$, $\delta = -5^\circ.6$). On the opposite side of the Sound, to the SE, a group of peaks on the southern part of Mull form by far the most prominent horizon features at the site: these are Dun na Ghaoithe (18.3 km; $A = 131^\circ.4$, $h = 2^\circ.1$, $\delta = -19^\circ.8$), Chreaghach Mhor (13.3 km; $A = 135^\circ.2$, $h = 2^\circ.1$, $\delta = -21^\circ.4$), Sgurr Dearg (19.5 km; $A = 137^\circ.3$, $h = 1^\circ.8$, $\delta = -22^\circ.5$) and Beinn Talaidh (16.7 km; $A = 146^\circ.7$, $h = 2^\circ.3$, $\delta = -25^\circ.5$).

The declinations obtained are plotted in Figure 13. It is immediately evident that they are concentrated in four clusters: around -30° and up to -25° (rising

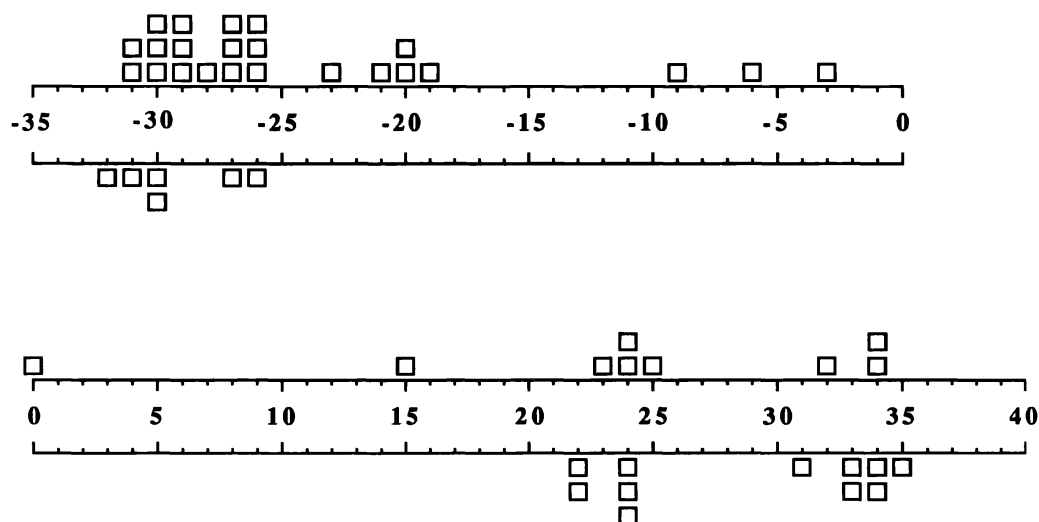


FIG. 13. Declinations of prominent hill summits at the north Mull sites. Easterly (rising) lines are plotted upwards; westerly (setting) ones downwards.

and setting lines); around -20° (rising lines only); around $+24^\circ$ (rising and setting lines); and around $+34^\circ$.

The first cluster contains at least one peak from each site. While some of the sites in the northern group contribute several peaks, Balliscate and Ardnacross each contribute only one. At Balliscate this is Speinne Mór, poking up through a small gap in local ground just east of S at a declination of $-28^\circ.9$. At Ardnacross it is Beinn Talaidh, just visible at the southern end of the wide eastern vista, yielding a declination of $-25^\circ.5$. It is interesting that both these peaks marking a rising point (although Speinne Mór is very close to due south) and the question arises as to whether these peaks might have performed the same function at the east coast sites as Ben More did at the sites of the northern group. In this regard it may be noted that Balliscate and Ardnacross are situated critically for sighting upon their respective peaks, in the same way as the northern sites in the case of Ben More. If the prominent peak in each case was associated with the rising of the southernmost moon,⁷¹ then it is clear that it was not critical that this peak was placed at the very limit of the 18.6-year cycle.

The second cluster contains five rising lines around -20° . Three arise from a group of distant peaks visible across the Sound of Mull from Ardnacross, one from an isolated summit appearing in a small gap in the south-eastern horizon at Dervaig N, and one from Ben Talaidh as viewed from Maol Mor. It is possible, though by no means proven, that at these sites the builders were able to incorporate a secondary association of a second peak with southern moonrise near the other limit of the 18.6-year cycle. Could it be that its unique position, incorporating the two most prominent peaks in southern Mull — Ben Talaidh and Ben More — roughly to mark the opposite limits of the rising position of the southernmost moon, made worthwhile the effort to construct the site on an unusually high ridge?

The third cluster contains nine rising and setting lines with declinations close to $+24^\circ$. Three rising lines arise from a group of distant peaks on the Scottish mainland as seen from Balliscate, and the fourth from Ben Hiant as viewed from Maol Mor. The five setting lines correspond to the five distant peaks on South Uist visible from Quinish. An obvious speculation here is that at these sites the builders were able to associate an additional prominent peak with the rising or setting summer solstice sun. The southernmost moon is most straightforwardly observed as the full moon nearest the summer solstice, so the association is a natural one. Indeed, the direct association between the setting solstitial sun and the simultaneously rising full moon is attested from ethnographic examples.⁷² Quinish was in a position, unique amongst the sites we have studied, to mark both these events simultaneously. From the northern coast of Mull in the vicinity of Glengorm and Quinish, the three peaks of Beinn Mhor, Ben Corodale and Hecla in South Uist form a prominent triplet on the distant horizon on a clear evening. Quinish was excellently placed to pick out the sun setting between the left-hand two peaks as it approached midsummer and between the right-hand two peaks at midsummer itself.

The fourth cluster contains nine rising and setting lines with declinations close to $+34^\circ$. Eight of them come from Balliscate and Maol Mor, the two sites with clear views to the N. The remaining one arises at Ardnacross, where the view to the E extends sufficiently far north to enable Ben Hiant to be seen. These declinations are well out of the range of the sun or moon and will not be considered further.

6.2. *Global Analysis*

The discussion of Section 6.1 has not made any attempt to tackle the question of whether the observed relationships between sites, prominent peaks and astronomical events could have arisen by chance, that is, through the action of factors quite unrelated to astronomy. In this section we shall indicate a strategy for doing so. In order to do this we shall focus upon Ben More and its relationship to the sites in the northern group.

A series of questions arises:

- (1) Were (a) the five sites deliberately situated in positions from which Ben More could be seen on the horizon, or (b) is this fortuitous?
- (2) If 1(a) is true, then (a) were the sites deliberately situated in positions on the limits of visibility for Ben More, or (b) is this fortuitous?
- (3) If 1(a) is true, then (a) were the sites deliberately placed with regard to the astronomical potential of Ben More, or (b) are the similar declinations fortuitous?

In order to tackle these questions we need to derive control data. First, we need to estimate from how many locations in northern Mull Ben More is visible, i.e. the chances that it will turn out to be visible at a site chosen for other reasons entirely. Second, we need to know its declination from other locations whence it is visible. We can then estimate the chances that the observed declination trend would be established if sites were placed without regard for the astronomical

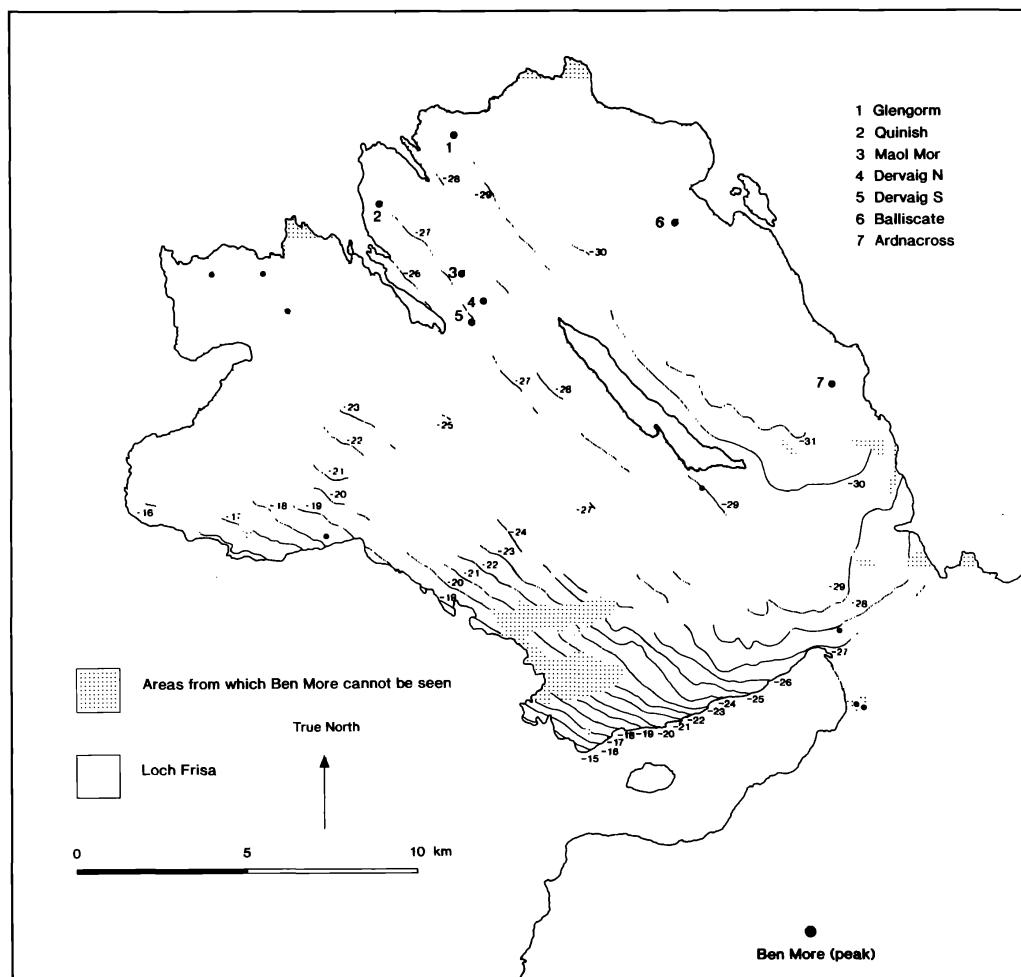


FIG. 14. The visibility and astronomical potential of Ben More. The areas from which Ben More can not be seen are shaded. The remaining areas are 'contoured' to show its declination.

possibilities. Finally, we would like to consider other locational factors explicitly and ask whether areas where Ben More is visible and has a certain declination tend to coincide with areas where sites might have been located for other reasons anyway.

The solution adopted was to work from Ordnance Survey maps. Working with the whole of northern Mull down to a line joining Salen and Knock, volunteers using maps and simple computer programs determined the locations from which Ben More was visible, and, if so, calculated its declination. The result was the 'declination contour map' reproduced in Figure 14. This map shows very clearly how the NW-SE topography of northern Mull affects the visibility of Ben More. It is clear that the general area within which the northern group is situated is particularly well suited to viewing the peak, and the possibility is raised that its visibility for each of the five sites might be fortuitous. Furthermore, the declination of Ben More varies little between different

TABLE 10. Prominent hill summits: azimuth and visibility data for nine locations in the vicinity of Glengorm. 'V' indicates that the hill summit is not visible from the site in question. Values shown in parentheses were not directly measured and have been estimated from maps and photographs; they are thus subject to possible inaccuracy.

Column headings

1	Site name	9b	Ben Corodale, S Uist (°820 8329, 527m)
2	Ben More (°525 7331, 967m)	9c	Hecla, S Uist (°826 8345, 606m)
3	Beinn na Drise (°475 7427, 424m)	10a	Ainshval, Rhum (°378 7943, 778m)
4	Cnoc an da Chinn (°439 7451, 390m)	10b	Askival, Rhum (°393 7952, 812m)
5	Beinn nan Clach Corra (°427 7471, 315m)	11	Beinn na Seilg, Ardnamurchan (°457 7642, 342m)
6	Beinn Chreagach (°414 7499, 262m)	12	Meall nan Con, Ardnamurchan (°503 7682, 437m)
7	Carn Mór (°398 7489, 342m)	13	Meall an Tarmachain, Ardnamurchan (°493 7663, 404m)
8	Beinn Bhuidhe (°375 7493, 289m)	14	Beinn an Leathaid, Ardnamurchan (°517 7677, 402m)
9a	Beinn Mhor, S Uist (°809 8311, 620m)	15	Ben Hiant, Ardnamurchan (°538 7633, 528m)

1	2	3	4	5	6	7	8	9a	9b
Glengorm	156.0	161.7	V	180.9	192.1	200.3	(213.7)	V	V
Site A	V	(161.1)	V	181.2	192.5	200.7	(214.0)	V	V
Site B	V	V	V	181.5	V	V	(214.7)	V	V
Site C	V	V	V	V	V	201.7	V	V	V
Site D	V	V	V	V	V	V	V	V	V
Site E	V	V	V	V	V	V	V	V	V
Site F	(155.4)	V	V	180.4	V	V	V	V	V
Site G	V	162.7	174.2	181.5	192.7	200.8	(214.0)	(316.2)	(317.4)
Site H	V	(160.2)	V	(179.6)	V	(198.9)	V	V	V

	9c	10a	10b	11	12	13	14	15
Glengorm	V	V	V	V	V	V	V	V
Site A	V	V	V	V	V	V	V	V
Site B	V	V	V	V	V	V	V	V
Site C	V	V	V	V	V	V	V	V
Site D	V	V	V	14.1	V	V	V	V
Site E	V	V	V	V	V	V	V	V
Site F	V	V	V	(14.2)	V	V	V	V
Site G	(318.2)	347.7	350.1	(13.4)	(28.0)	(28.7)	(34.3)	55.8
Site H	V	V	V	V	V	V	V	V

locations within these areas, so that the possibility is raised that its apparent lunar significance may be fortuitous too.

Further evidence is available, however, in the form of other sites in north Mull. There are six other free-standing megalithic sites: a four-stone setting at Tenga (ML13; °5040 74632), a prostrate stone pair at Calgary (ML8), and single standing stones at Lag (ML6), Cillchriosd (ML7), Tostarie (ML14; °3917 74561) and Killichronan (ML15; °5401 74193).⁷³ Including these sites on the declination contour map produces an interesting result. Three, Tenga, Tostarie and Killichronan, are within sight of Ben More. Of these, Tenga and Killichronan yield declinations for Ben More of $-29^{\circ}.1$ and $-27^{\circ}.9$ respectively, continuing the trend found at the five stone rows in the north. Yet Tenga is situated in the centre of northern Mull, overlooking Loch Frisa, and Killichronan is in the

TABLE 11. Prominent hill summits: declination data for nine locations in the vicinity of Glengorm. Rising points are indicated by roman type; setting by italic. Parentheses have the same meaning as in Table 10.

Column headings are as for Table 10.

1	2	3	4	5	6	7	8	9a	9b
Glengorm	-28.6	-30.1	V	-32.2	-31.2	-29.5	(-26.2)	V	V
Site A	V	(-30.4)	V	-32.2	-31.2	-29.5	(-26.2)	V	V
Site B	V	V	V	-32.1	V	V	(-25.8)	V	V
Site C	V	V	V	V	V	-29.1	V	V	V
Site D	V	V	V	V	V	V	V	V	V
Site E	V	V	V	V	V	V	V	V	V
Site F	(-28.4)	V	V	-32.1	V	V	V	V	V
Site G	V	-30.5	-32.0	-32.3	-31.3	-29.3	(-26.3)	(+22.8)	(+23.2)
Site H	V	(-30.1)	V	(-32.2)	V	(-29.8)	V	V	V

	9c	10a	10b	11	12	13	14	15
Glengorm	V	V	V	V	V	V	V	V
Site A	V	V	V	V	V	V	V	V
Site B	V	V	V	V	V	V	V	V
Site C	V	V	V	V	V	V	V	V
Site D	V	V	V	(+34.1)	V	V	V	V
Site E	V	V	V	V	V	V	V	V
Site F	V	V	V	(+34.1)	V	V	V	V
Site G	(+23.6)	+33.0	+33.4	(+34.2)	(+30.3)	(+30.2)	(+28.0)	+19.7
Site H	V	V	V	V	V	V	V	V

south, near to the narrow neck joining the two halves of the island. Only Tostarie, on the west coast, yields a completely different declination: $-18^{\circ}.3$. It is, of course, notable that while the other values fall one to three degrees within the extreme declination of the major standstill moon, this value is one degree within the minor standstill value. This means that the declination trend extends to other sites even though they are geographically removed from the northern group.⁷⁴

It is, of course, true that Ben More is not even visible from five of the extended list of sites in northern Mull, including two of the original stone rows. However, even if prominent peaks were of importance to the site builders, not everybody could have used the same one. There is, for example, no possibility of Ben More being seen from the north-eastern strip of the island where Balliscate and Ardnacross are located. This implies that we should construct declination contour maps for other peaks. Unfortunately, such work is highly labour-intensive.

Fortunately, a technological solution is at hand in the form of Geographical Information Systems (GIS).⁷⁵ Using a GIS, it should be possible not only to calculate visibility and display a declination contour map, but also to overlay this with maps showing other factors that might have influenced site locations, such as land use potential and surface geology. One of the major limiting factors is obtaining suitably accurate terrain data, but it is hoped to overcome this in the near future and to apply GIS technology to the Mull project.

6.3. *Local Analysis at Glengorm*

Our second approach to obtaining control data on prominent peaks was to undertake horizon surveys at the alternative sites in the vicinity of Glengorm. In order to do this we focused upon a moderate number of peaks considered to be prominent at one or more of the Glengorm locations. The azimuth data are tabulated in Table 10 and the declination data in Table 11.

The results generally confirm the conclusions of Section 6.1, that it was desired to have a prominent peak associated with the rising of the southernmost moon. Only Ben More is sufficiently far east of S to perform this function in the vicinity of Glengorm, and only Site *F* provides an alternative location from which it is visible. If it was crucial that Ben More was visible from the immediate vicinity of the site, then this would, for example, rule out Site *G*, despite its wider all-round views, and Site *A*, despite its being similar to the chosen site in every other respect. If it was also desirable, as concluded in Section 5, to have a reasonably distant horizon to the west of S, then the chosen site would have been preferable to Site *F*, where the horizon to the SSW was generally closer.

6.4. *Summary and Discussion*

In summary, there is evidence that there were two important considerations in placing the north Mull stone rows. The first was to have a prominent peak to the east of S in a position associated with the rising of the southernmost moon, towards its major standstill limit. The second (see Part Two) was to have a non-local horizon in the S and to the west of S. This suggests that it may have been important that, having risen, the moon should be clearly visible until it set again.

The stone rows at Glengorm, Quinish and the three near Dervaig all use Ben More as the prominent peak in question. All five sites are placed in positions where Ben More is only marginally visible, being clearly visible from some locations nearby but obscured by local ground from other such locations. Furthermore, the rows are all roughly oriented in the direction of Ben More, to within 10° in all cases except at Quinish, where the orientation is in most doubt. At Balliscate and Ardnacross, Speinne Mór and Beinn Talaidh seem to have served respectively as the peak in question. At Balliscate, as at the Ben More sites, the orientation of the stone row is within 10° of the peak. At Ardnacross, however, the orientations of the two rows ($197^\circ.5$ and $207^\circ.5$) are respectively some 50° and 60° different from the azimuth of Beinn Talaidh.

There is also evidence that at some sites the builders managed to make use of second peaks or groups of peaks, associating them with southernmost moonrise nearer the minor standstill or with the rise or set of the solstitial sun.

The main aim of this report has been to present data and many of the ideas are necessarily speculative in view of the small number of sites being considered. However, the project is already serving to generate new hypotheses concerning the function of the rows, especially with regard to their relationship with prominent features on the horizon. Some of these new ideas are testable on

existing data, and some may necessitate new fieldwork. Some are also serving to direct the development of the north Mull project itself.

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69. *Ibid.*, Table 7.1 and (for alignment *cba*) Figure 7.8, no. 133.
70. Thom, *op. cit.* (ref. 61), 67.
71. By this term we mean the moon at its most southerly declination in a particular month.
72. An excellent example is provided by the Sun Dance of the Plains Indians of North America. The Sun Dance ceremony was placed as near as possible to the summer solstice, but critically required a full moon. This was necessary to ensure that while the sun was setting in one direction, the moon would be rising in the opposite one. See F. Voget, *The Shoshoni-Crow Sun Dance* (Norman, 1984), 82.
73. Site numbers refer to Ruggles, *op. cit.* (ref. 63), where full descriptions and cross-references are given.
74. It is worthy of note that, of the two possible stone rows in the remainder of Mull, the one at Uluvalt (ML25), where all three stones are prostrate but the alignment is fairly well discernible, is also oriented upon Ben More. However, it is situated a mere 4 km away from the mountain, to its SE, and the peak yields a declination of more than +37°. See Ruggles, *op. cit.* (ref. 63), Fig. 7.10, no. 139.
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