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Topographical and Geophysical Survey at Knocknashee, Co. Sligo – Results from the 2016 Campaign

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Abstract

In the summer of 2016 a series of surveys were carried out of the summit of Knocknashee Hill, Co. Sligo. A topographical survey of the entire summit plateau was conducted, as was a magnetic susceptibility survey. Magnetic gradiometry and earth resistance surveys were carried out over a much smaller area, focused on a particularly well preserved group of roundhouses. The topographical survey revealed additional houses not previously recorded. It also allowed hitherto unnoticed settlement patterning to be observed. The magnetic susceptibility survey produced a map of probable areas of intense activity on the summit of the hill, and the magnetic gradiometry survey demonstrated the presence of additional structures, not visible as surface features, whose close, perhaps overlapping nature suggests that there may be a superimposition of structures not previously identified at Knocknashee.

Introduction

The site of Knocknashee comprises a large hilltop enclosure, situated on an isolated limestone plateau to the east of Slieve Gamp and located centrally within County Sligo, approximately 22 km southwest of Sligo town and 7 km northeast of Tobercurry (ITM 555625 819000). The plateau measures approximately 700 m NNE/SSW and 340 m NW/SE, covering an area of c. 21.5 hectares and coinciding with the townland of Knocknashee Common. At its base, Knocknashee hill measures 1150 m NNE/SSW by 775 m NW/SE. The hill is visually impressive, its flat ‘tabletop’ summit plateau unusual compared to other hills in the area, and rising to an altitude of 272 m above mean sea level, c. 150 m above the surrounding countryside.

The perimeter of the site is defined by sections of a low earthen bank running along most of the edge of the plateau. Along its eastern and south-eastern flanks a second, outer bank is discernible that runs along the edge of a terrace some meters below the summit plateau and roughly parallel to the inner bank.

Towards the northern end of the plateau, the area enclosed by the banks includes two large stone cairns, c. 120 m apart from each other, possibly Neolithic passage tombs, both partially disturbed (Egan et al. 2005: 21). The cairn to the north-west of the summit (survey ID 52 = cairn B) has a diameter of 28 m and a height of 2.5 m. A stone chamber is visible where cairn material has been displaced. The second cairn is located at the north end of the summit (ID 58 = cairn A). It is also approximately 28 m in diameter and about 1 m high. A ring cairn mentioned by Condit et al. (1991: 62) as being present at the north of the site cannot currently be located. It was also not mentioned by Egan et al. (2005) in their site inventory and thus may best be interpreted as a reference to traces of possible reworking or modification observable at cairn A (ID 58).

Cairn A and two of the larger roundhouse features (apparently our features ID 49 [= house site 35] and ID 53 [= house site 48]) were first recorded in the 1st edition 6-inch Ordnance Survey map (sheet SO032), based on 1837 field survey data (Fig. 1). Cairn B was not recorded on that map, likely so as to not obscure the indication of the trigonometrical station it carried. Unfortunately, the Ordnance Survey memoirs do not cover this part of Co. Sligo, and the Ordnance Survey letters in this regard are uninformative. It thus remains unclear if some of the damage to both cairns that can be observed today had already occurred prior to 1837 or if all of it was inflicted at a later stage, possibly when the trigonometrical station was toppled.

Apart from the Ordnance Survey map, no recording of archaeological features at the site was undertaken until the later part of the 20th and the beginning of the 21st century, when the Cambridge University Committee for Aerial Photography first documented the cairns and roundhouse occupation on the hill in two series of aerial photographs (AVI 94–98; AVJ 1–11). Subsequent survey work conducted at the site by Condit et al. (1991: 59–62 figs 3 and 4) and Carty (2004: 53) established the likely prehistoric nature of the perimeter banks and identified the outlines of at least 42 round houses in more detail, as well as a number of small enclosures, clustering in two groups in the north and east/southeast of the summit plateau.

Along the eastern and north-eastern flanks of the plateau, large sections of the inner perimeter bank have a modern dry-stone wall superimposed on them, partially obscuring the prehistoric features and making it difficult to identify the exact position of the original access and to determine if these banks indeed constitute the heavily eroded remains of defensive ramparts, as was suggested by Condit et al. (1991: 62) and Raftery (1994: 39), who interpreted the site as a Bronze Age hillfort. Egan et al. (2005: 1, 81) also assigned a Middle to Late Bronze Age date to the enclosure, but considered the roundhouse sites within it to be Neolithic, based on their proximity to the presumably Neolithic cairns and on the general similarity of the settlement layout to that at Mullaghfarna, c. 22 km to the southeast, where Neolithic flint tools and pottery were apparently found in association with compar-
able roundhouse structures (Egan et al. 2005: 1–2). Based on similar considerations, a Neolithic date for the roundhouse occupation on Knocknashee had already been proposed by Norman and St Joseph (1969: 24–25). A test excavation undertaken on the summit plateau of Knocknashee hill by Herity in the 1970s, which could potentially have shed some further light on the date and nature of the site’s occupation, remained unpublished (pers. comm. T. Kytmanow; cf. Herity 1974: 158). Our topographical and geophysical survey at Knocknashee conducted in the summer of 2016 built on the available information from the earlier work mentioned above and aimed primarily at establishing the exact extent of the roundhouse occupation on the summit plateau and the nature of the relationship between this occupation and the banks defining much of the plateau’s perimeter, not least with a view to determining the most suitable locations for subsequent test excavations in order to establish their precise date. The survey methods employed and subsequent interpretation of the survey results had to take into account the soil and vegetation cover, as well as historical land-use practices on Knocknashee hill.

Soil Cover, Vegetation and Land Use

The soil cover overlying the limestone that comprises Knocknashee hill is generally quite shallow, on the summit plateau only exceeding a depth of c. 0.30 m where natural depressions have acted as sediment traps. Despite the porous nature of the underlying limestone, the formation of gley soils on extensive stretches of the plateau makes for a lack of drainage and has caused the growth of blanket peat in the respective areas. This also seems to have conditioned the spread of extensive patches of heather in parts of the summit plateau. From a comparison between aerial imagery obtained during the 2016 survey campaign (Fig. 2) and photographs taken by the Cambridge University Committee for Aerial Photography in 1968...
Fig. 2 Birds-eye view of Knocknashee hill from the north, aerial imagery obtained during the 2016 survey campaign.

(Norman & St Joseph 1969, fig. 10), the extent of these patches of heather does not seem to have changed significantly over the last half century.

Soil cover is clearly deeper, the soils themselves better drained, and the vegetation consequently more lush, on the terrace that runs along much of the eastern edge of the hilltop, between the inner and outer bank. Some low banks running perpendicular to the two perimeter banks and dividing that terrace into several sectors of roughly rectangular shape may be remains of post-medieval field systems. It is unclear if these are related to the remains of at least one post-medieval building (ID 33 and 61 = rectangular buildings 2 and 3) and further dry-stone walls from what might be an outhouse or small enclosure (ID 31 = rectangular building 1) of similar date which survive on the south-eastern edge of the hilltop plateau, abutting to the interior of the modern field wall that defines the perimeter of the commonage. According to local oral tradition, the building in question was abandoned in the ‘Night of the Great Wind’ in 1839, with the family which to this point used it as a dwelling seeking shelter in one of the houses at the foot of the hill (pers. comm. A. Wilkinson). The building is clearly identifiable in the 1st edition 6-inch Ordnance Survey map (Fig. 1).

Current land use of the commonage is exclusively for rough grazing, and while what may be remains of historical field systems are visible not only on the limestone terrace between the inner and outer bank along the eastern perimeter of the plateau, but also on the north-western slopes of the hill, such evidence is completely lacking from the interior of the enclosure.

Research Objectives and Methodology

The objectives of the survey work carried out on the summit plateau of Knocknashee hill in 2016 were to create an inventory of all previously recorded features, determine their precise locations, detect additional, hitherto unrecorded structures, and explore the potential for a more extensive application of geophysical survey methods. This was achieved by a combination of ground-based GPS and aerial photographic survey. The latter was conducted using an unmanned aerial vehicle (UAV), to create a high-resolution orthorectified aerial photograph and digital elevation model (DEM) of the entire hill. The high-resolution DEM was used to enhance an existing
Fig. 3 Results of GPS survey overlaid on aerial photograph.
The initial ground-based GPS survey aimed at verifying the exact position and nature of features reported previously in published references and of potential further structures identifiable in publicly available DigitalGlobe imagery. The GPS survey employed Network Real Time Kinematic (NRTK) positioning technology, with an accuracy in the sub-5 cm range on the X, Y and Z axes. Diameters and/or profiles from 57 features were recorded, including house sites, small enclosures and the perimeter bank of the hilltop enclosure (Fig. 3). No trace of any structure was found in the GPS survey at six locations identified as potential house sites in the initial desk-based assessment. Additional GPS data were collected on the ground following the analysis of the data captured during the UAV photographic survey, with the objective of verifying the nature of newly identified features and calibrating their elevation data (Fig. 4).

In addition to the ground-based GPS and aerial photographic surveys, three types of geophysical survey were conducted by Earthsound Geophysics Ltd. and IT. Sligo, under licence 16R0112 (Bonsall et al. 2016). The entirety of the summit was surveyed using volume-specific magnetic susceptibility (Bartington MS2D, 5 m × 5 m resolution, acquired via gridless survey-grade GPS). A magnetic gradiometry survey (Geoscan Research FM256, 0.5 m × 0.25 m resolution) was carried out on
Table 1 Topographical survey structure IDs and corresponding description.

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Table 2 House-type classification

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<th>Description</th>
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</thead>
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<tr>
<td>A</td>
<td>A fully circular structure with a well defined bank and fosse, clearly visible as structural remains. An entrance feature may be visible.</td>
</tr>
<tr>
<td>B</td>
<td>A fully circular structure but with a less prominent profile. A fosse is present, but not well defined. An entrance feature may or may not be present.</td>
</tr>
<tr>
<td>C</td>
<td>C-shaped, semi-circular structure defined by a prominent fosse and bank.</td>
</tr>
<tr>
<td>D</td>
<td>C-shaped, semi-circular structure with a low bank. A poorly defined fosse may or may not be present.</td>
</tr>
<tr>
<td>E</td>
<td>A poorly defined circular or C-shaped structure with barely discernible bank and no eminently visible fosse. Structures can also be obscured by plant or peat cover.</td>
</tr>
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</table>

a smaller 60 m (east-west) by 40 m (north-south) area, designated here as Test Area 1 (Figs 5 and 6) centred on house sites 18, 19 and 20 (ID 8, 9 and 10 respectively). An earth resistance survey (Geoscan Research RM15 twin-probe array, 0.5 m × 0.5 m resolution) over an area measuring 60 m (north-south) by 20 m (east-west) was also carried out centred on these three house sites (Fig. 7).

Data from the terrestrial GPS, aerial photographic and geophysical surveys were collated in a geographic information system (GIS) to relate the results to each other in their spatial context. As Cartý’s (2004) survey report only became available after our initial desk-based assessment had been concluded, the ID numbers attributed to individual structures in our survey do not coincide with the numbering of house sites and other features in her report.

Survey Results

Our new survey work has increased the number of house sites at Knocknashee to at least 50 and possibly as many as 64. In addition, the 2016 survey has provided additional detail on a number of enclosures found on the summit plateau, such as the ‘D’ shaped enclosures A and B (ID 59 and 60) at the east side of the plateau, and a linear embankment which possibly
Fig. 5 Orthophoto (bottom) and magnetic gradiometry survey results (top) from Test Area 1, with house sites 18, 19 and 20.

Fig. 6 Magnetic gradiometry survey of Test Area 1 with interpretation of results overlain.

constitutes another large enclosure (ID 16). It also identified a short stretch of wall (ID 29) and some probable post-medieval buildings already recorded in the 1st edition 6-inch Ordnance Survey map (ID 31, 33 and 61) (Fig. 8 and Table 1).

It is entirely possible, even likely, that the dense cover of heather, which extends over a substantial proportion particularly of the central and southern expanses of the site and which affected the outcome of the UAV photographic survey, conceals further structures otherwise visible at the surface (Figs 5 and 8). While the LiDAR DEM supplied by the Ordnance Survey Ireland did not suffer from similar masking effects caused by dense vegetation, its limited resolution would have been insufficient to pick up most roundhouse features visible in the photographic aerial survey.

The subsequent magnetic gradiometry survey made it clear that even in those areas not under dense vegetation cover, further house sites and enclosures exist on the plateau that could not be picked up by the UAV photographic and GPS surveys. In any case, based on the results from these two surveys, a fivefold classification of the house sites on the summit plateau may be proposed (Table 2).

The results of the magnetic susceptibility survey, overlain on a georeferenced aerial photograph of the site, are displayed in Fig. 9. The light areas are the areas with the greatest magnetic enhancement; the dark areas are those with the least. There are concentrations of high levels of magnetic susceptibility in the north of the summit, towards the south-western edge of the summit and in one small hemispherical area on the north-eastern edge of the summit. Smaller areas of high magnetic susceptibility exist on the west side of the summit. Areas of slightly lower, but still raised, magnetic susceptibility

Fig. 7 Earth resistance survey of part of Test Area 1 with outline of house sites overlain (a) and interpretation of results (b).
are present across the summit, but especially in the northern, north-eastern and eastern parts of the plateau. The centre and centre-west of the summit, the highest point of the hill, has generally much lower magnetic susceptibility, although this may be due to the masking effect of blanket peat.

When the survey data is overlaid on the magnetic susceptibility data it becomes clear that there is some correspondence between the areas of high magnetic enhancement and archaeological sites and features. The areas of high magnetic susceptibility to the north of the summit seem to gather around the exteriors of the two cairns, with a concentration in the area between house sites 47, 48 and 50 (ID 53, 54 and 57). Most of the other house sites and probable house sites are located in areas of moderately high or high magnetic susceptibility. Only two definite house sites, 24 and 25 (ID 21 and 22), are located in areas of very low magnetic susceptibility (Figs 8 and 10).

An area 60 m (east-west) by 40 m (north-south) was surveyed by magnetic gradiometry. The most notable result of the magnetic gradiometry survey (Figs 5 and 6) is that not only several of the round houses already picked up by the UAV aerial photographic and GPS surveys were clearly apparent (Fig. 6, features 1 and 4), but that towards the north and west of the investigated test area an additional enclosing structure became visible (Fig. 6, feature 7) which potentially appears to contain another structure (Fig. 6, feature 8) that was not picked up by the topographical survey. Additionally, a curving feature was detected (Fig. 6, feature 2) running between house site 19 (ID 9) and house site 20 (ID 10), with indications of a pit (Fig. 6, feature 3) close to where this feature intersected the wall of house site 19. However, house site 18 (ID 8) was only partially discernible in the magnetic gradiometry data (Fig. 6, features 5 and 6) and one of the magnetic anomalies coinciding with its outline (Fig. 6, feature 6) merges with the anomaly indicating the enclosing structure to the east (Fig. 6, feature 7). There was no indication of the presence of house site 16 (ID 11) in this survey.

The earth resistance survey covered an area measuring 60 m (north-south) by 20 m (east-west) (Fig. 7). It successfully detected two of the house sites, house site 18 (ID 8) (Fig. 7b, feature 1) and house site 20 (ID 10) (Fig. 7b, feature 2) but failed to detect house site 19 (ID 9), situated between the other two houses. There was, instead, a linear high-resistance anomaly (Fig. 7b, feature 3) where a house-shaped anomaly was expected. The survey also detected a very low-resistance anomaly in the north-western corner of the survey area (Fig. 7b, feature 4) which may have been a drainage channel.

Discussion

Hilltop settlements are one of the few categories of archaeological sites whose understanding has not greatly benefitted from the boom in development-driven fieldwork during the ‘Celtic tiger’ years. Despite, or perhaps rather because of this lacuna, recent years have seen an increased focus on mountain-top archaeology in Ireland. Stefan Bergh (2015) has noted the presence of large clusters of prehistoric round houses in the vicinity of hilltop passage tombs, in particular at Mullaghfarna, Co. Sligo, and Turlough Hill, Co. Clare, which respectively have c. 150 and 140 house sites on their summits, but also Knocknarea, Co. Sligo, and Knocknashee, featuring 20 and 50 known house sites respectively (Bergh 2015: 24). For the roundhouse structures on Knocknarea, but also for a series of linear banks along the eastern perimeter of its summit, a Middle Neolithic date has been established (Bergh 2002: 147–148). As already pointed out in the introduction, various authors in the past have proposed a similar chronology for other clusters of roundhouses in hilltop positions found across the northwest of Ireland, including Knocknashee, Mullaghfarna and Turlough Hill (Norman & St Joseph 1969: 24–25; Herity 1974: 157–158; Carty 2004: 82; Egan et al. 2005: 21; Berg 2015: 33).

Bergh further hypothesised that, while the groups of houses at both Mullaghfarna and Turlough Hill were essentially domestic in character, the sites did not constitute typical villages but temporary settlements, focused on the passage tombs on the summits, perhaps used at particular times of the year associated with ‘ancestor rituals’ (Bergh 2015: 30). Excavations at Turlough Hill by Ros Ó Maoládhain and Noel McCarthy (2016) seem to confirm Bergh’s suggestions about the only occasional use of these house sites, interpreting a lack of artefacts from the four house structures they excavated at Turlough Hill to mean the houses were only periodically occupied. Ó Maoládhain and McCarthy found no datable artefacts during their excavations and have not, as yet, obtained any radiocarbon dates to support Bergh’s assertion that the houses at Turlough Hill are likely to date to the Middle Neolithic. Likewise, the chronological relationship between the large dry-stone walled enclosure on the eastern summit of Turlough Hill and the dense house clusters situated between that enclosure and the cairn on the western summit has yet to be established.

While direct dating evidence is still lacking also for the roundhouse occupation and enclosure banks at Knocknashee, the results from our 2016 survey now allow for a more detailed comparison with the aforementioned sites. Clearly, in comparison to Knocknarea, so far the only of these hilltop sites with a securely dated roundhouse occupation, the houses identified at Knocknashee cluster rather more densely, and many of them are situated in much greater proximity to the passage tombs than any of the houses on Knocknarea. What is broadly comparable is the presence of two main clusters in both hilltop locations of quite unequal size, but while on Knocknarea these are spaced c. 800 m apart (Bergh 2002, fig. 9.5), it is apparent from the results of the UAV photographic survey that the two large clusters of house sites on the summit of Knocknashee, a North Area and an East/Southeast Area, are only separated by a ‘corridor’ approximately 40 m wide which runs from the northeast corner of the summit of Knocknashee into the centre of the hilltop plateau (Fig. 11). The North Area consists of 17 house sites, three possible house sites and, perhaps importantly, the two cairns. The East/Southeast area consists of 30 house sites, and a further eight possible house sites. There are three other house sites outside these two clusters to the

²³ Already Macalister et al. (1911/12, 331–332) had suggested synchronicity between the roundhouse occupation at Mullaghfarna and the Carrowkeel passage tombs, but attributed both of them to a developed stage of the Bronze Age, based on the diffusionist preconceptions of the time.
Fig. 8 Results of GPS survey overlain on orthophotographic DEM.
Fig. 9 Results of magnetic susceptibility survey overlain on aerial photograph of Knocknashee.
southwest of the summit. The ground between the North Area and the East/Southeast Area appears to be no different in its characteristics from the ground upon which the two house-site concentrations are situated, and it seems likely that the space between these two areas was left deliberately unoccupied, though this would need to be confirmed through a more extensive geophysical survey.

The reasons for the deliberate avoidance of this ‘corridor’ are uncertain. It may be that there is a routeway through the site to either side of which the two clusters are arranged. However, the width of the ‘corridor’ seems greater than would be needed for a simply logistical allocation of space in this manner. Alternatively, it may reflect two human groups utilising the site, one which used the North Area and one which utilised the East/South East Area. Under the premise that the two cairns functioned as the main reference points for structuring the occupation on the hilltop plateau, the fact that the North Area cluster seems to focus on the cairns at that part of the site, and the absence of a similar focus at the East/Southeast Area, may suggest that the distinction is a social one, with perhaps one moiety (an elite group?) occupying house sites close to the passage tombs and another (non-elite?) moiety occupying space separated from the tombs. Alternatively, Margaret Carty’s (2004: 63) observation that from most of the houses which are in our East/Southeast Area only cairn B (ID 52) can be viewed, whereas all of the houses in our North Area offer a view of both cairn B and the more northerly cairn A (ID 58) may be significant. Perhaps one group was privileged in being able to view both tombs, whereas the other group could only view a single tomb. In this sense, the use of space with an unoccupied corridor between the two areas may emphasise the separation of an elite from non-elite groups.

There may also be some parallels between the arrangement of houses and the use of space on Knocknashee and that on Turlough Hill (cf. Bergh 2015). At the latter site there are two groups of house sites on an elongated hilltop. The westerly side of the western summit has a large cairn around which are clustered about 90 house sites. There is no passage tomb at the eastern side of the western summit of Turlough Hill, although there is a multivallate low-walled stone structure with an external diameter of about 35 m, around which the other 50 house sites group. A distinct gap exists between the two clusters of houses on the western summit of Turlough Hill, although this at least partly seems to be motivated by the topography of the site, which includes two natural depressions where construction of houses would be difficult (Ó Maoléidín & McCarthy 2016, fig. 2). However, the avoidance of more suitable areas between the two main house clusters perhaps suggests that the arrangement of space on the summit of Turlough Hill reflects more than simply the natural topography of the hill. The large enclosure of the eastern summit, with a diameter of approximately 225 m, does not seem to be associated with any significant number of house sites.

If Knocknashee was to follow the example of Turlough Hill, then we might expect another focus for activity on the summit of the hill, but in the form of an enclosure, not a cairn. Given the amount of peat cover near the high point of the summit it is not impossible that some kind of second focus point could exist at Knocknashee. Interestingly the ‘corridor’ between the two occupied areas of the hill would appear to lead to this area.

If indeed the ‘corridor’ between the occupation areas on the summit was, at least in part, a routeway for channelling movement of persons on the hilltop plateau, then it may be significant that where it appears to emerge from the northeast edge of the summit there are a geophysical anomaly and some interesting physical features. These consist in an area of high magnetic susceptibility at this point and in a number of earthworks running obliquely down the side of the mountain which do not appear to be field boundaries, but which could, conceivably, function as route markers delineating what is possibly the least-cost approach to the top of Knocknashee (Fig. 12). The magnetic anomaly could reflect heightened activity in the past at this ‘entrance’ point where walkers ascending Knocknashee first entered onto the summit.

The magnetic susceptibility survey also reveals areas of possible heightened activity around the tombs, in some cases encompassing the sites of houses in the tombs’ vicinity. Of course it is impossible without excavation to directly date any of this possible activity and it may be that there have been house sites constructed over areas which had been subject to intense activity prior to this.

The results of the magnetic gradiometry survey cover a much smaller extent of the hill than those of the magnetic susceptibility and UAV surveys. However, and despite the very low contrast the gradiometry results showed due to the influence of the overlying peats, the picture they provide is considerably more detailed than that from the magnetic susceptibility survey and reveals that there are structures, such as the possible enclosing structure and additional house site at the west side of house sites 18, 19 and 20 (Figs 5 and 6), and a curving structure and pit or potential hearth at the south-eastern side of house sites 19 and 20, which had not been detected to date. It is possible that not all the structures revealed by this survey are contemporary and that the picture emerging from the survey data shows more than one phase of activity. This potential multi-phase occupation would not have been readily apparent without the geophysical survey. Conversely, the comparison between the two data sets shows also that geophysics may not pick up all features revealed by the UAV survey, such as house site 16 which is not apparent in the data captured by the magnetic gradiometry survey.

It is, however, striking that the magnetic gradiometry survey did not identify any substantial pits or hearths within the hut sites. The contrasts across the entire data were very weak, ranging between -0.6 to 2.0 nT, and house sites ranging only between 0.2–0.9 nT, an extremely low contrast that makes prospection challenging without a priori information and which has been noted extensively for the low contrast soils offered by carboniferous limestone and gleys in Co. Sligo (Bonsall et al. 2013; 2014). The absence of cut features such as pits could be explained by a non-magnetic uniform backfill of natural soils and the impeded magnetic susceptibility of fired and unfired remains due to the blanket peats (Weston 2004). The only magnetometer anomaly which might be interpreted as such is located on the edge of house site 19 (Fig. 6, feature 3). This seems to set the structures surveyed in Test Area 1 apart from roundhouses excavated in other hilltop locations across the north of Ireland, such as Turlough Hill (Ó Maoléidín & McCarthy 2016: 16, 22–23) or Knock Dhu, Co. Antrim (Macdonald 2016: 37–43), and it might be tempting to take this as
Fig. 10 GPS survey results overlain on magnetic susceptibility survey results.
further confirmation of Bergh’s suggestions concerning the only occasional use of such houses. On the other hand, evidence for internal hearths also proved scarce at the iconic Middle Bronze Age coastal roundhouse village of Corrstown, Co. Derry, which otherwise produced evidence for intense habitation (Ginn & Rathbone 2012: 208), and across the island as a whole, less than half of all excavated Bronze Age roundhouses were associated with hearths (Ginn 2016: 101 fig. 6.5). Without excavation it will thus remain difficult to establish the exact nature of the use of the houses at Knocknashee.

The earth resistance survey covers a yet smaller area within Test Area 1 than the magnetic gradiometry survey, but is similarly detailed. It also gives a slightly different picture than the other forms of survey. It detects house site 18 and 20 but does not identify any contrasting anomaly for house site 19, and instead reveals a linear anomaly running through it.

Both the magnetic gradiometry and earth resistance surveys confirm that the two conjoined houses 19 and 20, in stark contrast to figure-of-eight pairs of houses dated to the Late Bronze and Iron Ages so far, do not seem to feature linked interiors (Figs 6 and 7), something already indicated by the topographic and UAV surveys for this pair of houses as well as for conjoined houses 47 and 48 (ID 54 and 53). Similar instances of paired houses are also known from Knocknarea and Turlough Hill (Bergh 2002, fig. 9.3; Ó Maoldúin & McCarthy 2016, fig. 2), and any future excavation at Knocknashee would have to target at least one of the two aforementioned pairs of houses, in order to establish the exact stratigraphic/chronological relationship between them, and to facilitate a more detailed comparison with similar pairs of houses and figure-of-eight structures known from other sites.

The two more detailed geophysical surveys conducted at Knocknashee also more generally hint at greater complexity of the surviving archaeology at this point than is apparent from traditional topographic or UAV survey. It suggests that this area would repay closer attention in the form of an excavation to tease out the stratigraphic relationships of the elements indicated by the magnetic gradiometry and earth resistance surveys and to obtain dating evidence to place the site within the broader archaeological context.

The latter seems particularly important, given that similar sites in the northwest of Ireland have traditionally been assigned to the Neolithic, although conclusive dating evidence so far is only available for some of the structures on Knocknarea, while comparable clusters of roundhouses associated with inland promontory forts in the northeast of the island, such as Knock Dhu and Lurigethan, Co. Antrim, are generally assigned to the Late Bronze Age. Also among the latter, however, only one site has so far provided conclusive dating evidence: the banks and most of the c. 70 roundhouses at Knock Dhu have been securely dated to the beginning of the first millennium BC, although at least one of the roundhouses has produced a Chalcolithic/Early Bronze Age date (Macdonald 2016: 37, 44).

Any future excavation would also have to target sections of the two perimeter banks. While these features have generally been interpreted as defensive in nature, it is striking that the building material particularly for the inner perimeter bank would seem to have originated largely from a series of scoops and quarry hollows stretching along its inner face, and that no attempt seems to have been made to use the removal of building material to render access to the summit plateau more difficult (cf. Condit et al. 1991: 61). This characteristic would seem more in line with Neolithic henges, or with later henge-like structures such as the ditch and bank defining the perimeter of Navan Fort than with other hillforts. On the other hand, it can be argued that the natural steepness of the slopes of Knocknashee hill constitutes an obstacle sufficiently substantial to keep any would-be attackers at bay, and that the necklace of scoops and quarry hollows ranging along the inside of the inner perimeter bank provides a more or less level staging area for any would-be defenders that would otherwise be lacking, providing them with additional cover without having to increase the height of the suspected rampart.

In any case, the uncertain nature of the perimeter banks does raise the question of the most appropriate terminology for describing the site. Notwithstanding the fact that Knocknashee has been referred to as a ‘hillfort’ in the literature on various occasions (Condit et al. 1991; Raftery 1994; Cart 2004), while both the date of its prehistoric occupation and the defensive character of the potential rampart surviving beneath modern field-boundary walls along the perimeter of the summit plateau remain uncertain, it seems prudent to avoid this particular terminology. Consequently, in these pages we have chosen to employ the term ‘hilltop enclosure’, despite the conventional limitation of this label to generally much smaller sites (cf. Grogan 2005: 29).

Conclusions

The UAV and geophysical surveys conducted in the summer of 2016 have added very considerably to our knowledge of Knocknashee. Prior to this survey campaign the presence of a significant number of roundhouse sites at Knocknashee was known, but the full extent of the occupation and the clustering of the house sites into two broad groups as well as the presence of an apparent ‘corridor’ between them was not evident. The UAV survey, in particular, has brought this into focus, added to the number of houses and related structures known and improved our knowledge of the detailed form of these structures.

The magnetic susceptibility survey has provided a potential map of activity on the hilltop which, while not correlating exactly with the house-site clusters, does indicate that there was intense activity at the passage tombs, and possibly at some of the house sites, as well as providing a number of intriguing other areas of apparently intense activity which will provide targets for future, more intensive, investigation.

The magnetic gradiometry survey, targeted on an area with a number of house sites and a series of high magnetic susceptibility readings, revealed more structural complexity to a group of house sites than had previously been thought. It identified a number of features which appear to be an additional house site and an enclosure encompassing the western side of several house sites.

Similarly, the earth resistance survey has shown that there are distinctions in what different survey techniques can reveal, this survey both uncovering additional details, a linear feature running through where house 19 should have shown up, and
Fig. 11 Results of GPS survey overlain on aerial photograph of Knocknashee with approximate extents of North Area and East/Southeast Area delineated.
Fig. 12 Results of magnetic susceptibility survey overlain on aerial photograph of Knocknashee with approximate extents of North Area and East/Southeast Area delineated and hypothetical locations of 'Corridor' and 'Entrance'.
not detecting features apparent in the other surveys (house site 19).

The limited magnetic gradiometry and earth resistance surveys conducted at Knocknashee indicate that, in comparison to earth resistance measurements, magnetic gradiometry has a greater potential to detect previously unknown house sites and other features at Knocknashee. Even though the very weak contrasts generated within both these datasets pose a hindrance to effective prospection strategies, it is anticipated that further survey work of this type may significantly increase the number of structures and structural elements known at the site and, as with the area already surveyed in this manner, hint at more than one phase of occupation activity.

The complexity of the structures, and the emerging evidence for multi-phase occupation at Knocknashee, make it imperative that an excavation is conducted to try and understand the relative sequence and absolute dating of the site. Obtaining scientific dating evidence from stratified contexts relating to both the roundhouse occupation and the perimeter bank is of paramount importance for a better understanding of the prehistoric occupation, as is a better definition of activity zones at the site. A trench targeting house sites 18, 19 and 20 would be able to unravel the stratigraphic relationships between the houses and other structural elements and obtain evidence, either artefacts or materials suitable for radiocarbon dating, to establish an absolute chronology of the site. Also a trench targeting the suspected rampart around the site could help determine the nature and date of the enclosing of the summit of the hill and establish, finally, if Knocknashee is a Bronze Age hillfort.

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Bibliography

Bergh, S.

Bonsall, J.; Gaffney, C. & Armit, I.

Bonsall, J.; Gimson, H.; Regan, D. & Hogan, C.

Carty, M.

Condit, T.; Gibbons, M. & Timoney, M.

Egan, U.; Byrne, E. & Sleeman, M.

Ginn, V.

Ginn, V. & Rathbone, S. (eds)

Grogan, E.

Herity, M.
1974 Irish Passage Graves: Neolithic tomb-builders in Ireland and Britain, 2500 B.C. Dublin, Irish University Press.


Macdonald, P.

Norman, E.R. & St Joseph, J.K.S.

Ó Maoláin, R. & McCarthy, N.

Raftery, B.

Weston, D.