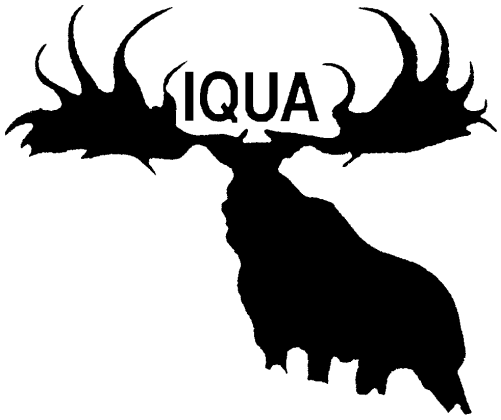

Irish Quaternary Association

Field Guide No. 28

Béara

Beara Peninsula

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PREFACE

This field guide complements the annual field meeting of the Irish Quaternary Association (IQUA), held on the Beara Peninsula, 10-12th Sept., 2010.

The fieldtrip is stimulated by the publication in 2009 of 'Local worlds: Early Settlement Landscapes and Upland Farming in south-west Ireland' by Prof. William O'Brien, UCC (and contributors). It was hoped that a fieldwork oriented guide would serve to further promote and increase awareness of the Beara landscape and the extensive and intensive work undertaken in unraveling the long-term settlement history of the peninsula, detailed in such magnificent form in 'Local Worlds'.

Sheet 84 and Sheet 71 (for Site 5 only) of the 1:50000 OSi Discovery Series are recommended for use with this field guide.

Stephen McCarron and Bettina Stefanini,
Maynooth, August 2010

INTRODUCTION

Bedrock Geology - Paul Goldsberry

Devonian and Carboniferous sedimentary lithologies

Maps produced by MacCarthy (2007) and Quin (2008) describe the broad geology of south-west Ireland, and detail the importance of the Beara Peninsula in interpreting the depostional history of the South Munster Basin. The oldest lithologies of the area include the Old Red Sandstones(ORS), locally with a green/purple colouration, of Upper Devonian age with beds striking roughly northeast-southwest. The ORS define the highest topography in the area, and form the spine of the peninsula itself, as well as Dursey Island. On the north side of the peninsula the Devonian stratigraphy is succeeded by lithologies correlatable to the Carboniferous Cork Group. Broadly speaking, the Cork Group consists mainly of marine clastics (Quin 2008; cf Goldsberry, 2008).

Igneous intrusions

At the southern most point of Black Ball head intrusive igneous dolerite lends extra height to the two hundred and four year old Signal Tower. Dolerite can also be seen at The Slath, further east along the south coast. Using evidence from the field it has been determined that these dolerites intruded before the area underwent deformation (Coe 1966).

Variscan Orogeny

Deformation in the area is due to the Variscan Orogeny, characterised by the development of tight folds orientated east-west to northeast-southwest, representing generally a north-south compression. This is reflected on Beara, as the spine of the peninsula, the Caha Mountains is created by a large, tightly folded antiform. The deformation was so intense that a pervasive cleavage has developed, destroying sedimentary structures across the area.

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Quaternary Geology - Stephen McCarron

No recent studies concentrate solely on evidence of Quaternary glacial events on the Beara Peninsula. Synge's early mapping (in the 1960s and 70s) proposed the presence of an ice cap margin that traversed the tip of the peninsula during the last glaciation (Late Devensian/Late Weicheslian/Last Glacial Maximum [LGM]/OIS 2). He, and Irish glacial geologists since (e.g. McCabe, 2008), proposed numerous sites of corrie glaciation in the Beara and neighbouring Iveragh peninsulas and radial flows of glacial ice northwards as far as Tralee Bay and southwards as far as the Celtic Sea from a 'local Ice Cap' centred on the uplands of Kerry. Rae and Harrison (2002) reviewed published accounts of local ice flow vectors associated with this concept, and sketch out a centre of ice dispersal on the southern flanks of the Iveragh Peninsula immediately south west of Kenmare, with some radial ice flows from this centre moving eastwards and inland across north-eastern parts of the Beara peninsula. Greenwood and Clark (2009) used published maps and satellite imagery of streamlined landforms (drumlins) located along the northern flank of the Beara Peninsula and at the head of Bantry Bay to propose two valley-parallel seaward 'flow stages' along the topographic lows of the Kenmare River and Bantry Bay (*fs*56 and *fs*58 respectively). Lacking chronological constraint in their models, for simplicity (*sic*) they assign the flows to the 'max. or deglacial' (Greenwood and Clark, 2009 (p 3113). These streamlining flows are not linked to outflows from an ice cap centred on the Iveragh Peninsula, rather the ice flow vectors are associated with a south-westwards extending lobe of the last British-Irish Ice Sheet. According to the ice sheet reconstructions published, the lobe's ice divide ran subparallel to the long-axis of the Beara peninsula.

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McCabe, A. M. (2008). Glacial Geology and Geomorphology: The Landscapes of Ireland. Edinburgh, Dunedin.

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Settlement History - William O'Brien

Early Human Settlement in the Beara Peninsula

With its high mountains and indented coastline the Beara Peninsula is a very distinctive physical environment for human settlement, both today and in earlier times. The mountainous interior has a major influence on the location and dispersal of settlement. The mountains are penetrated by deep valleys, which have provided sheltered environments for small-scale farming over time. The lowlying coastal margins have been the focus for settlement since the prehistoric period. Any constraints on farming are compensated for by the maritime setting, with numerous sheltered bays and offshore islands providing access to fishing grounds. This diversity of subsistence opportunities, as well as access to mineral deposits, notably copper, made Beara an attractive location for human settlement at different times.

This said, the earliest evidence of a human presence in the Beara Peninsula is quite late, only extending back some 5000 years. There has also been considerable attrition of archaeological sites in the more densely settled parts of Beara, particularly in the agricultural lowland along the coastal margins. Against this, there is remarkable preservation of archaeological landscapes beneath blanket bog growth in the hill valleys and uplands of Beara, where individual monuments may be viewed within contemporary settlement contexts.

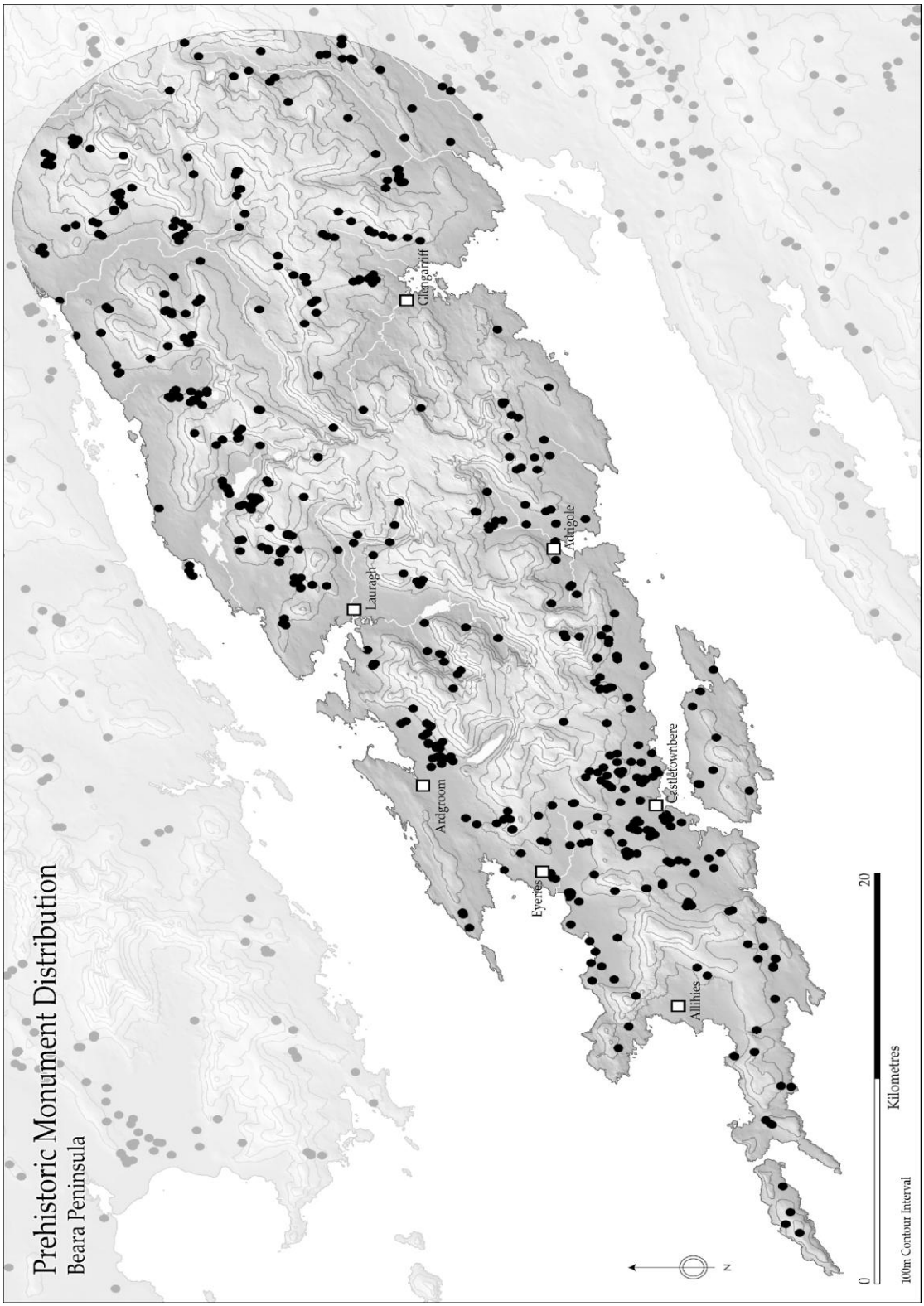

Fig. 1 Map of recorded prehistoric monuments in the Beara Peninsula. Includes distribution of wedge tombs, stone circles, stone rows, stone pairs, single standing stones, boulder-burials, radial stone cairns, Mount Gabriel-type copper mines, rock art and *fulachtaí fia.*

The earliest human arrivals to the peninsula may date to the gradual colonization of Ireland by Mesolithic peoples in the early post-Glacial period. Mesolithic settlement probably extended into the southwestern peninsulas, where the coastal environment would have provided important subsistence opportunities. This is borne out by discoveries at Ferriter's Cove in the Dingle Peninsula of Co. Kerry, which have identified a late Mesolithic coastal settlement dating 4600–3800 BC. With its rich marine resources, Beara would have been no less attractive for early forager settlement, however to date no Mesolithic sites have been found in the peninsula.

The centuries around 4000 BC saw the rapid introduction of farming and the Neolithic way of life into many parts of Ireland. While recent infrastructural projects have led to numerous discoveries of Neolithic house sites in Ireland, there is only sparse evidence of settlement during this period in Cork and Kerry. One explanation is that the region experienced a delayed Neolithicization, possibly because marine resources represented a more attractive subsistence option in coastal areas. A small number of megalithic tombs, of probable Early-to-Middle Neolithic date, are known the south-west region. The fact that these are mostly found in coastal areas may indicate early unsuccessful attempts at small-scale agricultural settlement. The only example in the Beara Peninsula may be a large stone cairn at Derreenacarrin, located west of Glengarriff. This unexcavated mound may house a passage tomb. Other evidence of early Neolithic settlement comes from pollen studies at Cashelkeelty, overlooking Kilmackillogue on the north side of the peninsula. A pre-elm decline phase of agriculture, involving both cereal cultivation and pastoralism, was dated to the mid-late fifth millennium BC. Any early agriculture phase, if substantiated, appears to have been short-lived, as the pollen record indicates the regeneration of woodland and the abandonment of farming in that area by the later fourth millennium BC.Farming was gradually adopted across the south-west region, including Beara from around 2500 BC onwards. With few known settlements, the evidence for spreading agricultural settlement across the south-west region during the final Neolithic/Early Bronze Age (*c*.2500–1500 BC) must be inferred from the distribution of the ritual monuments associated with these farmers. The wedge tombs built across Cork and Kerry at this time reflect widespread adoption of farming and population growth in the region. As many as 26 wedge-tombs have been identified in the Beara Peninsula, mostly found on hillsides in the hinterland of sheltered harbours on both sides of the peninsula.

Fig. 2 Kilmackowen wedge tomb, Beara, Co. Cork. An ancient field wall is built against the tomb.

In the later Bronze Age there was a gradual reduction in tree cover across the peninsula, with pollen records pointing to an increased area of land under cultivation and pasture, with the gradual emergence of an organised farmscape of field systems in areas of suitable soils. There are numerous hut sites and enclosures that may date to this period, however no Bronze Age houses have been identified in the peninsula prior to the current project. It is possible that Bronze Age people lived in rather ephemeral settlements, consisting of small groups of huts surrounded by fenced or ditched enclosures to protect themselves and their livestock. While these Bronze Age settlements are not easily identified, their existence may be inferred from the large number of *fulachtai fia sites* in the peninsula broadly dating from this period. These are generally visible as low mounds of burnt stone and charcoal. Excavation generally reveals a wood-lined trough, where water was boiled through the immersion of hot stones from an adjacent hearth, probably for cooking purposes.

The expansion of settlement across Cork and Kerry after 1500 BC is also manifested by the appearance of new types of ritual monument, different in form to the earlier wedge tombs, but retaining elements of the older religious beliefs. These include two types of stone circle, as well as stone rows and pairs, single standing stones, boulder-burials and radial-stone cairns. These 'stone circle complex' monuments combined rites of cremation burial with new rituals centred on the worship of heavenly bodies. There are numerous examples of such sites in the Beara Peninsula, including many found within early field patterns close to settlement enclosures. Their distribution suggests that there were significant concentrations of Bronze Age settlement in the coastal lowlands around Castletownbere, in the hinterlands of the natural harbours of Adrigole, Glengarriff, Ardgroom and Kilmackillogue, as well as in the deeper mountain valleys on the north-east side of the peninsula.

Fig. 3 Derrenataggart West stone circle, Beara, Co. Cork.

The Late Bronze Age in Ireland (1300–700 BC) was a time of great social change with the emergence of strong regional powers whose territories centred on large hillfort enclosures, mostly located in rich agricultural lands. The building of these strongholds, and the production of large amounts of bronze weaponry and gold, indicate that this was a period of great wealth, but also considerable political instability and endemic warfare. No hillforts have been identified in Beara, and this, together with the absence of goldwork and other prestige objects, suggests that the region was somewhat peripheral to the core settlement territories of the Late Bronze Age in south-west Ireland.

The spread of a Celtic culture and language to Ireland during the later first millennium BC took place at a time of considerable political instability in Ireland. Some believe that this was due to pressures on food supply, which began early in the first millennium BC when climate deterioration led to problems with soil fertility and caused the abandonment of agricultural upland. This is the conventional explanation for the preservation of Bronze Age settlement landscapes under blanket bog in areas like the Beara Peninsula.

The first contacts between Late Bronze Age Ireland and the iron-using world of the continental Celts were established in the centuries after 700 BC. Little is known about Beara in this period or, for that matter, the wider Cork/Kerry region. In fact, no Iron Age settlements were known in the peninsula prior to this project, apart from a small shell midden excavated at Monteensudder, near Glengarriff.

Medieval Beara

The prehistoric period in the Beara peninsula ends with the introduction of Christianity from the fifth century AD onwards, bringing with it a distinctive range of religious artifacts, sites and monuments. Early church sites have been identified at Caheravart and at Kilcatherine at the western end of the peninsula, and at Kilcaskan. Like Christianity, the discovery of four ogham stones in the peninsula is also part of a wider pattern of contact between south-west Ireland and the Roman world in the period *c*.300–600 AD. The Beara oghams include an inscription on what may be a Bronze Age monolith at Ballycrovane near Eyeries, as well as examples at Barrees Gour and Kilcaskan.

Fig. 4 Ballycrovane standing stone, Beara, Co. Cork.

In the centuries that followed there was also a significant expansion of agricultural settlement across the peninsula. Some 75 circular ringfort enclosures have been identified, including both earthen raths and stone-built cashels, many with underground souterrains. These farm settlements are mostly located in coastal lowland areas (30–100m OD) with better agricultural soils. There were also sporadic contacts with Viking maurauders at various times during the ninth and tenth centuries, with the possibility of small Norse settlements on Bere Island and Dursey Island.

Further reading:

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Late medieval/early modern

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Bronze Age Copper Mining in the Beara Peninsula - William O'Brien

The Bronze Age in Ireland spanned the period from the earliest introduction of copper and gold metalworking (copper and gold) around 2400 BC, which was followed 300-400 years later by the widespread adoption of tin-bronze to make work tools and weapons. Several thousand of copper, bronze and gold objects are known from this period of Irish prehistory. This includes the discovery of bronze axes and weapons at several locations in the Beara Peninsula. The Bronze Age ended with the development of ironworking after 500 BC.

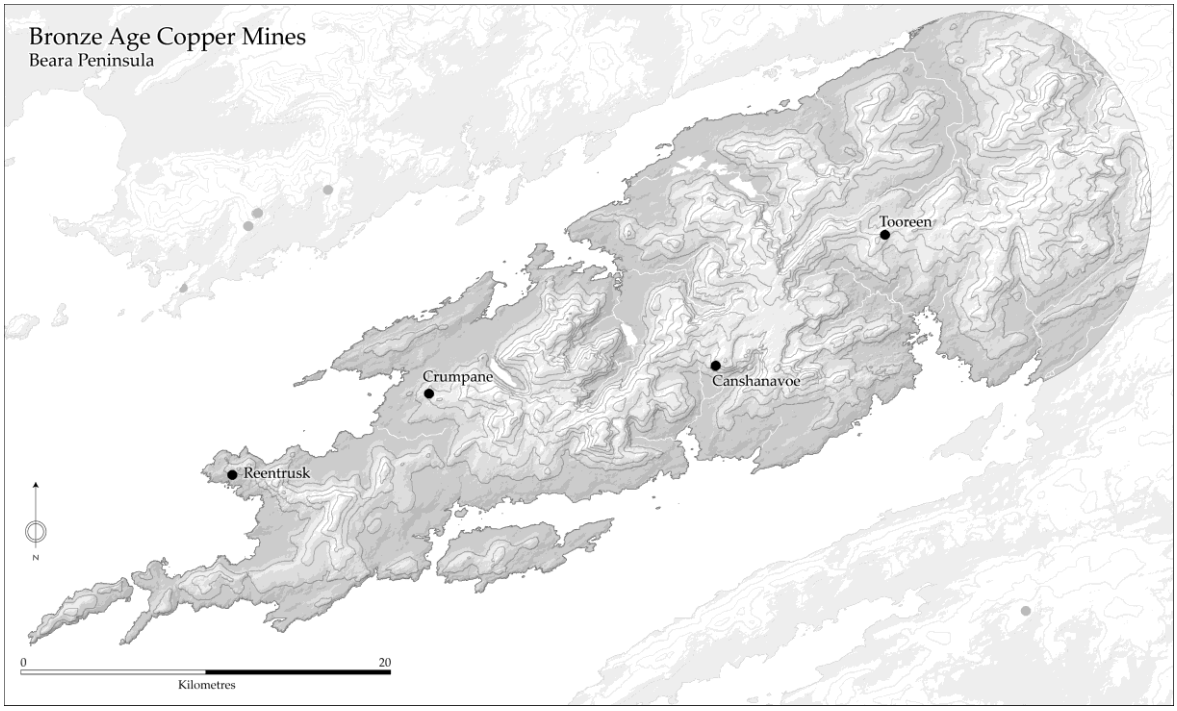

Fig. 1 Bronze Age copper mines in the Beara Peninsula.

Metal made an important contribution to almost every aspect of Bronze Age life, from art to warfare, to agriculture and crafts. The new technology opened up a range of new fabrication possibilities which Bronze Age metalworkers were quick to exploit. The supply of metal to regions lacking local sources laid the basis for trade contacts in a range of commodities. This had important social and economic implications for those groups who controlled copper mines and metal supply.

Bronze Age Mines in Cork and Kerry

Ireland was a prolific centre of Bronze Age metallurgy, partly linked to the working of copper mines in the Cork-Kerry region. The discovery of a rich copper mine at Ross Island,

Killarney, supplied almost all off the copper used in Ireland from 2400-1900 BC. The decline of this mine saw the emergence of other copper mines in Ireland, the best known being a series of small operations scattered through the peninsulas of west Cork. These are called Mount Gabriel-type copper mines, after a mountain near Schull in the Mizen Peninsula where some 32 individual workings have been found dating to 1700–1400 BC. These mines are located on surface exposures of sedimentary copper-beds. Similar workings are known from four locations in the Beara Peninsula, namely at Crumpane to the north-east of Eyeries, at Canshanavoe in the mountains above Adrigole, at Tooreen in the hills overlooking Glengarriff and, finally, at Reentrusk in Allihies parish. The Crumpane and Canshanavoe mines are also radiocarbon dated to the period 1700–1400 BC, confirming that the mining of surface copper-beds was widespread across the west Cork peninsulas in this period.

There is no evidence that the Allihies copper deposits were mined in the Bronze Age. This may be because any early workings were destroyed by the industrial operations of the nineteenth century. Another explanation is that many of the inland copper veins at Alllihies were too deep to be mined by Bronze Age techniques. The Dooneen lode on the coast, with its colourful copper staining, could certainly have been mined in that period, however any trace of early workings there may have been removed by coastal erosion.

Bronze Age Mining

These early mines in Beara provide an important insight into the search for copper in the Bronze Age. The early prospectors searched areas of suitable geology in the mountains and along the coastline, looking for rock outcrops streaked with the bright green and blue colours of oxidized copper ores. They were able to extract this mineralisation to a depth of around twelve metres, using inclined tunnels that followed the bedding of the sedimentary rock. They moved from one copper-bed exposure to the next, with the mining effort at each location determined by the richness of the metal ores present and the available labour in what were probably seasonal operations.

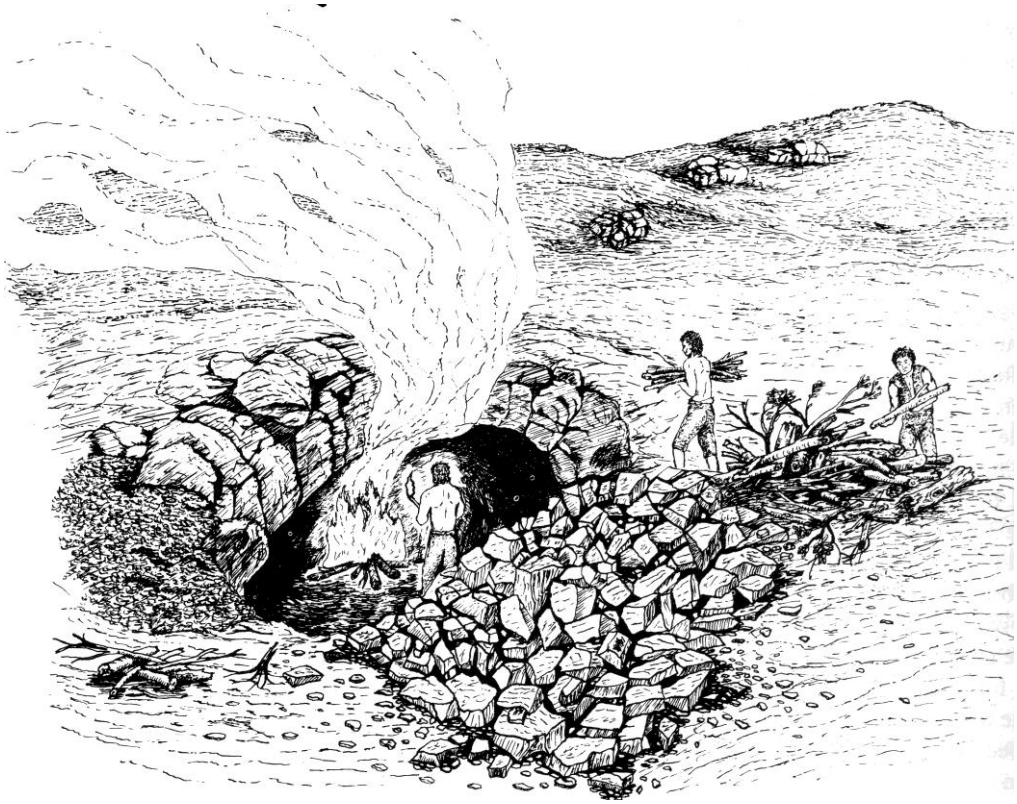

Fig. 2 Reconstruction of a Mount Gabriel-type mine, similar to those found in the Beara Peninsula.

Bronze Age copper mines are usually marked by an economy of effort, where only those rock types that actually contained ore minerals were extracted. This mining involved the use of fire in combination with stone hammers, bone and wooden tools. Fire-setting involved the burning of wood-fuelled fires against the mine face causing it to weaken, a heat-fracturing effect that was sometimes increased by water quenching. Rock was then removed by pounding the heat-shattered face with stone hammers, used either hafted or hand-held. The miners also used pick-like implements and fingers to prise out rock along fracture planes. Pointed wooden sticks used for this purpose have been discovered on Mount Gabriel, while there is some evidence for the use of antler picks at Ross Island. Metal mining tools do not appear to have been used in Bronze Age mining in Ireland.

Broken rock extract and charcoal residues from these Bronze Age mines was generally removed to the surface for sorting, using shovels and containers of some kind. The use of wooden shovels has been confirmed on Mount Gabriel, while Ross Island has produced evidence for the use of cattle shoulder-blade bones as scoops. While many Bronze Age

copper mines were surface operations, some deeper workings required the use of wooden ladders or ropes. Torches were also necessary in these mines, as seen by the discovery of numerous charred splints of pine at Mount Gabriel. To limit water seepage into open workings, the miners may have confined their operations to the summer months, though the seasonality of Bronze Age copper mining is poorly understood.

Once mineralised rock was extracted, Bronze Age miners were faced with removing the barren rock matrix around these copper minerals. The aim here was to prepare an ore concentrate that could then be reduced to metal by smelting. There is evidence of a multi-stage approach, beginning with the crushing of rock extract that was already highly broken by fire-setting extraction. This rock was further broken using stone hammers and anvil stones, and possible washed prior to the hand-sorting of visibly mineralised fragments. Today, this activity is marked by the presence of low mounds of crushed rock spoil rich in charcoal and broken stone hammers near the mine entrances.

Once an ore concentrate was produced the next stage was to reduce these copper minerals to metal by the process of smelting in furnaces. The identification of Bronze Age smelting sites is a particular problem, due to their low archaeological visibility and the fact that copper minerals may occasionally have been removed from the mine for smelting at another location. At present, Ross Island is the only early copper mine that has produced evidence of smelting, in the form of simple pit furnaces fuelled with charcoal.

Further reading:

O'Brien, W. 1996. *Bronze Age Copper Mining in Britain and Ireland*. Shire Publications, Buckinghamshire.

Field Excursions

Site 1 Ardgroom –Nick Hogan

Introduction

This article is intended as a short introduction to an intriguing archaeological landscape near Ardgroom (Dhá Dhrom) on the northern side of the Beara Peninsula, Co. Cork. A recent study of this landscape was undertaken as part of the *Marginal Landscapes Project*. This project was established with the aim of looking at the socio-economic development of upland environments over time, in terms of changing settlement patterns and subsistence strategies. The Beara peninsula was chosen for the study due, primarily, to the remarkable levels of archaeological preservation in evidence throughout its upland regions, many of which are covered by large tracts of blanket bog. The land-block at Ardgroom was one of three study areas selected for detailed recording and analysis. The other two areas are at Barrees, located 2km south-west of Ardgroom, and at Cloontreem, an upland valley which overlooks Castletownbere a further 2.5km to the south (Fig. 1). For more detailed information on all aspects of the project, reference can be made to O'Brien (2009).

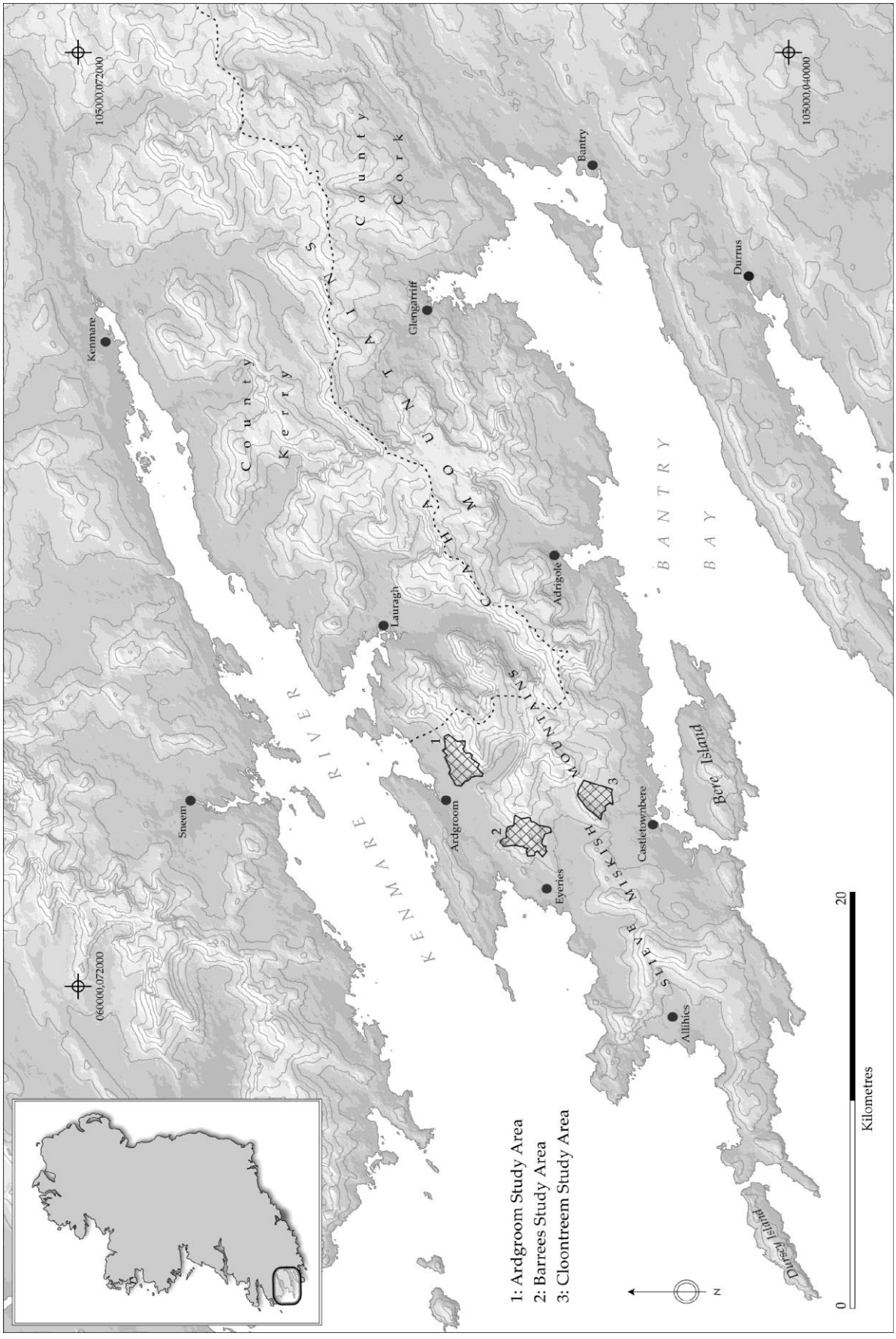

Fig.1 Location of the Ardgroom, Barrees and Cloontreem study areas.

The Ardgroom Shelf

The study area at Ardgroom is situated amidst a spectacular natural landscape, straddling the upper part of a broad coastal shelf (30–330m OD) that lies below a prominent mountain ridge to the south and the rocky coastline of Ardgroom Harbour to the north (Pl. 1).

Pl.1 The Ardgroom shelf, looking east/north-east from top of Skelligín.

It is located in the large townland of Ardgroom Outward and stretches some 2.4km east–west from an unnamed stream, 0.5km west of the Cork/Kerry border, toward Glenbeg Lough and the Ownagappul River. The southern limits follow a general line where grass and scree-covered slopes give way to more widespread rock outcrop in the upper slopes, while the area's northern limits coincide with where the gently sloping ground of the coastal shelf begins a steeper ascent into the mountains. This is also the point where intensively used agricultural land enclosed in an elaborate patchwork of small fields, gives way to large tracts of unenclosed ground used primarily for open-grazing.

At present, some of the 232-hectare survey area is enclosed and privately owned, but the majority (*c.*80%) is open commonage (Fig. 2). Agricultural activity is confined to sheep and cattle grazing on this commonage, with more intensive grazing occurring in the two strips of enclosed modern fields that extend into the study area from the north. The soil throughout is of a 'hill and mountain' type (after Conry and Ryan 1963), where pockets of peaty podzols spread across a terrain of blanket bog with variable bedrock and scree exposure. Natural drainage of the area occurs through a network of permanent streams, with numerous others appearing and quickly disappearing following periods of rainfall. Man-made channels have also been dug in some areas to enhance drainage. Access to wild food sources is limited in today's mostly open landscape, but with higher levels of

afforestation in late prehistoric times this would not always have been the case. Glenbeg Lough and the Ownagappul River, providing lacustrine and riverine resources, would have been important places in the landscape. Similarly, Ardgroom Harbour would have given access to an abundance of coastal resources and transport routes via Kenmare Bay. The landscape at Ardgroom can be considered a deeply inscribed cultural palimpsest. It is one of some 200 known locations on the Beara peninsula where old stone walls are preserved under blanket peat. This ancient 'farmscape' is also home to numerous Bronze Age monuments, including standing stones, cairns, *fulachtaí fia*, boulder-burials, and the well-known Ardgroom stone circle (Fig. 2). The presence of ancient enclosures, ringfort settlements, hut-sites and old field walls, combined with more recent traces of human activity, point to a long history of settlement in this landscape stretching from late prehistory to the present day. Many of these archaeological features are partly or entirely covered by spreading blanket bog, and some have been exposed as a result of turf-cutting in recent centuries. The peat cover, combined with low-intensity modern farming and a deeply-seated respect amongst many locals here for their natural and cultural heritage contributes to excellent preservation of archaeological remains in this landscape. Indeed, the wealth of archaeological monuments in the study area has long been recognized and numerous antiquarian accounts and published references bear testament to this (e.g. Crawford 1905, Barber 1973, Ó Nualláin 1984, O'Dwyer 1977, O'Brien 1991, Burl 2000).

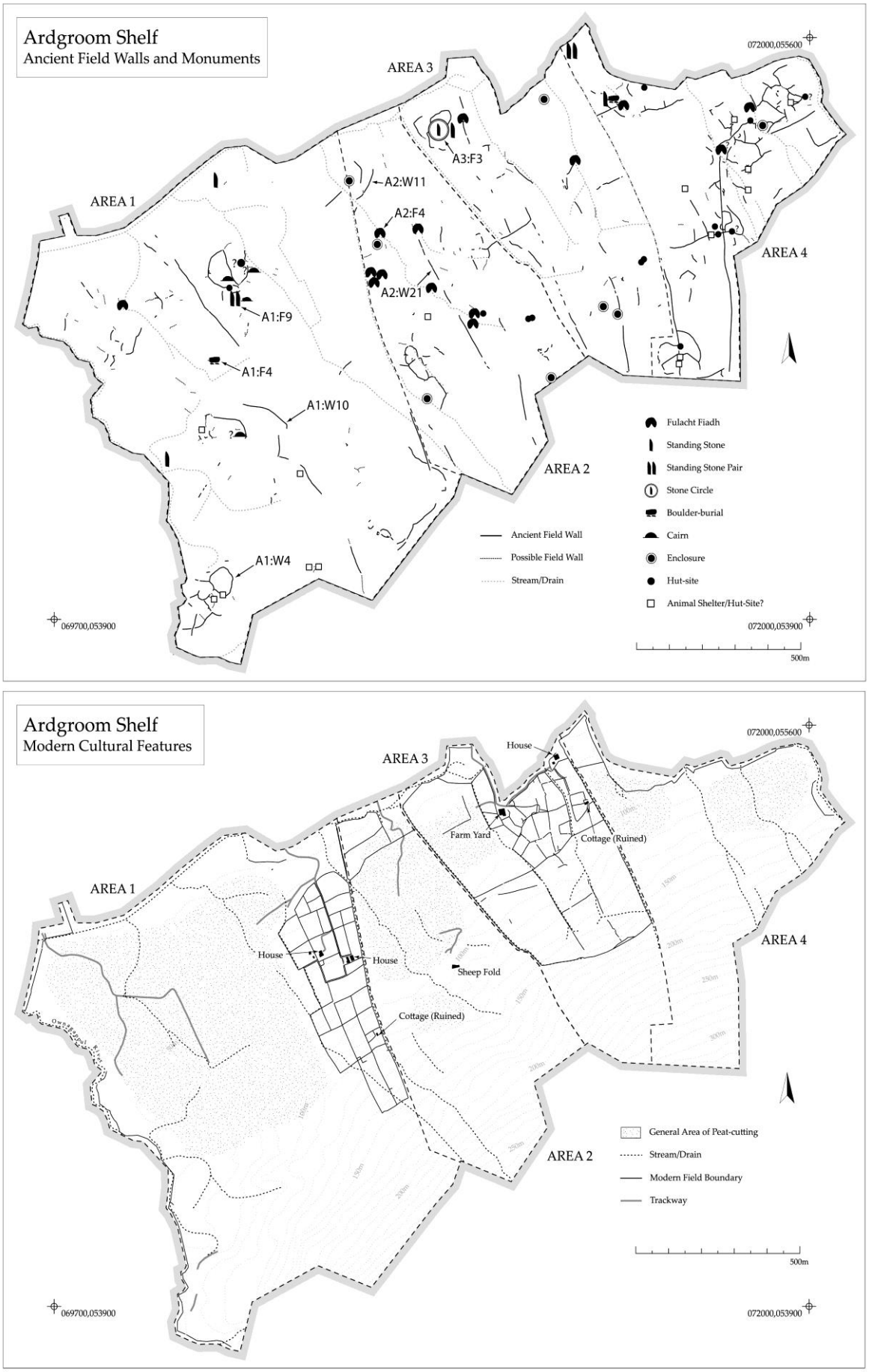

Fig 2. Detail of Ardgroom Shelf features, Monuments and Modern Culture.

During the fieldwork process, it became apparent that attempting a distinction between 'ancient' and 'modern' cultural features was crucial to facilitate some understanding of an overall landscape chronology. Certain archaeological features in the area like the stone circle, the ringfort, and the boulder-burials are broadly dateable based on existing archaeological evidence, but the dating of certain other features has proven more problematic. Foremost among these are the large numbers of anomalous stone enclosures/structures and extensive spreads of old field walls found at all elevations throughout the study area. In order to maintain some degree of objectivity in the absence of confirmed scientific dating, it was decided that all man-made objects pre-dating Ordnance Survey mapping in the 1830's would be considered as 'ancient'. Of course, this does not remove the right for informed interpretation and certain factors like wall typologies and evidence from recent excavations and palaeoecological research at nearby Cashelkeelty (Lynch 1981), Barrees and Cloontreem (O'Brien 2009, Overland & O'Connell 2009) can play important roles when considering outline chronologies for the Ardgroom land-block.

Overview of Results

A total of eighty-three cultural features have been identified and recorded in the study area. These features range from *fulachtaí fia* and boulder-burials, to animal enclosures and modern houses. During the course of the survey *c.*12,410m of ancient walls and *c.*15,020m of modern walls were also mapped (Fig. 2).

The area's surviving monuments confirm human activity stretching back at least some 3,000 years. There are no known monuments to indicate Mesolithic or earlier Neolithic settlement area, though wedge tombs at nearby Bofickil and Cloontreem do suggest people were moving in this landscape during the final Neolithic and early Bronze Age. The impressive number of Bronze Age monuments including a multiple-stone circle, five single standing stones, two stone pairs, two boulder-burials, five cairns and thirteen confirmed *fulachtaí fia* demonstrates that this was a period of significant ritual activity in the Ardgroom area. With the exception of a number of *fulachtaí fia*, all of these monuments are found at lower elevations and tend to cluster. This has lead to the identification of three distinct Bronze Age 'ritual centres on the lower slopes of Tooreennmna Mountain. It is also possible that a number of pre-bog field walls and anomalous stone enclosures found in the vicinity of these monuments themselves date to this period. If this was the case, it would suggest there were important early agricultural dimensions to this landscape.

The subsequent Iron Age, noted for its low levels of surface expression, may also have been a significant period in the development of the landscape at Ardgroom. Excavated evidence from the neighbouring Barrees valley has identified a number of field patterns and associated settlement sites dating to the final centuries BC and the early centuries AD. Many of these field walls and enclosures share close morphological similarities with those found at Ardgroom, raising the strong possibility that the landscape was intensively utilised for settlement and agriculture during this period.

The remains of a cashel, a ringfort and a possible souterrain within the study area offer evidence of continued settlement through the medieval period. This is mirrored in the wider environs with ringorts at Liosnagat, to the north of the study area, and at Dromard, a large fort prominently positioned overlooking Ardgroom Harbour. At nearby Barrees, recent excavation has dated the construction of a number of field walls and associated enclosures to the early and high medieval periods, and it is quite possible that a number of those at Ardgroom sharing similar traits are contemporary.

A collection of ruined cottages and stone structures indicate that post-medieval settlement within the study area was focussed in the two strips of enclosed modern fields, with the surrounding commonage employed as open grazing grounds. Contemporary records indicate a number of families living here around the time of the famine, and local sources suggest that up to thirteen families may once have shared a small cluster of fields in the easternmost of the two strips. Since the Ordnance Survey's mapping of the area in 1842, little has changed in the overall structure of the landscape. Some internal reorganisation of the enclosed fields has occurred, in addition to the construction of modern drains and the renovation of a number of post-medieval dwellings.

Conclusion

Set against a striking natural backdrop where the towering slopes of the Caha Mountains unroll to meet the rocky shoreline of Kenmare Bay, the study area at Ardgroom is home to a remarkable cultural landscape whose surviving relics hint at a story spanning some three or four millennia. A combination of blanket peat coverage and low-intensity modern agricultural practices has contributed to excellent levels of archaeological preservation here. The earliest signs of human activity stretch back to the Bronze Age when a number of monuments of the 'stone circle complex' were constructed, confirming the area as having imbued a significant ritual importance during this period. Settlement in the medieval period is represented by monuments including a ringfort and a cashel and evidence of later

settlement during the post-medieval period can be found in contemporary map and documentary sources, supported on the ground by clusters of stone cottages and associated structures. Perhaps the most notable feature of the Ardgroom landscape is the density of ancient field walls that bisect its expanse of open ground. Many of these stone walls are wholly or partially buried beneath a deep blanket peat cover that is typical of this region's upland environments. With the absence of scientific dating evidence from the area at present, it is impossible to ascertain an exact chronology for the development of these walls. It is possible, however, to consider the notion that some of the earliest fields at Ardgroom may in fact date to the time of the Bronze Age monument builders, and evidence from recent scientific studies at nearby Barrees goes some way toward supporting this. This evidence also supports the likelihood of the Ardgroom landscape having witnessed significant phases of pastoral and arable farming throughout the Iron Age and Medieval periods. Undoubtedly, though, a future programme of targeted archaeological excavation and palaeoecological investigations would be the best means of addressing some of the outstanding questions concerning past human settlement on this coastal shelf.

The study area at Ardgroom is indeed an extraordinary landscape, with examples of excellent archaeological preservation visible at every turn. What is truly extraordinary, though, is that this landscape is not unique in Beara, but just one of many rich and ancient cultural tapestries spanning the entire length of this remarkable peninsula.

Selected catalogue entries from O'Brien (2009)

Key: 'A'=Study subarea; W= Wall, F=Feature; IG = 12 Figure Grid Ref of site

A1:W4

Large stones and boulders set both upright and horizontally; smaller stones placed horizontally and domino construction in between. Partially covered by peat growth. Height is 0.40m and 0.72m wide.

A1:W10

Domino-stone construction with vertical spacer stones and large stones set on edge. Upper portion of wall well preserved; extent of lower portion masked by deep blanket bog. Height is 0.74m and 0.86m wide.

A1:F4; IG (070179, 054625)

Boulder-burial on relatively dry ground on the lower northern slopes (60m OD) of Tooreennamna Mountain. Boulder has an irregular shape, lying length-ways on four support stones with the addition of an inserted thin stone fragment in one case. It slopes

gently to north-west. Boulder measures 1.4m (N–S) by 1.45m and is 0.28–0.39m deep. Top of boulder is 0.49m above ground level on the north-east side and 0.38m on the west. Standing stone A1:F1 and stone pair A1:F9 are visible from the boulder-burial.

A1:F9; IG (070262, 054836)

Standing stone pair on grassy mound (59m OD) in the northern foothills of Tooreennamna Mountain. One stone remains upright and one has fallen and is lying flat. The upright stone is rectangular and measures 1.45m high and 0.76–0.83m wide. Its long axis is aligned north north-east/south south-west. Five support stones are visible around the base. A quartz boulder abuts the east-facing side (0.60m N–S by 0.58m). The fallen stone's long axis is aligned north-east/south-west. It is 3.50m long, 1.10m wide at the base and 1.08m wide at the top. A number of support stones are visible where the base once stood. Cairn A1:F10 is 10m to east. Standing stone A1:F1 is visible from here.

A2:W11

Rubble construction with occasional vertically set stones surviving as wide bank with stone exposed throughout. Runs north, terminating close to a modern field boundary. Exposed by peat cutting in area with extensive scree. Height is 0.45m and width is 1.55m.

A2:W21

A combination of domino-stone construction and stones set lengthways on edge. Cut by modern trackway at northern end. Probable continuation of A2:W5 and A2:W20. Height is 0.45m and 0.55m wide.

A2:F4; IG (070674, 054894)

Fulacht fiadh on gently sloping ground on lower slopes (77m OD) of Tooreennamna Mountain. Low rise U-shaped mound with visible heat-shattered stones and charcoal enriched sediment. Possible trough on west north-west side. Mound measures 4.90m (N–S) by 7.10m and is 0.25m high. Possible trough is 2.30m wide at opening.

A3:F3; IG (070866, 055322)

Multiple stone circle in Canfea at the foot (58m OD) of Tooreennamna Mountain. Nine stones remain standing out of the original eleven; the tenth stone has fallen while the eleventh stone is no longer at the site. Ó Nualláin (1984a) recorded a 0.25m deep socket which he believes held the eleventh stone. Four boulders lie in the circles interior. The area enclosed measures 7.20m (N–S) by 6.20m. The stones range in height from 1.10–2.06m and in width from 0.39–0.87m. The stone circle is situated on the perimeter of a circular field (see A3:W16, A3:W20 below). The proximity of standing stone A3:F4 (below) has

led O'Brien (1970) to compare it to Kilmackowen where a standing stone (site 51) and a wedge tomb (site 52) are closely positioned. The site is depicted on OS six inch first and second edition maps as 'Stone Circle'.

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Site 2 Palaeoecological investigations at Barrees - Anette Overland

Overview

The paleoecological investigations at Barrees were, first and foremost, undertaken to provide an environmental context for archaeological survey and excavation in the under-explored and mainly upland landscape that lies between Ardgroom and Castletownbare on the Beara peninsula, Co. Cork (Fig. 1), the results of which have recently been published (O'Brien, 2009; Overland and O'Connell, 2008, 2009). The study area harbours a variety of archaeological features including a Bronze Age copper mine, *fulachta fiadh*, hut sites and enclosures of various sizes, as well as a network of ancient stone walls, many of which are partially obscured by shallow peat (details in O'Brien 2009). A particular focus of the investigations was to establish a chronology for these stone walls, the environmental context in which they were built, and especially the land-use patterns associated with their construction and use.

The landscape under investigation is characterized by skeletal soils and peaty podzols derived from the nutrient-poor sandstones and overlying drift, which support mainly rough pastures, heaths and peatlands (Conry and Ryan, 1963). Present-day farming is concentrated in the lowlands where remnants of Atlantic oak woodlands (Blechno-Quercetum petraeae scapanietosum) survive, i.e. the typical fern and bryophyte-rich sessile oak woodlands on acidic soils of western Ireland and Britain (Kelly, 1981; Cross, 2006). *Ulex europaeus* forms a band of open shrubby vegetation *c.* 10–20 m wide uphill from the open woodland. Above this, there are rough pastures, wet heath and blanket bog. Cultivation ridges, which were widely used in western Ireland for potatoes and also oats and rye, indicate arable farming in the recent past. Though arable farming has now ceased, the uplands still serve as outfields for sheep-grazing and thus contribute significantly to the local farming economy. Landscapes such as that at Barrees also make important contributions to the overall cultural heritage of Europe (Overland and O'Connell in Krzywinski *et al*., 2009).

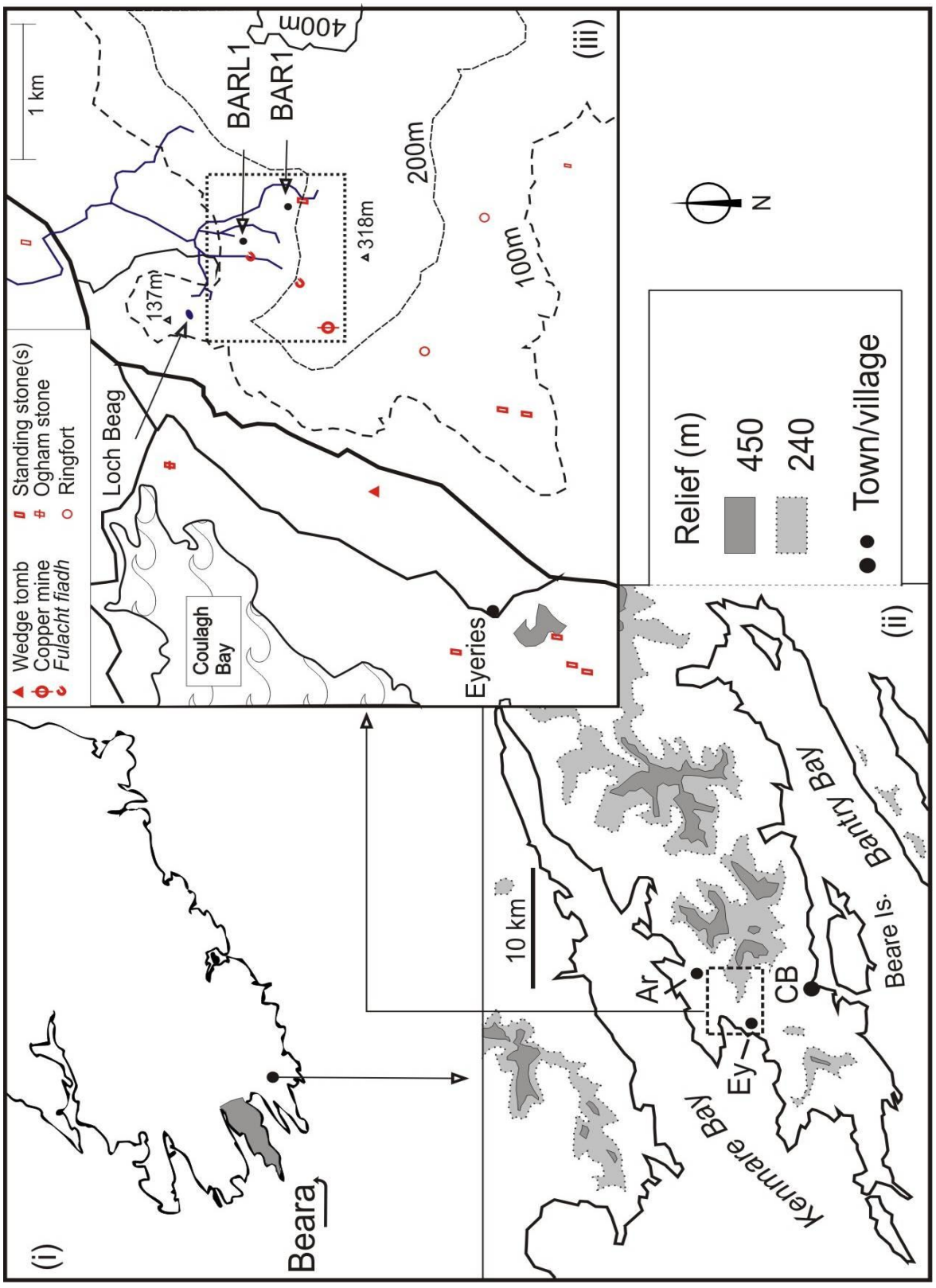


Figure 1. Maps at various scales showing location and main features of the study area. (i) Map of southern Ireland. The Beara peninsula is shaded; (ii) Detail of south-western Ireland centred on the Beara peninsula. The town Castletown Bere (CB), and the villages Ardgroom (Ar) and Eyeries (Ey), and relief are shown; (iii) The study area and immediate surrounds. Roads, contours, the main archaeological field monuments and the village of Eyeries are shown. Arrows points to the lake Loch Beag, where lake profile BEG1 was taken, and peat profiles BAR1 and BARL-1.

Detailed pollen analytical and macrofossil analyses, and radiocarbon dating have been carried out on several short peat monoliths dug out from trenches during excavation of stone walls in Barrees, and on a peat core and a lake core from small basins, the results of which have been published in Overland and O'Connell, 2008, 2009 (also see Overland 2007). These papers provide a detailed account of site descriptions, fieldwork, methods and results, while here only a selection of the palaeoecological results is presented (Figs 2-5). Radiocarbon dates (see Overland 2007; Overland and O'Connell, 2008, 2009) and interpolations between these, provide chronologies for the Figures, and calibrated ages AD/BC are used in both text and Figures.

Stone wall sections

A schematic representation of the stone walls and sampling strategy of the short peat monoliths, with a brief interpretation of the landscape development at each site, is presented in Fig. 2. The BAR1 monolith gives the most detailed record of vegetation and environmental change of all the five peat monoliths that were investigated, in that it spans the longest time period, and also includes pollen samples from pre-wall contexts (Fig. 2).

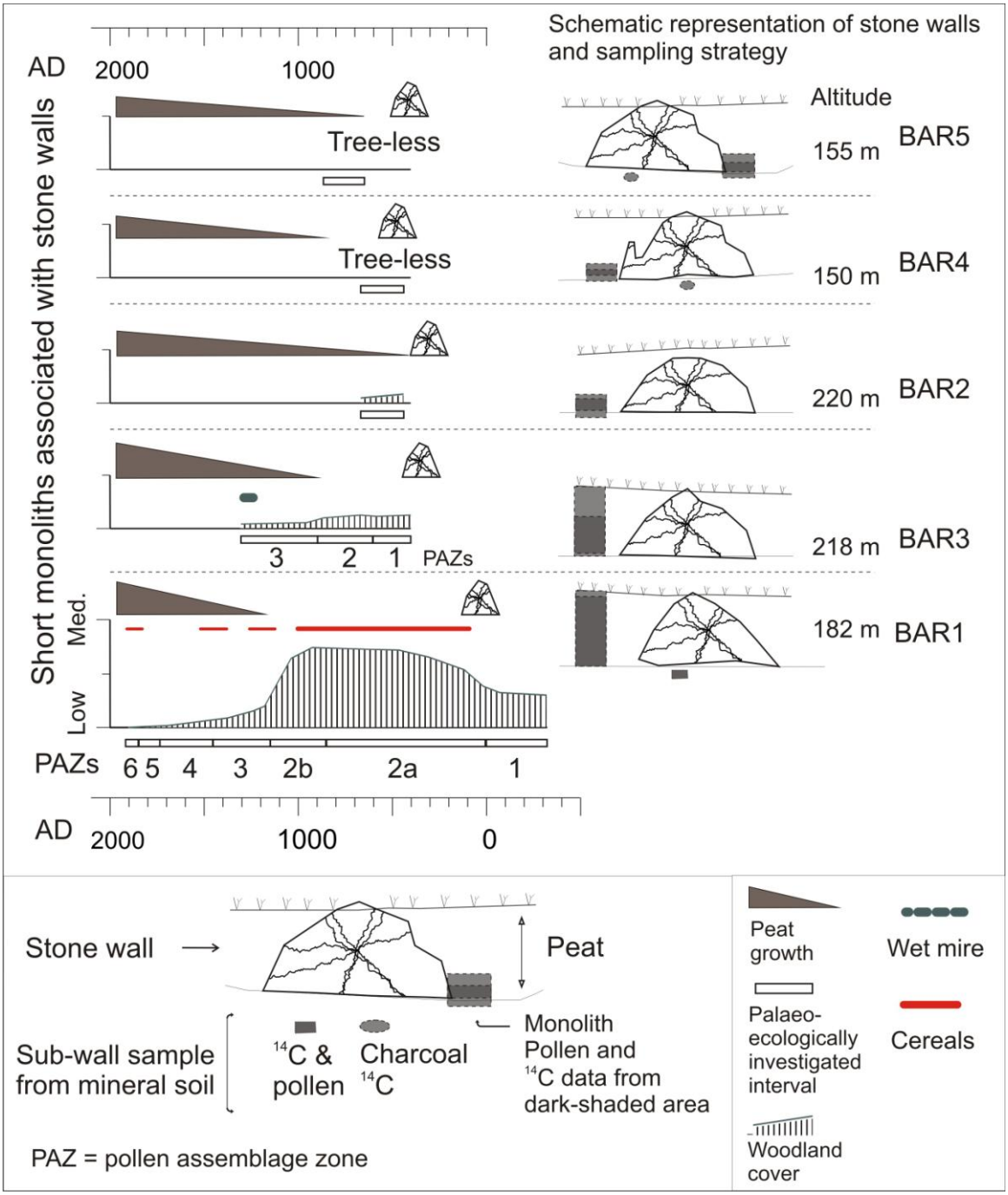


Figure 2. Schematic representation of investigated stone wall sections and palaeoecological sampling strategy, including a summary of landscape development in Barrees.

This wall section was built in around AD 1, while the other four investigated wall sections was built in the period AD 200–600. The monolith BAR1 was taken from the most prominent field wall enclosure in the Barrees valley, and is presented with some detail:

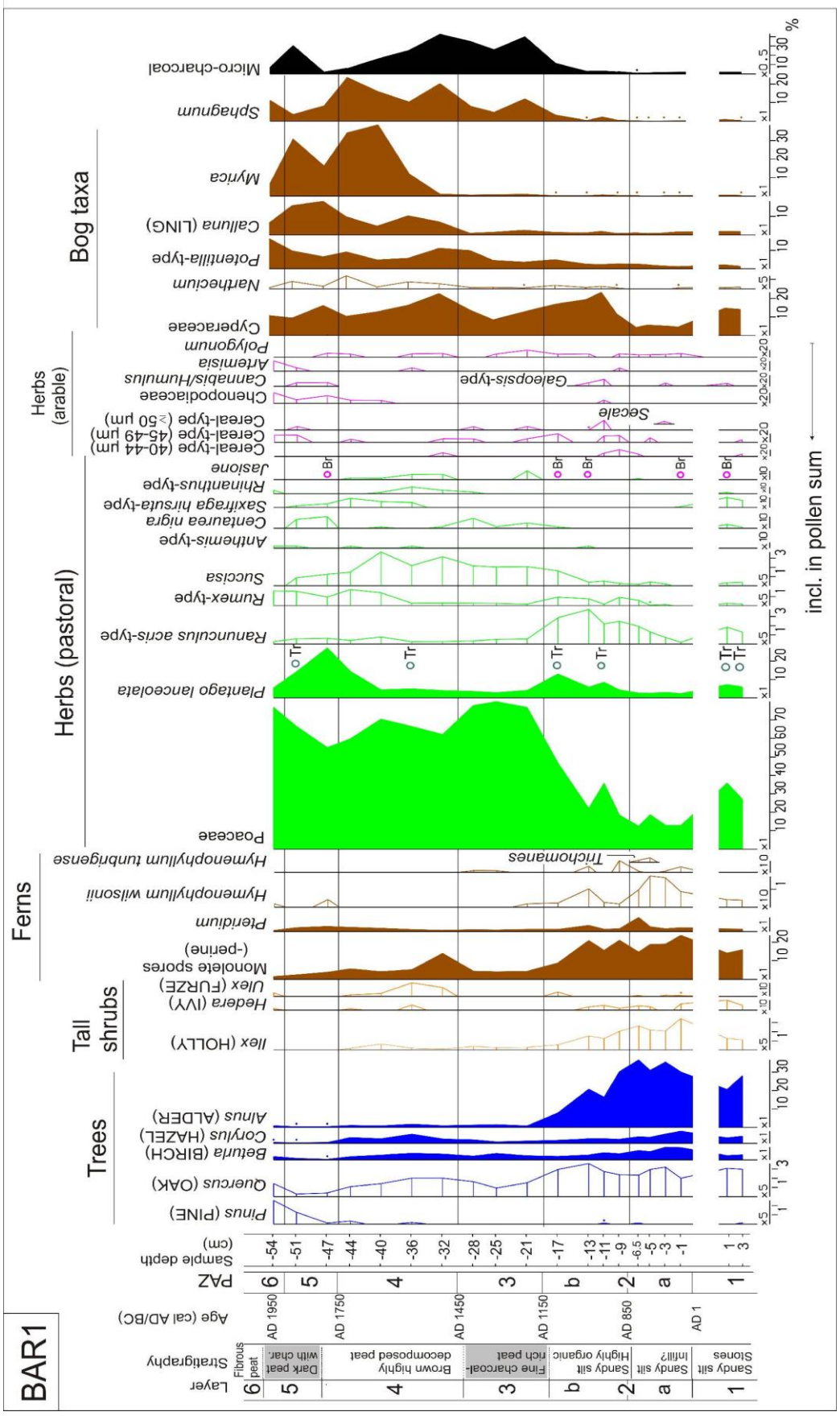
BAR1 (51°42'25.2"N, 9°55'03.2"W, alt: 182 m)

Introduction

The pre-wall pollen spectra (PAZ1; 1 and 3 cm; end of 1st millennium BC) are from the mineral soil that was sealed as a result of wall construction (Fig. 3).

They reflect vegetation and land use locally in the years (possibly decades) prior to wall construction. Rather species-rich grassland dominated in which grasses, *Plantago lanceolata* and other herbs played an important role. Alder was common in the vicinity of the site, and oak, hazel, birch and holly were probably also common in the immediate vicinity. In general the landscape was relatively open, but trees and especially alder were common, and there was little or no bog/heath development.

Figure 3. Percentage pollen diagram from peat profile BAR1. The pollen data are expressed as percentages based on a total terrestrial pollen sum (TTP). Bog taxa, *Sphagnum* and charcoal were excluded from the pollen sum, and were calculated relative to TTP and the sum of taxa pertaining to the component in question. The depth relate to cm over (negative values) or below (positive values) mineral ground. Abbr: Tr, *Trifolium repens*; Br, Brassicaceae pp. (values <1% and mainly <0.2%).


BAR1
Layer
Stratigraphy
Age (cal AD/BC)
PAZ
Sample depth (cm)
Ferns
Trees
Tall shrubs
Herbs (pastoral)
Herbs (arable)
Bog taxa
Pinus (PINE)
Quercus (OAK)
Betula (BIRCH)
Corylus (HAZEL)
Alnus (ALDER)
Ilex (HOLLY)
Hedera (IVY)
Ulex (FURZE)
Monolete spores (-perine)
Pteridium
Hymenophyllum wilsonii
Hymenophyllum tunbrigense
Trichomanes
Poaceae
Plantago lanceolata
Ranunculus acris-type
Rumex-type
Succisa
Anthemis-type
Centaurea nigra
Saxifraga hirsuta-type
Rhinanthus-type
Jasione
Cereal-type (40-44 µm)
Cereal-type (45-49 µm)
Cereal-type (≥50 µm)
Secale
Chenopodiaceae
Cannabis/Humulus
Artemisia
Polygonum
Galeopsis-type
Cyperaceae
Narthecium
Potentilla-type
Calluna (LING)
Myrica
Sphagnum
Micro-charcoal
Sandy silt Stones
Sandy silt Infill?
Highly organic rich peat
Fine charcoal-rich peat
Brown highly decomposed peat
Dark peat with char.
Fibrous peat
AD 1950
AD 1750
AD 1450
AD 1150
AD 850
AD 1
incl. in pollen sum
%

Pollen Zones

PAZ2; -1 to -17 cm (*c.* AD 1–1150) is subdivided into subzones PAZ2a (-1 to -6.5 cm) and PAZ2b (-9 to -17 cm). It is assumed that layer 2a began to form shortly after wall construction in the early centuries AD, and layer 2b formed prior to local peat initiation. PAZ2a (*c.* AD 1–850) is rather similar to the pre-wall mineral soil spectra. *Alnus*, however, is more strongly represented, and *P. lanceolata* and especially Poaceae have lower values. Occasional cereal-type pollen were recorded including a *Secale*-type pollen at -3 cm (Fig. 3). Vegetation and land use were broadly similar to that which pertained before wall construction. Grasslands, however, were not as important as before, there was cereal growing (but minimal), and rather species-rich, alder-dominated woodlands. PAZ2b (*c.* AD 850–1150) suggests replacement of alder-dominated woody vegetation by grassland. A high diversity of herbs (see Overland and O'Connell 2008, 2009) suggests species-rich grasslands that presumably served as pasture. Cereal-type pollen achieve their highest representation in the profile (max. 0.5% in -11 cm) and there are also records for plants associated with disturbed ground, trampling and arable farming (cf. *Galeopsis*-type, Brassicaceae and *Polygonum*). This suggests disturbance, including arable farming, at or in the general vicinity of the site. The high Cyperaceae representation suggests wet, sedge-rich grasslands. An increase in *Sphagnum* suggests local initiation of bog in the early 2nd millennium AD.

PAZ3; -21 to -28 cm (*c.* AD 1150–1450) relates to layer 3, i.e. the dark, charcoal-rich layer that formed the basal peaty deposits. The zone is dominated by Poaceae, tree-values are very low, and there is an increase in *Sphagnum* and *Potentilla*-type (presumably *P. erecta*, a species of acid soils and tolerant of burning). Micro-charcoal representation is high. These features suggest a period of intensive land-use with grass-dominated vegetation on shallow peaty soils, in which acidophiles such as *Succisa* were well represented. The evidence for cereal cultivation is weaker than in PAZ2b.

PAZ4; -32 to -44 cm (*c.* AD 1450–1750) show an increase in bog/heath taxa such as *Calluna* and *Myrica*. *Ulex* is recorded throughout and is best represented in the two lowermost spectra (Fig. 3). The decline in grazing pressure at the beginning of the zone may have favoured the spread of furze, which is common at local and regional levels today.

PAZ5 and 6; -47 to -54 cm (*c.* AD 1750–mid 1900). The secondary rise in *Pinus*, reflecting pine planting in the wider region, is recorded at -51 cm, while other AP curves are at their lowest for the profile. The peak in *P. lanceolata* at the base of the zone suggests that plantain grew locally, presumably in a grassland context, and in considerable abundance. Ericoids (*Calluna*) were important at least locally. Cereal-type pollen are few but, on the other hand, pollen of arable weeds and disturbed habitats achieve highest representation (though still modest; Fig. 3). In the uppermost spectrum Poaceae increase, and *P. lanceolata* declines further, which probably reflects changes in vegetation as the farming population and activity decline from the second half of the nineteenth century onwards.

Peat core BAR-L1: (51°42'30.4"N, 9°55'10.6"W, alt: 140 m).

The basin where peat core BAR-L1 was taken is small (*c.* 40 m diameter) and the pollen record is mainly local in character. Fig. 4 show a composite pollen diagram from the basin that span the late Neolithic (c. 2500 BC) to *c.* AD 1800, and provides a record of local landscape development at an elevation somewhat lower than the investigated stone-wall sections (Fig. 1). At this elevation pine became locally extinct at about 2300 BC (Overland and O'Connell, 2008, 2009). Subsequently, alder dominated locally until the mid-Bronze Age (1400 BC). During mid and late-Bronze Age (zone 3) the values of trees are greatly reduced (mainly due to much lower *Alnus* representation) but oscillate considerably, and the herb-values are generally high. This most likely reflects variations in intensity of local farming activity. Substantial human activity is recorded in Barrees valley during the Bronze Age (O'Brien 2009), associated with local copper mining and settlement. At the start of the Iron Age until the early medieval (zone 4; *c.* 400 BC–AD 700) there is increased representation of trees, probably in the context of reduced local human activity, while from the early medieval onwards the upland landscape became more or less treeless (also see Fig. 2). Another notable feature of the early medieval period (zone 5) is the increased representation of bog taxa, such as Cyperaceae, Ericoids and *Myrica* (Fig. 4). The so-called secondary rise in *Pinus* can be registered from *c.* AD 1700–1850 (Overland and O'Connell, 2008, 2009).

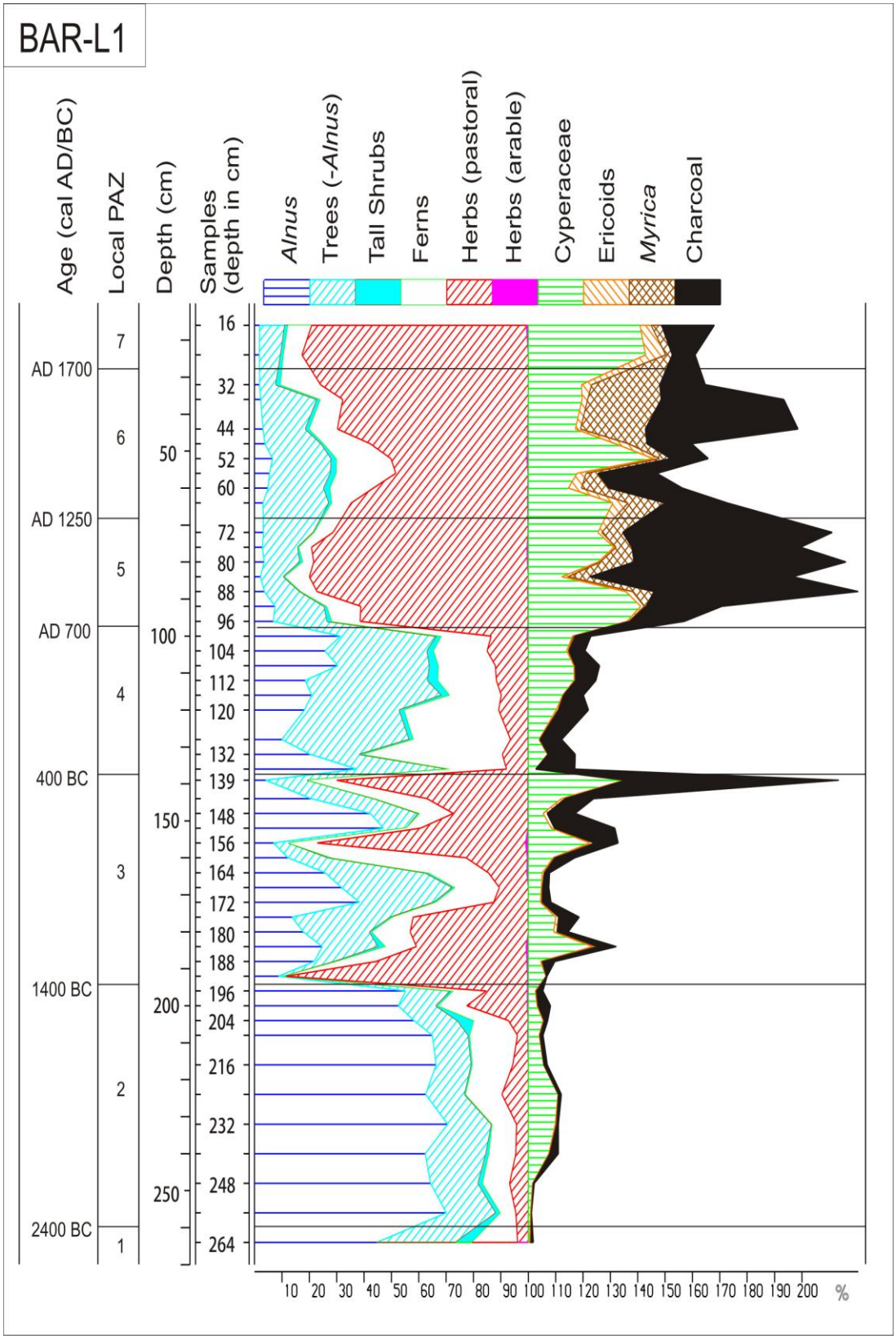


Figure 4. Composite percentage pollen diagram from BAR-L1 from the peat basin. The pollen data are calculated as for BAR1. The depths relate to cm below peat surface at the time of fieldwork.

Lake Cores

Loch Beag: (core BEG1, 51°42'4.3"N, 9°55'32.5"W, alt: 103 m).

Loch Beag is a small lake situated in the lowlands of Barrees where present-day farming is concentrated (Fig. 1). The open body of water is *c*. 50×30 m, whereas the former lake, including filled-in marginal parts, measures *c*. 100×80 m. The catchment is small and consists mainly of the elevated ground and flat bog-filled area to the south-east of the lake. Species like *Erica tetralix, Hylomocomium palustre, Menyanthes trifoliata, Myrica gale, Narthecium ossifragum, Rhynchospora alba*, and several *Sphagnum* species, were frequent about the lake. The surrounding areas were partly rough pastures, where *Juncus effusus, J. acutiflorus, J. articulatus* and *J. squarrosus* were common, and partly drained reclaimed pastures.

The full pollen diagram from this lake is available in Overland (2007), while a general picture of openness of vegetation and landscape development for most of the post-glacial period is provided by a composite pollen diagram (Fig. 5). Pine was overwhelmingly dominant for much of the early post-glacial, and declines from the Neolithic onwards (also see Bradshaw and Browne, 1987; Bradshaw, 1993; Mighall *et al.*, 2004). The Neolithic period (*c*. 3700–2500 BC) is associated with high tree values, and very low, if any, human impact. During the early and mid Bronze Age (*c.* 2500–1400 BC) trees dominate, but there is substantial opening up of the landscape, especially in the later Bronze Age (1400–450 BC). This is mainly as a result of local pastoral farming that included an arable component, but expansion of bog also contributed to increased openness of the landscape. A sharp increase in micro-charcoal suggests increased use of firing during the Bronze Age. The lake is situated rather distant from the nearest Bronze Age copper mine (approximately 1 km to the south; Fig. 1) and so it is unlikely that fires associated with this or other prehistoric mines in the wider region are reflected in the lake. The micro-charcoal is more likely associated with local farming and settlement. Human activity is somewhat reduced in the vicinity of the lake at the end of the Iron Age and the beginning of the medieval period (*c.* AD 200–700), while intensive human activity associated with the historical period began to register at *c.* AD 700 with a reduction in trees and increase in pastoral indicators and micro-charcoal.

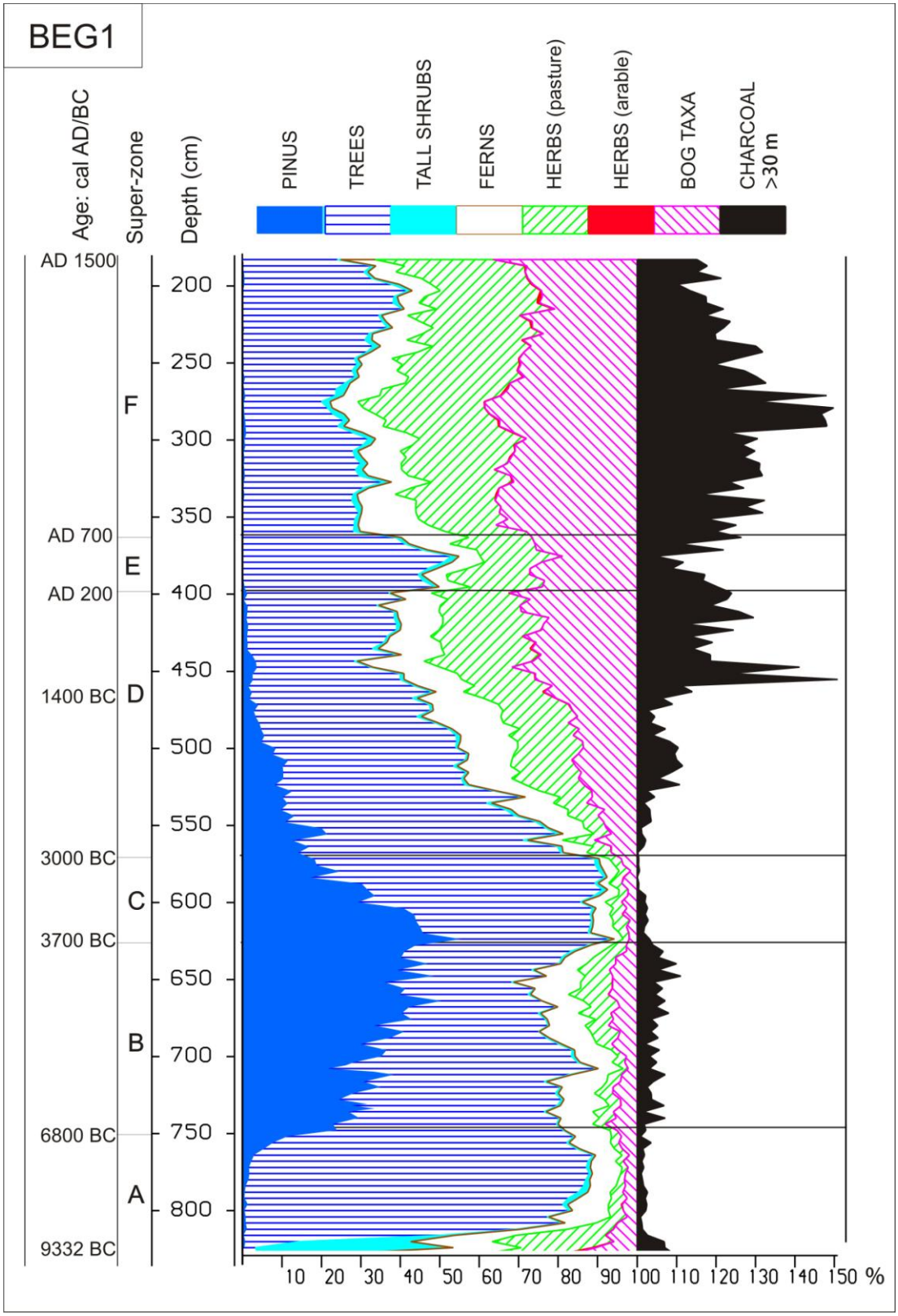


Figure 5. Composite percentage pollen diagram from lake profile BEG1. Bog taxa are included in the pollen sum, together with trees, tall shrubs, ferns, and herbs. The depths relate to cm below water surface at the time of fieldwork.

Summary

The Barrees uplands show a long history of human influence. Some of the earliest evidence relates to copper mining in the mid-Bronze Age (1600 BC), and a pair of standing stones and two *fulachta fiadh*, which also relate to the Bronze Age. While significant opening-up of the landscape began relatively early in the Bronze Age (between *c*. 2400–2100 BC), the main woodland clearances took place in the later Bronze Age (beginning *c*. 1400 BC and continuing into the Iron Age, i.e., to c. 400 BC). In the mid- and later Iron Age, there was considerable fine-scale spatial variation, with activity being concentrated mainly in the uplands (at *c*. 200 m asl) and at lower elevations. Radiocarbon dating and pollen evidence show that the linear stone-wall system was laid out towards the end of the Iron Age (*c*. AD 400) in the context of a largely open landscape. While the initial foci of bog growth appear to relate to the late Neolithic/beginning of the Bronze Age, widespread development of blanket bog was essentially a phenomenon of the late 1st/early 2nd millennium AD. The final demise of upland woody vegetation dates to the early medieval period (AD 700).

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Site 3 DURSEY - Penelope Durell

Introduction

Off the extreme southwest tip of the Beara peninsula lies County Cork's most westerly island, treeless and exposed to the Atlantic. With the outlying Bull, Cow, and Calf Rocks Dursey, or *Oileán Baoi*, forms the tail end of the Slieve Miskish range. Only a narrow channel separates Dursey from the mainland but very strong currents

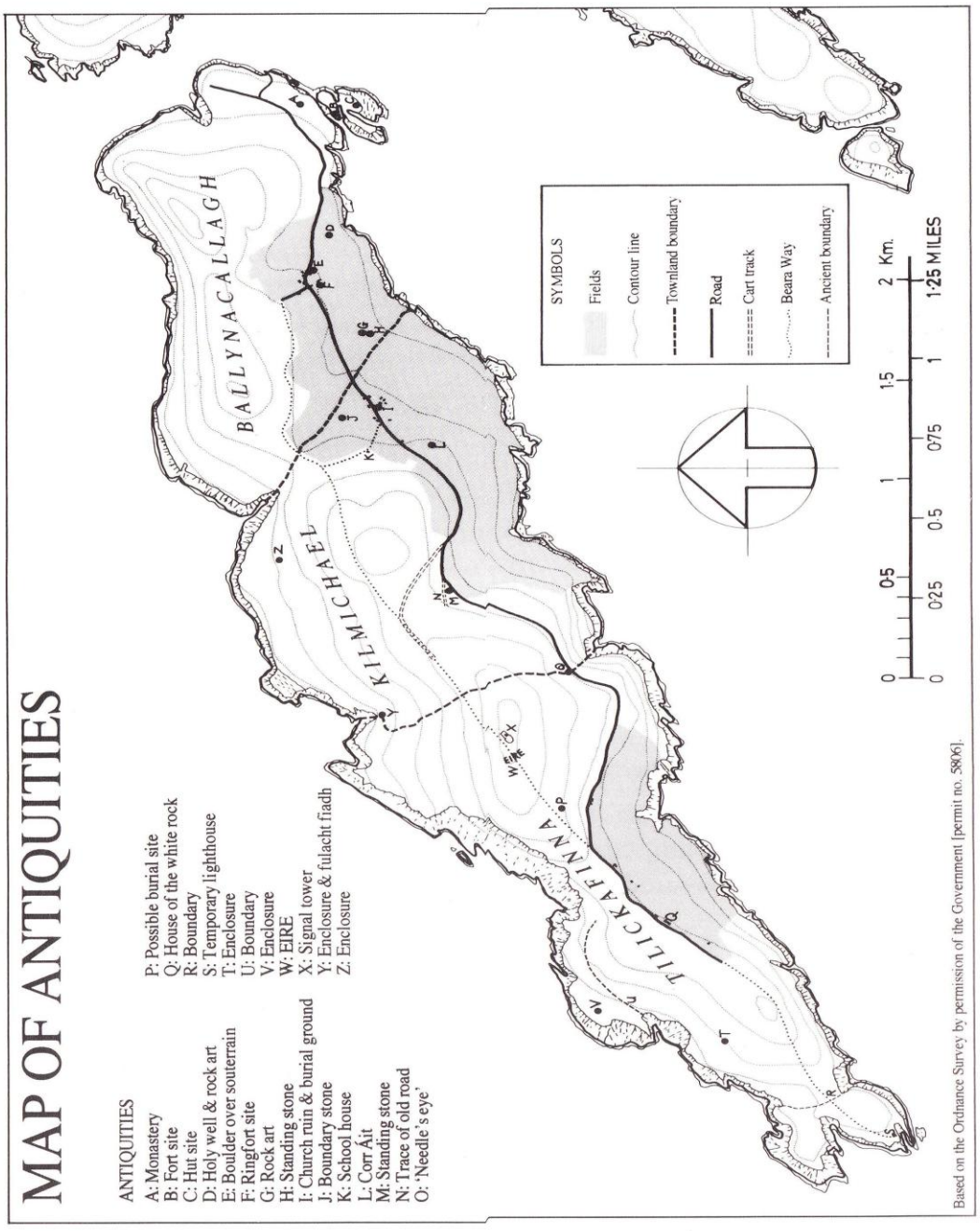

Fig1. Map of Dursey Antiquities

surge through it and in rough weather crossing by small craft would be perilous. In the past the islanders could be cut off for days or even weeks on end. This aspect of its geography has been a key factor in shaping the island's history. Dursey is c. 6.4 km long and c. 2.4km wide, formed by a line of low hills (highest point 252m) with the land sloping down to the sea on either side to the north and south. The habited and cultivated area is on the lower part of the south side, while the upper ground and north side are commonage for rough grazing and turfcutting. This island of c. 567 hectares contains 3 townlands, each with its own small cluster of houses: Ballynacallagh *Baile an Chalaidh* 'townland of the landing-place or ferry', Kilmichael *Cill Mhícíl* 'church of St Michael' and Tilickafinna *Tigh Lice Finne* 'house of the white rock' where the few houses are more spaced apart. The State Papers for 1497 include two references to Dursey: 'in the isle of Dorsey, a silver mine', and 'Dorsay' is listed as one of seven havens in O'Sullivan country. Before the 17th century many foreign fishing vessels, especially from Spain, frequented these waters. The 1841 census records 358 inhabitants and 58 dwellings. Fish had always been the islanders' main food source, so during the Famine they fared better than mainlanders who were dependent on the potato. However, throughout the rest of the 19th century economic factors caused a gradual population decline with many islanders emigrating, and by 1901 the inhabitants numbered 200. In 2010 residents are down to single figures. A unique feature here is the cable car, inaugurated in 1969, which connects the island to the mainland over the 225m channel.

Names and Mytholgy

One of its names from ancient times was *Inis Baoi*, from the goddess Baoi or *Cailleach Bhéarra*, the Hag of Beara, as this island was considered to be her residence. Another old name was *Inis Tarbhna* 'bull island', and Dursey derives from the Norse equivalent, *Thjor Sey*. 'Dorrosey' first appears on a map from 1339 and in variant forms on at least 19 more maps up to 1609. The townland Tilickafinna owes its name to a large white rock incorporated in the gable of an old dwelling, now a farm shed, but still inhabited in the 19th century. The name was first recorded in a will of 1612, so this building or part of it is at least four centuries old **[site Q]**. Dursey and the rocks are associated with various myths and legends, including the story of Corc Duibhne, legendary ancestry of a Dingle peninsula sept. Here his foster parents would wash him daily on the back of their white red-eared cow. After a year the sin of his

incestuous birth was transferred to this animal, which sprang into the sea and became the Cow Rock. Another version has a bull leaping into the water followed by a cow and calf and the three turned into the eponymous rocks. The Bull Rock was identified with the gateway to the underworld and inhabited by Donn, a deity personifying death, hence its name *Tigh Doinn* 'house of Donn'. Here also was the burial place of the drowned Milesian Donn.

North Side Prehistoric Sites

The uninhabited north side slopes facing the Skellig, Bull and Cow Rocks bear testimony to extensive prehistoric land use, with several relict field boundaries revealed by turf cutting, enclosures, hut sites and a *fulacht fiadh*. Within the townland of Kilmichael in an area called *Drom Rua* is *Clochán Uí Chrónacháin*, set in cutaway bog **[site Z]**. The dimensions of this collapsed drystone enclosure are 12m by 11m. Later the east and west sides were adapted to create raised turf-drying beds. Coincidentally this area is the setting for a folktale about a man who discovers a magic treasure, only to lose it soon afterwards. This enclosure is an area of ancient field boundaries that follow a NW to SE direction for about 170m from the cliff top up along the hillside. On the lower slopes of *Cnoc Mór* near *Faill Bólais* lies a network of old stone field boundaries c. 60m N-S; 70m E-W. Here an incomplete subcircular enclosure 8m in diameter is delimited by radially set stones. Next to it is a turf stand, which appears to have been made with stones from the enclosure. About 50m east of the enclosure dark charcoal-enriched soil and fragments of heat-shattered stones form a crescent-shaped mound: a *fulacht fiadh* near a stream **[site Y]**. These sites border the townland boundary between Kilmichael and Tilickafinna. Ancient field lines are also visible further west on the lower slopes of the hill beyond the Tilickafinna townland boundary. The line of an old stone boundary begins at the cliff edge at *Faill Ath-Fhearnáin* and extends upwards along the hillside in a NE direction for over 400m **[site U].** Between this boundary and the sea is a roughly D-shaped area (38m NW-SW), with the straight side at SW (L 40m) **[site V]**. The collapsed remains show that it was once a substantial drystone wall of 1m thickness and 0.5m height. This site is partly on sloping ground that levels out closer to the sea. In one corner of the enclosure on the level ground there is an oval hut site (5.5m NW-SE; 4m NE-SW) built mainly from large stones. According to island tradition, this enclosure is known

as The School and is believed to have had a connection with Skellig Michael monks. From the west side of the enclosure a stone field boundary curves for about 160m to the edge of the cliff. A D-shaped enclosure overlooking the Bull and Cow Rocks is located on a level part of the slope above the area known as *Cúl Cathairín* 'back or area of the little ringfort'. The curved part is an earthen bank up to 1.5m wide with upright stones (H 0.8m) protruding intermittently. The back or straight side of the enclosure to the SE is 37m in length, formed by the rock outcrop of the hillside that rises behind it. Here inside the enclosure is a rectangular hut site (3.1m by 2m) formed by an earthen bank and the outcropping rock of the SE side. Contiguous upright stones (H 0.4m) protrude at intervals along the bank **[site T]**.

South Side Prehistoric Sites

The house cluster of Ballynacallagh has several prehistoric traces within or close to it. In 1919 workmen shifted a large boulder on the left side of the road through the village and discovered a souterrain with several chambers; inside there were limpet and periwinkle shells, also soot on the ceilings. Earth has collapsed into it since then **[site E]**. About 50m beyond it a field called *cathair*, suggesting the presence of a ringfort, has a high encircling wall within it **[site F]**. The field down the slope before the house cluster is called *Gort na Tiobraid*, named for a holy well. Its pool is created by a spring rising under a large boulder and at the edge lie flat stones, one with a cupmark and another with five. The rounds were still practiced here within living memory **[site D]**. About halfway between Ballynacallagh and Kilmichael a field below the road called *Gort na Gainimhe* has a stream on its eastern boundary. Next to this stream lies a flat slab with five cupmarks **[site G]**. A few metres to the west in the same field there is a prominent standing stone of 1.8m height, orientated NNE-SSW with a recumbent stone beside it **[site H]**. Beyond Kilmichael there is a gate across the road. To the left a low stone wall (about 2.05m wide) defines a roughly circular site measuring 6.1m E-W and 5.05m N-S with a slab covering the entrance. Folklore tells of a tunnel running from its interior to *Gort an Achaidh* two fields away to the east. An elderly woman who died during the Famine was buried here. A colourful figure associated with Dursey in the mid-18th century was Morty Og O'Sullivan, smuggler and recruiter for continental armies. Some of the 'recruits' were conscripts rather than volunteers who were kept under guard in a walled enclosure known as *Corr Áit* while awaiting shipment to France. Tradition suggests that this place is the location **[site L]**.

Another standing stone, 1.05m high and orientated NW-SE, is situated in the V between the road to Tilickafinna and the former roadtrack of *Bóthair an Túir* **[site M]**. Up the steep slope to the right of the road above the first house in Tilickafinna there is a sheltered level hollow fronted by several protruding stone slabs that have fallen or are leaning haphazardly. A stream runs at one side and there are unrestricted views as far as Mizen Head. Here there is an oval hut site (widest point 3m) with an earthen bank and internal facing of stone slabs, and a few metres away a box-like structure measuring 1.6m by 0.85m and formed by six upright stones **[site P]**. The Beara Way passes above this spot and a short distance further up this path towards the signal tower there is another standing stone, 1.05m high with N-S orientation **[not on Antiquities Map]**.

The Medieval Period

According to tradition marauding Vikings brought their local captives to Dursey, which served as a holding station before these unfortunates were shipped off into slavery. It is also said that monks from Skellig Michael established a church here that was sacked by the Vikings. A papal taxation list of 1302 documents a church on Dursey. Until January 1995 when it collapsed in a storm part of the east gable of the church of St Michael still stood in the heart of Kilmichael. It contained traces of a window and part of a wall niche. The style and masonry were consistent with a building of the 13th-14th century. It is said that a bishop was buried in the southwest corner. When Carew's forces attacked Dursey in June 1602 they burnt the church, with islanders seeking sanctuary inside it **[site I]**. In 1986 Cork Archaeological Survey personnel identified a bullaun stone about 50m SW of the church. The grassy open space surrounding the church was once a burial ground. Here a series of thin upright slabs are the vestiges of stone-sided graves. Approximately 12 hectares of Kilmichael were once glebe lands of the old church and the boundaries were demarcated by four stones. Only one remains in situ, in the Field of the Stone **[site J]**. Kilmichael is the likely birthplace c. 1590 of Philip O'Sullivan whose father Diarmuid was the uncle of chieftain Donal Cam O'Sullivan Beare. The boy left his island home shortly before the tragic events of 1602 and grew up in Spain to become a renowned historian. Little is known about the exact origins of a later ecclesiastical ruin at the northeast end of the island **[site A]**. It was known as 'St Mary's Abbey' and adjoining land is called *Gort na Mhainistir*. It may have had an association with

the Franciscans. The nave measures 8.8m by 9.5m and the chancel is 5.6m by 7.5m. A masonry break reveals where the chancel was extended to the east. In the west end there is an inscribed family tomb containing descendants of the O'Sullivan Beare chieftains. Philip O'Sullivan wrote that it was built by a Spanish bishop named Bonaventure and later dismantled by pirates. It is said that Bishop Thomas O'Herlihy took refuge here in 1570 but the following year he was lured away to Kerry, captured and imprisoned in the Tower of London. The surrounding land is the island's burial ground.

Ilaunbeg

Close by lies Ilaunbeg, a small island shaped like a distorted figure of eight or a jigsaw puzzle piece. Once it was connected to Dursey by a drawbridge and is easily accessible at low tide. The inner section is *Láthair an Chasleáin* **[site B]** containing the stone-wall foundations of the fort built by Diarmuid O'Sullivan in the latter part of the 16th century. Here are the outlines of two rectangular buildings, walls 1.2m thick, within a rectangular enclosure 31m long by 23m wide. In June 1602 the fort was attacked and taken by Carew's forces, who razed it to the ground, executed the defenders and slaughtered the island population. Philip O'Sullivan in Spain no doubt received survivors' accounts and vividly describes in *The Catholic History of Ireland* the massacre and the burning of the church and houses. The outer part of Ilaunbeg is the location of a late medieval settlement cluster of seven hut sites close to the shore **[site C]**. In 2003 Dr Colin Breen from the University of Ulster led a small archaeological excavation on one of these hut sites, finding pieces of Iberian pottery and tiles. These dwellings would have been some of the houses burnt in 1602.

Signal Tower

The highest hill, *Cnoc Mór* or *Cnoc Bólais*, was the beacon hill where fires were lit to warn against pirates in the 17th century, and was almost certainly a place for ritual bonfires in ancient times. More poignantly, islanders on emigrant ships bound for America would see bonfires lit by their relatives as a last farewell as they passed by the island heading out into the Atlantic. Prominent here is a roofless rectangular tower **[site X]**, one of a chain of signal towers erected along the coast in the first decade of the 19th century following the attempted French naval invasion of Bantry Bay in 1796. The signalling system used flags and large canvas-covered balls. The team at

each tower consisted of a Navy Lieutenant, a midshipman and two men for look-out and signalling duties. The building contractor also held the contract for the Black Ball Head, Bere Island and Sheep Head towers at £910 10 shillings each. The towers were built to a standard pattern, with defensive features: two storeys over a semi-basement with a projecting gallery over the entrance and small overhanging turrets on two corners of the flat roof. The entrance was by a ladder to the first floor that could be hauled up in the event of attack. The façade was weather-slated. The external dimensions here are 6.12m E-W by 5.82m N-S, with walls more than 77cm thick. According to tradition, stone for the building was quarried at the base of the hill and carried up in baskets. Both men and women were employed at this work, earning two pence and one penny per day respectively. The outline of the wide roadway *Bóthair an Túir*, made at the time from the base of the hill towards the summit, is still visible **[site N]**.

Although this tower was scheduled for completion by 1805 the work dragged on for years, hampered by logistical difficulties, absenteeism and misappropriation of building materials. The naval men assigned to the post frequently complained about the poor living conditions. James Moriarty, the last lieutenant stationed here, was the father of a notable naval figure, Henry Augustus Moriarty (1815-1906), who was born at the tower. In 1857 and 1858 Henry navigated the *Agamemnon* in laying the first Atlantic telegraph cable. He navigated the *Great Eastern* in 1865 and 1866 when laying the second and third transatlantic cables; and, when the cable broke in mid ocean in 1865, he fixed the position so accurately that the broken end was subsequently recovered. A more modern vestige of times of war is to be found about 100m west of the tower. Here 5m-high letters forming the word EIRE and below it the numbers 32 are picked out in stone on the ground **[site W]**. Dating from 1943 this is one in a sequence of 84 markers placed on coastal points clockwise from Carlingford Lough to Malin Head. Officially this was undertaken by the Irish government to warn bomber pilots that they were now approaching neutral territory, but the truth was revealed 50 years later that it was done at the request of the American government as a guide for their pilots.

Lighthouse buildings

The Calf Rock lighthouse was established in 1869 but a ferocious storm destroyed its upper section in November 1881, leaving only the reddish stump of the tower that still

stands. The rectangular enclosure of thick high stone walls perched on Dursey's most westerly tip served to protect the wooden shelter that housed a temporary light for nearly seven years until the completion of the Bull Rock Lighthouse in 1889 **[site S]**.

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Acknowledgment

My special thanks go to Connie Murphy.

Site 4 Mining in the Allihies district – Theo Dalke

Allihies is situated at the western tip of the Beara Peninsula in South West Ireland. Reaching out into the Atlantic it is framed by the Kenmare River to the north and the Bantry Bay to the south. In 1840 Beara was described by Capt. Hall as a "wild and primitive district abounding in picturesque and romantic scenery", and it still is beautifully wild, picturesque and scenic.

The Geology:

The Slieve Miskish and the Caha Mountains form the impressive spine of the peninsula which is topped by the majestic peak of Hungry Hill (750 m). The area is underlain by slates and siltstone of late Devonian age and belong to the Upper Old Sandstone series (Frasnian Fammenian Stage; 374 to 360 mill years old). To the west the Slieve Miskish Mountains open up like an amphitheatre surrounding the coastal valley of Allihies. The remains of several disused mines are scattered along the northern slopes: The Allihies Copper Mines. During their operation between 1812 and 1882 they had turned out to be the most productive copper mines in Ireland. Several studies from 1837 to 1988 surveyed the geology and mineralisation of the valley which is geologically divided into the Ballydonegan Slate (1.5km thick) and the Allihies Sandstone (3.5km thick). They are believed to be floodplain sandstones. A major anticline is running NE-SW from the middle of the valley (Kealogue) towards Dursey Head. North of the village is a syncline striking NW- SE from Mountain Mine towards Cods Head (Hercynian deformation- Late Carboniferous).

'The complex of faults and shear zones in the area have provoked considerable discussion with regards to their relative age, mode of formation and relationship to mineralisation.'

The main ore bodies are found in hydrothermal quartz veins. The main ore is chalcopyrite ($CuFeS_2$) accompanied by pyrite (FeS_2), bornite (Cu_5FeS_4), tetrahedrite ($Cu_{12}Sb_4S_{13}$), hematite (Fe_2O_3), molybdenite (MoS_2) and chalcocite (Cu_2S). Secondary deposits are copper, iron and molybdenum carbonates, oxides and sulphides. The oxidation layers show gossanous hematite outcrops and large amounts of malachite ($Cu_2CO_3(OH)_2$) staining. Azurite ($Cu_3(CO_3)_2(OH)_2$) is present on the stope walls of the Mountain - and Duneen Mine. Yellow layers, probably some sort of

molybdate, have been observed on small veins of molybdenite. Connellite ($Cu_{19}Cl_4S0_4$ $(OH)_{32}2(H_20)$ can be found beside other secondary minerals as covelline (CuS), goethite and limonite. Various generations of quartz, carbonates, feldspar, mica, chlorite, kaolinite and occasional rutile are the fault filling gangue minerals. Of the ample carbonates occurring several generations of calcite, ferroan calcite, ferroan dolomite, ankerite and siderite are identified. Some ore samples contained low levels of silver and gold. Tin and uranium are mentioned but not well documented.

The Mining

Copper mining in Allihies can now be dated back to the Middle Bronze Age - around 1500 BC since the author discovered ancient mine workings at Reentrusk near Allihies in 2007. The Reentrusk mine can be linked to the type of West Cork mines which are best known from the Mount Gabriel (See Introduction to Guide). These mines followed outcrops of quartz veins containing rich and colourful beds of malachite - $Cu_2CO_3(OH)_2$, a vibrant green crystalline copper carbonate mineral and/or azurite – $Cu_3(CO_3)_2(OH)_2$, a blue and translucent copper mineral. Both minerals formed as secondary minerals in the oxidation layers of copper deposits. Deposits of chalcopyrite – ($CuFeS_2$), a copper iron sulphate and the main target of the 19th century mining in Allihies, were not attacked by middle Bronze Age miners on Beara. Chalcopyrite was a challenge for early metallurgists. To separate the copper from sulphur and iron a special heat treatment was needed, probably a roasting process as described 1552 by Gregorius Agricola in 'De Re Metallica'. Surprisingly this technique was known and practised 2500 BC in the copper mines of Ross Island, near Muckross in Killarney. (O'Brien, pers. comm.)

Reentrusk mine is situated at the bottom of a 6m high rock face with a vertical outcrop of quartz. The horizontal workings are 12 m wide, and open up to 1 to 1.5 m above the surface. The total depth is unknown. A small chamber working can be accessed through a short tunnel at the right end. The walls are smooth and show only little signs of second mineralisation. The bottom of the mine is filled up with rock debris. Several stone hammers are visible. The up to 3 m high spoil mount runs along the full length of the mine und covers the lower part of the workings. Rock debris,

charcoal and stone hammers are visible where the grass cover is eroded. The ruin of a small stone house of uncertain age stands on top of the spoil heap. The overhang from the old mine is fenced in and obviously used as a shelter for animals. No signs of ore processing could be found so far on the surrounding rocks. The nearest ancient fields and hut sites (not dated) are situated 1 km to the east. The ancient mine in Reentrusk was only a small operation but the Bronze Age miners were confronted with the same challenges as miners during the age of the Industrial Revolution. No smelting places or furnaces or any form of copper slag have been identified in Allihies or on Beara. Nothing is known how and from where the tin came to Beara and how it was paid for or who collected the ore for the smelting and/or bronze production in unknown places. The nearest known tin deposits which were operated at the same time were possibly the tin and copper mines in Cornwall. One day the archaeometallurgy might be able to give an answer to the question: Were the Bronze Age mines of Allihies, Beara and West Cork insular operations with some sporadic contact to the continent, or were they part of a well established long-distance prospecting - and trading network that operated along shore lines and rivers?

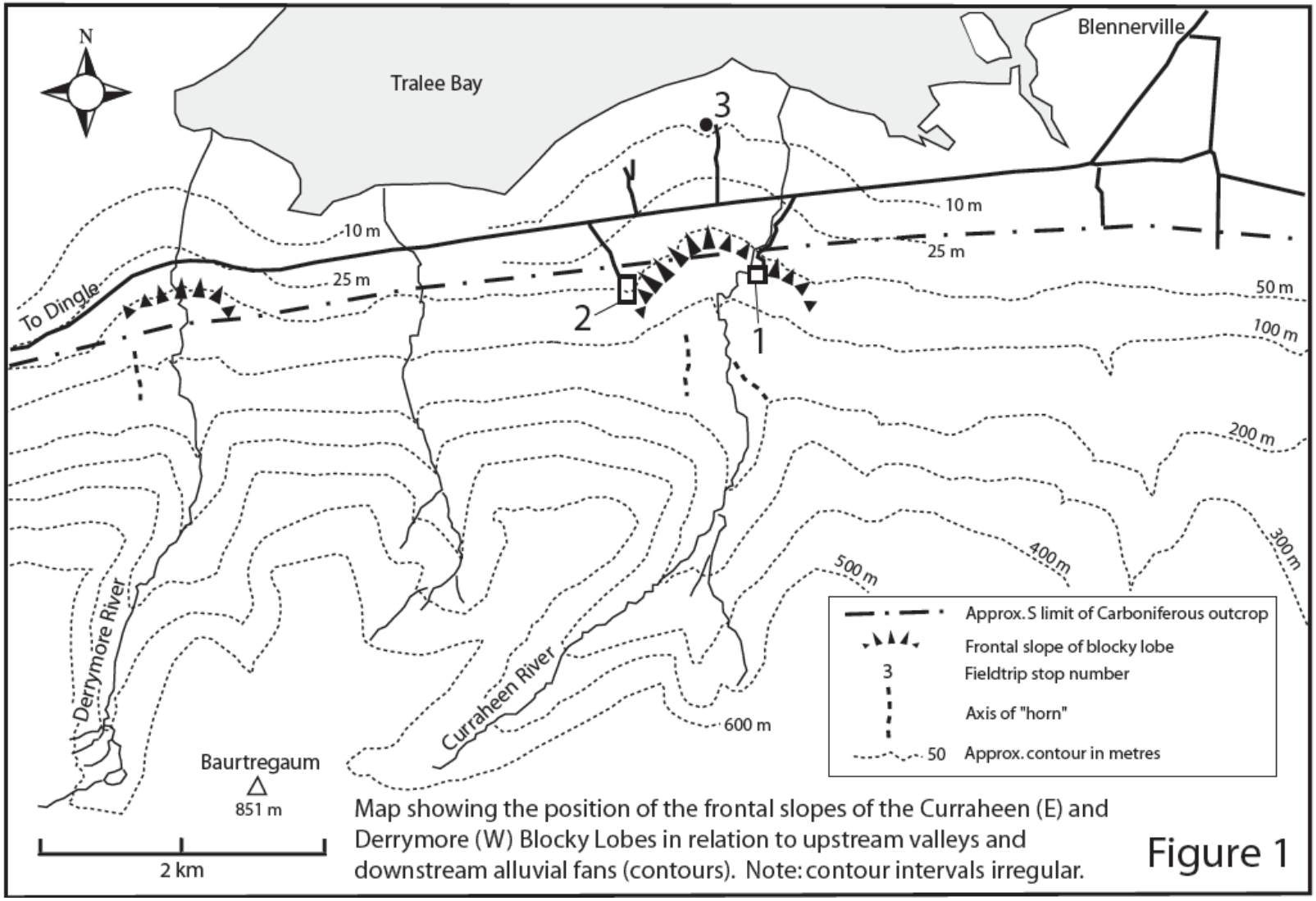
Site 5 Sediment Fans of the Curraheen River, Slieve Mish, Co. Kerry - M.E.Philcox

Introduction

The Curraheen River flows NE for c.4 km through the heart of Slieve Mish before emerging from the steep E-W mountain front c.5 km SW of Tralee (Fig.1). From this exit point the river flows N for c.2.5 km to its mouth in Tralee Bay. North of the mountain front the river flows across a composite sediment fan, which is the principal topic of this part of the IQUA fieldtrip. The northern, lower half of this fan is alluvial, and is referred to here as the "Curraheen Alluvial Fan". It is clearly expressed in plan by the coastline, where it is nearly 3 km wide (Fig.1). Where exposed, the alluvial fan consists of coarse boulder gravel (**Stops 2 & 3**).

The inner, southern half of the composite fan, the "Curraheen Blocky Lobe", is quite different. It has a steep arcuate frontal slope (Fig.1) rising from the alluvial fan, and from below it looks like a large end-moraine. However, the ground does not drop away on the inner side as in an end-moraine, but instead rises more gently, though irregularly, as far as the apex of the fan at the mountain front. Its surface is strewn with large angular blocks of sandstone and conglomerate <6 m across, derived from the inner reaches of the Curraheen valley. A similar but smaller "blocky lobe" lies in front of the Derrymore River valley, c.3.5 km to the W.

The main themes for this fieldtrip are: 1) the character, origin and environmental significance of the Curraheen Lobe; 2) its relationship to the Curragheen Alluvial Fan; and 3) the age of these features relative to Quaternary events elsewhere on the Dingle Peninsula.



Map showing the position of the frontal slopes of the Curraheen (E) and Derrymore (W) Blocky Lobes in relation to upstream valleys and downstream alluvial fans (contours). Note: contour intervals irregular.

Figure 1

Bedrock geology

Devonian sandstone and conglomerate formations outcrop within the Curraheen valley (Pracht 1996). The dip in the inner part of the valley is nearly flat, but increases to c.40° towards the N nearer the mouth, where the conglomerate is subsurface. The sides of the inner valley are dominated by vertical cliffs. Strong joints have played a key role in the production of the large blocks that litter both the inner valley and the exterior blocky lobes. Most of the lower ground N of the mountains is floored by Carboniferous Limestone (Fig.1), which makes no contribution to either the blocky lobes or the alluvial fans.

Curraheen Blocky Lobe

The steep arcuate front of the Curraheen Lobe is c.1.5 km across (E-W) and roughly 20-25 m high, rising from the smooth slope of the alluvial fan below. The irregular upper surface of the lobe is fan-shaped, and covered with elongate depressions and ridges with a local relief of several metres, some orientated roughly parallel to the lobe front. The overall slope of the lobe is probably less than 5°, but has not been measured. The surface of the lobe is littered with angular blocks up to at least 6 m across. Most of these consist of red sandstone, but there is also a high proportion of blocks of the Lough Slat Conglomerate Formation, which forms high-level cliffs in the inner part of the valley.

The E-W northern front of Slieve Mish is relatively straight (Fig.1). However, on each side of the Curraheen and Derrymore Lobes there is an anomalous northward-projecting ridge, referred to here as a "horn". Their axial spines, where they abut the mountain front, are several tens of metres above the level of the blocky lobes, and they slope gradually down onto the lobes. The horns are covered with large boulders and blocks similar to those on the lobes. The horns occur only at the exits of these two valleys and they do not fit known bedrock geology. They are therefore probably drift features.

There are few exposures in the Curraheen Lobe, most of the river banks having collapsed. However, an excavated pathway in the upper part of the river bank immediately W of the old water tanks on the NE flank of the lobe (Fig.1, **Stop 1**)

provides faces <6 m high. These show a sandy boulder diamict with matrix-supported sandstone clasts <2.5 m across, similar to those on the surface of the lobe. There is no visible bedding in the main exposures, but at the N end, on the frontal slope of the lobe, sorted sand and gravel beds a few cm thick dip N at 20-40°, and probably reflect reworking down the frontal slope of the lobe. The equivalent block-strewn lobe of the Derrymore River is better exposed in several places along the river bank.

Derrymore Blocky Lobe

The Derrymore River emerges from the mountain front down a series of bedrock waterfalls totalling c.12 m high onto a fan-shaped blocky lobe similar to the Curraheen Lobe. The lobe is smaller (Fig.1), its frontal slope is stepped and there is at least one smaller inner arcuate "front" much nearer the apex. Conglomerate blocks in this lobe consist of schist-rich Inch Conglomerate, derived from the head of the Derrymore valley. This lobe too is accompanied by boulder-strewn "horns". Topography and the coastal plan suggest that an alluvial fan lies outside the Derrymore Lobe, but no exposures have been located to date.

River bank exposures adjacent to the Dingle Way (footpath; Q 744104), typically 4-6 m high, mainly show sandy matrix-supported bouldery diamict as in the Curraheen Lobe. Boulders locally show a poorly developed upstream imbrication dip. Also present locally are subordinate beds <1 m thick of sorted fine gravel and of sand. Over-steepening of some beds suggests down-slope deformation (creep?) (Fig.3)

Curraheen Alluvial Fan

North of the steep front of the Curraheen Lobe the ground drops gently down to the coast in the form of a relatively smooth, flattish cone (see contours in Fig.1), which constitutes the Curraheen Alluvial Fan. The fan has no visible apex, as the upper part is covered by the blocky lobe. Surface irregularities partly reflect former stream courses, but there are also some pits, possibly artefacts related to the construction of the old Dingle railway, which crossed the upper part of the fan. The present river mouth is some 400 m E of the outer tip of the fan. Abundant beach cobbles and boulders suggest that the fan extends beyond the present coast.

Fan sediments are exposed in a small pit (**Stop 3**, Fig.1) c.500 m from the shore. Here c. 4 m of coarse boulder gravel (base covered), consisting almost entirely of red sandstone with occasional vein quartz, forms two units. The lower one, >3 m thick, is a clast-supported, massive gravel with mainly well rounded to edge-rounded clasts <25 cm across in a coarse sandy matrix. Although mainly without obvious clast alignment, in places there are poorly defined clusters of clasts with steep long axes, suggesting cryoturbation. The top unit, <1 m thick, is better sorted and bedded, and reflects either local re-working of the fan surface, or renewed valley erosion, after cryoturbation. Field boundaries across the fan are built of rounded red sandstone boulders similar to those in the pit.

Similar boulder gravel is well exposed at the "Seaweed Plant" (a superseded activity), in a quarried-out square at the foot of the W side of the Curraheen Lobe (**Stop 2**, Fig.1). In the inner (S) part of the square red sandstone and siltstone beds dip N at c.20-25°, with some local folds. Bedrock top slopes roughly N at c.10°.

Bedrock is directly overlain along the E side of the site by boulder gravel in a down-slope-thickening wedge (Fig 2), which is at least 6 m thick where last seen at the N end of the site. Up slope the wedge thins out completely at the back of the factory. Up on the shoulder in the SW corner of the site a dredged ditch reveals bedrock shedding angular debris into the overlying ?-head deposit; there is no boulder gravel here. In the axial part of the fan the up-slope pinch-out of the gravel probably extends nearer to the mouth of the Curraheen valley.

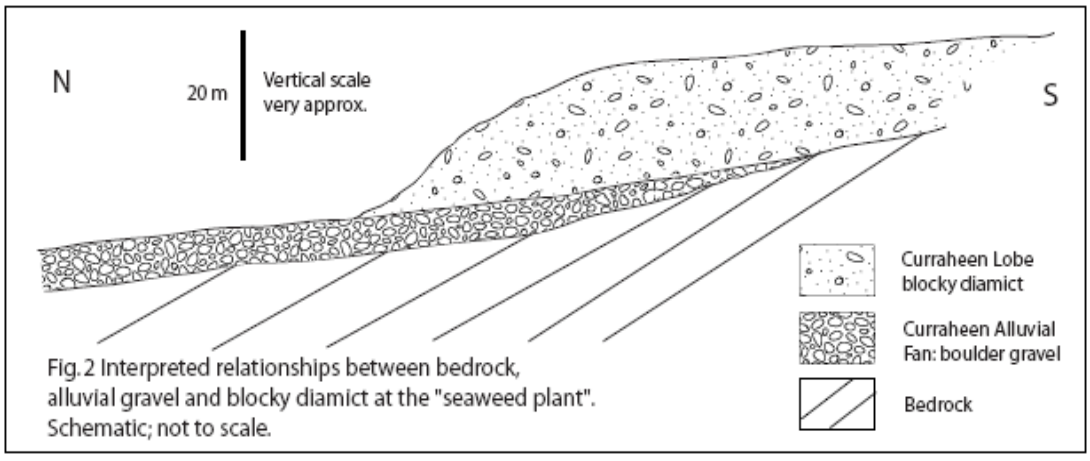


Fig. 2 Interpreted relationships between bedrock, alluvial gravel and blocky diamict at the "seaweed plant". Schematic; not to scale.

Exposures at the north end of the site reveal c.6 m of massive gravel sitting on bedrock. Most of the gravel is similar to that in the pit at **Stop 3** (see above), but in addition there are a few conglomerate boulders and common flattish, angular to edge-rounded slabs of sandstone >50 cm across. These slabs probably reflect the proximity of bedrock, in contrast to the down-fan position of Stop 3. Further up slope on the E side of the site typical boulder gravel is overlain by a unit of much finer gravel c.1.2 m thick, reminiscent of the top unit at Stop 3. No cryoturbation features were seen, but the upper part of the gravel is rarely exposed.

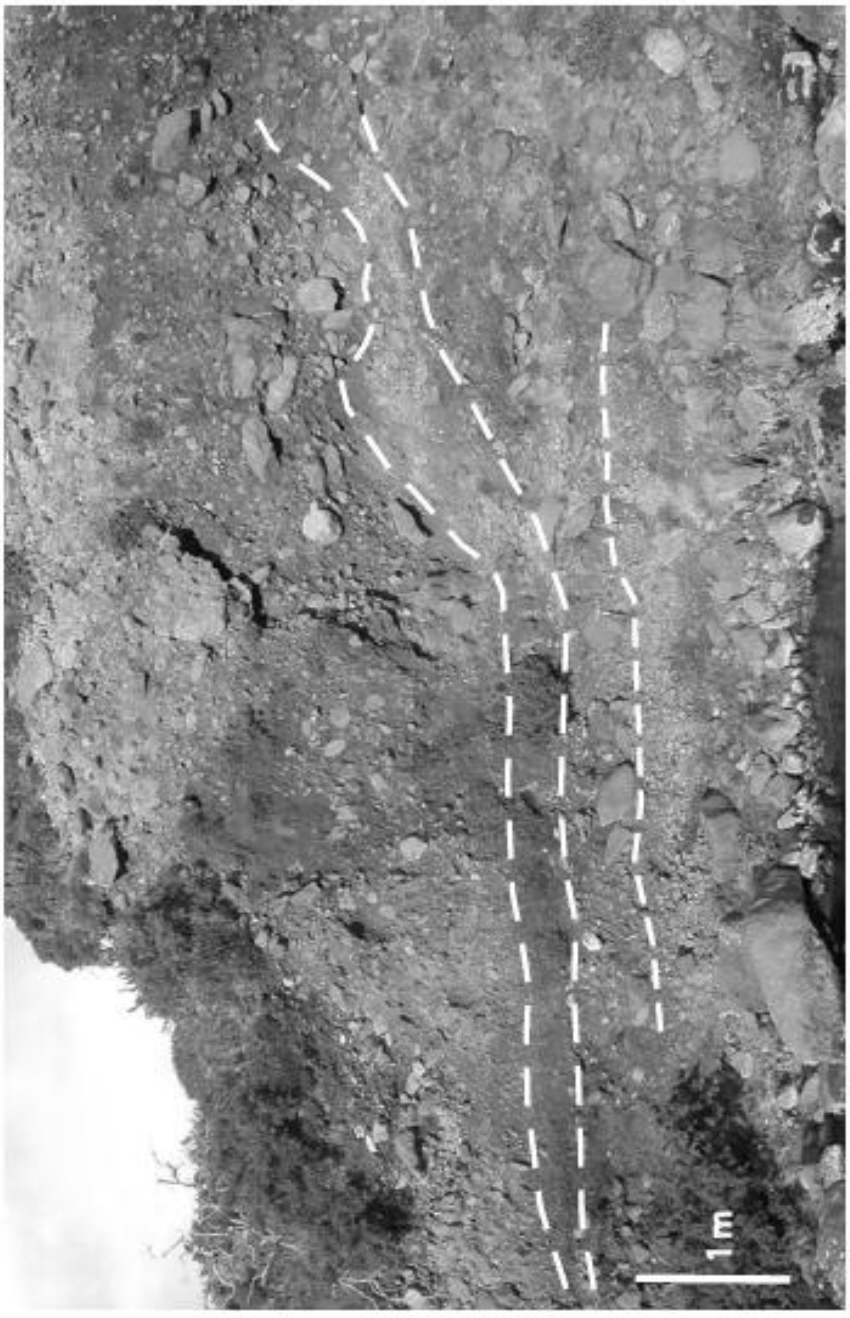


Figure 3. Cliff exposure in Derrymore Blocky Lobe, Derrymore River (Q 744104). Sandy bed, locally oversteepened, outlined by longer dashes. Fine gravel with clasts aligned sub-horizontally lies below shorter dashed line. Rest is matrix-supported bouldery diamict.

Relationship between Curraheen Lobe and Fan

The profile and plan view of the composite sediment fan outside the Curraheen valley strongly suggest that the alluvial fan was overridden by the blocky lobe. Relationships at the Seaweed Plant (Fig.2) support this interpretation. The W margin of the Curraheen Lobe was just intersected by excavation of the plant site. Well consolidated, unsorted angular boulders in a sandy matrix, form a clast-supported bouldery diamict at the foot of the lobe, overlying the fine gravel at the top of the fan succession.

Discussion

The Origin of the Blocky Lobes

The principal visible features of the blocky lobes are the fan-like form; steep front >20 m high; irregular top surface rising gently to the apex at the valley mouth; abundance of large (<6 m) angular blocks on the surface, many derived from at least 2 km up valley; and internal composition of matrix-supported, sandy boulder diamict, with occasional beds of sorted sand and fine gravel. The lobes have the appearance of large, composite debris flows, but, if they are, can they have originated as rock glaciers?

Active rock glaciers are basically bodies of coarse, angular clasts that are flowing down slope away from their source areas with the aid of ice (e.g. Whalley and Martin 1992), but there are disagreements over precise definitions, related to mode of formation. Some authors (e.g. Harris and Murton, 2005) confine the term to debris bodies that formed only under permafrost conditions. The debris is "cemented" interstitially by ice and moves by creep, generally at rates of much less than 1 m/yr (Janke and Frauenfelder 2007). Other authors (see Harrison *et al.* 2008) include bodies that are carried on moving glaciers, not necessarily in permafrost conditions. In the case of defunct rock glaciers it is usually impossible to distinguish between these types, as the end-products are the same. (Thus permafrost conditions cannot be inferred from the presence of rock glaciers alone).

The Curraheen and Derrymore Lobes have some features in common with rock glaciers, including crudely concentric ridges and depressions on the top surface.

However, the matrix-supported fabric is not compatible with rockfall/talus deposits, even with infiltrated "fines". Also, the time required to develop these lobes as rock glaciers may be too great. As the conglomerate formations, for instance, outcrop well up-valley, the derived blocks must have been transported for >2 km from source and possibly >4 km in Curraheen. Even assuming a flow rate for a rock glacier as fast as 1 m/yr, it would take a minimum of 2,000 yrs to transport conglomerate blocks to the lobe front, if no other mechanism were involved. If the blocks came from the inner part of the Curraheen valley, which is probable, or the flow rate was 0.5 m/yr, it would take 4,000 yrs. In the context of climatic fluctuations in the Late Midlandian (Coxon and McCarron 2009) these Figures suggest that transportation solely as rock glaciers is unlikely.

There is nothing inherently unlikely about the presence of a large rock glacier within the Curraheen valley. That there was no shortage of falling debris (at times) is shown by the extensive block fields that now cover much of the inner valley, where angular blocks several metres across are abundant. The blocks were derived from the valley walls (now commonly vertical cliffs) and transported initially as rock avalanches across the valley floor or onto a glacier. If such a rock glacier were disrupted by a catastrophic event, such as the bursting of a thermokarst or ice-dammed lake, this could lead to one or more massive debris flows. These could carry the former supraglacial blocks out of the valley more rapidly and further than a rock glacier would, to form the matrix-supported blocky lobe. The Derrymore river sections suggest episodic sedimentation and probable reworking of earlier flows.

Such events have been described by Haeberli (2005), and are most likely to occur as climatic conditions ameliorate, leading to increased rock falls and other paraglacial events. It may not be coincidence that the Curraheen Alluvial Fan, which pre-dates the Curraheen Lobe (by an unknown time-span) appears to be cryoturbated. (More obvious severe cryoturbation, not necessarily contemporaneous with the fan, is widespread in the Tralee Bay area.)

The origin of the "horns" is also uncertain, as their exact morphological relationship to the blocky lobes is not known. They do not necessarily reflect an unconnected,

earlier event. For instance, the two horns might be the remains of an initial debris flow that produced a front at a high level just outside the valley mouth. Subsequent collapse of the front, in response to continuing flow upstream, would have extended the flow path down slope and reduced its elevation to that of the present blocky lobe.

The Curraheen Deposits in Context

Most previous work on glacial and related deposits on the Dingle Peninsula has been centred W of the Derrymore River. The main events, as interpreted by Mitchell (1970), Lewis (1974) and Warren (1986), are as follows. One or more early glaciations from the N left limestone tills up to an altitude of c.160 m on the N side of Slieve Mish and introduced granite boulders to the area. North- and north-east-flowing glaciers from a local ice cap on the Coumenare Plateau (W. of Slieve Mish) were contemporaneous or slightly later. After large-scale retreat, ice from the mountain valleys extended out as large piedmont glaciers, one from the Owencashla valley reaching the north shore of Tralee Bay at Fenit (Mitchell 1970) with related deposits beyond Kilfenora (Heijnis *et al.* 1993). This phase was followed by smaller valley glaciers, which produced the "arcs of fresh moraine" (Mitchell, 1970, p.157 & Fig.7) emanating from the Curraheen and Derrymore valleys, which are the "blocky lobes" of this guide. The block fields and moraines in the interior of the valleys are younger still.

Mitchell (1970, map, Fig.7) shows an inner and earlier outer lobe in front of the Curraheen valley, corresponding to the two piedmont phases. The inner one is clearly the Curraheen Blocky Lobe. Mitchell did not specify the evidence for the outer piedment lobe, most of which is located where the alluvial fan forms the present surface. Possible candidates for part of an earlier, and larger, lobate moraine are the block-strewn horns on either side of the valley exit. These ridges cannot be younger than the main blocky lobes, but they might represent an early stage in their development (see above), rather than representing an older piedmont glacier.

Large-scale alluvial fans have not been described on the N side of Slieve Mish, although Mitchell (1970, p.158) refers to "frost-disturbed torrent-gravel" at the mouth of the Finglas River, near Camp, c.5 km W of the Derrymore River. Lewis (1974, p.216) termed this the "Finglas Gravel Fan", but made no mention of a corresponding

morphological feature. Both Lewis and Mitchell refer to an overlying till, which Mitchell assigns to the Owencashla Piedment Glacier (1970, Fig.7 & p.158). A contradictory interpretation is put forward by Ó Cofaigh et al. (2008, p.142 & Fig.5), who studied the cliff sections here in detail. They record only soil above 1.5 m of cryoturbated boulder gravel. Till below the boulder gravel is >3 m thick, and was derived from the mountains. This till could possibly be older than the Owencashla Piedmont Glacier, if it relates to the inferred ice cap on the Coumenare Plateau. These contradictory records of the local succession are possibly the result of large rafts of till within gravel, and *vice versa*, that have been recorded here and elsewhere in related sections (e.g. Ó Cofaigh et al., 2008, Fig.5).

There is clearly a need for more fieldwork in the Camp area, including mapping the geomorphology. At present, making the assumption that the Finglas Gravel Fan is time-equivalent to the Curraheen Alluvial Fan, it seems that a significant fluvial phase intervened between two glacial advances from the Dingle Peninsula, producing large-scale boulder gravel fans, which have previously been barely recognized.

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Fieldsite Logistics

Map base: Discovery 1:50,000 Sheet 71.

Stop 1: Q784111. Old water tanks beside Curraheen River c.500 m S of main Tralee-Dingle road. Turn left off main road 3.3 km from Blennerville windmill at signpost to St Brendan's Church. Assemble in church carpark and decant into maximum of 5 cars. Continue up lane to locked gate barrier. Park closely in yard of abandoned cottage. Short walk up road to water tanks.

1. View Curraheen Lobe front and top surface. 2. View alluvial fan below. 3. Visit river bank exposures along path immediately S of SW corner of tanks.

Stop 2: Q775110. "Seaweed Plant" on W side of Curraheen Lobe. Neatly walled entrance on left (S side) immediately beyond abandoned petrol station roughly 400-500 m W of crest of hill. Drive into courtyard.

1. View bedrock and rockhead slope on E side. 2. Examine boulder gravel behind northern factory building, and contact with bedrock. 3. Walk up track on W side of site, to view profile of Curraheen Lobe and alluvial fan, and up-slope pinch-out of fan gravels.

Stop 3: Q781121. Turn right out of Seaweed Plant. Turn left off main road just E of crest of hill, down gravel road to isolated barn. Park. Gravel pit immediately S.

1. Examine gravel in mid-fan position, including clast orientations. (Time permitting, walk to beach down this track, to examine interbedded sub-recent (?-storm-) beach gravels and peat.)