BETWEEN THE MEADOWS

The archaeology of Edercloon on the N4 Dromod–Roosky Bypass

Caitríona Moore

BETWEEN THE MEADOWS

The archaeology of Edercloon on the N4 Dromod–Roosky Bypass

BETWEEN THE MEADOWS

The archaeology of Edercloon on the N4 Dromod–Roosky Bypass

Caitríona Moore
with contributions by N Bermingham, D J O'Connor, G Plunkett, E Reilly, I Stuijts and J Wilmink

TII Heritage 11

First published in 2021 by
Transport Infrastructure Ireland
Parkgate Business Centre, Parkgate Street, Dublin 8, DO8 DK10
Copyright © Transport Infrastructure Ireland and the authors

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission in writing of the publisher. This book is sold subject to the conditions that it shall not, by way of trade or otherwise, be lent, re-sold, hired out or otherwise circulated without the publisher's prior consent in any form of binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

Library of Congress Cataloguing-in Publication Data are available for this book.

A CIP catalogue record for this book is available from the British Library.

Material from Ordnance Survey Ireland is reproduced with the permission of the Government of Ireland and Ordnance Survey Ireland under permit number 2021/OSi_NMA_273.

ISBN 978-1-911633-30-3
ISSN 2009-8480
TII Heritage 11

Copy-editing: Editorial Solutions (Ireland) Ltd
Cover design, typesetting and layout: Dogtag Creative
Index: Julitta Clancy
Printed by: W&G Baird Ltd on paper sourced from sustainable forests

Front cover—The well-preserved trackway EDC 45 constructed with densely interwoven brushwood and roundwoods, looking west. The smaller togher to the left and on a slightly different alignment is EDC 48 (CRDS Ltd).

Back cover—Aerial view of the numerous wetlands that define the landscape surrounding Edercloon, Co. Longford (Ordnance Survey Ireland).

Contents

Foreword

The townland of Edercloon in County Longford first came to archaeological notice in 1964, when the raised bog there yielded a prehistoric stone axe that retained a portion of its original wooden handle. This was a rare survival made possible by the particular environmental conditions found in bogs, but the preservative peat of Edercloon was not yet ready to relinquish all of its archaeological secrets. Forty-two years later, archaeological testing on the N4 Dromod–Roosky Bypass led to further discoveries—a network of ancient wooden trackways—thus, new road construction unearthing bygone road construction. This proved to be one of the most remarkable archaeological complexes ever excavated in Ireland's wetlands.

The content of *Between the Meadows* is highly significant as it relates the results of the excavation of a well-preserved complex of wooden structures and associated artefacts in a peatland context. Forty-six wooden objects were found, including wheel fragments, finely pointed spears, tool handles, and vessels. While such complexes have been recorded widely in Ireland's midland bogs, few have been scientifically investigated to this extent, and fewer still have been the subject of detailed publication. The level of organic preservation alone will interest and intrigue readers, as will the story it has enabled archaeologists to relay—the discovery of a potentially unique wetland ritual complex that was the focus of sustained activity over thousands of years, as is argued by Caitríona Moore, the lead author and excavation director.

Evidence for human activity at Edercloon extends back almost 6,000 years, when the first narrow track of branches and twigs was laid down on the wet bog surface. This practice would continue for the following four millennia as further structures were built and numerous artefacts deposited among them. But the story of Edercloon is not limited to the sites and objects submerged within the peat, it is also the story of an evolving landscape. Volcanic ash, ancient pollen, microscopic organisms, deep accumulations of peat, beetles' wings, and the wood of the trackways themselves have been the subject of specialist study, the results of which greatly enhance and explain much about the archaeological story recounted in the pages that follow.

Between the Meadows is a testament to the intellectual and physical labours of many contributors, not least the 100 archaeologists from 17 countries that came to work on the N4 Dromod–Roosky Bypass project. In closing, I would also like to acknowledge the support received from the staff of the Roscommon National Roads Regional Office and compliment the proactive partnership approach that they took in responding to the discoveries made at Edercloon.

Peter Walsh
Chief Executive
Transport Infrastructure Ireland

Dedication

Between the Meadows is dedicated to three people who contributed greatly to the success of the Edercloon excavations and the construction of the N4 Dromod–Roosky Bypass but who sadly passed away since the scheme's completion.

To palaeoentomologist Dr Eileen Reilly (1970–2018) whose contribution here and elsewhere was remarkable.

To Chair of Celtic Archaeology Professor Barry Raftery (1944–2010) who paved the way for all of us in the peatlands.

To clerical officer Bríd Ward (1963–2015) who formed an integral part of the Roscommon National Roads Regional Office team.

Acknowledgements

The excavations at Edercloon took place over five months in 2006 and thanks are due to the many people and institutions who were involved in both the on-site and post-excavation works. I would like to acknowledge the staff of the Roscommon National Roads Regional Office who administered the road scheme on behalf of Leitrim County Council and Longford County Council, with funding from the National Roads Authority (now TII). David Meade was the Project Engineer for Roscommon National Roads Regional Office. I would also like to recognise the staff of the principal engineering consultants, Roughan & O'Donovan, who project managed the scheme. Morgan Harte was the Project Engineer for Roughan & O'Donovan. Ministerial Directions were provided by the National Monuments Service, represented by Martin Reid, in consultation with the National Museum of Ireland. Thank you to the Senior Archaeologist David O'Connor and to Dr Stephen Mandal and Finola O'Carroll, all of Cultural Resource Development Services (CRDS) Ltd. I would like to thank TII Head of Archaeology and Heritage Rónán Swan and TII Archaeologist Orlaith Egan for their support throughout the investigations, both of whom acted as Project Archaeologist at different stages of the archaeological works. Sincere thanks to TII Archaeologist Michael Stanley who greatly assisted in bringing the book through the final stages of publication.

Edercloon was excavated by a great team of archaeologists who worked and played hard in the summer of 2006. Particular thanks go to Jean O'Dowd the Senior Site Supervisor whose contribution was invaluable and to Richard Reid who oversaw the considerable day-to-day management of the site and supplies. Thanks are also due to the 11 Site Supervisors: Fiona Beglane, Gianmarco Cattari, Vincenzo Cherubini, Ross Crawford, John Fletcher, Dominic Gallagher, Jane Hamill, Rachel Homan, Niall Jones, Igor Kolosuzk and Axel Lundell. I am grateful to Carlo Zito for his photography of the site. Thank you also to Site Surveyor Ken Russell and to Chiara Chiriotti, Thorsten Kahlert and Alana Doyle who carried out the photogrammetric recording.

Special thanks are due to Dr Nóra Bermingham, Dr Gill Plunkett, Dr Eileen Reilly and Dr Ingelise Stuijts for their considerable contribution to the project and many helpful discussions since its inception. I am very grateful to Dr Robert Sands for his advice and help with the woodworking recording and tool signature tracing. The woodworking programme was ably assisted by John Diffey, Rhianwen Howell and Sara Elifani-Sheils. Thank you to David Brown of the School of Natural and Built Environment, Queen's University Belfast, for helpful discussions on chronology. Sincere thanks also to Conor McDermott of the University College Dublin School of Archaeology for advice on many aspects of the excavation,

for his photographic reconstruction of the Edercloon block wheel and his generosity when it came to book loans. Professor Aidan O'Sullivan, University College Dublin School of Archaeology, also provided helpful comments and discussion on woodworking and artefacts. Thank you to Dr Benjamin Gearey, Department of Archaeology, University College Cork, for helpful input on a range of topics. Thank you to Joanne Hamilton and Seamus McPhilib of the National Museum of Ireland, Country Life, in Turlough Park, Co. Mayo, and to carriage makers Paddy Egan and Tom Cullinane for comments on the wheel fragments. Thanks also to Isabella Mulhall of the National Museum of Ireland, Archaeology, in Kildare Street, Dublin, for her assistance in relation to the Edercloon axe. Tim Coughlan of Irish Archaeological Consultancy Ltd supplied information on Cloonshannagh Bog, Co. Roscommon, and kindly gave permission for the inclusion of unpublished dating results.

For extensive work on illustrations and mapping thank you to Chiara Chiriotti, Dr Stephen Mandal, and Michael Stanley. I would also like to thank John Sunderland for his beautiful artefact photographs, Marianna Ripa and Eamon Russell for their skilled illustrations of the same, and Johnny Ryan for his vessel reconstruction. John Sunderland also provided the photographs that adorn the chapter title pages (with the exception of Chapter 6). Sincere thanks to Professor Gabriel Cooney who commented on an early draft of this book. I am grateful and indebted to Professor Barry Raftery whose visits to Edercloon were occasions of lively and happy discussion. The excavation and this publication owe much to his pioneering work in Ireland's raised bogs. Last, but by no means least, thank you to my husband Brian for putting up with Edercloon for so long.

Caitríona Moore

TII Digital Heritage Collections

The following excavation reports and ancillary data relating to the N4 Dromod–Roosky Bypass are published in the TII Digital Heritage Collections at the Digital Repository of Ireland website (www.dri.ie).

DRI identifier	Site description	Web link
E3288 Faulties	Early modern lime kiln	https://doi.org/10.7486/DRI.sb39mq17n
E3292 Cloonturk 2	Early Bronze Age *fulacht fiadh*	https://doi.org/10.7486/DRI.1r66xf922
E3293 Cloonturk 1	Post-medieval agricultural activity	https://doi.org/10.7486/DRI.1z410760d
E3295 Clooncolry 1	Early–Middle Bronze Age *fulachtaí fia*	https://doi.org/10.7486/DRI.25152128f
E3297 Clooncolry 3	Early modern farmhouse and outbuildings	https://doi.org/10.7486/DRI.2j635k644
E3301 Moher 1	Middle Bronze Age *fulachtaí fia* and an early modern lime kiln	https://doi.org/10.7486/DRI.3b59dq36b
E3304 Moher 4	Early medieval pits and furrows	https://doi.org/10.7486/DRI.3x81m240d
E3305 Moher 5	Late Neolithic/Early Bronze Age *fulacht fiadh*	https://doi.org/10.7486/DRI.4455nv088
E3307 Georgia 1	Bronze Age *fulacht fiadh*	https://doi.org/10.7486/DRI.4j03sd445
E3309 Aghamore 1	Post-medieval fire spots	https://doi.org/10.7486/DRI.4x51wz80v
E3310 Aghamore 2	Bronze Age *fulachtaí fia*	https://doi.org/10.7486/DRI.5425zr48w
E3311 Aghnahunshin	Early Bronze Age *fulachtaí fia*	https://doi.org/10.7486/DRI.5b001j167
E3312 Tomisky	Iron Age and undated trackways and archaeological wood	https://doi.org/10.7486/DRI.5h743984w
E3313 Edercloon	Neolithic–early medieval trackways and platforms	https://doi.org/10.7486/DRI.5q485352c
Ancillary data		
Bermingham, N 2009 *Final Report: Testate Amoebae and Plant Macrofossil Analyses, Edercloon, Co. Longford.* Final Report for CRDS Ltd.		https://doi.org/10.7486/DRI.nc58d9238
Stuijts, I 2021 Wood Analysis Data Sheets.		https://doi.org/10.7486/DRI.nk32g2937

CHAPTER 1

Introduction

by Caitríona Moore and David J O'Connor

Introduction

From the earliest beginnings

April 2006 was unseasonably cold; early mornings were still white with heavy frost on which the weak sunshine, when it arrived, had little effect. None felt this more keenly than the small team of archaeologists who had arrived to work at Edercloon, Co. Longford, their task to investigate a potential archaeological site identified the previous autumn during test-trenching. The cold starts and even colder ground in which they worked were, however, soon forgotten as a small pasture began to reveal secrets it had hidden for millennia. Beneath the surface of a grassy field lay a deep and waterlogged bog, quietly concealing a wealth of archaeological sites and artefacts of exquisite preservation and remarkable complexity.

The sites discovered at Edercloon[1] (from the Irish *eadar* meaning between and *cluain* meaning meadow) ranged from large wooden trackways or toghers (from the Irish *tóchar*) to short paths, platforms and small deposits of wood (Moore & O'Connor 2009b). Built at a narrow point in the bog, their construction began during the fourth millennium BC and persisted almost continuously to the ninth century AD. Throughout these centuries, people came time and time again to lay their paths and tracks. Some sought to traverse the narrow stretch of bog, possibly forming part of longer regional routes through the landscape. Others crossed only short, perhaps treacherous or unstable, areas. Many of the excavated toghers took routes through the wetlands, skirting the adjacent dryland, and criss-crossing and merging to form a network of interconnected paths and platforms. The latter sites in particular, built during the centuries of the Late Bronze Age and Early Iron Age, are unparalleled in the archaeological record and were some of the largest and most intriguing discoveries made. Buried deep within these structures was an array of wooden artefacts, items people made and used in everyday life such as bowls, wheels, spears and tool hafts. Prosaic objects by nature, their preservation was nonetheless extraordinary and their inclusion an apparently deliberate act imbued with meaning and reflecting a prolonged tradition at Edercloon.

The discovery of these sites and artefacts was a remarkable one; however, the story of discovery at Edercloon really began in 1964, when local farmer Johnny McGlynn found a hafted stone axe (Illus. 1.1) while he was cutting turf in the bog beside his home (Lucas 1967, 2). This chance and rare discovery made its way to the National Museum of Ireland where it remains on display to this day. The story of Edercloon is not just of the sites and artefacts buried

1 ITM 606811 785043; height 25 m OD; Excavation Reg. No. E3313; Excavation Director: Caitríona Moore.

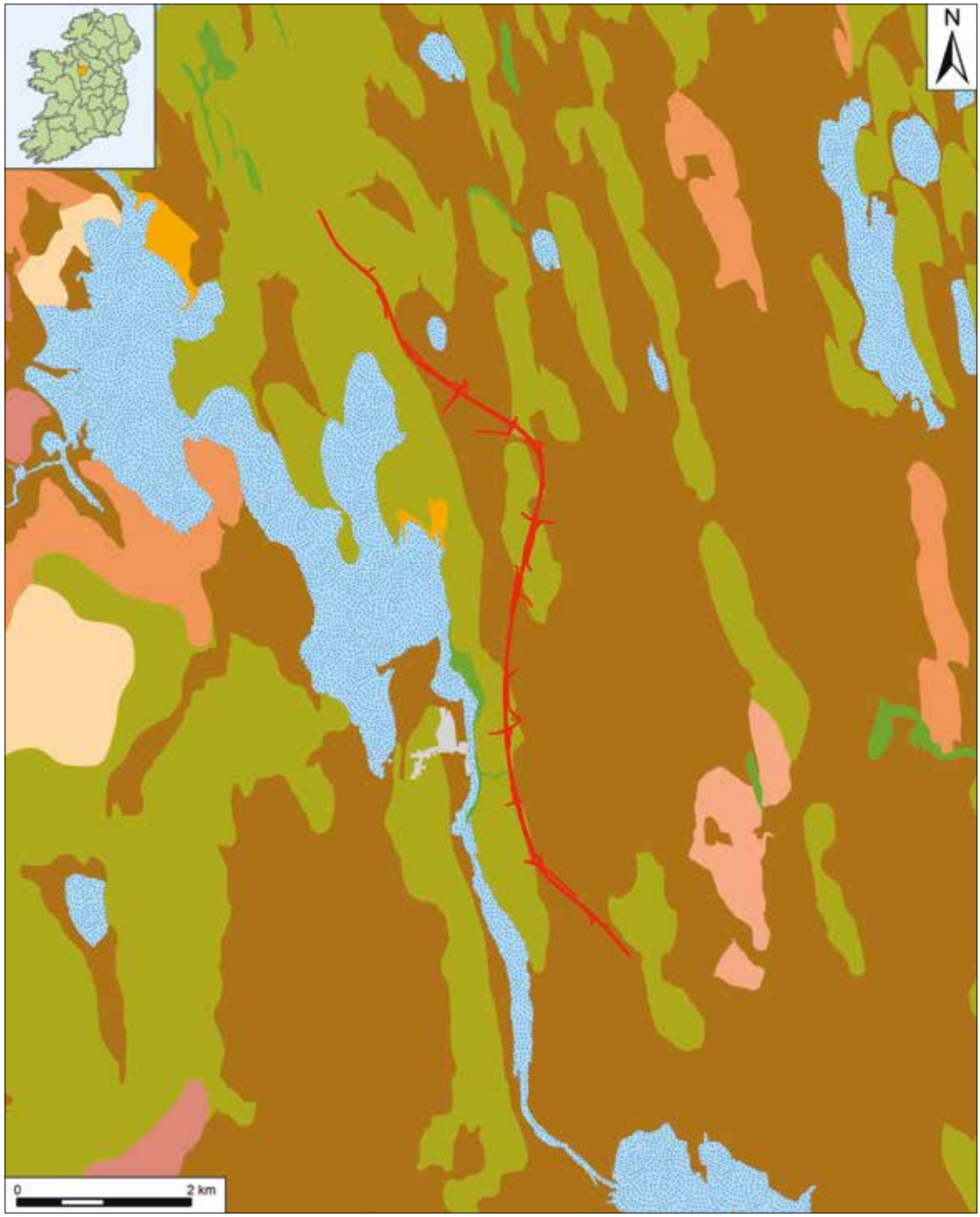
Illus. 1.1 The stone axehead and the remains of its alder-wood handle (registration number 1964:58) found by Johnny McGlynn at Edercloon, Co. Longford, in 1964 (this image is reproduced with the kind permission of the National Museum of Ireland).

in the bog. It is also the story of an ancient landscape as it developed through millennia and was inhabited, managed and exploited by the people who lived within it. It is the story of a community, of skilled wood workers and craftspeople, of things made, used, abandoned and buried, a story of traditions. This book is the story of their discovery and their place in Irish archaeology and beyond.

Background studies and archaeological investigations

The N4 Dromod–Roosky Bypass, which opened to traffic in December 2007, involved the widening and realignment of sections of the existing N4 Dublin–Sligo road north of Dromod, Co. Leitrim, and south of Roosky, Co. Roscommon. The realigned sections were then merged with a newly built road to the east, bypassing both towns (Illus. 1.2). The new road commences in County Longford, passing through the townlands of Edercloon and Tomisky, in the parish of Mohill and the barony of Longford. It is located in County Leitrim for the remainder of its length, traversing the townlands of Aghnahunshin, Aghamore (Roosky electoral district), Georgia or Gorteennoran, Moher (Roosky electoral district), Knockmacrory, Killinaker, Cornagillagh (Mohill barony),

Illus. 1.2 Locations of archaeological sites excavated on the route of the N4 Dromod–Roosky Bypass in counties Leitrim and Longford, based on the Ordnance Survey Ireland Discovery Series map (Transport Infrastructure Ireland).



Illus. 1.3 The extent of peat cover (shown in brown) in the vicinity of the N4 Dromod–Roosky Bypass, based on the Irish National Soils Map, 1:250,000 km, V1b (2014) by Teagasc and Cranfield University (Transport Infrastructure Ireland).

Clooncolry, Cloonturk, Drumod Beg, Furnace or Bleankillew, Faulties, and Fearnaght. The townlands are located in the parishes of Mohill and Annaduff and the barony of Mohill. The overall scheme, a 10 km-long dual carriageway, was relatively small in scale, but the excavations undertaken in advance of its construction have significantly added to our archaeological understanding of the area.

As part of the design and planning process a number of studies were carried out on the proposed route including desk-based assessments and an Environmental Impact Assessment undertaken by Roscommon National Roads Regional Office. These were followed by archaeological testing of the entire route by Sheelagh Conran of CRDS Ltd between August and October 2005 under Excavation Licence No. 05E0983. A total of 43,294 linear metres of trenching was conducted. Twenty-five sites of interest were identified and investigated further, of which 11 proved to be non-archaeological. The remaining 14 sites produced evidence of human activity in the area dating from the Neolithic to the early modern period (Table 1.1). These mostly consisted of mounds of burnt stone and charcoal (also known as *fulachtaí fia*) on the wetland/dryland margins. The most exceptional site was

Table 1.1—Archaeological sites excavated on the N4 Dromod–Roosky Bypass, from south to north. Edercloon and Tomisky are in County Longford, the remaining sites are in County Leitrim

Site name (Excavation Reg. No.)	Site type	Period[2]
Edercloon (E3313)	Trackways, platforms and archaeological wood	Neolithic–early medieval
Tomisky (E3312)	Trackways and archaeological wood	Iron Age–early medieval(?)
Aghnahunshin (E3311)	*Fulachtaí fia*	Early Bronze Age
Aghamore 2 (E3310)	*Fulachtaí fia*	Early Bronze Age
Aghamore 1 (E3309)	Fire spots	Post-medieval
Georgia 1 (E3307)	*Fulacht fiadh*	Bronze Age
Moher 5 (E3305)	*Fulacht fiadh*	Late Neolithic/Early Bronze Age
Moher 4 (E3304)	Pits and furrows	Early medieval
Moher 1 (E3301)	*Fulachtaí fia* and lime kiln	Middle Bronze Age and early modern
Clooncolry 3 (E3297)	Farmhouse and outbuilding	Early modern
Clooncolry 1 (E3295)	*Fulachtaí fia*	Early–Middle Bronze Age
Cloonturk 1 (E3293)	Agricultural activity	Post-medieval
Cloonturk 2 (E3292)	*Fulachtaí fia*	Early Bronze Age
Faulties (E3288)	Lime kiln	Early modern

Note: excavations were also conducted at Georgia 2 (E3308), Moher 6 (E3306), Moher 3 (E3303), Moher 2 (E3302), Killinaker 1 (E3300), Killinaker 2 (E3299), Cornagillagh (E3298), Clooncolry 2 (E3296), Cloonturk 3 (E3291), Furnace 4 (E3290) and Furnace 1 (E3289) in County Leitrim, but these sites proved to be of no archaeological significance.

the complex of trackways and platforms at Edercloon, with a small number of additional sites, likely part of the same complex, uncovered in the adjacent townland of Tomisky (Moore & O'Connor 2009a).[3] The N4 excavation programme ran from January to August 2006. Being an approved road scheme under the definition of the National Monuments (Amendment) Act 2004, the project was assigned a Ministerial Directions number (A031) by the National Monuments Service (for the Minister), in consultation with the National Museum of Ireland. All of the archaeological works were carried out on behalf of the National Roads Authority (now TII), Leitrim County Council and Longford County Council, and were funded via the National Development Plan 2007–2013 and the European Union Structural Funds.

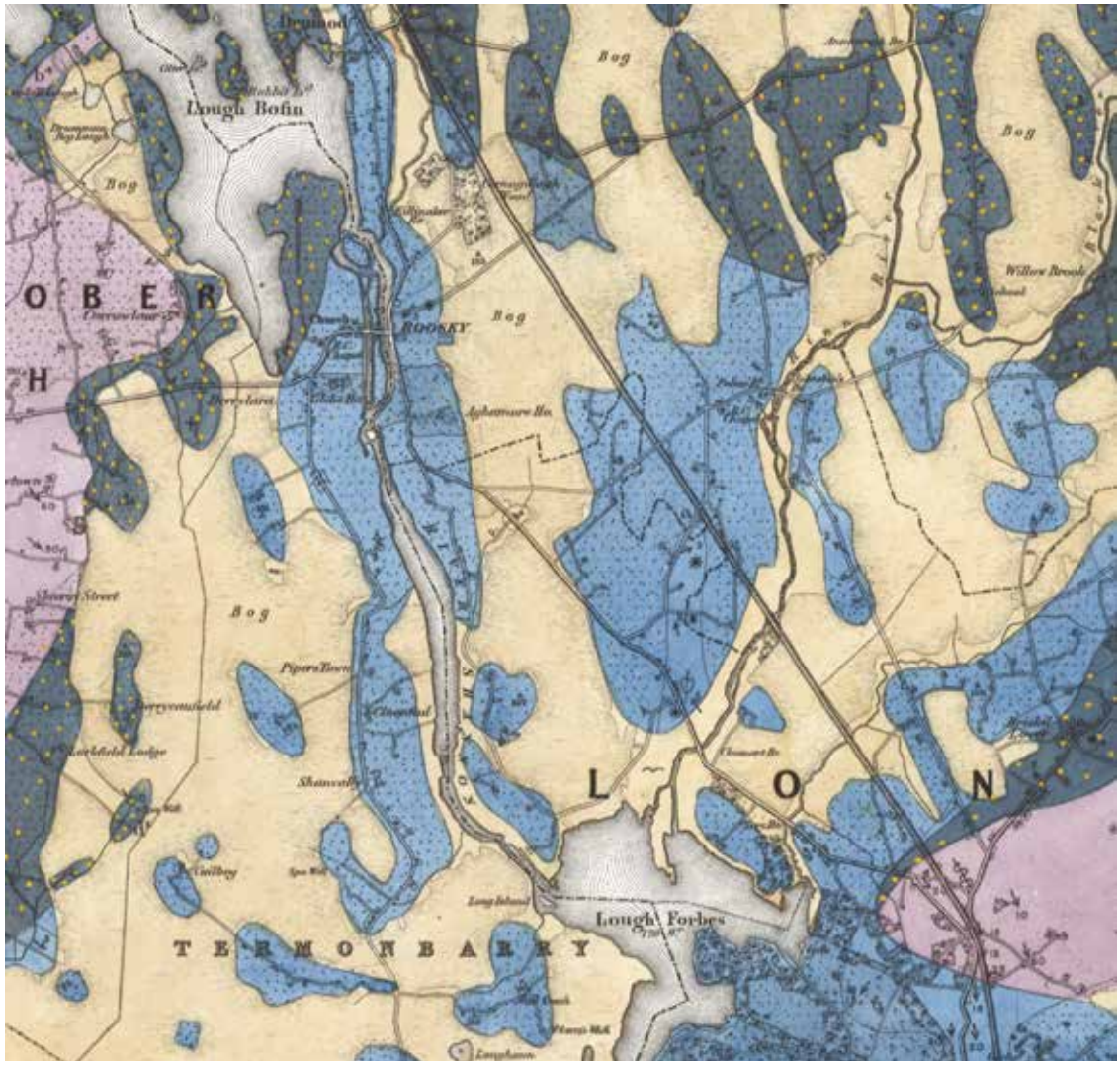
A landscape shaped by water

Edercloon lies at the western edge of County Longford, just south of the County Leitrim border and the town of Roosky, Co. Roscommon. It is a relatively small townland of 200 acres, almost half of which is covered with raised bog. Immediately to its north-west is the slightly larger townland of Tomisky, its 273 acres also predominantly covered by bog. Much of the bog in both townlands was reclaimed during the early part of the last century and, although a portion of Edercloon is exploited for private turbary (turf cut for fuel), at the time of the excavation pasture covered much of the townland. Edercloon and Tomisky occupy a narrow point in a string of bogs bordering the River Shannon. This is a landscape shaped by water; its underlying solid geology is of Carboniferous Limestone bedrock. It was once part of the early post-glacial Greater Lough Ree/Derg complex before this lake was reduced by the growth of fens and raised bog (Illus. 1.3). (Fens are alkaline peatlands fed by mineral-rich surface water or groundwater. Raised bogs are acidic and exclusively fed by precipitation and mineral salts introduced from the air.) The wet mineral soil cover consists of a groundwater gley, technically a fertile soil but the high clay content causes poor drainage in places, resulting in widespread peat accumulation.

The River Shannon, bordered by low-lying pasture, meanders from Lough Scannal and Lough Bofin, in the north, to Lough Forbes, in the south. Vast raised bogs dominate the landscape west of the river, while those to the east are narrower forming linear tracts of wetland (Illus. 1.4 and 1.5). Between these bogs is agricultural land characterised by small, irregular, straight-sided fields with earthen or stone boundaries interrupted by wind-blown trees. The Dromod–Roosky Bypass travels for 10 km through this landscape, its northern end through a drumlin belt with small lakes, its southern end skirting the margins of the wetlands. The latter formed the backdrop to many of the archaeological sites uncovered on the scheme, all of which were influenced to some degree by the presence of water and, in particular, the setting of the wetland–dryland interface (see below).

2 The following chronological ranges are used in this volume; however, some periods are further subdivided for specific environmental analyses—Mesolithic period: 8000–4000 BC; Neolithic period: 4000–2500 BC; Early Bronze Age: 2500–1700 BC; Middle Bronze Age: 1700–1200 BC; Late Bronze Age: 1200–800 BC; Iron Age: 800 BC–AD 500; Early medieval period: AD 500–1100; Medieval period: AD 1100–1550; Post-medieval period: AD 1550–1700; Early modern period: AD 1700–1900.

3 ITM 606569 785198; height 47 m OD; Excavation Reg. No. E3312; Excavation Director: Caitríona Moore.



Illus. 1.4 Extract from (Strokestown) Sheet 78 of the Geological Survey of Ireland 1:63,360 geological map series published in 1871. The extract is centred on the location of the Edercloon excavations and shows the bog (light brown) in relation to the solid geology of the area (Permit Number CP20/005 British Geological Survey © UKRI 2018. All rights reserved).

The prehistoric landscape

Given the dominance of wetlands in this landscape it is perhaps unsurprising that the greatest concentration of prehistoric sites in the wider area occurs in Cloonshannagh Bog, Co. Roscommon, west of the River Shannon and c. 6 km south-west of Edercloon. The sites in Cloonshannagh include toghers, platforms and smaller structures dating from the Neolithic to the Iron Age (Ó Maoldúin 2008; Coughlan & Whitaker 2019). Further afield, c. 25 km to the south, the Mountdillon Bogs in County Longford also contain a wealth of prehistoric sites and, although they are at some remove from the scheme, several

Illus. 1.5 Aerial view of the numerous wetlands that define the landscape surrounding Edercloon. This photograph from 2005 is centred on the location of the Edercloon excavations (Ordnance Survey Ireland).

share noteworthy similarities with structures uncovered at Edercloon (see Chapter 3). Both concentrations of sites indicate sizeable prehistoric communities in the broader landscape, complementing the evidence from Edercloon.

While the wider landscape contains a variety of monument types on the dryland, only one occurs in close proximity—an Early Bronze Age wedge tomb (Sites and Monuments Record No. LF008-037) south of Edercloon in the adjacent townland of Clooneen (Beirne), Co. Longford (see Illus. 1.2). Concentrations of various prehistoric monuments do occur some distance from the scheme, slightly more prevalent to the west and north-west, less numerous and more dispersed to the east. Likewise, stray finds

of early prehistoric date are few but include stone axes from Aghintemple, Co. Longford, to the south-east (Halpin 1984, 84), and Cuilbeg, Co. Roscommon, to the south-west (ibid., 129).

The investigations conducted in advance of the construction of the bypass have certainly helped populate the previously sparse archaeological record of the area. No sites dating from the Mesolithic period (c. 8000–4000 BC) were discovered; however, a roughly made chert Bann Flake (Find No. E3313:1b/29:67) found close to togher EDC 1b/29 in Edercloon (see Chapters 4 and 6) suggests human presence in the area at this time. The traces of Neolithic people are a little more visible in the landscape as evidenced by the occurrence of various types of megalithic tombs (de Valera & Ó Nualláin 1972; Moore 2003). A number of these lie in reasonable proximity to the bypass route with records of others, such as a megalithic structure (LE036-001) at Rinn, Co. Leitrim, to the north-east of Dromod, which are no longer extant (Moore 2003, 10). There are two court tombs (LE033-046 and LE033-047) at Creenagh (Mohill barony), also to the north-east of Dromod, while portal tombs occur to the north at Cloonfinnan (LE032-086) and to the north-east at Clooncoe (LE036-009) and Lear (LE036-012) in County Leitrim, and to the east at Melkagh, Co. Longford (LF005-007) (Cooney 1997).

The Neolithic and the arrival of agriculture brought the need to clear and enclose land, affecting the forest cover of the countryside. This is reflected in the local pollen record, which indicates an increase in grasses and weeds c. 3750 BC (Plunkett, Chapter 2). It was shortly after this time that the earliest trackways were built at Edercloon (see Chapter 3). Neolithic activity was also found during excavations at Moher 5 where burnt spreads produced chert and flint blades and flint chunks.[4] Charcoal from the site has been radiocarbon-dated to the centuries of the Late Neolithic/Early Bronze Age (see Appendix 1 for details).

Bronze Age monuments in the landscape surrounding the scheme are limited to standing stones at Derryharrow and Creenagh, Co. Longford, at Fearnaght and Clooncoe, Co. Leitrim, and at Cartron, Tooloscan and Fearagh, Co. Roscommon. Stray finds of Bronze Age artefacts have also been few but include the hafted stone axe from Edercloon (Halpin 1984, 85) (Illus. 1.1), the haft of which was recently radiocarbon-dated to the Early–Middle Bronze Age (I Mulhall, pers. comm.), a Middle or Late Bronze Age spear from Cloonart South, just south of Edercloon, and a Middle Bronze Age spearhead from Cloontagh to the west (Halpin 1984, 84). The significance of Roosky as a crossing point on the River Shannon may have a prehistoric origin as a number of Bronze Age and Iron Age finds from the river suggest it was used as a fording point at an early date (Bourke 2001, 201, 233).

Fulachtaí fia were excavated at seven sites along the Leitrim section of the bypass: Aghnahunshin[5], Aghamore 2[6], Clooncolry 1[7], Cloonturk 2[8], Georgia 1[9], Moher 1[10] and Moher 5. These sites generally comprise

4 Moher townland (Roosky electoral district): ITM 605855 787430; height 47 m OD; Excavation Reg. No. E3305; Excavation Director: Aisling Collins.
5 ITM 606023 7785991; height 46 m OD; Excavation Reg. No. E3311; Excavation Director: Matthew Seaver.
6 Aghamore townland (Roosky electoral district): ITM 605942 786246; height 52.5 m OD; Excavation Reg. No. E3310; Excavation Director: Laurence McGowan.
7 ITM 606185 790261; height 53.5 m OD; Excavation Reg. No. E3295; Excavation Director: Laurence McGowan.

a trough in which water was heated for a variety of purposes using hot stones. Frequent use of the trough often results in the formation around it of a kidney-shaped mound of burnt stone and charcoal (Hawkes 2018). The prevalence of this site type on the scheme is doubtless due to the positioning of the bypass along the wetland–dryland interface, where the necessary water sources were readily available. Nonetheless, their frequency suggests an active and perhaps sizeable Bronze Age community in the area, who are not so clearly evident on the dryland.

Clooncolry 1 (McGowan & O'Connor 2009a) and Cloonturk 2 (McGowan & O'Connor 2009b) at the northern end of the scheme and Aghamore 2 (McGowan & O'Connor 2009c) towards the southern end, comprised deposits and spreads of burnt stone with associated features such as pits, stake-holes and troughs. All have been dated to the Early Bronze Age with a Middle Bronze Age phase also indicated at Clooncolry 1 (see Appendix 1 for details). More substantial *fulachtaí fia* with evidence for multiple phases of use were excavated at Aghnahunshin (Seaver & O'Connor 2009a), Georgia 1 (Seaver & O'Connor 2009b) and Moher 1 (Collins & O'Connor 2009), clustered towards the southern end of the scheme, just north of Edercloon and Tomisky. Radiocarbon dating of features at Aghnahunshin and Georgia 1 indicated their use in the Early Bronze Age, with much later activity also taking place during the medieval period (see below and Appendix 1). At Moher 1, features of Early Bronze Age date lay in close proximity to a Middle Bronze Age burnt mound overlain by a substantial U-shaped Late Bronze Age *fulacht fiadh* (see Appendix 1).

The Early Bronze Age phases of use at these sites coincide with the building of several toghers at Edercloon (Chapter 3), at a time when the wet fen was becoming a raised bog. Despite the clear archaeological evidence for people in the area, anthropogenic indicators are muted in the pollen record which indicates a quite closed and wooded local landscape at this time (Chapter 2). The Late Bronze Age was the start of a period of intense activity at Edercloon (Chapter 4), but elsewhere on the scheme was only identified at Moher 1.

Similarly, the Iron Age, in particular the early centuries, was significant at Edercloon and identified at Tomisky, but not otherwise represented elsewhere on the scheme or within the immediate landscape save the aforementioned wetland sites. At a regional level, extensive linear earthworks such as the Doon of Drumsna, Co. Roscommon, and the Black Pig's Dyke, which extends across numerous counties, including Leitrim and Longford, indicate the presence of significant Iron Age communities (Raftery 1994, 83–8). These centuries saw the local environment, in particular the bog, shift to drier conditions, but while people were very clearly active at Edercloon, their presence, as evidenced in the pollen record, remained subdued, suggesting that their impact on the local landscape was minimal (Chapter 2).

8 ITM 605859 790828; height 43.2 m OD; Excavation Reg. No. E3292; Excavation Director: Laurence McGowan.
9 Georgia or Gorteennoran townland: ITM 605813 787006; height 47 m OD; Excavation Reg. No. E3307; Excavation Director: Matthew Seaver.
10 ITM 605793 787798; height 44 m OD; Excavation Reg. No. E3301; Excavation Director: Aisling Collins.

The medieval and later landscape

The landscape surrounding Edercloon and further along the scheme to the north is not rich in medieval monuments. A late 12th-century church (LE037-004001) and associated features at Cloonmorris, Co. Leitrim, approximately 1 km to the east, do, however, indicate the presence of an established community in the region at the time. These monuments are at the site of an early monastery associated with Saint Bréanainn which may have been known as Eadarchlauin (Edercloon). Ringforts at Aghamore (LE037-003) and Moher (LE037-001), Co. Leitrim, provide further evidence of human settlement along the dryland bordering the River Shannon. To the south, around the village of Newtown Forbes, Co. Longford, a proliferation of ringforts and a crannóg (LF008-003) attest to extensive early medieval settlement that becomes more widespread but evenly distributed to the east. The bogs west of the River Shannon also contain several toghers and platforms of early medieval date (Coughlan & Whitaker 2019, 49–60).

Three sites at Edercloon have been dated to the early medieval period, only one of which was a substantial togher. The reasons for such paucity may be varied (see Chapter 5); however, the same pattern was reflected elsewhere along the scheme whereby medieval activity was only identified at three excavated sites. At Moher 4, the burnt fill of a post-hole was dated to the early medieval period (Collins & O'Connor 2008b, 13–14).[11] At Aghnahunshin, and Georgia 1, early medieval and medieval radiocarbon dates respectively are attributed to activity such as scrub burning (Seaver & O'Connor 2009a, 26; 2009b, 22) above the extant Bronze Age monuments.

While human settlement of the area clearly pre-dates the first historical sources, the beginning of written documentation illustrates how firmly established communities across south County Leitrim, east County Roscommon, and north County Longford were. During the early medieval period, the area was settled by the Conmaicne Rein, who were initially based at Fenagh in north County Leitrim but seem to have settled most of south Leitrim, and the area became known as Magh Rein. By the late seventh/early eighth century counties Leitrim, Cavan, and part of Roscommon were conquered by the Uí Briúin, a branch of the royal dynasty of Connacht. Christianity had been firmly established at this time, as demonstrated by monasteries founded in Leitrim at Mohill by St Manchán sometime in the sixth century (Gwynn & Hadcock 1970, 187) and that at Annaduff probably sometime after AD 766, according to Lewis (1837a, 28). The area subsequently became known as the kingdom of Breifne ruled by the Uí Briúin Breifne. The barony of Mohill formed part of the kingdom of Muinter Eolais with one of the chief families being the Mac Raghnaill (Reynolds). During the latter part of the first millennium AD, the kingdom of Uí Briúin Breifne grew in strength and in size, expanding into Mide. The kingdom seems to have reached the height of its power in the 12th century under Tighernán O'Rourke and is said to have stretched 'from Kells to Drumcliff' (Simms 1979, 305).

The kingdom of Uí Briúin Breifne was conquered briefly during the early years of the Anglo-Norman colonisation with Hugh de Lacy being given the title of 'king

11 ITM 605795 787548; height 48 m OD; Excavation Reg. No. E3304; Excavation Director: Aisling Collins.

of Midhe and Breifne and Airghaill' after the assassination of Tighernán O'Rourke. Although the O'Rourkes remained in Breifne as vassals of the Anglo-Normans, they came under increasing pressure during the 13th century when the combined forces of the O'Conor kings of Connacht to the west and the O'Reilly kings to their east made a bid to gain Breifne. The area of west Breifne (modern County Leitrim) seems to have fallen under the control of Cúchonnacht O'Reilly at this stage but by 1256 Conchobhar O'Rourke had regained control after the battle of Magh Sleacht and he is called 'king of Breifne', 'king of Uí Briúin and Conmaicne' by the Connacht annals (*AC* 1256; *ALC* 1256; Simms 1979, 305–19). Augustinian rule arrived at Mohill in the 13th century and the church is described as a parish church in 1470 (Moore 2003, 183). The O'Rourkes ruled west Breifne until the 17th-century Plantation of Leitrim.

The Plantation of Leitrim in 1620–22 proved to be a failure, owing to the uninviting terrain and the resistance of dispossessed native landholders. The rebellion of 1641 forced the Protestant settlers to flee to County Cavan, and County Leitrim was not resettled until the Cromwellian and Williamite wars later that century. During the 17th century, the landscape changed with the development of towns such as Newtown

Illus. 1.6 The town of Dromod, Co. Leitrim (Michael Stanley).

Illus. 1.7 Roosky Bridge, built in 1845, connects counties Leitrim and Roscommon across the River Shannon at Roosky, Co. Roscommon (Michael Stanley).

Forbes, which grew around Castleforbes, the estate of the Earl of Granard. To the north, Carrick-on-Shannon and Jamestown were developed by settlers who also introduced industry into the area. One such industry, the smelting of iron ore, had a detrimental effect on the local forests, which were almost entirely decimated by the end of the 18th century. The town of Dromod (Illus. 1.6) 'originated in the establishment of works for smelting iron ore, which were carried on successfully till the supply of fuel failed in 1798' (Lewis 1837a, 519). The iron works at Dromod were set up a year or two after the Battle of the Boyne and were worked from 1695 to 1713 (Butler 1935, 98). One local townland—Furnace—owes its name to the iron-smelting industry. It was so-called 'because foreigners came there . . . and set up there in an old castle and began to melt iron and had always a big furnace burning' (Crowe 1938). Population increase in the 17th and 18th centuries led to the more fertile areas becoming among the most densely populated in County Leitrim. The area was included in the Distressed Poor Law Unions and in the Congested Districts of the 19th and early 20th centuries.

The Shannon figured prominently in proposals for navigation schemes in the late 17th and early 18th centuries. In 1755, Thomas Omer oversaw the construction of a canal to the west, bypassing the shallows at Roosky. By the early 19th century, the state of repair of the canalised sections of the Shannon Navigation was poor and in the 1840s improvement works saw the abandonment of the canal at Roosky in favour of dredging out the river channel. A new lock and weir were constructed downstream and the bridge was replaced (Illus. 1.7) (Delany 1987, 55–8; Lewis 1837b, 541). By the early 19th century, Roosky was a market and post-town and was said to participate 'in the general trade of the river' (Lewis 1837b, 541). The Midland Great

Western Railway line arrived in 1856 and the Cavan-Leitrim Railway finished in July 1887 linking Dromod to the Great Northern Railway at Belturbet. In 1920, a branch line was opened to the Arigna coalmines but in 1956 the line finally closed.

Archaeological remains from the post-medieval and early modern periods were found at a number of sites along the scheme in County Leitrim. The northernmost excavation at Faulties uncovered scant remains of a 19th-century kiln, depicted on the first edition (1836) Ordnance Survey six-inch map (Seaver & O'Connor 2008).[12] A well-preserved lime kiln was also excavated at Moher 1 where it overlay several phases of prehistoric activity (see above). Evidence of agricultural activity was found at Cloonturk 1 (McGowan & O'Connor 2008)[13] to the south of which, at Clooncolry 3, was a ruined stone farmhouse and outbuilding possibly dating from the 19th century (O'Carroll & O'Connor 2008).[14] Just north of Edercloon and Tomisky, the area around Aghamore 1 was known locally as 'the cannon fields' and it was said that a militia camped in the fields during the 17th century. A metal detection survey here uncovered artefacts including a musket ball, and the discovery of some small fire spots and glass bottles suggests some truth to the story (O'Carroll & O'Connor 2009).[15]

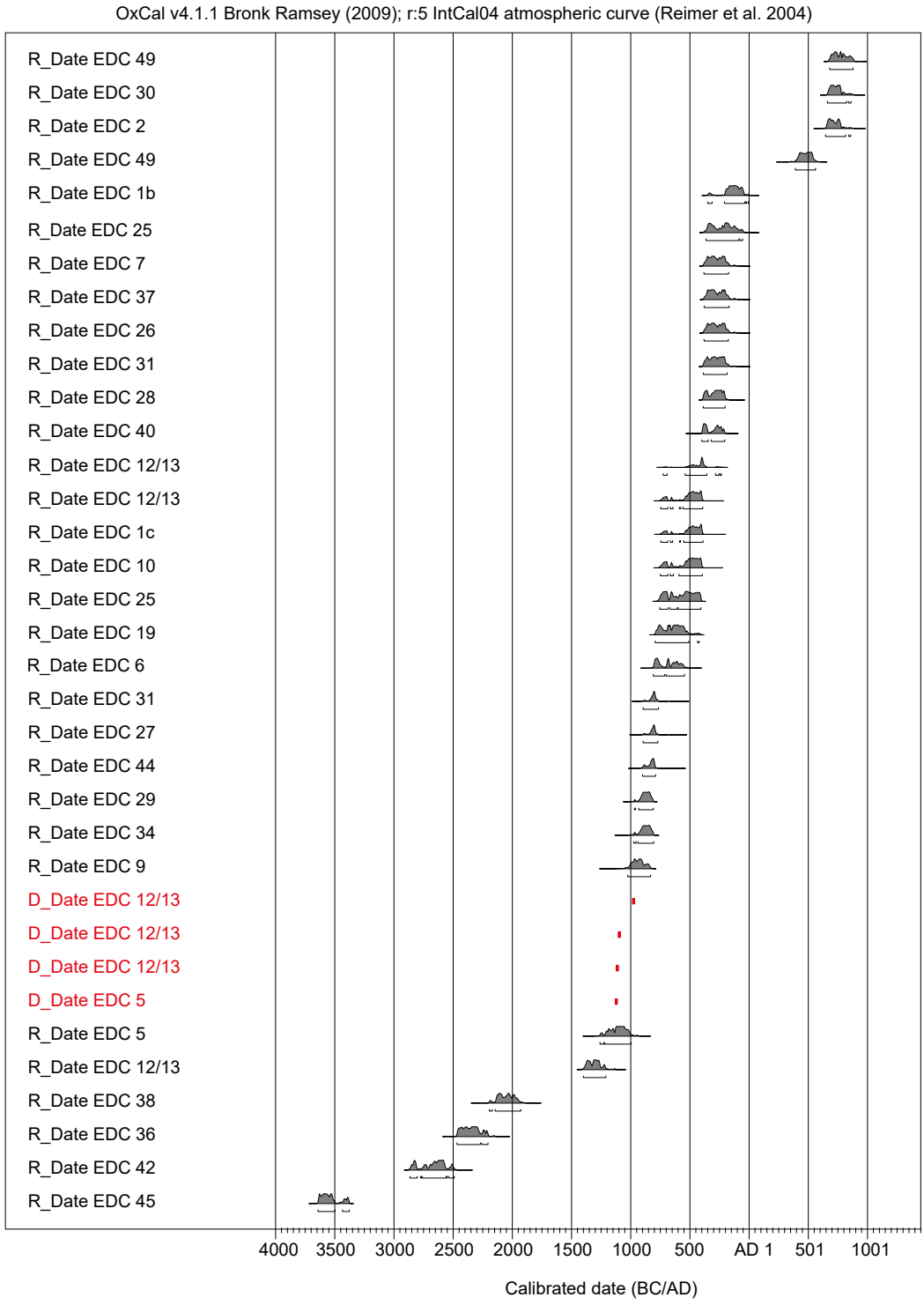
The Edercloon complex

Forty-four structures dating from the Neolithic to the early medieval period were excavated in Edercloon (Illus. 1.8 and Illus. 1.9) and a further six in the adjacent townland of Tomisky to the north-west. Built almost exclusively of wood, they ranged from large multi-phase toghers to short paths, platforms and small deposits of worked wood. While many of the smaller sites may have been short lived, some of the larger trackways were huge structures and would likely have had a visual impact on the local landscape over an extended period (Illus. 1.10). Unknown prior to 2006, the complex demonstrates that this small corner of County Longford has a hitherto undisclosed rich archaeological past not readily identified on the surrounding dryland (see above).

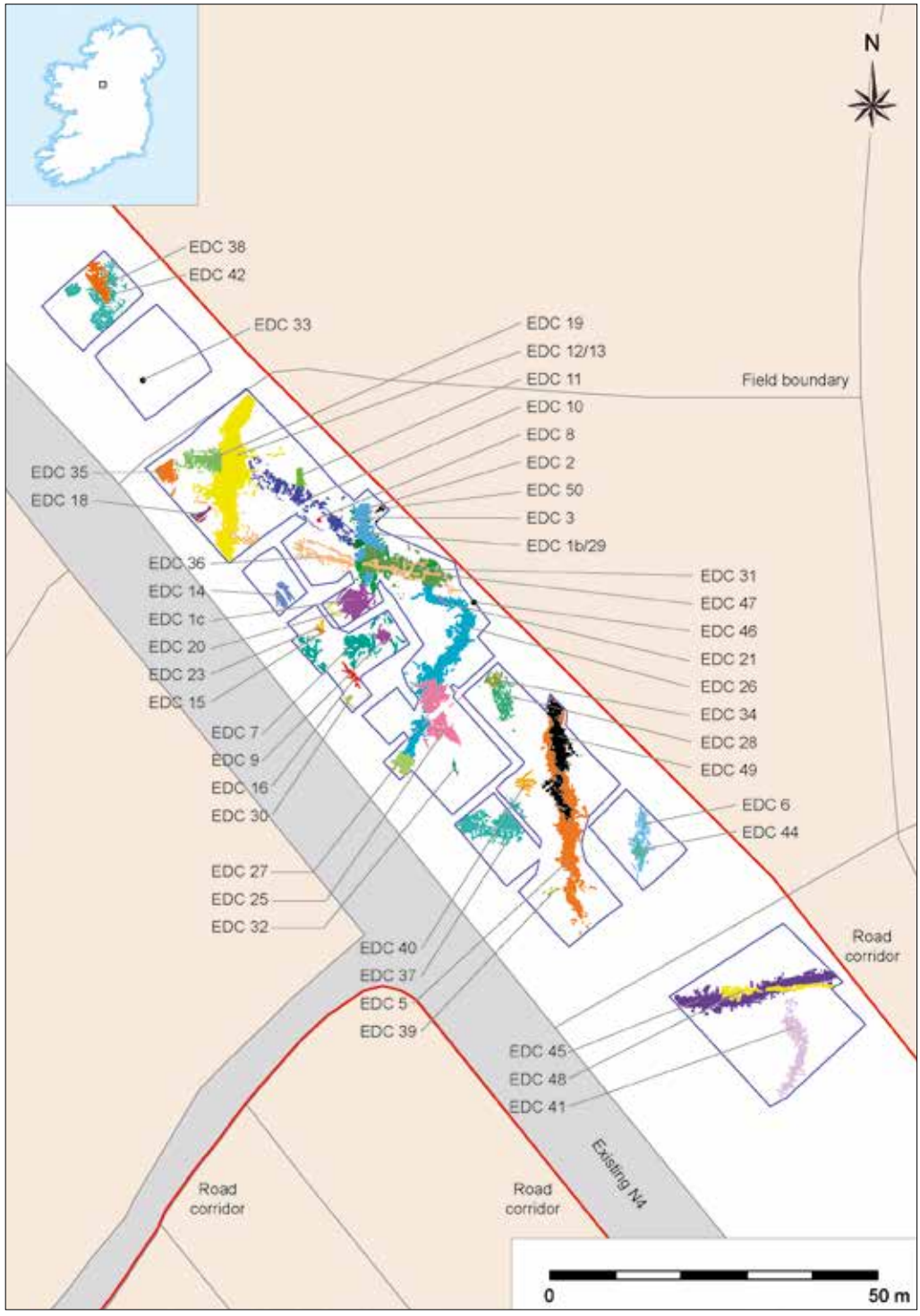
The 44 sites of the Edercloon complex were numbered using the format EDC 1, EDC 2, etc. Those in Tomisky were numbered as TOM 1, TOM 2, and so on. Classification of these sites was in accordance with the National Monuments Service peatland site classifications in operation at the time of the excavations. These terms have since been revised and for clarity within this volume the sites are referred to simply as toghers, platforms and deposits of archaeological wood (Table 1.2). Earlier publications relating to the Edercloon excavations (Moore & O'Dowd 2007; Moore 2008a; McDermott et al. 2009) referred to the presence of 48 sites; however, the results of scientific dating, research and analysis has resulted in some structures being combined and the site total now stands at 44.

Radiocarbon and dendrochronological dating have demonstrated that, while the sites at Edercloon and Tomisky span four

12 ITM 604424 792208; height 50 m OD; Excavation Reg. No. E3288; Excavation Director: Matthew Seaver.
13 ITM 605908 790796; height 44 m OD; Excavation Reg. No. E3293; Excavation Director: Laurence McGowan.
14 ITM 605950 788798; height 45 m OD; Excavation Reg. No. E3297; Excavation Director: Finola O'Carroll.
15 ITM 605887 786441; height 44.5 m OD; Excavation Reg. No. E3309; Excavation Director: Finola O'Carroll.



Illus. 1.8 Radiocarbon (R_Date) and dendrochronological (D_Date) dating results from Edercloon (CRDS Ltd).



Illus. 1.9 Plan of the archaeological complex excavated at Edercloon. The sites have been coloured and layered to best distinguish them from one another rather than to indicate the vertical sequence of site construction (CRDS Ltd).

Illus. 1.10 Aerial view of the excavations at Edercloon, looking north (Hard Hat Photography Ltd).

Table 1.2—Archaeological sites excavated at Edercloon and Tomisky, Co. Longford

Site name	Site type	Period	Associations
EDC 1b/29	Togher	Late Bronze Age/Early Iron Age	Below EDC 2, associated with EDC 10, joined with EDC 31, above EDC 36
EDC 1c	Platform	Late Bronze Age/Early Iron Age	Associated with EDC 1b/29, above EDC 20
EDC 2	Archaeological wood	Early medieval	Above EDC 1b/29
EDC 3	Archaeological wood	Undated	None
EDC 5	Togher	Late Bronze Age	Below EDC 49
EDC 6	Togher	Iron Age	Above EDC 44
EDC 7	Togher	Iron Age	Above EDC 9
EDC 8	Archaeological wood	Undated	Above EDC 10
EDC 9	Platform	Late Bronze Age	Below EDC 7
EDC 10	Togher	Late Bronze Age/Early Iron Age	Below EDC 8, associated with EDC 1b/29, EDC 11 and EDC 12/13
EDC 11	Togher	Undated	Associated with EDC 10
EDC 12/13	Togher	Middle Bronze Age/Early Iron Age	Associated with EDC 10, joined with EDC 19, above EDC 36
EDC 14	Platform	Undated	None
EDC 15	Archaeological wood	Undated	Above EDC 23

Site name	Site type	Period	Associations
EDC 16	Archaeological wood	Undated	None
EDC 18	Togher	Undated	None
EDC 19	Togher	Late Bronze Age/Early Iron Age	Joined with EDC 12/13
EDC 20	Platform	Undated	Below EDC 1c
EDC 21	Archaeological wood	Undated	Above EDC 26 and abutted EDC 31
EDC 23	Archaeological wood	Undated	Below EDC 15
EDC 25	Togher	Iron Age	Above EDC 26
EDC 26	Togher	Iron Age	Below EDC 21, EDC 25 and EDC 27, joined with EDC 31
EDC 27	Platform	Late Bronze Age	Above EDC 26
EDC 28	Togher	Iron Age	Above EDC 34
EDC 30	Archaeological wood	Early medieval	None
EDC 31	Togher	Late Bronze Age/Early Iron Age	Joined with EDC 1b/29 and EDC 26, below EDC 21, above EDC 36 and EDC 47
EDC 32	Archaeological wood	Undated	None
EDC 33	Archaeological wood	Undated	None
EDC 34	Platform	Late Bronze Age	Below EDC 28
EDC 35	Togher	Undated	None
EDC 36	Togher	Early Bronze Age	Below EDC 1b/29, EDC 12/13, EDC 31 and EDC 47
EDC 37	Togher	Iron Age	None
EDC 38	Togher	Early Bronze Age	Above EDC 42
EDC 39	Archaeological wood	Undated	None
EDC 40	Archaeological wood	Iron Age	None
EDC 41	Togher	Undated	Above EDC 45
EDC 42	Togher	Late Neolithic	Below EDC 38
EDC 44	Platform	Late Bronze Age	Below EDC 6
EDC 45	Togher	Early Neolithic	Below EDC 41, above EDC 48
EDC 46	Archaeological wood	Undated	None
EDC 47	Archaeological wood	Undated	Above EDC 36
EDC 48	Togher	Undated	Below EDC 45
EDC 49	Togher	Early medieval	Above EDC 5
EDC 50	Archaeological wood	Undated	None
TOM 1	Archaeological wood	Undated	None
TOM 2	Archaeological wood	Undated	None
TOM 3	Togher	Iron Age	None
TOM 4	Togher	Undated	None
TOM 5	Archaeological wood	Undated	None
TOM 6	Archaeological wood	Undated	None

millennia, the peak of construction occurred during the centuries of the Late Bronze Age and Early Iron Age when a network of large interconnected toghers and platforms was built (Moore 2008a; McDermott et al. 2009). While the spatial and chronological proximity of so many large sites is unusual in an Irish context, so too are several other aspects of the complex. Many of the toghers appear to have been built and rebuilt over multiple centuries and constructed to depths of over 1 m. Most were orientated north–south, with seeming disregard for the adjacent dryland, which lies only 50 m to the east. Furthermore, an astonishing 46 wooden objects, 45 from Edercloon and one from Tomisky, were buried within the sites, again predominantly during the Late Bronze Age and Early Iron Age. The inclusion of artefacts in wetland sites is not overly unusual; however, the proliferation of objects and the ordered manner in which they were deposited suggest a deliberate and structured act (Chapter 8).

The ancient environment of Edercloon

The toghers, platforms and artefacts of Edercloon and Tomisky are, of course, only half of the story of this complex, the second being the ancient environment in which they were built and which was exploited for their construction. Wetland excavations on the scale of Edercloon offer a rare opportunity to study this environment and reconstruct the contemporary landscape. A range of analyses (see Chapters 2 and 7) was used to study the development and changes in this landscape through time, some the result of human interference, others caused by natural processes. Peat sequences were subject to multi-proxy studies to understand the development of the bog and the vegetation in the surrounding landscape. Identification and analysis of several thousand wood samples allowed detailed reconstruction of the forests used to build the sites. The remains of beetles and other insects provided intricate information about the conditions local to individual structures.

The earliest stage in the development of the bog at Edercloon was the growth of a reed and alder-rich fen around 4230–3970 BC, surrounded by a mixed wooded landscape. No archaeological evidence of human activity at this time was uncovered, although the recovery of the stray Bann Flake (Chapter 6) suggests that people were active in the area towards the end of the Mesolithic. Around 3750 BC the landscape began to open up as Neolithic farmers sought to establish pastures. This coincided with the construction of the earliest toghers at Edercloon, which were built to cross the wet fen surface. These sites contained a limited number of wood species all locally grown. The landscape continued to change and by the Late Neolithic/Early Bronze Age the surrounding area was once more dominated by woodlands. By the start of the Early Bronze Age the fen was becoming replaced by the growth of raised bog. The raised bog surface was rich in grasses, heather and *Sphagnum* moss, but remained a very wet environment, fringed with woodlands on which an apparently scarce local population had little impact.

During the Early to Middle Bronze Age (c. 1900–1500 BC) the water table of the bog was significantly lower owing to a bog burst, an often catastrophic event whereby the internal water management and control systems of a bog are pushed beyond capacity, causing it to overflow and rupture in a torrent of peat and water,

much like a landslide. This caused a shift to much drier conditions on the bog surface. As the water table began to recover so too began a new phase of trackway construction, characterised by very large deep structures, some of which endured for several centuries. By the centuries of the Late Bronze Age, increased water levels caused another bog burst, after which dry conditions prevailed once more (c. 900–50 BC). This situation continued for several hundred years coinciding with the peak of trackway construction which continued into the Iron Age. During this time, several large toghers were connected forming a network of routes within the bog, the local ground conditions of which were varied but dry overall. These were accompanied by a number of smaller paths and platforms. Despite the scale of construction on the bog, the local pollen record suggests fairly low-level human interaction with the surrounding landscape, with no strong indications of extensive farming. The local woodlands at this time were varied and plentiful and a wide variety of wood species, some from managed sources, were exploited for building materials. Wet conditions became constant during the Late Iron Age and were perhaps the reason for a cessation of trackway construction at this time. It was not until the seventh century AD, by which time ground conditions had improved, that toghers were once again constructed. Some contemporary farming activity is indicated in the surrounding landscape at this time, intensifying from the 14th century onwards.

Excavating Edercloon

The excavation of such a dense complex of archaeological sites presented many challenges for the team. Waterlogged wooden remains are by their very nature fragile and require a careful approach for their successful excavation and recording, and the recovery of important samples. Archaeological wood in raised bogs is often pristine when first exposed, its bark still shiny and its colour vibrant. Deterioration begins immediately, however, and within seconds seemingly fresh branches darken as their colour fades and they begin to dry, often rapidly followed by splintering and desiccation. The excavations at Edercloon may have had frosty April beginnings, but these conditions were short lived and much of the work was completed during a very hot and dry summer. These circumstances intensified the rate of deterioration calling for innovative approaches to successfully complete the project.

Simple measures such as frequent watering and keeping sites covered with heavy polythene went some way to alleviating these difficulties (Illus. 1.11); however, these were not always practical as sites needed to be exposed for long periods to allow recording. One of the most time-consuming and important tasks was the production of scaled drawings of each structure. Naturally, for smaller sites these could be completed with ease using traditional methods involving measuring tapes and/or planning frames. For some of the very large, multi-layered and complex sites, however, these techniques were too time-consuming in the context of the fragile nature of the deposits. To solve this problem a technique known as photo planning was used. Superseded now by more advanced technologies, this was at the time relatively new and rare on Irish excavations. The method involved placing numbered tags at regular intervals over each structure, creating a temporary grid, which was later anchored

Illus. 1.11 A trackway being partially covered to protect it from the sun while recording takes place on the exposed portion (CRDS Ltd).

into the overall site grid. Each structure was then photographed using a camera at a fixed height and level (Illus. 1.12). The resulting images were downloaded, rectified, digitally stitched together and scaled producing a vertical scaled photomosaic of each site (see Moore & O'Connor 2009b, 593–642) (Illus. 1.13). These images were then traced onto drafting film to create scaled plans that were used on site like conventional plans, with contextual information, sample locations, etc., added as appropriate. This method proved to be faster and more accurate than conventional manual planning, especially for sites in which large volumes of wood were set at angles and/or had collapsed in antiquity. A total of 175 scaled drawings and sections were produced during the project, the majority using the photo planning technique. In tandem with the production of photomosaics was a project to produce 3D models of some of the sites and artefacts recovered. This proved to be particularly helpful in understanding the different types of wheel fragments recovered at Edercloon (Chapter 6) and producing reconstructive hypotheses of how they may have looked and functioned in the past (Moore & Chiriotti 2010).

Beyond Edercloon—the context of wetland archaeology in Ireland

While the Edercloon complex was unknown prior to 2006, wetland archaeology has a long and distinguished history in County Longford. This is largely due to the pioneering work of the late Professor Barry Raftery, whose excavations in the Mountdillon Bogs in 1985–91 (Raftery 1996) highlighted the archaeological wealth of the Longford peatlands. These excavations,

Illus. 1.12 Photo planning of the Late Bronze Age togher EDC 5 (John Sunderland).

Illus. 1.13 Photomosaic of the Early Neolithic toghers EDC 45 and EDC 48 (CRDS Ltd).

some 25 km south-west of Edercloon, were the catalyst for several decades of systematic investigation into Ireland's raised bogs, which identified archaeological sites in their thousands (Moloney et al. 1993a; Irish Archaeological Wetland Unit 2002a; 2002b; 2002c; 2002d; 2002e; 2003; Moore et al. 2003; Whitaker 2006a; 2006b; McDermott 2007, 29; van de Noort et al. 2013). Like those excavated at Edercloon, these sites range in scale from large constructions designed to traverse bogs, to short paths providing small-scale local access. Platforms are also numerous and indicate people's desire or requirement to spend time out in the wetlands, possibly hunting and gathering the abundant resources therein. By far the most common site type in Ireland's raised bogs are small unstructured deposits of archaeological wood (McDermott 2007, 24; van de Noort et al. 2013, 29), which, although poorly understood, indicate repeated human activity and presence in the wetlands. Rarer discoveries have included occupation sites of prehistoric and early medieval date (Moloney et al. 1993b; Stanley & Moore 2004), bog bodies (Bermingham & Delaney 2006), and artefacts ranging from stray prehistoric arrowheads to deliberately buried wooden objects (Murray et al. 2002; Moore et al. 2003). Some of these have been spectacular discoveries and the inspiration for in-depth consideration and multi-disciplinary studies (Bermingham & Delaney 2006; van de Noort & O'Sullivan 2006; Gearey et al. 2019).

Wetland excavation on the scale of that at Edercloon has been rare, however, and between the late 1980s and the present day only a small number of projects of comparable scale have been undertaken (Gowen et al. 2005; Coughlan & Whitaker 2019; Coughlan & OCarroll 2019). As such, the excavations at Edercloon provided a rare opportunity for the detailed exploration of a wetland archaeological complex and its associated environmental background.

CHAPTER 2

Environmental setting

by Nóra Bermingham and Gill Plunkett

Environmental setting

Peat bogs have long been recognised as valuable archives of past environments, as the conditions that promote peat development also contribute to the preservation of a wide range of organic material within the peat. Thus, the plants that once grew on the bog and the insects and other microfauna that lived on them form part of the peat; other material such as dust or volcanic ash (tephra) from distant volcanoes and pollen from the surrounding countryside can also be blown onto a bog surface and become trapped within the peat. As peat accumulates over time, environmental changes in the local (bog) and wider (hinterland) area are reflected by changing abundances of specific plants and microfauna. This information can be used to reconstruct past environments (palaeoenvironments) and to identify when and how the environment changed, whether by natural processes, such as climate change or vegetation succession, or as a result of human activity. Palaeoenvironmental

Illus. 2.1 Aerial view of the remnant of intact raised bog north-east of the Edercloon archaeological complex, which is visible here to the left of the excavation cuttings. The Tomisky complex is in the foreground (Hard Hat Photography Ltd).

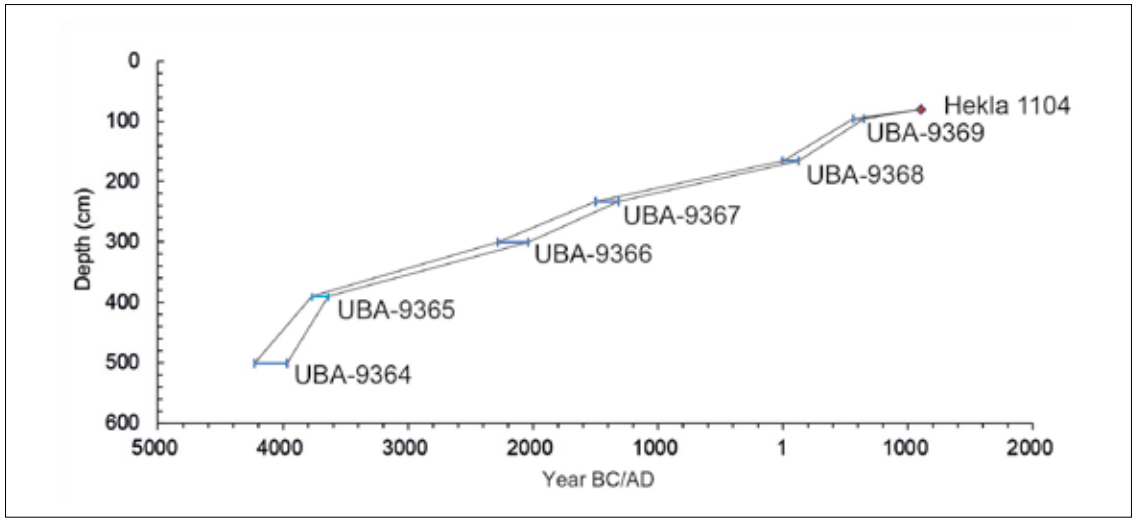
reconstructions therefore provide an important backdrop to understanding the archaeological record, particularly with regard to examining the environmental context in which human activity took place, the impact of humans on the environment, and the ever-changing dynamic between humans and the natural world.

At Edercloon, the presence of remnant raised bog adjacent to the zone of archaeological activity (Illus. 2.1) has enabled the collection of uninterrupted peat sequences that date back to the start of the Neolithic period and continue to the present day. The sequences have been studied using a range of techniques (described below) with the aims of reconstructing general bog development, changing bog surface wetness, and the vegetation history of the surrounding area to provide a continuous environmental context for the archaeological record.

Illus. 2.2 Specialist coring equipment was used to collect two vertical peat sequences from the high bog at Edercloon, one for palaeohydrological analysis (core EDC2) and one for pollen analysis (core EDC3) (Nóra Bermingham).

Palaeoenvironmental analyses

A series of adjacent cores was extracted from the uncut bog beside the Edercloon archaeological sites using a 10 cm-chamber Russian corer to a depth of 5.4 m (Illus. 2.2). Core segments were collected in PVC guttering and wrapped in plastic sheeting. The cores were numbered EDC2 and EDC3 (not to be confused with sites EDC 2 and EDC 3, both deposits of archaeological wood). The cores present a stratified record of changes in the bog and its hinterland over the many millennia in which the bog was forming. Peat samples were taken at intervals throughout the sequence to reconstruct changes in bog water levels (palaeohydrology) and vegetation history, the former using testate amoebae (single-celled microscopic organisms) and plant microstratigraphy, the latter pollen analysis. Age constraints for the records were obtained from core EDC3, dated using a combination of radiocarbon dating and tephrochronology—a dating technique based on the analysis of tephra layers within sedimentary sequences (see Plunkett 2008 for methods). Six samples were selected for AMS (Accelerator Mass Spectrometry) radiocarbon dating to determine the age-depth relationship of the profile (see Table 2.1).



Illus. 2.3 Time-depth curve from core EDC3, based on calibrated radiocarbon dates and the Hekla AD 1104 tephra marker. The zero on the Depth axis represents the surface of the intact bog (Gill Plunkett).

The tephrostratigraphic record from EDC3 is outlined in Davies (2006). Owing to operating difficulties with the electron microprobe facility, reliable tephra analyses were obtained for one tephra horizon only, and these in small numbers only. The results indicate that the horizon at 42–43 cm probably corresponds to the historical eruption of the Hekla volcano in Iceland in AD 1104, although more analyses are needed to confirm this identification. AMS dates are shown in Table 2.1 and a simple linear age model for the site is presented in Illustration 2.3. These indicate that the profile spans the Neolithic through to modern times. The results suggest a highly variable peat accumulation rate through the sequence, with rapid peat accumulation of 1 cm every 4 years below 390 cm, followed thereafter by moderately fast accumulation of an average 1 cm every 14 years. The chronological framework for core EDC3 was extrapolated to core EDC2.

Table 2.1—Results of AMS radiocarbon dating of core EDC3

Lab. no.	Depth (cm)	Material	^{14}C determination	δ^{13}C ‰	Calibrated age range (2σ)
UBA-9369	95–96	Wood	1465 ± 18	-30	AD 560–650
UBA-9368	165–166	*Sphagnum*	1945 ± 22	-20.1	AD 1–130
UBA-9367	232–233	Wood	3143 ± 23	-30.9	1500–1320 BC
UBA-9366	300–301	Wood	3756 ± 21	-28	2280–2040 BC
UBA-9365	390–391	Twigs and plant macrofossils	4910 ± 32	-33	3770–3640 BC
UBA-9364	501–502	Twig fragments	5249 ± 23	-28.6	4230–3970 BC*

* This date is omitted from Illustrations 2.4–2.6 as it derives from a depth below that of the testate amoebae and plant macrofossil record from core EDC2.

Bog hydrology at Edercloon: testate amoebae and plant microstratigraphy

Nóra Bermingham

Testate amoebae (Protozoa: Rhizopoda) and plant macrofossils (microstratigraphy) are used as palaeoenvironmental indicators in peat, most commonly as indicators of hydrological change (Tolonen 1986; Charman et al. 2000). As such, they enable the reconstruction of changes in bog surface wetness, which is useful in climate reconstruction (Chiverrell 2001; Swindles et al. 2007a; 2007b) and in examining the relationship between archaeological sites and the bog in which they were built (Bermingham 2005; Caseldine & Gearey 2005; Caseldine et al. 2005).

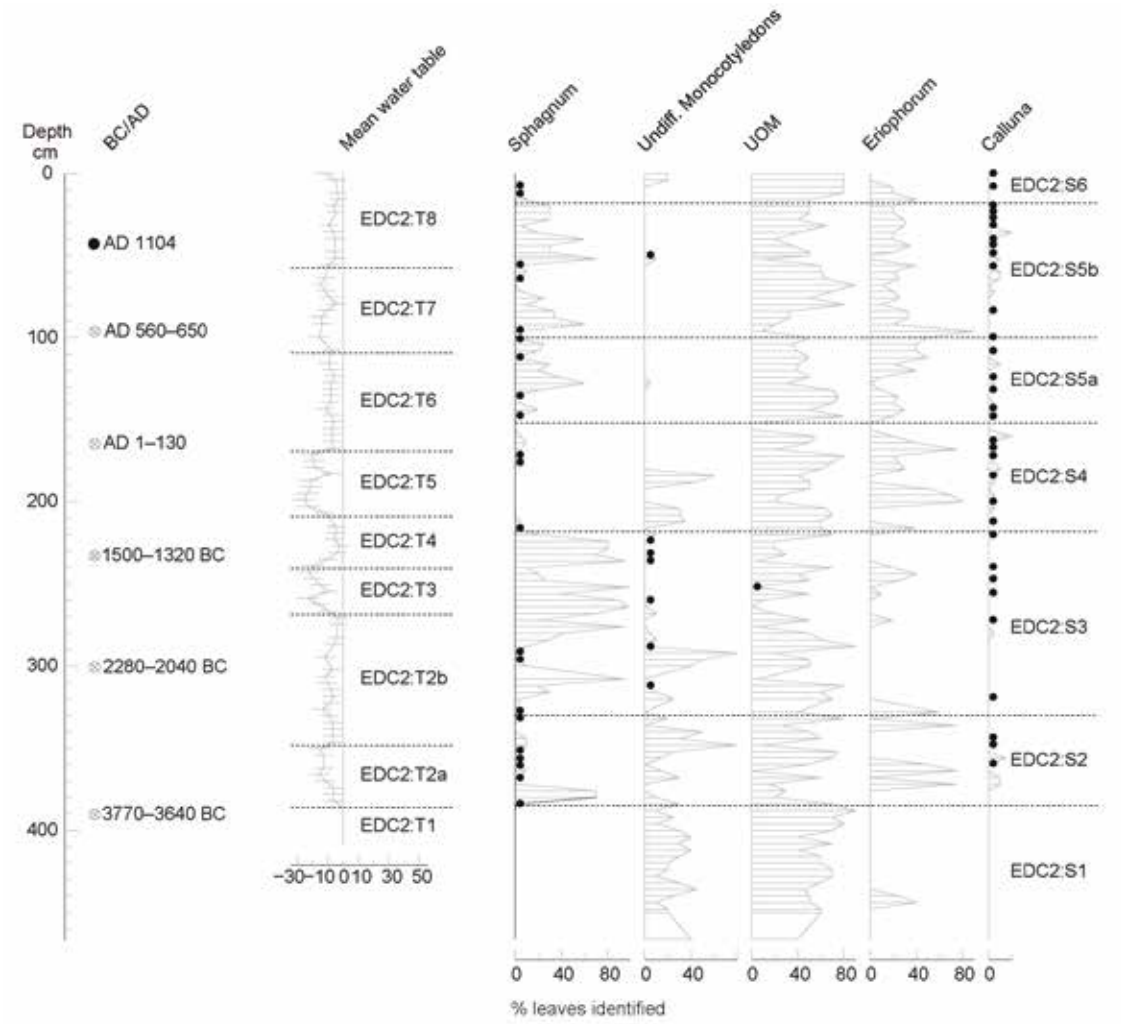
This study attempts to address these areas of interest: human–environment interactions and the potential for wider palaeoenvironmental reconstruction including climate. The sequence from Edercloon represents one of the longest high-resolution, peat-based palaeohydrological records from Ireland, spanning a period from the Early Neolithic into modern times. As such, it has provided new evidence for long-term environmental change against which shorter, less complete records may now be compared.

Methods

The high bog situated to the north-east of the excavations was selected as the sampling site as it provided a full and intact vertical sequence from the base of the bog to the present surface. A 5-m sequence designated EDC2 was retrieved using a 10 cm-chamber Russian corer. The sequence was sub-sampled at 4-cm resolution for testate and plant microstratigraphic analyses. Preservation was variable with testates confined to ombrotrophic (raised bog) levels. Testate amoebae and plant microstratigraphy preparations and analyses followed standard procedures outlined in the relevant reports (Bermingham 2008a and 2009).

The testate counts (150 ± 5) and plant microstratigraphic results were analysed and plotted using the software *psimpoll* 4.10 (Bennett 2002). In each case, zones were assigned by means of visual inspection, with zone boundaries avoiding sample levels. Testates were zoned based on the reconstructed mean water table (RMWT). This is a representation of the relationship between testate amoebae and hydrology, in this case depth to water table, through time (Charman et al. 2000; Charman & Warner 1992; Woodland et al. 1998). This relationship is reconstructed using statistical analysis, specifically by applying a transfer function to the fossil assemblage data: ecological information from modern species was used to infer the likely hydrological conditions represented by the sub-fossil assemblage. The Edercloon data were analysed using a European transfer function (Charman et al. 2007) by Professor Dan Charman, University of Plymouth. Samples with less than 150 testates were excluded from the water table reconstruction.

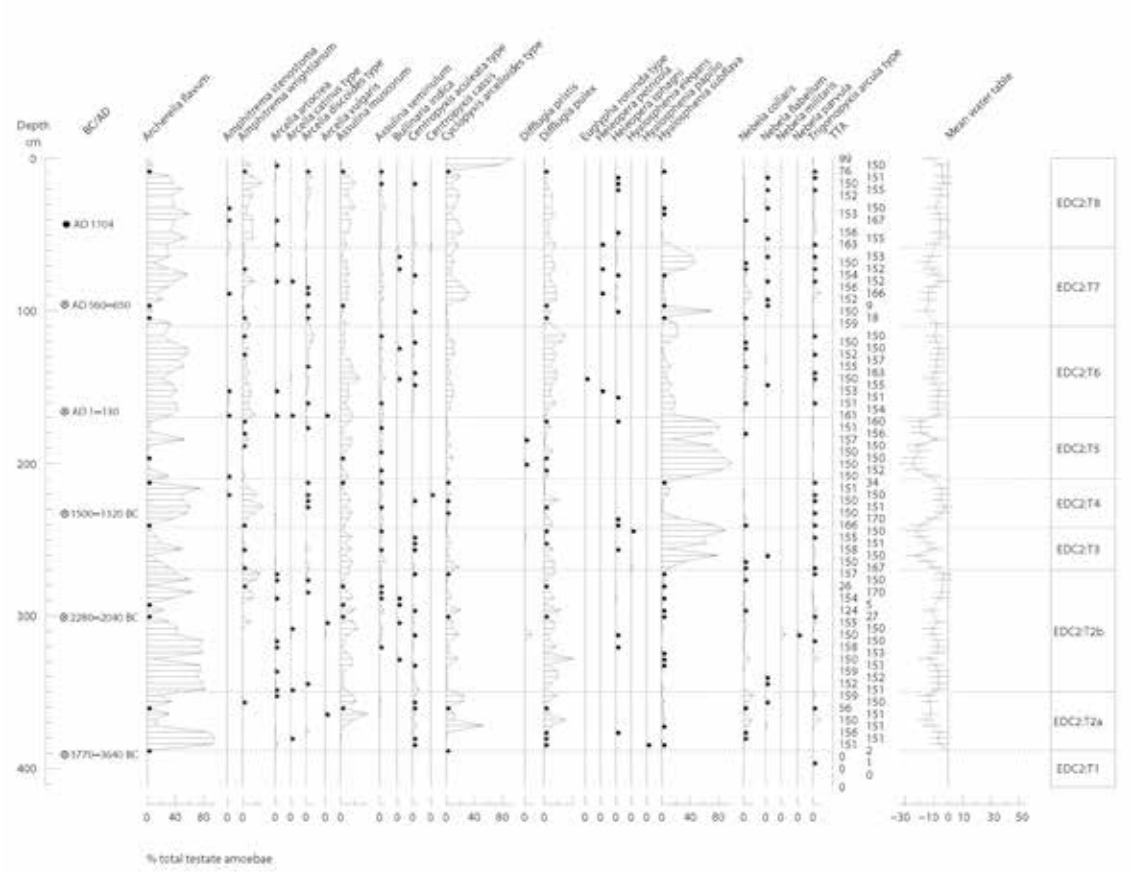
The percentage of *Sphagnum* (peat moss) leaves is expressed as a percentage of the *Sphagnum* component of the total peat components. Testate and plant microstratigraphic results are presented in the summary diagram (Illus. 2.4), with detailed results respectively shown in Illustrations 2.5 and 2.6.



Illus. 2.4 Testate amoebae (zones EDC2:T1–8) and plant microstratigraphic (zones EDC2:S1–6) results from peat core EDC2. The black dots indicate points where a presence was identified but was very low. The indications for the mean water table are relative to the surface of the bog at these points in the stratigraphy, 'minus' numbers indicate a deeper water table and drier conditions, 'plus' numbers indicate a higher water table with standing water or a pool on the bog surface. The chronological framework produced by Gill Plunkett is extrapolated from the radiocarbon (crossed circles) and tephrochronological (black circle) dating of core EDC3 (Nóra Bermingham).

Early to Middle Neolithic (c. 3800–3000 BC)

The testate record for this point in the sequence is initially sparse with insufficient numbers to allow mean water table reconstruction (testate zone EDC2:T1). This represents the top of the fen and/or the fen–raised bog junction where testates are frequently absent or poorly preserved. The plant remains support the existence of the fen at this depth (microstratigraphic zone EDC2:S1), as do the insect results (see Reilly, Chapter 7). This period saw the first human



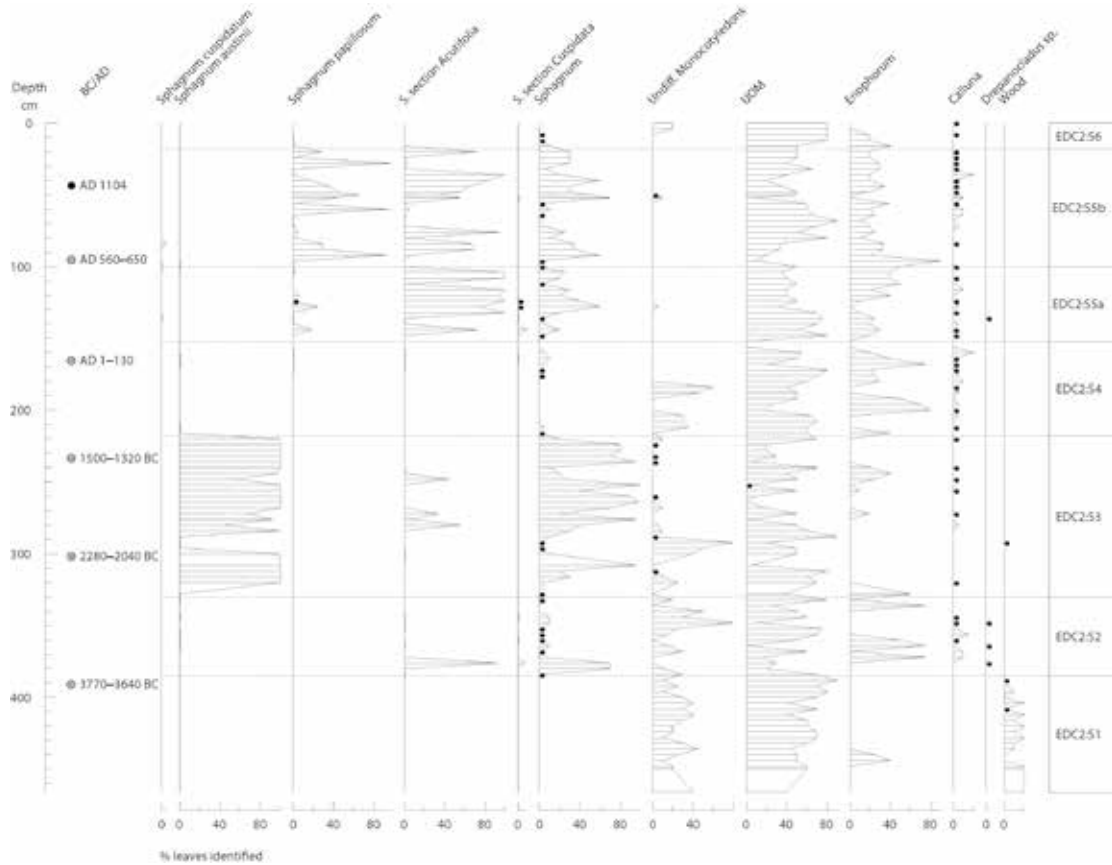
Illus. 2.5 Testate amoebae results from peat core EDC2. The black dots indicate points where a presence was identified but was very low (Nóra Bermingham).

activity at Edercloon with the building of the short togher EDC 48, rapidly replaced by the more substantial EDC 45 (Chapter 3).

The beginning of the RMWT curve corresponds with the appearance of Sphagna (*Sphagnum* section *Acutifolia*) in the plant microstratigraphy (EDC2:S2) and increased representation of testate amoebae taxa favouring moderately dry conditions such as *Difflugia pulex* and *Nebela collaris*. A change to a drier milieu capable of supporting xerophilic taxa that favour very dry conditions, such as *Trigonopyxis arcula*-type, is suggested. The RMWT has fallen to below -15–20 cm (EDC2:T2a) below the surface of the bog at that point and time in the stratigraphy, with less wet surface conditions implied than at the opening of the sequence. The occurrence of *Calluna* heather and low Sphagna representation following an initial high supports this picture of relatively dry bog surface conditions.

Middle Neolithic to Early Bronze Age (c. 3000–1900 BC)

In sub-zone EDC2:T2b, the overall trend is towards wetter, reasonably stable conditions. The water table curve fluctuates but is generally maintained above -10 cm



Illus. 2.6 Plant microstratigraphic results from peat core EDC2. The black dots indicate points where a presence was identified but was very low (Nóra Bermingham).

and rises as the sub-zone closes. The wet-indicator *Archerella flavum* is the dominant testate amoebae taxon with reductions in cosmopolitan taxa—which can inhabit a wide range of situations from wet to dry—and/or moderately dry taxa. In the upper part of the zone, testate *Amphitrema wrightianum,* which typically occupies pools on the bog surface, emerges.

The plant microstratigraphy and testate records correspond less well here. The proxies may be responding differently in time to changes in bog surface wetness. *Sphagnum* is mainly represented by *S. austinii,* a taxon with a wide hydrological range that makes its use in palaeohydrological reconstruction problematic (Stoneman et al. 1993). Conditions appear to have been variable with spikes in *Sphagnum*, undifferentiated monocotyledons—flowering plants, the seeds of which contain only one embryonic leaf—and unidentified organic material (UOM) suggesting low-level wet/dry changes. Human activity at Edercloon during this time comprised the building of three toghers—EDC 36, EDC 38 and EDC 42—the dates for which span the full range of the period (Chapter 3), and the locations of which may in part have been influenced by very local ground conditions (Reilly, Chapter 7).

Early to Middle Bronze Age (c. 1900–1500 BC)

Testate zone EDC2:T3 marks the first pronounced change in bog surface conditions—Dry Shift 1—represented by changes in taxa indicative of wet/dry shifts, i.e. *Hyalosphenia subflava, Amphitrema wrightianum* and *Archerella flavum* (Tolonen 1986; Charman et al. 2000). Here, *H. subflava* dominates with a background fauna of mainly cosmopolitan or moderately dry taxa. The mean water table drops to a new low, recovers and drops again. The amplitude of the shift suggests a sudden and serious drop in the bog water table.

During this period, the main peat former is *Sphagnum austinii* with lesser and infrequent amounts of *S.* section *Acutifolia* occurring. The accumulation of poorly to moderately humified Sphagna is implied with a reduction in *Sphagnum* representation around the same depth the mean water table drops for a second time (sub-zone EDC2:S3a).

Middle to Late Bronze Age (c. 1500–900 BC)

There is greater correspondence between proxies from c. 1500 BC. In EDC2:T4 (equivalent to microstratigraphic sub-zone EDC2:S3b), the RMWT implies that the water table has recovered and almost reaches the bog surface. Reliable wet-indicator testate taxa *Archerella flavum* and *Amphitrema wrightianum* have recovered. The wet regime implied prior to the dry shift in EDC2:T3 appears to be re-established here. *Sphagnum imbricatum* dominates the plant stratigraphy, with *Eriophorum* (a flowering plant in the sedge family) and *Calluna*, which both prefer drier regimes, absent. This time period saw the beginning of the construction of very large trackways at Edercloon, at least one of which, EDC 12/13, continued in use for several centuries (Chapter 4).

Late Bronze Age to Late Iron Age (c. 900–50 BC)

A second major shift to a dry regime—Dry Shift 2—is implied in the mean water table curve (EDC2:T5) and the plant microstratigraphy (EDC2:S4). The RMWT drops to its lowest point. This dry shift is both abrupt and pronounced and is dominated by dry-indicator testate taxa, particularly *Hyalosphenia subflava*. The water table recovers temporarily in the top half of the zone but a dry milieu is quickly re-established. This dry shift is registered in the plant microstratigraphy by the almost complete absence of *Sphagnum*. Evidently, *Sphagnum* growth was seriously inhibited. That this shift registers strongly in both proxy records may mean it represents a higher amplitude shift than the dry shift implied earlier in the Bronze Age. It also appears to have lasted longer than the first shift, with a low water table maintained over c. 850 years. The centuries of the Late Bronze Age to Early Iron Age saw intense human activity at Edercloon, with a dense network of interconnected trackways and platforms constructed in the bog (Chapter 4). The one scientifically dated togher in Tomisky (TOM 3) also coincides with this dry shift and it is likely that other undated sites there were of similar date.

Late Iron Age to early medieval (c. 50 BC–AD 500)

The situation changes again in this zone (EDC2:T6) with a return to a wetter and stable regime. The water table recovers to

above -10 cm and the combination of taxa represented (dominated by *Amphitrema flavum*) implies the prevalence of wet conditions. *Sphagnum* peat accumulation resumes and *S. imbricatum* all but disappears from the record (EDC2:S5a). *S.* section *Acutifolia* and *S. papillosum* are the main peat formers. The severity of the hydrological change in preceding centuries may explain the eclipsing of *S. imbricatum* as the primary peat former at Edercloon.

Early medieval to medieval (c. AD 500–950)

The stability of the preceding centuries is once again challenged. The overall trend in EDC2:T7 is towards a somewhat drier regime albeit not as unequivocal as Dry Shifts 1 and 2 described above. A lowered water table and increases in *Hyalosphenia subflava* bracket EDC2:T7. *Sphagnum* representation improves and is maintained following an initial *Eriophorum* spike in EDC2:S5b. Evidence of medieval activity on the bog was scarce, possibly in part due to modern reclamation and drainage; nonetheless, three structures including the togher EDC 49 were built during this time (Chapter 5).

Medieval (c. AD 950) to present

In this zone (EDC2:T8), the water table has recovered. Bog surface conditions are relatively wet and stable, similar to the situation in the Late Iron Age. As the sequence closes, the water table appears to drop implying further change in hydrology towards a drier regime. This is matched by reduced *Sphagnum* representation and the dominance of UOM.

Dry shifts and bog bursts

Two dry shifts (EDC2:T3 and T5) and two lower amplitude dry phases (EDC2:T2a and T7) have been identified at Edercloon. The dry shifts are pronounced, seemingly sudden and relatively long term, lasting between c. 400 and 850 years. They imply that the system was subject to large-scale and extensive drainage, a process not out of place in a modern context. However, prehistoric people lacked the resources to drain bogs and, consequently, other factors must be considered. The answer may be found by comparison with other studies conducted in Irish bogs.

A multi-proxy palaeohydrological study in Kilnagarnagh, Co. Offaly, implied a number of pronounced dry shifts (Bermingham 2005). An associated stratigraphic survey identified severe cessations in peat growth that corresponded with the higher resolution dry shifts. The best-replicated shifts occur in the Iron Age, Late Iron Age and early medieval periods. These events may be linked to a bog burst that occurred within the same bog system c. 750 m to the south in Tumbeagh around 1000 BC (Casparie 2006). Bog bursts result from over-saturation of a system, occurring when it is pushed beyond its hydrological threshold (Streefkerk & Casparie 1989) and can be viewed as an internal, albeit catastrophic mechanism for managing water. The burst at Tumbeagh resulted in the formation of a bog lake that was subject to repeated discharge over its lifetime. Such large-scale discharge was likely to have had system-wide impacts.

Similarly, in Derryville, Co. Tipperary, a series of dry shifts, replicated across the same range of proxies, coincided with multiple bog bursts identified in gross stratigraphy (Casparie 2005). These shifts date to 1250

BC, 800 BC, 700 BC and 600 BC, AD 150, AD 250 and AD 550 (Caseldine & Gearey 2005). Between each dry shift, the system's water table recovered and wet phases are implied.

The character of both dry shifts at Edercloon is similar to the bog-burst related shifts identified at Kilnagarnagh and Derryville. In each instance, water table drops are pronounced and abrupt and *Sphagnum* representation is greatly reduced, often disappearing from the record. In addition, truncated and displaced peat deposits were identified at Derryville and strata indicative of long-term, interrupted peat accumulation occurred at Kilnagarnagh. Given these similarities, it is probable that Dry Shifts 1 and 2 identified at Edercloon are the result of two separate bog bursts. Dry Shift 1 coincides with a period whereby no structures appear to have been built in the bog; in contrast a period of intensive activity occurred during Dry Shift 2 (see below).

What makes a bog burst?

The association of the dry shifts with bog bursts, an internal mechanism of hydrological control, suggests the main control on the development of these bogs was internal rather than external. Climate change is the primary external control postulated for hydrological change within bogs and is typically recognised in the identification of synchronous wet/dry shifts between sites (Barber et al. 2003). Where shifts appear to occur independently these are typically regarded as non-climatic events. At Edercloon, Dry Shifts 1 and 2 may date to 1900–1500 BC and 900–50 BC. There is no dated parallel from Derryville or Kilnagarnagh for Dry Shift 1 though overlapping dry phases have been identified elsewhere (Swindles et al. 2007b; Barber et al. 2003). The absence of widespread synchronicity suggests Dry Shift 1 may be an independent local event.

In contrast, Dry Shift 2 at Edercloon occurs around the same time as major shifts at Derryville and Kilnagarnagh at 800 BC and 845–50 BC, each interpreted as the product of bog bursts rather than climate change. Other raised bogs in Ireland also exhibit dry shifts around the same time. Humification records, which relate to the process of plant decomposition, from five sites in Northern Ireland suggest drier conditions between 850 BC and 760 BC (Plunkett 2006). Testate and plant macrofossil evidence from three further sites suggest relatively dry or intermediate hydrological conditions prevailed around 850 BC (Swindles et al. 2007a).

The dry shifts at these sites have not been related to bog bursts but perhaps this requires consideration. The prevalence of dry conditions at this time contrasts with a global shift to wetter and cooler conditions from 850–760 BC, the result of decreased solar activity (van Geel et al. 1996; 1999). Why the opposite appears to be occurring in Ireland is uncertain. The influence of the North Atlantic on Ireland's climate may be a factor (Plunkett 2006). Another may be non-uniform temporal and spatial responses to changes in solar activity, with Irish bogs exhibiting a delayed reaction to the climatic deterioration of the mid-ninth century BC (Swindles et al. 2007a). These explanations, however, involve external forces on bog development without accounting for internal bog dynamics.

Investigations at Kilnagarnagh suggest that in the centuries preceding the Iron Age (i.e. before the ninth century BC) the bog was insulated from the potential effects of climate change (Bermingham 2005). The most significant dry shift, the result of a probable

bog burst, occurred at the same time as the climate became wetter and cooler. Bog bursts are triggered by pushing the system beyond its water storage and management capacity. Increased effective precipitation, a consequence of a deteriorating climate, could have been the catalyst for the bog burst at Kilnagarnagh (ibid.). This may also be the case at Edercloon, Derryville, and other Irish bogs where a dry signal has been returned around 850 BC. Hence, the broadly synchronous dry signal emanating from Irish bogs may in fact reflect the onset of wetter conditions more generally. If this is the case, then climate change can be considered an important control on hydrology within Irish raised bogs.

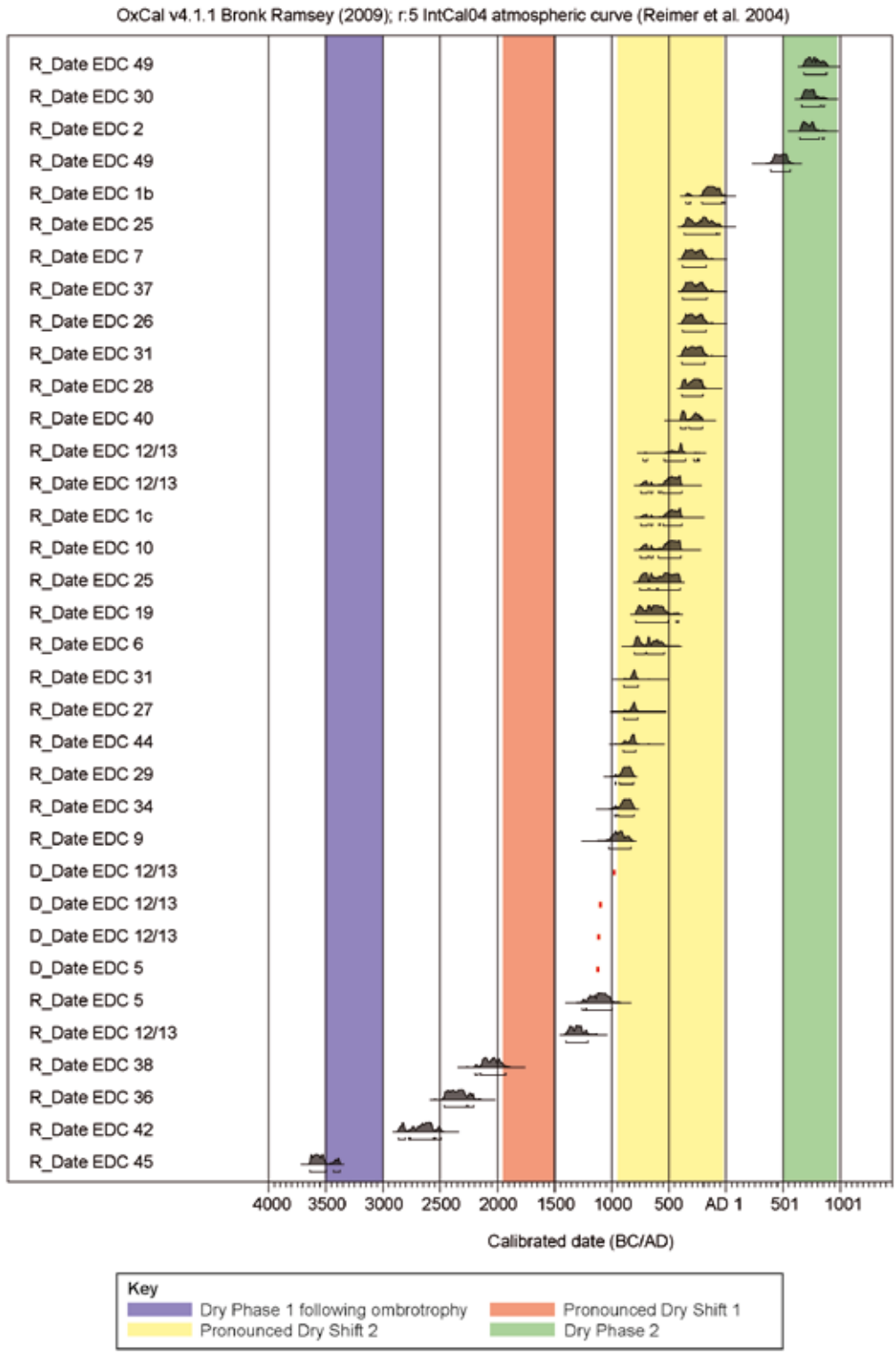
Palaeohydrology and the archaeological record

A common question posed in wetland archaeology is just how wet or dry were the bogs in which trackways and other structures were constructed. The palaeohydrological records from Edercloon have provided evidence for two pronounced dry shifts each followed by wetter phases with periods of relative stability implied. Matching trackway dates against the proposed dates for wet/dry phases and shifts at Edercloon suggests trackway construction occurred during both wet and dry phases (Illus. 2.7). There also appears to be gaps in construction during both such phases.

The earliest dated sites at Edercloon (Neolithic toghers EDC 45 and EDC 48) were built within the latter years of the fen but there was no apparent site construction in the early development of the raised bog (c. 3500 BC), described above as a dry phase (EDC2:T2a). Occasional trackway building occurred during a relatively stable and wet period between 3000 BC and 1900 BC, with an apparent gap in construction that coincides with Dry Shift 1. The greatest period of trackway construction occurred after c. 1500 BC, with construction continuing up to the end of the first millennium BC. This more or less coincides with Dry Shift 2. There was no trackway construction in the Late Iron Age, when a stable and somewhat wetter regime prevailed. Site construction resumed around the sixth century AD by which time the bog surface conditions had improved. From the mid-10th century AD, the water table recovered with a stable, damp situation prevailing until relatively recently.

There may be a correlation between periods of human activity on the bog and surface hydrology. Trackway construction prior to c. 1000 BC was occasional, typically occurring during wet phases. The first millennium BC is a period of pronounced water table collapse during which time site construction intensified. A drier bog surface may have enabled better access thus facilitating trackway construction and greater access to the bog.

It is reasonable to assume that raised bogs imposed technical limitations on those who wished to access them. Until the advent of large-scale drainage, very wet or saturated systems were typically inaccessible or difficult to access. Any reduction in wetness may have enabled access, particularly assisted access using trackways. The palaeohydrology data from Edercloon suggest that serious or catastrophic water table collapse resulted in a drier bog surface. Trackway builders appear to have taken advantage of this situation during the first millennium BC. This does not exclude other explanations for the intensification in site construction at Edercloon during this time. It may simply



Illus. 2.7 Wet/dry phases and shifts at Edercloon (CRDS Ltd/Nóra Bermingham).

mean that the desire or need to construct sites in this location was made easier by long-term and significant change in bog hydrology. The trackways can be viewed as an extension of human activity into new parts of the bog.

Conclusion

The palaeohydrological record from Edercloon has provided new evidence for significant environmental and hydrological change within the bog. Testate amoebae and plant microstratigraphy sequences display similarly timed analogous trends. Based on apparent absence of synchronous events from elsewhere in Ireland or the United Kingdom, these appear to have been largely independent events up until Dry Shift 2. This may be contemporary with dry shifts identified in other Irish bogs around 850 BC. At two sites, Kilnagarnagh and Derryville, these shifts have been linked to bog bursts and represent realignment of internal drainage mechanisms. Other Irish sites exhibit similarly timed dry shifts although these have not been linked to bog bursts. The dry situation around 850 BC suggested by the Irish data contrasts with evidence from the United Kingdom and Europe in which cooler/wetter conditions are implied at this time. Irish bogs appear to have responded differently to this deterioration in climate that saw them become over-saturated and forced to burst.

The most intense period of human activity on the bog is concurrent with a major dry shift in conditions—Dry Shift 2—that may have occurred between 900 BC and 50 BC. That there was some degree of local variability is reflected in the insect records from individual archaeological sites (see Reilly, Chapter 7). In general, the underlying trend, however, was towards dry conditions that appear to have facilitated access to the bog at the close of the Bronze Age and throughout the Early Iron Age.

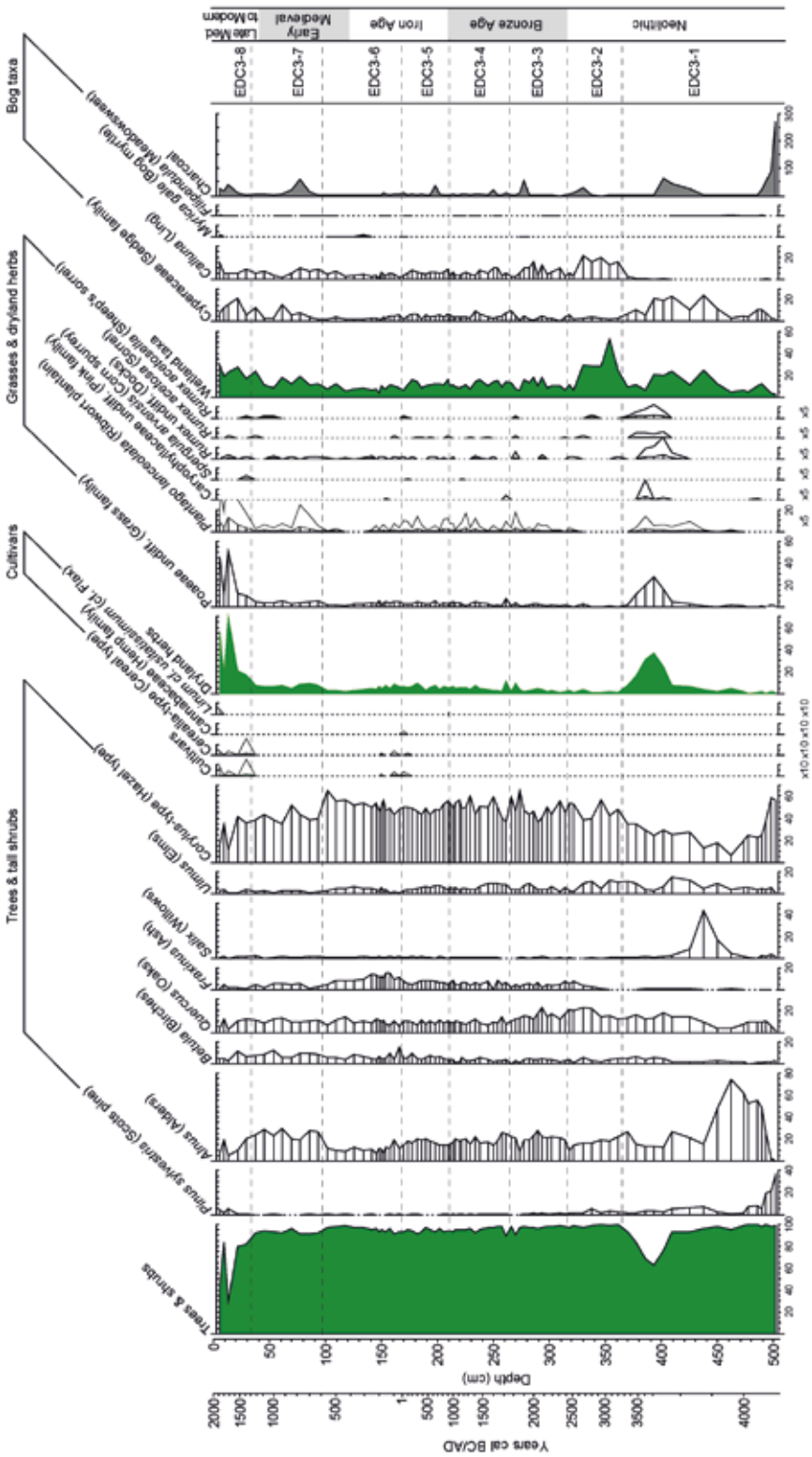
Vegetation history at Edercloon

Gill Plunkett

Pollen analysis has long been used to provide an understanding of vegetation history and past landscape evolution. From an archaeological perspective, the technique can enable the identification of land-use history in the form of woodland clearance and regeneration phases, and specific types of activity—arable or pastoral farming—can sometimes be gleaned from the range of weed taxa present in a pollen profile. Previous pollen studies have provided an environmental context for understanding human activity in peatlands at Corlea, Co. Longford (Caseldine, Hatton & Caseldine 1996; Caseldine, Hatton, Huber et al. 1996), and Derryville, Co. Tipperary (Caseldine et al. 2005). The pollen record (Illus. 2.8) from Edercloon provides insights into the nature of broader land-use over the timeframe in which the archaeological sites were being built and used. For ease of description, the pollen record is divided into zones.

Methods

Samples for pollen analysis were extracted at 2–4 cm intervals throughout the sequence, although the analyses presented here represent 2–8 cm intervals. Samples were prepared using standard techniques to enable pollen concentrations to be calculated (Stockmarr 1971). Pollen identification was aided by reference to Faegri & Iversen (1989), Moore et al. (1991) and van Leeuwen et al. (1988) (for the distinction of dock (*Rumex acetosa*) and sheep's sorrel (*R. acetosella*)). Where possible, bog myrtle (*Myrica*) pollen



Illus. 2.8 Palynological results from Edercloon (Gill Plunkett).

has been distinguished from hazel (*Corylus*), but it is possible that some *Myrica* pollen has been included in the *Corylus*-type sum. Charcoal fragments >20 μm were also recorded.

Arboreal (tree and shrub) taxa, dryland herb and cultivar percentages are calculated as a proportion of total dryland pollen (excluding sedge family (Cyperaceae), heather family (Ericaceae), bog myrtle and other predominantly wetland herbs). Wetland taxa, spores from non-vascular plants and charcoal percentages are based upon the total pollen sum. Diagrams are drawn using Tilia 2.6.1 (Grimm 1992; 2011). Local pollen assemblage zones (LPAZ) were determined using standard statistical methods that examine the relationship of pollen assemblages in adjacent levels (Grimm 1987).

Neolithic

EDC3-1 (365–502 cm; 4100–3300 BC): The Early to Middle Neolithic landscape surrounding Edercloon appears to have been strongly dominated by woodland. Tree and shrub taxa are dominated by alder (*Alnus*), which may have become established on or around the bog. Willow (*Salix*), which reaches a maximum at approximately 3870 BC, is also likely to have been a component of the local fen vegetation, with Cyperaceae (sedge family) and meadowsweets (*Filipendula*) growing on the bog. On drier ground, pine (*Pinus*) is at a maximum at the opening of the zone, but soon declines to leave oak (*Quercus*), elm (*Ulmus*) and hazel (*Corylus*-type) as the dominant woodland taxa. Elm percentages decline briefly between approximately 3700 BC and 3600 BC, although concentration values (not shown) suggest a more extended reduction in elm between approximately 3900 BC and 3500 BC. At 401–402 cm (approximately 3750 BC), a substantial rise in Poaceae (grass family) is accompanied by increases in weeds such as ribwort plantain (*Plantago lanceolata*), Caryophyllaceae (pink family) and docks (*Rumex* species). These changes are indicative of human activity. Charcoal values peak temporarily at this time. In the bog, EDC 48 and EDC 45 are the only toghers evident, likely built within the developing fen (Reilly, Chapter 7). By 3500 BC, woodland taxa recover and human activity appears to have declined in the catchment.

EDC3-2 (315–365 cm; 3300–2500 BC): The Middle to Late Neolithic zone sees the rise of elm and hazel-type and a minor resurgence of pine as evidence for human activity dissipates. Changes in the local conditions on the bog are indicated by a major and sustained increase in heather (*Calluna*) (observed also in the plant macrofossil record, see sub-zone EDC2:S2 in Illus. 2.6) and a decline in Cyperaceae, indicating the transition to raised bog. Other Ericaceae (heather family) also feature substantially during this zone. From around 2800 BC, ash (*Fraxinus*) expands to become a substantial component of the woodland. This is again a period of limited human activity on the bog with the building of EDC 42, a short togher laid down in wood-rich peat (Bermingham 2008b, 13; Reilly, Chapter 7).

Bronze Age

EDC3-3 (263–315 cm; 2500–1750 BC): The Early Bronze Age landscape around Edercloon remains mainly wooded at the opening of this zone, but there is a change in the woodland structure as the final pine decline occurs. Oak and hazel-type curves fluctuate, possibly indicating woodland interference, with opening suggested

by modest representations of Poaceae and ribwort plantain—a plant common on cultivated or disturbed ground. The appearance of bracken (*Pteridium*; not shown) at the same time may similarly be due to disturbances in the woodland. On the bog, heather and other Ericaceae decline, and an increase in alder may indicate an expansion of alder carr—waterlogged wooded terrain populated with alder trees—around the fringes of the bog. Two toghers, EDC 36 and EDC 38, date to within this period (Chapter 3).

EDC3-4 (203–263 cm; 1750–770 BC): Human activity continues to be recorded through the Middle to Late Bronze Age zone, with small expansions in Poaceae and dryland herbs and reductions in oak and hazel-type. Elm values fall around the 15th century BC, but although ribwort plantain increases slightly from this time, the pollen record remains dominated by arboreal taxa and human impact on the woodland appears modest. There are no notable changes in the bog flora. This time period saw the beginning of a prolonged phase of trackway and platform construction at Edercloon, starting with togher EDC 5, followed by EDC12/13 and the associated network of interconnected sites which continued into the Later Bronze Age and Early Iron Age (Chapter 4).

Iron Age to early medieval

EDC3-5 (167–203 cm; 770 BC–AD 40): Evidence for human activity continues through the Early to Developed Iron Age zone and from the late second century BC crop cultivation is represented by Cerealia-type (cereals) and Cannabaceae (cannabis family), as well as arable weeds such as corn spurrey (*Spergula arvensis*) and sheep's sorrel (*Rumex acetosella*). Aside from a decline in hazel-type, it is difficult to discern any significant changes in the surrounding woodland composition or local bog conditions. Sites were constructed in Edercloon and Tomisky throughout this period (Chapter 4).
EDC3-6 (97–167 cm; AD 40–600): From the Late Iron Age to early medieval period, human activity persists to the end of the first century AD and then declines, as ash reaches its maximum and elm and hazel-type expand. Anthropogenic indicators all but disappear, implying abandonment of the catchment.

Early medieval to modern

EDC3-7 (33–97 cm; AD 600–1300): More substantial changes amongst the arboreal taxa are visible from the early medieval period to the start of the late medieval period, as alder rises, and ash, elm and hazel-type decline considerably. These changes coincide with expansions in Poaceae, ribwort plantain, bracken and charcoal, indicating human activity which persists throughout the zone. There were few excavated sites contemporary with this period, due possibly to recent peatland reclamation and drainage; however, at least one togher (EDC 49) and two deposits of archaeological wood (EDC 2 and EDC 30) date to this interval.

EDC3-8 (5–33 cm; AD 1300–1900): The zone spanning the late medieval to modern period sees an opening up of the landscape, as arboreal taxa give way to Poaceae, ribwort plantain and other weeds, particularly from the 18th century AD. By the top of the sequence, pine re-expands, following its re-introduction to Ireland in the early modern period. Other exotic trees are not recorded to any significant degree, however, and a considerable amount of native woodland appears to have remained in the surrounding area. Cereal cultivation is represented

through the zone, and at the top of the profile, *Linum* cf. *usitatissimum* is recorded, which probably derives from cultivated flax.

Summary

The pollen record from Edercloon reveals a predominantly wooded landscape through much of the prehistoric and medieval periods. Woodland was characterised by oak, elm and hazel, with ash emerging as an important component from the Late Neolithic period. Around the bog, fringe woodland comprised alder, birch and willow. Pine appears to have been poorly represented in this area since the end of the Mesolithic. The fourth millennium BC Elm Decline and third millennium BC declines in elm and pine are classic features of Irish woodland development (Jessen 1949; Hirons & Edwards 1986), and demonstrate that the Edercloon pollen record was sensitive to regional-scale woodland changes. By and large, the pollen record suggests that human impact on the dryland surrounding Edercloon was generally modest throughout the prehistoric and early medieval period, the exception being during the Early Neolithic.

Low pollen concentrations in the lower 1.5 m of the sequence may be related to rapid peat accumulation and poorer preservation of pollen as a result of the likely high pH of the fen peats at this time. Nevertheless, the most pronounced phase of human activity recorded at Edercloon can be found during this period, corresponding to the Early Neolithic period. Interestingly, with the exception of elm, the main dryland trees show no signs of disturbance at this time, and instead it is the wetland taxa—alder and willow—which decline. The strong representation of human activity at this time may then indicate the nearby presence of humans and their impact on the immediate vegetation around the bog. In common with many other pollen records from Ireland (see O'Connell & Molloy 2001; Whitehouse et al. 2014), however, pressure on the landscape seems to have declined by the Middle to Late Neolithic.

Subsequent interference with the woodland can be seen in the Early Bronze Age. The activity appears to persist throughout the second and first millennia BC but extensive clearances typical of the Middle and Late Bronze Age (Plunkett 2009) are not evident, nor does there appear to be a decline in activity associated with the collapse of the Bronze Age. This suggests that, although occupation of the Edercloon locale may have been continuous through this time period, the surrounding area was not intensively farmed. What is perhaps unusual about the Edercloon later prehistoric pollen record then is not that human activity appears uninterrupted, in contrast to other Irish records, but rather that it lacks evidence for more extensive farming phases seen elsewhere. It is notable that indications of cultivation are lacking until the Early Iron Age, implying that activity on the adjacent bog was remote from centres of crop production.

During the Early Iron Age, cultivation in the catchment is represented for the first time. This activity can be placed within the context of a farmed landscape not only in the vicinity of this bog but widely recorded elsewhere in Ireland (e.g. Plunkett et al. 2009). The re-expansion of woodland in the early centuries of the first millennium AD can be correlated with the wider phenomenon of the Late Iron Age Lull (Molloy 2005; Coyle McClung 2013), although its duration seems protracted in the vicinity of Edercloon until the seventh century AD, if the chronology

is correct. Early medieval farming activity is once again represented by only modest increases in grasses and weed taxa, but at higher values than at any time since the Neolithic period. A more substantial and sustained human impact on the woodland begins in the 14th century.

Conclusions

With the exception of the Early Neolithic and late medieval to recent times, the landscape around Edercloon appears to have been dominated by woodland. The extent of human activity represented by farming indicators during the Early Neolithic part of the diagram is particularly striking in view of how muted the anthropogenic signal is in subsequent millennia, although the apparent lack of impact on the main woodland taxa may suggest that the focus of activity was in proximity to the bog. Some disturbance of the woodland is evident during the Bronze Age, Early Iron Age and early medieval periods, but is considerably subdued in comparison to other sites, where the impact is usually greater. On the whole, cultivation is poorly represented through the diagram, but this may simply be due to the distance at which activity was taking place from the bog.

CHAPTER 3

Neolithic to Early Bronze Age Edercloon

by Caitríona Moore

Neolithic to Early Bronze Age Edercloon

Neolithic Edercloon—incursions into the fen

The Early Neolithic was a period of great change in Ireland. As the hunter-gatherer lifestyle gave way to agriculture, so too the landscape started to change and the vast lakes that dominated the midlands began to be inundated by fens and eventually raised bog peats (Waddell 2000, 25). At Edercloon the fen began to develop shortly after 4230–3970 BC (Chapter 2), and so what would eventually develop into a raised bog would, at this time, have been quite a wet environment populated with plants and trees, and to which animals had some access (Chapters 2 and 7). Pollen records indicate a human presence in the area around Edercloon at this time (Chapter 2); however, as outlined in Chapter 1, archaeological evidence on the surrounding dryland is scarce. The excavation of two Neolithic toghers (Illus. 3.1) at Edercloon, which attests to human activity in the wetlands, is therefore significant.

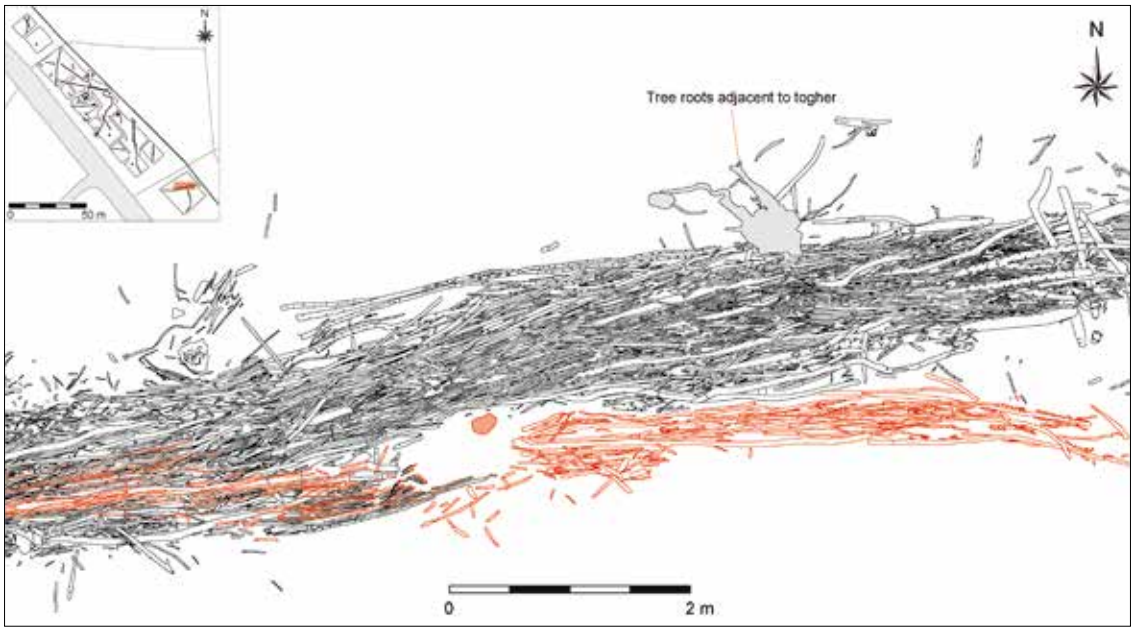
EDC 48—the first path

The first site to be built in Edercloon was EDC 48 (L16.9 m min.; W1.45 m; D0.2 m), a short togher orientated ENE–WSW. It was a simply constructed site consisting of closely laid longitudinal brushwood beneath which were two pieces of transverse brushwood spaced 0.25 m apart (Illus. 3.2 and 3.3). The longitudinal elements were up to 5 m in length and all of the pieces identified were hazel (see Stuijts, Chapter 7). EDC 48 was a somewhat insubstantial site, with large gaps along its length, some filled with scattered fragments of brushwood and some apparently the result of disturbance from tree roots. Although it had a maximum width of 1.45 m, measured on the basis of occasional outlying material, the actual walking surface of the togher was c. 0.5 m. This small site was a simple and straightforward path, designed to allow an individual to walk over the wet surface of the fen. The wood used in its construction was harvested by tearing branches from larger stems or trunks and only one piece had evidence of having been cut with a stone tool (Moore 2008b, 5).

EDC 48 has not been scientifically dated but its location directly beneath EDC 45 (radiocarbon-dated to the Early Neolithic, see below) makes it the earliest togher within the excavated complex. It was orientated ENE–WSW, just off the axis of the overlying EDC 45, and both sites followed the same meandering line. A maximum of 0.04 m of peat lay between the two toghers; however, for the most part they were in direct contact suggesting a very short time span between their construction. Exactly how long this time period may have been is unknown, but it is unlikely to have been more than a season, perhaps less. Short simple toghers such as EDC 48 are very common in Ireland's

Illus. 3.1 Schematic plan of Neolithic and Early Bronze Age sites at Edercloon (CRDS Ltd).

Illus. 3.2 The well-preserved trackway EDC 45 constructed with densely interwoven brushwood and roundwoods, looking west. The smaller togher to the left and on a slightly different alignment is EDC 48 (CRDS Ltd).



Illus. 3.3 Plan showing a portion of EDC 45 and EDC 48 (in red) (CRDS Ltd).

raised bogs (McDermott 2007, 24; Whitaker & OCarroll 2009, 164–5; van de Noort et al. 2013) and were most likely built to allow access through small, possibly particularly wet or treacherous areas of the bog surface. EDC 48 would have been easily and rapidly built and although its full length is unknown it likely represents the work of an individual or a small group, rather than a large communal undertaking.

EDC 45

EDC 45 (L25 m min.; W1.8 m; D0.2 m), which lay directly above EDC 48, was a more substantial togher and has been radiocarbon-dated to 3650–3370 BC (Wk-20960; see Appendix 1 for details). It ran east–west in a gradually curving S-shape for a minimum of 25 m (Illus. 3.1 and 3.2). EDC 45 had a very clear design and was built by laying a sparse layer of longitudinal brushwood and roundwoods directly onto the bog surface. This was then overlain by irregularly spaced heavy brushwood, roundwoods and small timbers which were placed transversely or diagonally across the line of the site. Following this, a layer of longitudinal brushwood and occasional roundwoods up to 7 m long was loosely woven under and over the transverses, and into the basal layer (Illus. 3.3). Although the pattern of the weave was quite irregular, the sequence of under/over indicated that the site was built moving from west to east. EDC 45 had an overall width of 1.8 m; however, like EDC 48 below it, this was exaggerated by outlying material and the walking surface of the togher was on average 1.1–1.2 m wide.

The distinct and deliberate structure of EDC 45 created a small but strong and elastic togher in which pegs were not required. It was predominantly composed of hazel although alder, apple-type wood, and small amounts of birch, willow and elm were also present (Stuijts, Chapter 7). With regard to apple-type wood, the differentiation between the genera and species of the Maloideae

subfamily is not generally possible with wood anatomy and they are usually grouped into the apple subfamily, which includes, amongst others, hawthorn, rowan-type, whitebeam, service tree, apple and pear. In this text, the terms 'apple-type' and 'rowan-type' are used for identifications.

The gradual S-bend in the site appears to be due to the presence of a woodland root system which necessitated a meandering course through the larger tree roots. This interaction between the local environment and the site plays an important role in its interpretation. EDC 45 was built within the latter years of the fen's existence, close to the dryland margins (Reilly, Chapter 7). Just prior to this, at approximately 3750 BC, pollen records indicate the incursion of people into the area around Edercloon, borne out by a rise in grasses and weeds and a decline of alder and willow (Plunkett, Chapter 2). A fen environment comprises a combination of open water, vegetation-rich pools and, on its margins, water-tolerant tree species such as willow and alder (Mitchell & Ryan 2007, 145). As such, it is a habitat with abundant resources which, in addition to plants and trees, would have included waterfowl and grazing mammals (Coles & Coles 1989, 153). This seems to have been exactly the environment in which EDC 45 was built, as insect remains from beneath the site indicate the presence of vegetation-rich pools, woodland and animals in the immediate area (Reilly, Chapter 7). Currently, dryland lies 60–70 m east of Edercloon but in the Neolithic period would have been closer (Bermingham 2008b, 14). Orientated east–west, it seems likely that EDC 45 was built to allow people to cross the wet surface of the fen and access the resources therein.

One of the most striking aspects of EDC 45 is its resemblance to a togher excavated in Corlea Bog, Co. Longford, 25 km to the south-east. Corlea 9, with a comparable date of 3702–3030 BC (GrN-16831), was of similar dimensions to EDC 45 but was traced for almost 400 m across the bog. It was of identical construction to EDC 45 (Illus. 3.4), with a discernible weave moving west–east (Raftery 1996, 81–3). Further similarity

Illus. 3.4 Corlea 9, Co. Longford, a Neolithic togher of almost identical construction to EDC 45 (Barry Raftery).

between the sites occurred in the worked wood assemblages, both of which contained wood with the characteristic toolmarks of stone axes. These sites also contained a specific type of worked end called a split, or split and axed, end exclusive to the Neolithic and recorded in contemporary material from trackways in Mountdillon, Co. Longford (O'Sullivan 1996, 304), and a slightly later Neolithic togher in Cloonshannagh, Co. Roscommon, just 6 km to the south-west (Moore 2017, 7).

Despite the geographical distance between them, the similarity of these two toghers is remarkable and it is tempting to view it as evidence that these sites were built by the same group of people or perhaps independent groups between which there was contact. Conversely, it may be coincidental and merely a case of people applying an instinctive and effective approach, using shared knowledge. While only a length of 25 m of togher EDC 45 lay within the road corridor, the length recorded for Corlea 9 indicates that these paths, although narrow and light, were capable of extending across the wetlands for substantial distances.

Discussion

The paucity of sites in Edercloon during the Neolithic may indicate that the fen and its margins were easily accessed without the need for artificial paths. A similar situation was suggested at Derryville Bog, Co. Tipperary, where evidence of Neolithic activity was scarce (Cross May et al. 2005a, 61), but Bronze Age activity in the fen was extensive (ibid., 351–4). The occurrence of such a small number of Neolithic sites at Edercloon fits into the wider Irish pattern of togher construction. Raftery (1996, 412) suggested that the scarcity of Neolithic sites in Irish bogs was due to the circumstance of discovery and that the number would dramatically increase in future years. Despite several decades of survey and excavation throughout the midland raised bogs, this has not been the case and, while numbers are slowly increasing, they remain low in comparison to those for the later prehistoric and medieval periods (Irish Archaeological Wetland Unit 2002a, 2; 2002b, 11; 2002c, 9; 2003, 7; Whitaker 2006a, 15; 2006b, 8; van de Noort et al. 2013, 50; Bermingham 2016, 63; Moore 2018, 13). This situation is mirrored in continental Europe where few trackways of the period have been identified (Casparie 1987, 61; Hayen 1987a, 121). Conversely, in Britain there are 42 trackways of known Neolithic date (Brunning 2008; Brunning & McDermott 2013, 373); however, many of these are located in the Somerset Levels (Coles & Coles 1986, 65–84) and, as such, may represent a specific regional phenomenon.

In general, Neolithic activity in County Longford is muted and only a small number of sites have been identified. In County Leitrim, the presence of Neolithic people is clearer, largely due to the increase in megalithic tombs as one moves west (de Valera & Ó Nualláin 1972). The artefactual evidence is equally limited; Neolithic finds from bogs in the surrounding area include stone axes from Aghintemple, Co. Longford, to the south-east (Halpin 1984, 84), and Cuilbeg, Co. Roscommon, to the south-west (ibid., 129).

Late Neolithic and Early Bronze Age Edercloon

The end of the Neolithic and the start of the Bronze Age can be seen as one of the greatest

periods of technological change in prehistoric Ireland. The advent of metallurgy not only introduced new and valuable metal objects to the population, but also brought tools with a far greater efficacy allowing more effective and dramatic impact upon what was still a predominantly wooded landscape. Between approximately 2800 BC and 1900 BC three toghers of quite varying design, scale and apparent function were built.

EDC 42—a transitional togher

EDC 42 (L11 m min.; W2 m; D0.08 m) was a short togher radiocarbon-dated to 2870–2490 BC (WK-20956), and so built perhaps as much as 1,000 years after EDC 45. Orientated north–south it was composed predominantly of a single layer of transverse brushwood, roundwoods and twigs, which included birch, hazel, ash, apple-type wood and elm (see Stuijts, Chapter 7). The material in the togher was very widely spaced with gaps of 0.3–0.7 m recorded between elements (Illus. 3.5). Intermittent pegs were placed at the edges and along the centre line of the togher, and along its eastern edge were occasional small and medium-sized stones. Natural wood and roots occurred in the peat directly beneath the site and appeared to have been incorporated or utilised within its structure.

Located at the very northern extent of the excavation area (Illus. 3.1), EDC 42 lay 0.4 m below EDC 38 (see below) in an area extensively disturbed by peat cutting,

Illus. 3.5 The Late Neolithic trackway EDC 42 being prepared for photo planning. This site incorporated tree roots and occasional stones (CRDS Ltd).

close to the find spot of the Edercloon axe (J McGlynn, pers. comm.). The togher was clearly truncated at each end and survived for a length of only 11 m. It was well defined, measuring 2 m wide, and so although its surface was sparse it does appear to have been a reasonably substantial site. The incorporation of natural wood and roots into the togher is somewhat unusual but not unique, having parallels with platform sites at Derryville Bog (Cross May et al. 2005b, 344–5). The design of EDC 42 appears to simply have involved the laying of brushwood, roundwoods and occasional pegs on a woody peat surface in order to stabilise it for human passage. This togher was one of the few sites excavated at Edercloon to incorporate stones into its construction. These were concentrated along its eastern edge and may have functioned as markers. The area of the bog in which EDC 42 was built was very wood rich, borne out by both peat stratigraphic survey (Bermingham 2008b, 13) and the analysis of insect remains from directly beneath the site (see Reilly, Chapter 7). The latter in particular identified a strong terrestrial signal indicating the close proximity of dryland. Like many sites in Edercloon (see Chapter 8), EDC 42 was orientated north–south and ran parallel to the nearby dryland. Although it was heavily truncated and its original length is unknown, this orientation suggests that EDC 42 functioned to allow movement through rather than across the wetlands.

A small assemblage of worked wood from EDC 42 was subject to detailed toolmark recording which identified the use of both stone and metal axes at the site (Moore 2008b, 8). The earliest metal axes in Ireland were copper axes believed to have been introduced c. 2400–2200 BC (Waddell 2000, 124). Pre-dating this by several centuries, the metal toolmarks from EDC 42 represent very early use of metal axes in Ireland and demonstrate that both stone and metal tools coexisted for a period.

EDC 36—into the Early Bronze Age

The next site to be built at Edercloon was the togher EDC 36 (L38 m min.; W3.05 m; D0.06 m), which has been radiocarbon-dated to 2470–2200 BC (Wk-20202). It was composed of a single layer of longitudinal roundwoods and brushwood, which overlay irregularly spaced transverse brushwood and roundwoods (Illus. 3.6). The longitudinal elements were laid an average of three pieces wide and were quite widely spaced, 0.1–0.3 m apart. The transverses were also very spaced out with distances of 3–4 m between them. In common with the Neolithic toghers EDC 48 and EDC 45, pieces of EDC 36 had become dispersed, and while the maximum width of the site was 3.05 m, the actual togher surface was much narrower varying from 0.7 m to 1.5 m wide. The wood species used in EDC 36 have been identified as predominantly alder and ash, with a small amount of hazel also present (Stuijts, Chapter 7).

EDC 36 was the first site to be built in the raised bog at Edercloon and was a very simply constructed togher with a walking surface of longitudinally laid roundwoods supported by well-spaced transverse roundwoods. The apparent wide spacing of the longitudinals is unlikely to have been part of the original design and it is probable that some lateral movement of the elements occurred in antiquity. This may have been caused by quite wet conditions prevalent on the bog at the time (Bermingham 2009, 15; Chapter 2) and, in particular, beneath the togher itself where insect remains included several species of beetle common to pools (Reilly 2008a,

Illus. 3.6 Looking south-east along EDC 36, a simple togher of longitudinal roundwoods overlying occasional transverse elements. Some of the longitudinals were displaced over time. (CRDS Ltd).

Illus. 3.7 Early Bronze Age togher Derryoghil 7, Co. Longford, the structure of which closely resembles that of EDC 36 (Barry Raftery).

18; Chapter 7). With such a narrow walking surface, EDC 36 can only have been intended for use as a footpath for humans and, even so, the rough surface, presumably prone to movement, may have been difficult to use. Although an animal presence around the site was evident in the insect remains (Reilly, Chapter 7), it seems unlikely that this togher was built to facilitate the movement of livestock. Animals around the site, whether domestic or wild, were likely attracted to the area by pools of open water. Although only a 38 m stretch of EDC 36 occurred within the road corridor, the site clearly ran beyond this limit and, with a north-west–south-east orientation, it was one of the few toghers in Edercloon that appeared to have a relationship with the nearby dryland, towards which it ran. The excavations at Edercloon took place at the narrowest crossing point within a large bog complex (Bermingham 2008b, 12) and, while most of the trackways do not appear to have taken advantage of this (see Chapter 8), EDC 36 may have been constructed to allow safe passage across the wetlands.

In common with EDC 45, EDC 36 bore remarkable similarity to a contemporary togher excavated in the Mountdillon Bogs. Derryoghil 7 was of identical construction to EDC 36 (Illus. 3.7), the only difference being the presence of pegs holding its transverse elements in position (Raftery 1996, 127–9). Like EDC 36, the longitudinal elements of Derryoghil 7 had become displaced in antiquity and gaps of up to 0.15 m were noted between them (ibid.). A similar togher was also excavated in Cloonshannagh. RO-CLS001J-L was of slightly denser construction but the similarity is clear and its date of 2460–2210 BC (Coughlan & Whitaker 2019, 8–9) is almost identical to that returned for EDC 36. The method of construction used in these sites was quite distinctive and this trackway type appears to be relatively rare. As with EDC 45 and Corlea 9 (see above), it is possible that these sites were built by the

same regional group. Further afield, however, a site of this type, dated to the Late Bronze Age, was excavated in the Netherlands (Casparie 1987, 50).

EDC 38

The final site of the Early Bronze Age in Edercloon was EDC 38 (L5.7 m min.; W2.4 m min.; D0.15 m), which has been radiocarbon-dated to 2200–1920 BC (Wk-20955). This short togher was composed of a layer of predominantly transverse brushwood and roundwoods densely interspersed with twigs, bark and leaves (Illus. 3.8). A small amount of wood from the site was analysed as to species and included alder, birch, hazel, ash, apple-type and oak (see Stuijts, Chapter 7). EDC 38 lay directly above EDC 42 (Illus. 3.1) and, like the latter, was heavily truncated by turf cutting, with modern saw marks recorded on some individual elements (Moore 2008b, 3). It appeared to be orientated north–south; however, its truncation means that it could have had a different form and may have been a platform rather than a linear structure.

Illus. 3.8 Togher EDC 38, built in the Early Bronze Age using brushwood, roundwoods, twigs and bark. This site was heavily truncated by turf cutting (CRDS Ltd).

The position of EDC 42 directly below it and on roughly the same axis, may have caused slightly drier conditions on the bog surface influencing the positioning of this site. The reuse of routeways is a recurrent characteristic of Edercloon toghers in the Late Bronze and Early Iron Age (see Chapter 4), as is the preference for north–south orientation (Chapter 8). Study of the development of the raised bog at Edercloon and of insect remains specific to EDC 38 have shown that the togher was built in the early levels of the raised bog, just above the fen peat (Bermingham 2008b, 11; also Chapter 8).

Approximately 10 m south-east of EDC 42 and EDC 38 was EDC 33 (L3 m; W0.5 m; D0.15 m), a fragmented and disturbed deposit of two roundwoods, a piece of brushwood and two possible split timbers (Illus. 1.9). A single metal toolmark was recorded on a piece of brushwood. This site was

located within an abandoned turf cutting and although it is undated its position between EDC 38 and EDC 42 to the north-west and EDC 12/13 and EDC 19 (see Chapter 4) to the south-east would suggest a prehistoric date.

Discussion

The end of the Neolithic and the beginning of the Bronze Age was a period of environmental and technological change at Edercloon. As the wet fen changed to raised bog so too the use of stone axes gave way to metal implements, albeit gradually. EDC 42 was the final site to be built on the fen surface, and with evidence of the use of both axe types, it indicates a period when the two technologies coexisted. At this time the landscape around Edercloon appears to have been wooded and relatively closed (Plunkett, Chapter 2). In contrast, EDC 36 and EDC 38 were built on the raised bog, with the fen close beneath, at a time when the landscape appears to have opened up slightly (Chapters 2 and 7). All of these sites were simple, single-phase constructions of a scale suitable for pedestrian use and, while the truncation of EDC 42 and EDC 38 somewhat hampers their interpretation, EDC 36 certainly seems to have been built to traverse the bog.

Excavations at the northern extent of the road scheme at Clooncolry 1 (McGowan & O'Connor 2009a, 14–15) and Cloonturk 2 (McGowan & O'Connor 2009b, 14–15) identified several burnt mounds and associated features contemporary with the Early Bronze Age toghers at Edercloon. Further south, at Moher 1, a stake ring, possibly representing the remains of a basket (Collins & O'Connor 2009, 23), and at Moher 5 a spread of burnt material associated with an adjacent mound were also dated to this period (Collins & O'Connor 2008a, 13–14). These sites located along the margins of the wetlands demonstrate the frequent interaction of people with this landscape. A wedge tomb (LF008-037) in the townland of Clooneen (Beirne), just over a kilometre south of Edercloon, further suggests the presence of an established Early Bronze Age community.

The largest group of sites within County Longford contemporary with the Early Bronze Age toghers at Edercloon are several toghers of the Mountdillon complex that were built during the second millennium BC (Raftery 1996, 412; Whitaker 2009, 13–15), while another group of contemporary toghers were excavated in Cloonshannagh, Co. Roscommon (Coughlan & Whitaker 2019, 8–11).

CHAPTER 4

Late Bronze Age and Iron Age Edercloon

by Caitríona Moore

Late Bronze Age and Iron Age Edercloon

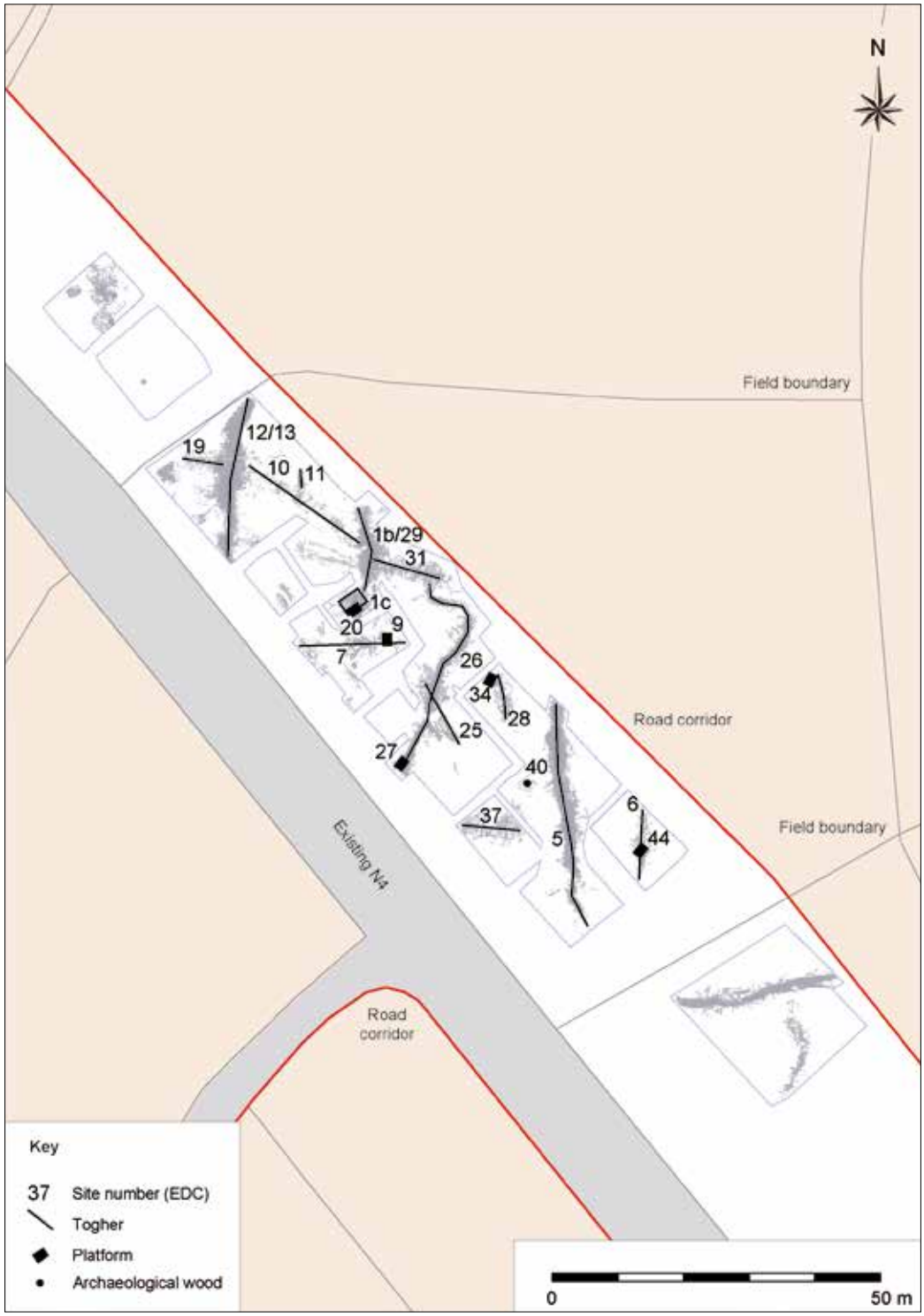
From the end of the Middle Bronze Age through to the Iron Age was a period of very intense activity and building in Edercloon. This resulted in the construction of a dense network of interconnected trackways and associated platforms (Illus. 4.1). Although characterised by very large toghers, this period also saw the construction of occasional short pathways and platforms, the latter occurring both in relative isolation and associated with the trackways. This phase of activity followed approximately 800 years when no sites were built and, perhaps not surprisingly, coincides with increasingly dry environmental conditions (Bermingham, Chapter 2).

The toghers of the period were particularly large and dating evidence has indicated that several were repeatedly rebuilt or replaced, resulting in depths of over 1 m. Owing to the dense and jumbled character of the deposits of wood it was almost impossible to identify separate chronological or structural events within these sites. As a result, the partition of these sites into separate layers was at times arbitrary, reflecting a practical need to pause excavation and record the exposed material rather than having established clear stratigraphic divisions. This difficulty has been compounded by radiocarbon and dendrochronological dating results, several of which conflict with internal site stratigraphy and the stratigraphic relationships between interconnected sites. As a result, the sites in this chapter are not presented in exact chronological order but rather in a sequence that best reflects human activity at Edercloon during the Late Bronze Age and Iron Age.

Toghers of the Late Bronze Age and Iron Age

EDC 5

Although not the earliest site of this period, EDC 5 (L32.5 m min.; W3.6 m; D1.3 m) was one of the first large toghers to be built at Edercloon. Constructed at the beginning of the Late Bronze Age, its lowest layer has been radiocarbon-dated to 1260–970 BC (WK-20961) and dendrochronologically dated to 1120 BC ± 9 years or later (Q11026; see Appendix 2 for details). It was one of the largest toghers to be excavated and ran north–south, parallel to the adjacent dryland. The northern end ran beyond the limits of the excavation but a subsequent research-led geophysical survey has established that EDC 5 ran for a further 19 m to the north (Bonsall et al. 2016). The southern end represented the terminus of the togher in this direction. EDC 5 was not built in a straight line but rather ran in a very gradual S-shape, with a distinct turn east at its northern end and one to the west at its southern extent (Illus. 4.1 and 4.2). It was an exceptionally deep site with two dense layers, between which



Illus. 4.1 Schematic plan of Late Bronze Age and Iron Age structures at Edercloon. Platform EDC 1c is denoted by an open rectangle to distinguish it from platform EDC 20 (CRDS Ltd).

Illus. 4.2 Looking south along the line of EDC 5, with the early medieval togher EDC 49 above it in the small cutting in the foreground (CRDS Ltd).

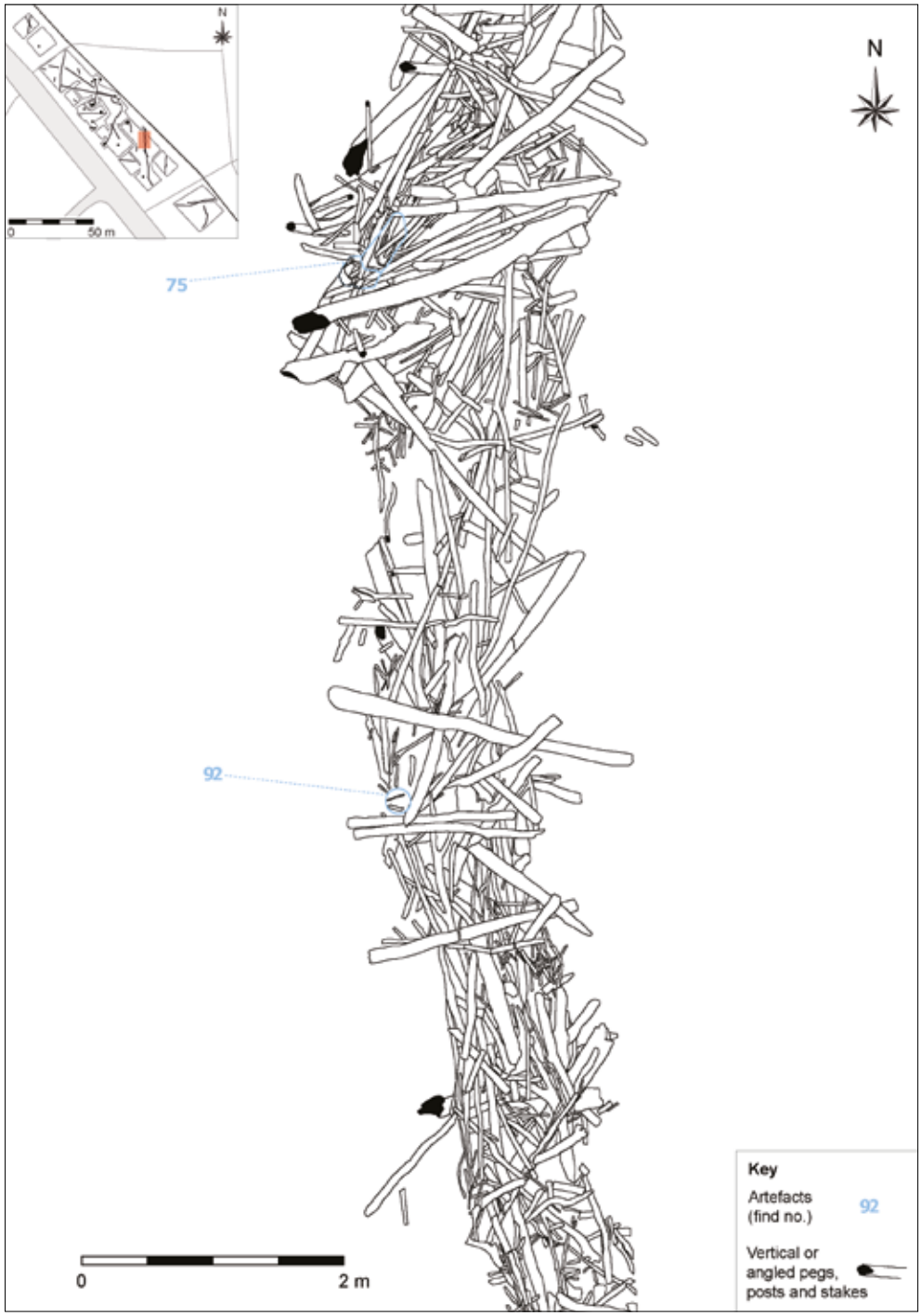
was a sporadic layer of wood-rich peat. As explained above, these layers are somewhat arbitrary and it is thought that EDC 5 was built in a single episode.

The upper layer of EDC 5 was 0.5 m deep and was quite variable consisting of sections of longitudinally laid roundwoods and split timbers, areas of lighter roundwoods and brushwood, the latter occasionally very haphazard and irregular, and in one place a section of transverse brushwood (Illus. 4.3). Slightly more ordered, the lower layer, which was 0.62 m deep, comprised predominantly longitudinal roundwoods and brushwood overlain by occasional transverse roundwoods and brushwood (Illus. 4.4). Seven transversely laid large roundwoods spaced 0.8–2 m apart were set at angles of 30–45°. There were some variations in the lower layer of EDC 5, particularly at each end. At its southern end was a concentration of transverse roundwoods, while at its northern end a third basal layer of transverse roundwoods was present. Ten roundwood pegs with an average length of 1.1 m were located at either side of the togher and were set at angles of 45–90°. Their position, driven through the depth of the structure, suggests that they were inserted after it was built. The shallower roundwoods set at 30–45° may also have functioned as pegs. The overall width of the togher (3.2 m) was greatly exaggerated by these elements and on average its walking surface was 1.5–2 m wide. The wood used in EDC 5 was exceptionally well preserved and 500 pieces have been identified as to species (Stuijts, Chapter 7). This work has shown that a very wide variety of trees were used in the site with hazel and birch dominating, followed by diminishing amounts of ash, alder, apple-type, willow and oak. EDC 5 lay approximately 0.3 m below the early medieval togher EDC 49 (Illus. 4.5), and EDC 40, a small deposit of worked wood dating to the Iron Age, lay 3.4 m to its west. One exceptional aspect of EDC 5 was the 11 wooden artefacts recovered during its excavation, all of which were found within its basal layer (see Chapters 6 and 8).

Reconstruction of the development of the bog at Edercloon has shown that the northern end of EDC 5 was built on the raised bog, but its southern part lay within fen peat (Bermingham 2009, 15). A similar disparity was noted in the examined insect assemblage, which generally indicated wet, raised bog conditions at the northern end of the site and a fen/carr woodland setting with vegetation-rich pools at the southern end (Reilly, Chapter 7). This appears to be the result of a bog burst prior to Dry Shift 1 (c. 1900–1500 BC) which discharged to the south-west (the natural drainage direction of the wider bog complex) and displaced raised bog peats, exposing lower fen levels (Bermingham 2009, 18–19; also Chapter 2). It is unclear whether this difference in ground conditions was apparent to those who built EDC 5; however, it may have influenced certain aspects of its construction and does appear to have affected the site over its lifespan.

One feature of EDC 5 that may have been a direct reaction to its local environment was the manner in which its construction changed along its length, particularly at its southern extent. This end of the togher was characterised by the use of wide transverse roundwoods that would have added stability in this wetter part of the terrain. Also at this end was the actual terminus of the togher, which, somewhat surprisingly given its scale and structure, just petered out. While this could reflect the manner in which it was built, it may be that ground conditions were simply too wet to continue with the

Illus. 4.3 Plan of upper layer of the northern end of togher EDC 5 composed of longitudinal roundwoods and brushwood and a dense, haphazard deposit of light brushwood (CRDS Ltd).



Illus. 4.4 Plan of lower layer of the northern end of EDC 5 showing a more ordered structure of longitudinal roundwoods overlain by occasional transverse elements. A fragmented alder-wood trough (E3313:5:75) and a piece of twisted hazel brushwood (E3313:5:92) were recovered along this section of the togher (CRDS Ltd).

construction.

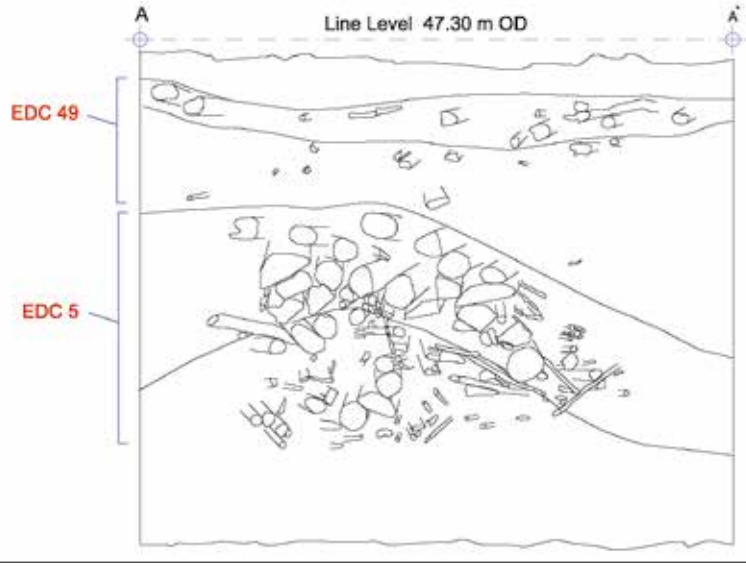
As a functioning togher, EDC 5 would have had a surface with an average width of 1.5–2 m, composed predominantly of longitudinal or transverse roundwoods and brushwood. While the site was very solid and cohesive, this uneven and varying surface would have been quite difficult to walk on, and certainly would not have been suitable for either animals or wheeled vehicles. The latter is particularly interesting given that a portion of a block wheel (Find No. E3313:5:69; see Chapter 6) was recovered from the base of the togher.

The most striking aspect of EDC 5 was its immense scale, particularly its depth, which was over 1 m (Illus. 4.5). Somewhat haphazard in its design, clear structural layers or chronologically distinct events were not apparent within the site and, indeed, the two layers described above represent only an arbitrary division to allow ease of description. Thus, it is thought that EDC 5 was built in a single episode or, at the very least, over a short period of time whereby significant peat growth between the layers did not occur. If this was the case, the trackway would have stood high above the bog surface and, in addition to being exposed to the elements, would have required a very strong structure of supports to hold it in position. While 10 large pegs of up to 2.8 m in length were included along the length of the site, these are unlikely to have been enough to secure such a volume of wood across wet, uneven terrain. Added to this is the fact that the wood in EDC 5 was in an excellent state of preservation and was probably not exposed for any great period (Stuijts, Chapter 7). Indeed, EDC 5 as a whole was in a very good condition and, in comparison with some of the other large toghers at Edercloon (i.e. EDC 12/13 or EDC 26, see below), it appeared to have suffered very little damage. Standing high on the bog surface EDC 5 would have appeared more like a wall or barrier and the possibility that it functioned as such is discussed further in Chapter 8.

Consequently, while the scale of EDC 5 signifies a substantial undertaking, probably on a communal level, there is no real evidence of the site having been subject to any significant wear or exposure. Its scale may have been a response to the wet ground conditions of the time which, however, probably made the trackway sink very quickly, a fate attributed to other toghers of large scale and weight elsewhere in Longford (Raftery 1996, 419). EDC 5 was physically isolated in that it did not connect with any other sites. Located approximately 65 m south-east of the multi-phase EDC 12/13 (see below), the two sites are likely to have been contemporary for a period, forming two parallel structures along the bog edge.

EDC 12/13

EDC 12/13 (L29.4 m min.; W3.85 m; D1.44 m) was an exceptionally large trackway located at the northern end of the excavation area (Illus. 4.1). Radiocarbon and dendrochronological dating (Table 4.1) indicate that the construction of the togher began at the end of the Middle Bronze Age and continued into the Iron Age. Orientated north–south it veered NNW–SSE at its extreme southern end and was built with up to four layers, each several pieces deep. Like EDC 5, the construction of EDC 12/13 varied considerably along its length and, notably, none of the layers could be traced continuously from north to south. Distinctly structured sections of the trackway in which the components were methodically laid



Illus. 4.5 Section through toghers EDC 5 and EDC 49, where they extend northwards beyond the excavation cutting (CRDS Ltd).

were apparent; however, much of the site consisted of quite haphazard deposits of wood.

Table 4.1—Radiocarbon and dendrochronological dates from EDC 12/13 (see Appendices 1 and 2 for details)

Lab. code	Layer no.	Estimated felling date	Calibrated date range
Wk-20198	1	—	730–230 BC
Wk-25204	1	—	750–390 BC
Q11031	3(?)	Late 1037 BC or early 1036 BC	—
Q11029	3	1110 BC ± 9 years or later	—
Q11028	3	1196 BC ± 9 years or later	—
Wk-25202	4	—	1410–1210 BC

EDC 12/13 contained a combination of roundwoods, brushwood, twigs and split timbers laid longitudinally, transversely, and irregularly. At its northern end, there was a substantial but poorly preserved wattle panel of woven brushwood known as a hurdle (Illus. 4.6), while at its southern end was a well-structured section of longitudinal and transverse roundwoods and brushwood (Illus. 4.7), part of which had sunk below the level of the main structure. In the centremost area of the site there were two parallel transverse roundwoods, each over 2 m in length, which were set 2 m apart. These extended out of the eastern edge of the site exaggerating its width by almost 2 m (Illus. 4.8). Around these was a very haphazard arrangement of wood much of which was fragmentary and set at varying angles. There were approximately 100 pegs positioned throughout EDC 12/13, set at angles of

Illus. 4.6 Cleaning of the hurdle panel at the northern end of togher EDC 12/13 (John Sunderland).

40–90°. The identification of over 600 pieces of wood from the togher indicated that hazel was the most common species used followed by ash, apple-type, birch, alder, willow, oak, holly, elm and heather. The hurdle at the northern end of the site was made exclusively of hazel (Stuijts, Chapter 7).

The width of EDC 12/13 varied considerably along its length and between different layers. At both ends it had an average width of 1.5–2 m; however, in the central part of the site this increased to 4 m, not including the two parallel roundwoods that extended a further 2 m to the east.

Given the massive scale of EDC 12/13 it is not surprising that over 1,300 worked ends, cut with both bronze and iron tools, were recovered (Moore 2008b; see also Chapter 8). Additional woodworking evidence was provided by 50 split timbers, which included tangential, radial, half, and quarter splits. EDC 12/13 yielded 10 wooden artefacts, the majority of which were recovered from the central area, close to its junction with EDC 19, a short togher that merged with the western edge of EDC 12/13 (see Chapters 6 and 8).

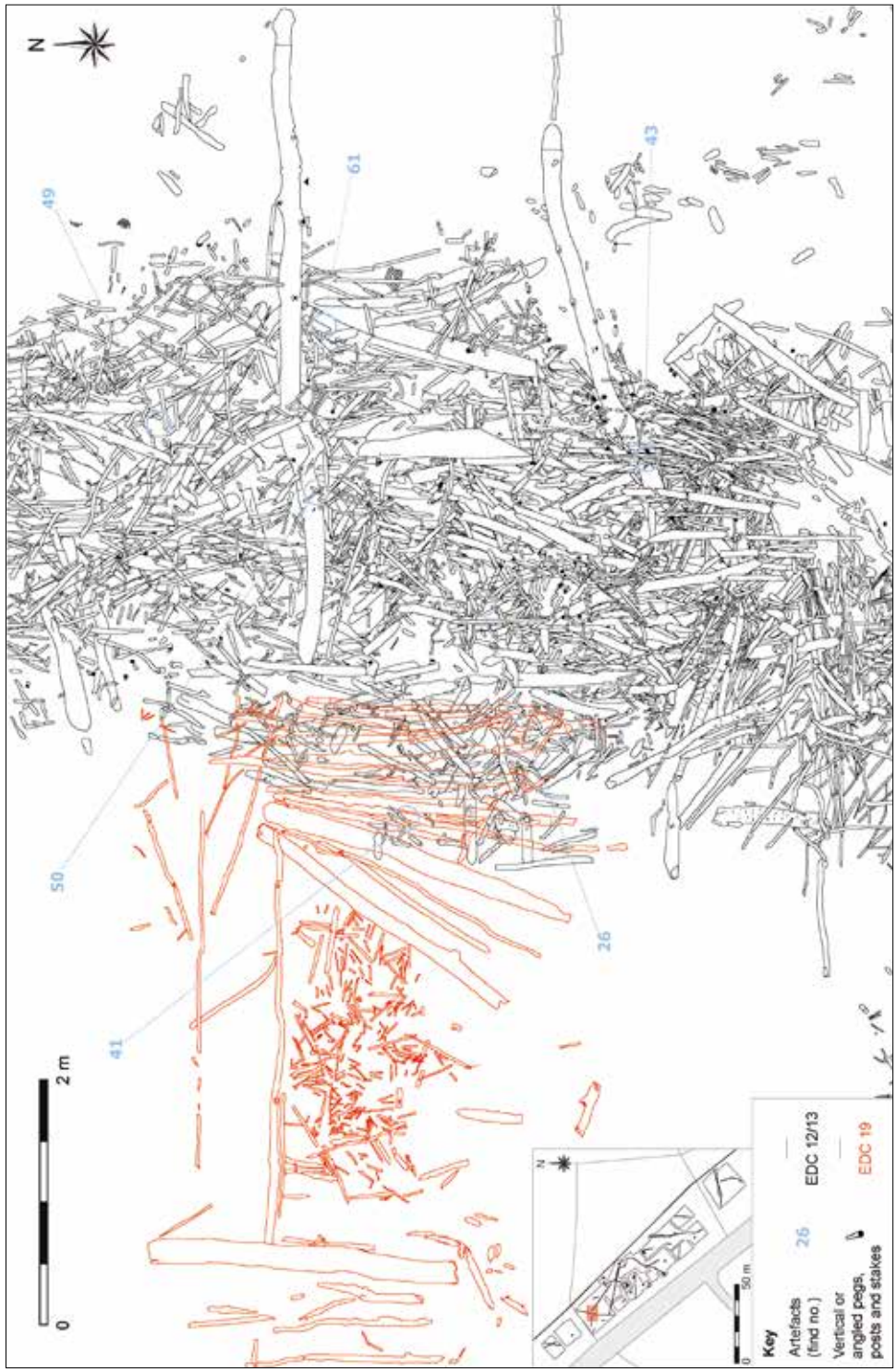
Insect remains from within and beneath EDC 12/13 indicated the presence of vegetation-rich pools beneath the site and possibly muddy and foul conditions at each end. Furthermore, fen marsh conditions and reed beds were indicated at the southern end of the togher (Reilly, Chapter 7). As was the case with EDC 5, this may be the result of raised bog peat displacement following a bog burst prior to 1900 BC (Bermingham, Chapter 2). Wetter ground conditions at the southern end of the togher may explain the deep layering of wood, apparent sinking of some of the most structured portions of the site, and the gradual curves along its length (Illus. 4.7).

With a depth of 1.44 m, EDC 12/13 contained a vast amount of wood and, although four main layers were discernible as distinct construction events, it is probable that smaller layers, perhaps the result of seasonal or annual rebuilding, were present within these. The wider implications of this are discussed in Chapter 8 but the broad date span of this togher indicates that it was an important enough site to be rebuilt over several centuries. The haphazard structural form of EDC 12/13 is best paralleled in other sites at Edercloon, such as EDC 1b/29 or EDC 26 (see below), but these sites do not compare well with most excavated toghers in Ireland, an observation discussed further in Chapter 8.

The central portion of EDC 12/13 was the deepest and widest part of the site, the width being exaggerated by two long transverse roundwoods that extended out from its eastern edge. These elements abutted the north-west end of another substantial togher, EDC 10 (see below), but were also aligned with EDC 19. This suggests that the central part of EDC 12/13 was a crossroads or perhaps a platform accessible from several directions. Extremely haphazard and uneven, this part of the site may have been disturbed through heavy use, although the excavation of a modern field drain nearby may also have caused some displacement, and certainly impacted on the preservation of the wood in this area.

The 10 artefacts recovered from EDC 12/13 further suggest that it was a place of some significance (Chapter 8). One of these finds was a fragment of a wheel rim (E3313:12/13:50) found in an elevated, almost vertical position and likely to date to the Late Bronze Age or the Early Iron Age horizons. EDC 12 /13 would not have been suitable for wheeled vehicles; however,

Illus. 4.7 The southern end of EDC 12/13 showing the well-structured, curving line of the togher (CRDS Ltd).



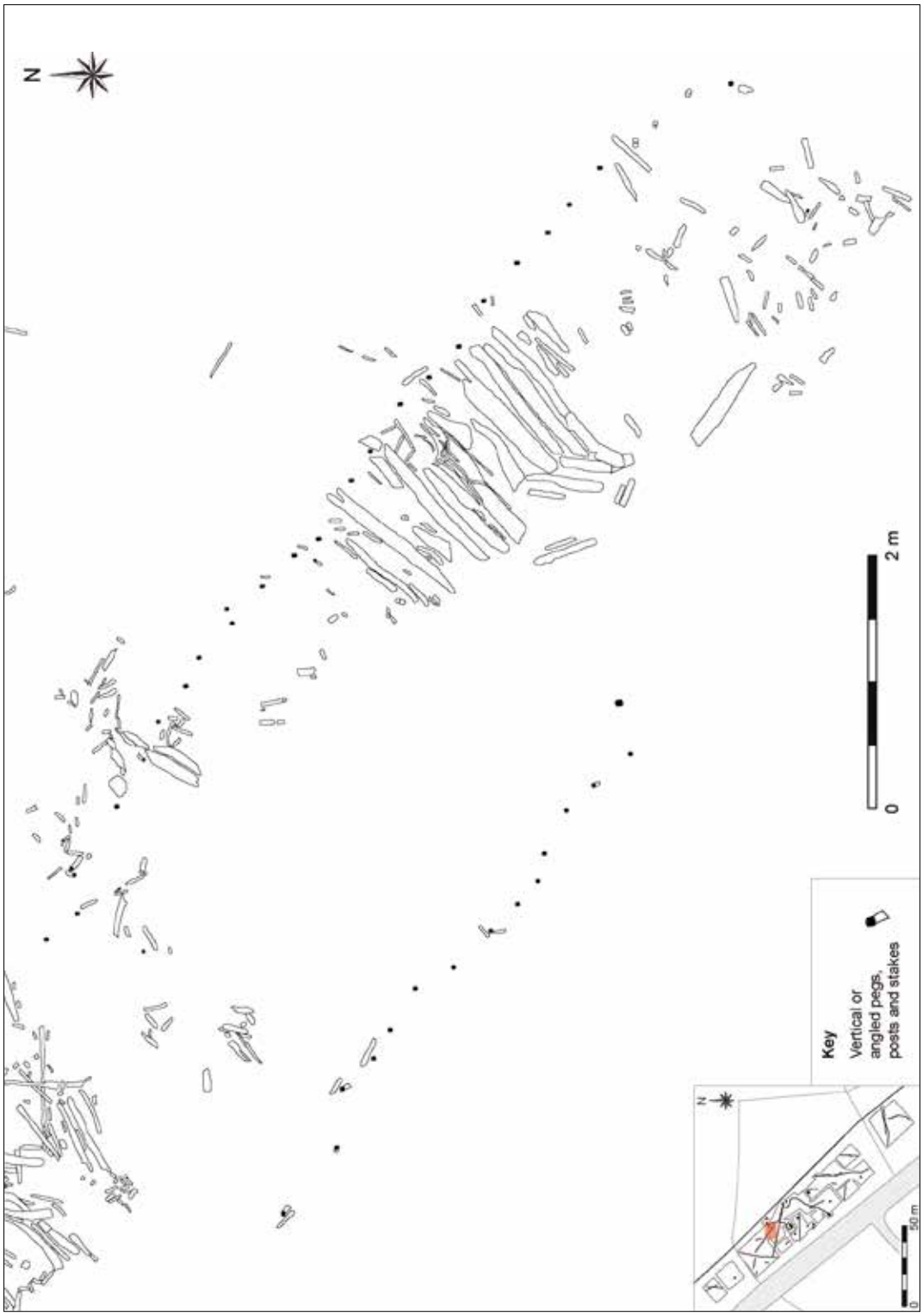
Illus. 4.8 Plan of the central portion of EDC 12/13 showing the junction with EDC 19 to the west and the two large roundwoods extending out to the east (CRDS Ltd).

EDC 19 or EDC 10 may once have been (see below). Orientated north–south, EDC 12/13 skirted rather than approached the nearby dryland. It exited the northernmost corner of the excavation area and ran towards a small area of intact raised bog where, in an exposed turf bank, lay a large togher of split timbers, brushwood and roundwoods. Roughly in line with EDC 12/13, this is very likely to be a continuation of the site.

EDC 10

EDC 10 (L20 m min.; W3.28 m; D0.16 m) was one of the most unusual sites and comprised the remains of what appears to have been a substantial togher of very distinctive construction. A radiocarbon date from a piece of ash brushwood from the site coincides with a plateau in the calibration curve giving a dual result of 760–640 BC and 560–390 BC (Beta-217356). The implications of this are discussed below and in Chapter 8, but woodworking analysis suggests that the earlier date is more likely. Clearly delineated on each side by a line of pegs, the surface of the site consisted only of three concentrations of transverse roundwoods, brushwood and split timbers between which were areas of scattered and fragmentary wood (Illus. 4.9). With the exception of the pegs, all of the wood was in a poor state of preservation, particularly when compared to other structures within its vicinity. This was also noted during species analysis, which identified small amounts of ash, alder and birch from the site. The most common species used was hazel, which was almost exclusively chosen for the pegs. A possible reason for the poor condition of the wood may be seen in the examined insect assemblage, which, despite indicating areas of localised wetness, suggested quite dry conditions overall (Reilly, Chapter 7). Such conditions were further indicated by plant macrofossils and testate amoebae (Chapter 2), demonstrating that the site was built during a marked dry period (Dry Shift 2) after a bog burst occurred towards the end of the Late Bronze Age (Bermingham 2009, 10). Dry conditions on the bog may have allowed EDC 10 to have been used, and thus exposed, for a long period, which may account for its degraded and fragmentary state. Another possibility is that the excavated remains represent only the substructure of a large togher that was dismantled in the past. This cannot be proved; however, stratigraphic and dating anomalies within the wider Edercloon complex (see EDC 25 and 31 below, and Chapter 8) may indicate the use of old wood, whereby new sites may have been partly constructed by robbing out wood from existing sites within the bog.

Although its remains were scant, EDC 10 was one of the few excavated sites that displayed a clear design and cohesive structure, and its remains are reminiscent of a type of togher termed a corduroy road (Illus. 4.10). These are characterised by a surface of transverse timber or roundwoods that, in many cases, overlie a substructure of longitudinal supports, and almost always incorporate pegs or uprights (Raftery 1996, 218–23; Cross May et al. 2005d, 211). Several examples have been investigated in Ireland (Raftery 1996, 203–10; Cross May et al. 2005d; Coughlan & Whitaker 2019, 23–5) and date from the Neolithic through to the Iron Age. Corduroy roads were also found in Britain's Somerset Levels (Coles & Coles 1986, 71) and are common in Germany (Hayen 1987a, 120–36) and the Netherlands (Casparie 1982, 115–64; 1987, 52–3). The scale and structured form of these sites has led to their interpretation



Illus. 4.9 Plan of the southeastern end of togher EDC 10 showing the sparse surface of transverse roundwoods, brushwood and timbers delineated on each side by a line of pegs (CRDS Ltd).

Illus. 4.10 Suggested reconstruction of togher EDC 10 (Chiara Chiriotti, CRDS Ltd).

as roads for wheeled vehicles and in Europe direct evidence of this has been found (ibid.). Given the very poor condition of EDC 10 it is impossible to say for certain whether it was a corduroy road; however, it would have been big enough for vehicles.

The dual radiocarbon date returned for a piece of ash from EDC 10 prompted a woodworking study that concentrated primarily on the pegs as they retained the best preserved toolmarks. The conclusion of this analysis was that Late Bronze Age tools were used in the construction of the site (Moore 2008b, 5) and so it is suggested that EDC 10 was constructed in or before 760–640 BC. While the use of bronze tools at this date is not overly controversial, it is a somewhat late use of this technology and stands in contrast to the apparent early use of iron elsewhere within the complex (see below).

EDC 10 was orientated north-west–south-east and at its south-east end merged with the western edge of EDC 1b/29 (Illus. 4.1). The latter was a large multi-phase togher that ran north–south, perpendicular to EDC 10, and the base of which has been radiocarbon-dated to 970–800 BC (Wk-25201). The exact

relationship between the two is unclear as the scant remains of EDC 10 were impossible to trace within the dense structure of EDC 1b/29. It is not altogether clear whether EDC 10 truly ran into the larger site, they may simply have abutted each other. Dating results from both suggest that EDC 1b/29 was built on its north–south axis prior to the construction of EDC 10. Curiously enough, this arrangement was mirrored on the opposite (eastern) side of EDC 1b/29, where it merged with EDC 31 (see below), almost directly opposite the position of EDC 10. This pattern of merging or crossing sites mirrors that between EDC 12/13, EDC 19 and EDC 10.

Running perpendicular to EDC 10, at its north-western end, was EDC 12/13 (Illus. 4.1). EDC 10 was particularly sparse at this location and the pegs, which so clearly defined its south-eastern end, were less prevalent. Owing to this, a direct stratigraphic link between the two sites was not apparent; however, they did seem to abut. Almost directly opposite this point, on the western edge of EDC 12/13, lay EDC 19. This east–west orientated togher very clearly merged with the edge of EDC 12/13. Dated to 800–420 BC (Wk-20199), EDC 19 may have been contemporary with EDC 10. The two sites were not of identical construction but were somewhat similar (see below) and conceivably constituted a single structure crossing over or through the larger togher EDC 12/13.

EDC 10 was predominantly orientated north-west–south-east; however, approximately halfway along its length there was a slight shift and its north-western end was orientated WNW–ESE. The reasons for this are unclear, although the contrasting ground conditions under the site may have played a role. Another possibility is that the orientation was altered slightly in order to meet or join with EDC 19, suggesting that the two sites may have been built from different directions.

EDC 10 appears to have been a large well-structured togher, built to run between or possibly through the parallel and multi-phase trackways EDC 12/13 and EDC 1b/29. A clearly interlinked network of trackways like this has not been identified elsewhere in Irish bogs and it suggests that the people who used these sites needed and/or desired communication routes through and within, rather than merely across the wetlands (see Chapter 8).

EDC 11

EDC 11 (L2.92 m; W1.02 m; D0.11 m) was a small togher located only 0.1 m north of the edge of EDC 10 (Illus.4.1). It was a simple but well-structured site of longitudinal light brushwood, twigs and a single roundwood (Illus. 4.11). Woodworking was evidenced by metal-cut toolmarks throughout. With the exception of one piece of willow, all of the wood in EDC 11 was of apple-type (see Stuijts 2021). The togher lay at approximately the same level as EDC 10 but was in a much better state of preservation. The reason for this is unclear. Although it was not scientifically dated, the position of EDC 11 in relation to EDC 10 suggests that it also dates to late prehistory, and may well have been contemporary with the larger togher.

EDC 19

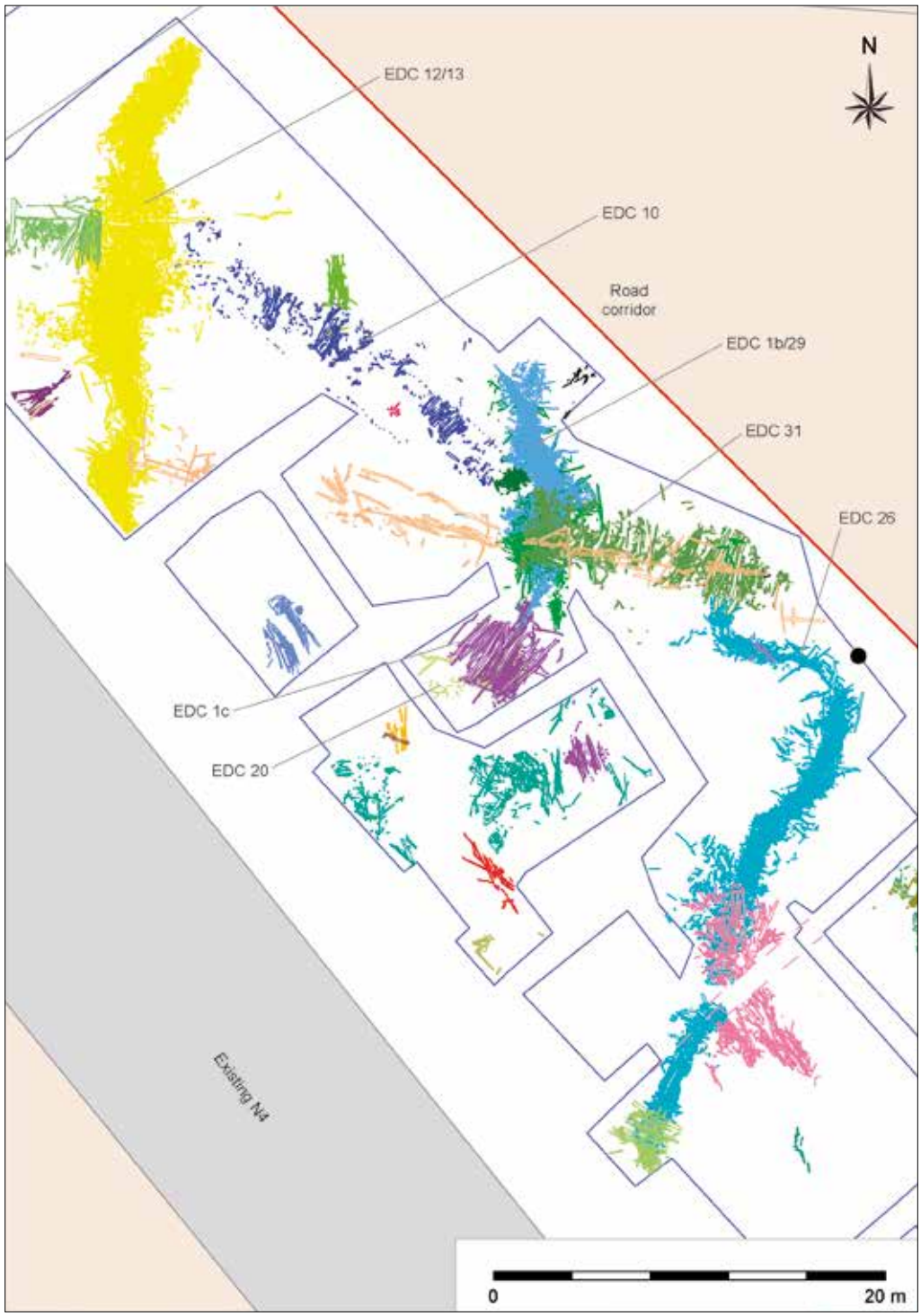
EDC 19 (L6.25 m min.; W3.05 m; D0.2 m) was a short togher, the eastern end of which merged with the western edge and central part of EDC 12/13 (Illus. 4.8). Dating to 800–420 BC (Wk-20199), it was built with

Illus. 4.11 The undated short togher EDC 11 (top right), located 0.1 m north of the edge of EDC 10 (CRDS Ltd).

heavy transverse roundwoods bounded on its northern side by a large longitudinal roundwood and on its southern side by pegs. The species used in its construction included hazel, ash, birch and willow (see Stuijts 2021). Structurally, EDC 19 was not dissimilar to a corduroy road; however, its western end was truncated by a large field drain and only a short length of the site survived. Drainage also impacted on the level of preservation, and toolmark studies on the site were unsuccessful in establishing the exact types of tools used (Moore 2008b, 5–6). The most significant aspect of EDC 19 was its relationship with EDC 12/13 and, as discussed above, it seems that these two sites, and possibly also EDC 10, criss-crossed or merged together. EDC 10 and EDC 19 were not perfectly aligned; however, both echoed corduroy construction and it is possible that they were the same structure crossing through EDC 12/13 in the centuries of the Late Bronze Age/Early Iron Age.

EDC 1b/29

At the opposite end of EDC 10 lay EDC 1b/29 (L14.5 m min.; W2–6 m; D1.01 m), a substantial and well-preserved togher orientated north–south (Illus. 4.1 and 4.12). As was the case with EDC 12/13, which lay approximately 25 m to the north-west, EDC 1b/29 was composed of multiple layers of wood with a total depth of over 1 m. Radiocarbon dating indicates that its construction began in the centuries of the Late Bronze Age and that the final layer was added in the Iron Age. Four individual layers were recorded but it is quite possible that within these were additional small layers representing annual or seasonal rebuilding. Such actions, comprising say the addition of a single layer of brushwood, would not allow time for peat accumulation and would be extremely difficult, if not impossible, to recognise in such deep stratigraphy, or to



Illus. 4.12 Schematic plan of Late Bronze Age and Iron Age structures EDC 1b/29, EDC 1c, EDC 10, EDC 12/13, EDC 20, EDC 26 and EDC 31 (CRDS Ltd).

identify through scientific dating. This is an important point but is not particularly problematic and it seems that, like EDC 12/13, EDC 1b/29 was a togher the significance of which warranted its rebuilding and maintenance over several centuries.

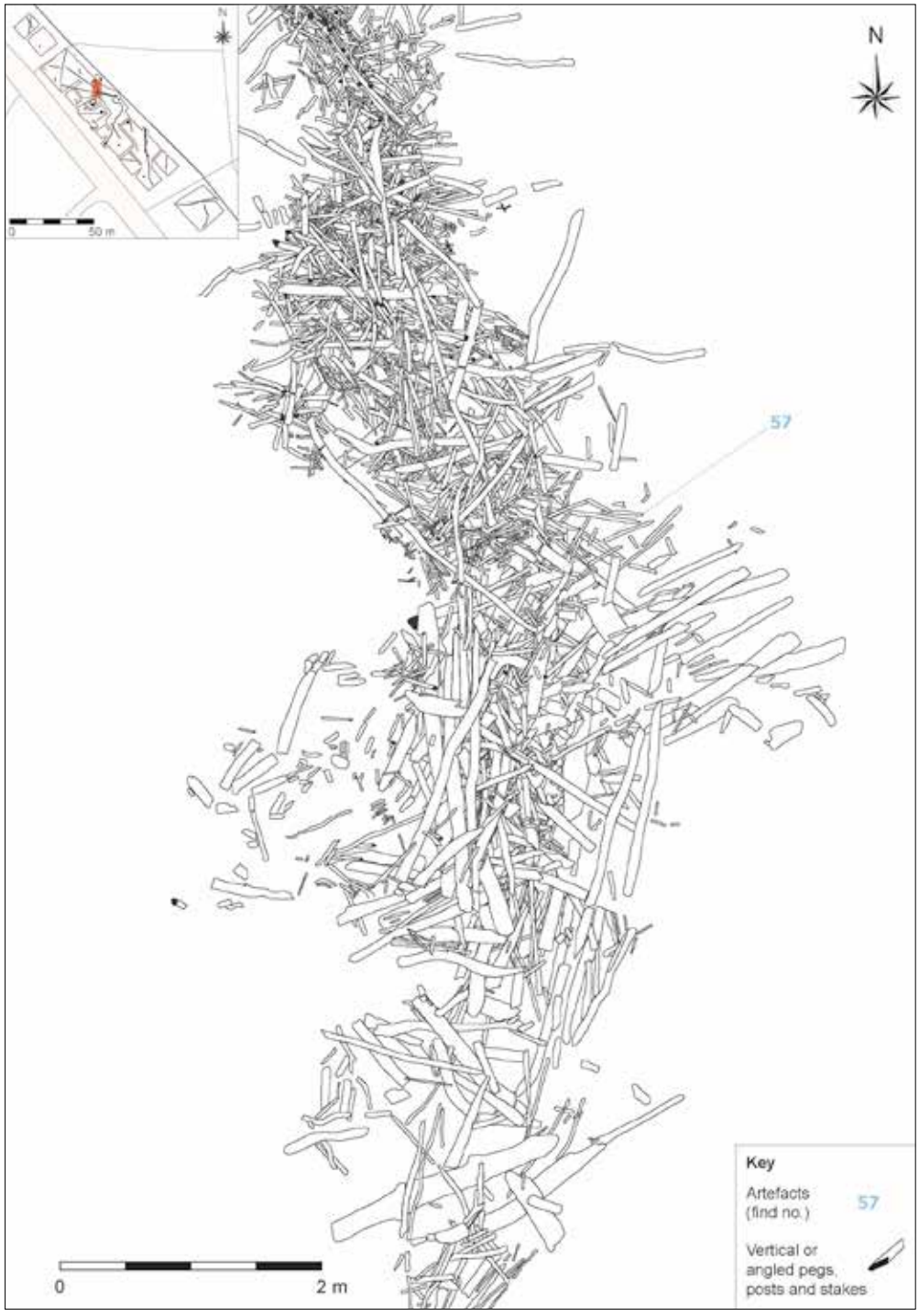
The basal layer of EDC 1b/29 has been dated to 970–800 BC (Wk-25201) and was built with a mixture of longitudinal and transverse brushwood, roundwoods and timbers (Illus. 4.13). At its southern extent, it was quite sturdy and dominated by the use of heavy roundwoods, many of which sloped eastwards at 5–30°. Towards the north, the predominant building material was brushwood and at its northernmost point it was composed of a dense deposit of irregularly laid brushwood set at 0–90° angles. In appearance this section looked more like a smashed and crude wattle structure than a togher. No weave or formal arrangement of elements was discernible, however, and it may simply have been an extensively disturbed light brushwood layer.

The structure of the upper layer mimicked that of the lower and was heaviest and most ordered at the southern end. This part of the site has been radiocarbon-dated to 350–20 BC (Wk-25199) and was composed of large transverse timbers and roundwoods, overlain by longitudinal roundwoods and brushwood (Illus. 4.14). Although the uppermost longitudinal material was reasonably flat, the lower elements, in particular the transverse timbers, sloped eastwards into the peat at 20–30° angles. The northern end of the site included roundwoods, small timbers and a large amount of light brushwood. This material was laid longitudinally, transversely and irregularly. At the western edge of EDC 1b/29 was a structurally distinct area that was numbered Feature 2. This comprised a dense bed of irregularly laid light brushwood, almost 300 pieces, very few of which had been worked. These were overlain by five pieces of brushwood orientated east–west. Feature 2 somewhat resembled a rudimentary woven structure; however, as with the southern end of the togher, no definite weave or formal arrangement of wood could be ascertained and it may simply have been a small dump of material at the edge of the site.

Analysis of over 1,200 pieces of wood from EDC 1b/29 indicated that, like EDC 12/13, hazel was the most common species used, accounting for almost half of the examined samples. Birch was also common, followed by diminishing amounts of willow, ash, alder, apple-type wood, holly, oak and one piece of ivy (see Stuijts, Chapter 7).

Insect remains from beneath the upper layer of the site, at its southern end, were dominated by ant species indicative of quite dry conditions, to the extent that heather may have taken root on the togher surface. This is common on toghers, which acted like artificial dry islands attractive to certain plants (Reilly 2008a, 26). Additional insect remains from this part of the site were of water-loving beetles, suggesting the presence of *Sphagnum* pools within the substructure of the trackway. Particularly wet conditions at this end of EDC 1b/29 could account for the distinct sloping of the heavier structural elements, which was a feature of both the basal and upper layers. It may also have contributed to the very high level of wood preservation encountered (Stuijts, Chapter 7).

Although structurally dense and intricate, EDC 1b/29 was in many ways a straightforward togher with a clear design and orientation. During an early stage of its excavation, the north-west–south-east orientated EDC 10 was uncovered running



Illus. 4.13 Plan of the basal layers of EDC 1b/29 (CRDS Ltd).

Illus. 4.14 Excavation of the uppermost layer of EDC 1b/29; the roundwood structure in the background is platform EDC 1c (CRDS Ltd).

into or merging with its western edge (Illus. 4.15). The poor condition of the latter and the density of the former made it difficult to discern the precise relationship between the structures, so a number of scenarios are possible. The date for EDC 10 is slightly later than the earliest phases of EDC 1b/29. Thus, it is possible that EDC 10 may have led to and terminated at EDC 1b/29, perhaps providing a link between it and EDC 12/13, approximately 25 m to the north-west. Opposite the convergence of EDC 1b/29 and EDC 10 lay another togher, EDC 31. This was very clearly connected to EDC 1b/29 to the extent that the transverses of one became the longitudinals of the other (Illus. 4.16). Scientific dating of EDC 31 has produced complex results (see below) but it may have been contemporary with EDC 10. This pattern of interconnected sites directly mirrors that of EDC 12/13, EDC 19 and EDC 10. The convergence of EDC 1b/29, EDC 10 and EDC 31 occurred at the deepest part of EDC 1b/29, where it has been suggested that wet conditions and the weight of the wood caused layers of the togher to sink. These factors are likely to have contributed somewhat to the difficult stratigraphy outlined above and further discussed below.

Two artefacts were found during the excavation of EDC 1b/29. The fragmentary remains of a withy (E3313:1b/29:11)—a rope made from twisted wood—were recovered from the uppermost layer, while a notched and dowelled timber (E3313:1b/29:57) was retrieved in the lowest levels. This is

Illus. 4.15 The upper layer of EDC 1b/29 and in the background the poorly preserved EDC 10 delineated by a line of brushwood pegs (CRDS Ltd).

the lowest number of finds from any of the large trackways at Edercloon but it may be significant that both were found in the densest part of the site where it converged with other structures, mirroring the pattern of artefact deposition within EDC 12/13.

Woodworking evidence from EDC 1b/29 was extensive and comprised 25 split timbers and over 500 worked ends. Analysis of these indicated the use of iron axes, which stands in contrast to the strong evidence for the use of Late Bronze Age tools at EDC 10 (Moore 2008b). The contemporary use of iron and bronze is not overly problematic; however, given the Late Bronze Age date for the base of EDC 1b/29 this may represent a very early use of iron in Ireland.

Platform EDC 1c

EDC 1b/29 was associated with two platforms (EDC 1c and EDC 20) at its southern end, one overlying the other (Illus. 4.12). The uppermost platform was EDC 1c (L5.25 m; W3.87 m; D0.52 m), a roughly square structure with an upper layer of north-east–south-west orientated timbers, roundwoods, brushwood and twigs (Illus. 4.17). Beneath this was a second layer of similarly laid brushwood, roundwoods and twigs up to two pieces deep. A small number of pegs were apparent within both layers and were concentrated in the southern corner of the site, set at angles of 60–80°. EDC 1c was composed predominantly of birch followed

Illus. 4.16 The junction of toghers EDC 1b/29 and EDC 31 (top left), looking south, where the transverses of one became indistinguishable from the longitudinals of the other. The yellow pegs in the foreground mark the line of EDC 10 (Hard Hat Photography Ltd).

by pieces of apple-type, ash, willow and hazel. Small amounts of alder, holly, elm, oak and rose were also present (see Stuijts, Chapter 7).

Radiocarbon dating of a piece of birch from the upper layer of EDC 1c returned a dual result of 750–700 BC and 540–390 BC (Beta-217355), owing to the date coinciding with a plateau in the calibration curve. Insect remains from beneath the platform have indicated that while the platform was built over a pool the substructure was drier allowing for the growth of heather and establishment of ant colonies (Reilly 2008a, 22). The activity or activities that took place on the platform remain unknown, but it could have had a variety of functions such as a hunting platform or a space on which to gather and process resources. It may also have functioned as a social space where people could congregate (see Chapter 8).

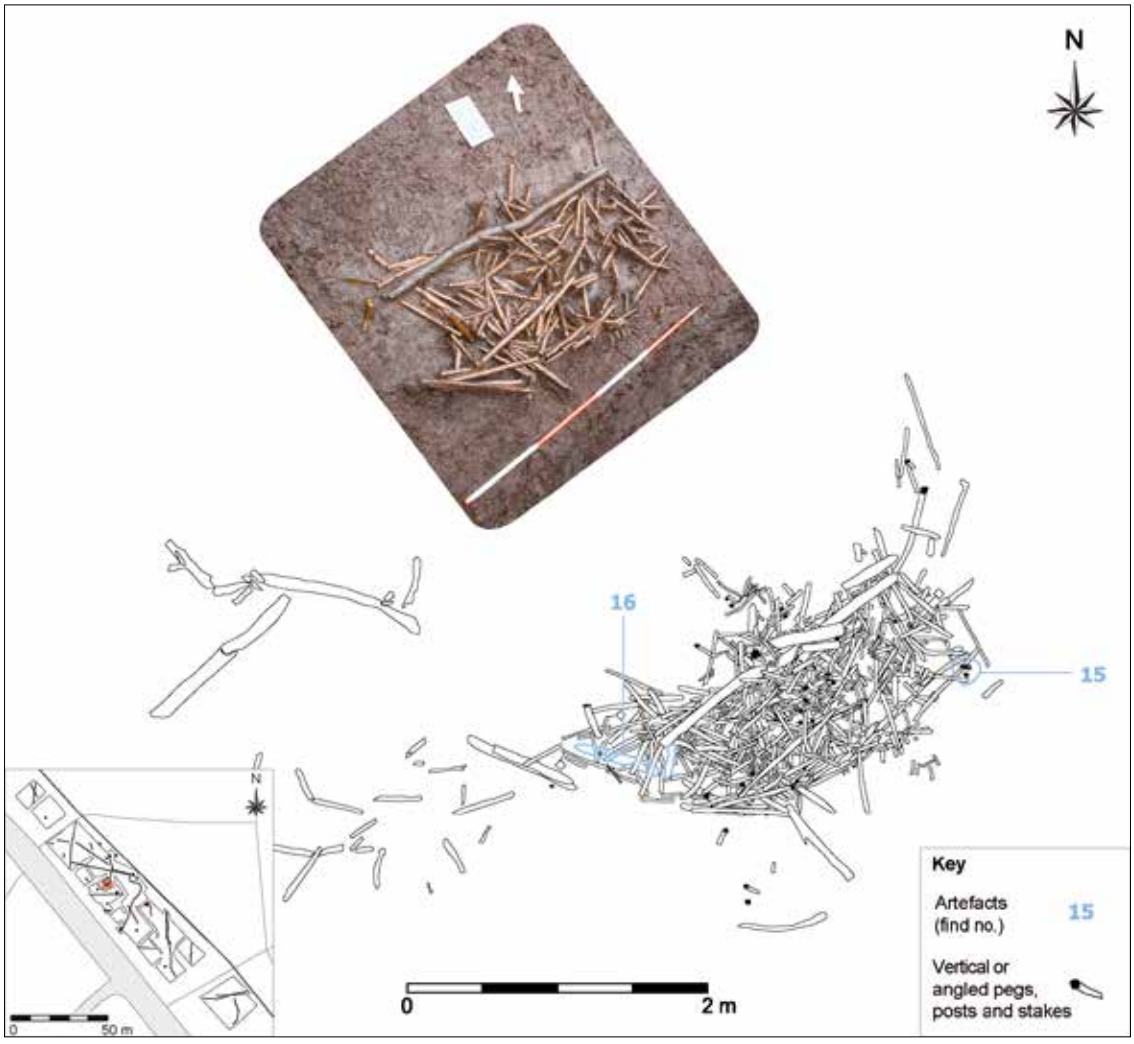
EDC 1c lay 1 m south of the southern end of EDC 1b/29 and the uppermost layers of the two sites lay at a similar physical level. As outlined above, the base of the togher has dated to 970–800 BC, while the uppermost layer dates to 350–20 BC. It is likely that EDC 1b/29 was frequently rebuilt throughout this time span and so EDC 1c must have coexisted with its earlier or middle levels. This apparent discrepancy between physical levels and dates is a recurring difficulty at Edercloon, particularly in the vicinity of EDC 1b/29. In this case, the likely sinking of the large togher (see above) may have been a contributing factor. EDC 1c was in a very

Illus. 4.17 The upper layer of platform EDC 1c (CRDS Ltd).

good condition and the wood in the site, although waterlogged, appeared to have been subject to very little wear or exposure. The implication of this is that the platform was not in use or exposed for a prolonged period; however, the togher remained a focus until well into the Iron Age. The convergence of toghers at EDC 1b/29 may also have been partly or wholly due to the position of EDC 1c, a substantial platform being a likely focal point in the bog.

Platform EDC 20

EDC 20 (L3.1 m; W1.6 m; D0.35 m) was a smaller platform at the same physical level as the basal layers of togher EDC 1b/29 and lay 0.20 m below platform EDC 1c. Structurally, it was a haphazard site of irregularly laid fragmentary brushwood, most of which was set at angles of up to 40°. As such, it had no clear surface but, in spite of this, had well-defined edges, one of which was delineated by a single roundwood (Illus. 4.18). Longer than it was wide, EDC 20 has been classified as a platform for several reasons. The principal one was its location 1 m south of the southern terminus of EDC 1b/29. Much like the apparent relationship between the upper layers of the togher and platform EDC 1c, the lower layers of the togher also appeared to lead to and terminate at EDC 20. As to why the site was so irregular, there are a number of possible explanations. The wood in EDC 20 was in a very good condition and so is unlikely to have been exposed to



Illus. 4.18 The small platform EDC 20. The plan shows the very haphazard upper layer of wood. The accompanying photograph was taken half way through its excavation and shows the roundwood delineating its north-west edge (CRDS Ltd).

the elements for a prolonged period. If the site was built in a particularly wet area, say over or within a pool, attempts to use it could have dislodged the brushwood, forcing it downwards at irregular angles. Peat samples from EDC 1c, just 0.2 m above it, indicated the presence of a pool beneath the larger platform and so possibly at the level of EDC 20.

A second possibility is that EDC 20 was deliberately built in this manner and was never intended to have a regular surface. Two artefacts were included within the site, a heavily worn bucket handle (E3313:20:15) and a very finely worked wooden object (E3313:20:16) (see Chapter 6). The latter was broken in two pieces and deposited at right angles to each other suggesting it was broken prior to deposition. While the deposition of wooden objects in similarly diminutive sites

has several parallels (Moore et al. 2003, 132; Stanley et al. 2003, 6–8), it is proposed here that EDC 20 was a purely votive site, with a proliferation of brushwood stakes pinning down these two finds. This suggestion is made in the context of strong evidence for votive deposition at Edercloon, which is discussed further in Chapter 8.

EDC 20 was not scientifically dated and while it certainly appeared to relate to the lower layers of EDC 1b/29, physical levels, particularly in this area of Edercloon, are not a reliable indicator of contemporaneity. Nonetheless, it seems likely that it was contemporary with some level of EDC 1b/29 or could perhaps have pre-dated it entirely.

EDC 31

The intricate stratigraphic relationships within this area of Edercloon were further complicated by the presence of togher EDC 31 (L12 m min.; W4.8 m; D0.6 m). This togher merged at its north-west end with EDC 1b/29 and at its opposite south-east end with togher EDC 26 (see Illus. 4.12 and 4.16). At its north-west end, it was composed of transverse roundwoods, brushwood and timbers overlying three longitudinal roundwoods, 2.65–5.1 m in length and set c. 1 m apart. One of these and some of the upper transverse elements appeared to have become slightly displaced in antiquity. Despite this, this section of the site was well structured and, like trackways EDC 10 and EDC 19, was reminiscent of a corduroy road. At the south-east end of the three longitudinal roundwoods, the structure of the togher was less cohesive and comprised sparsely laid transverse brushwood. Beyond this, the alignment of the site shifted slightly to the north but its composition was once more quite structured and composed of large transverse roundwoods, interspersed with brushwood and timbers, some of which extended out to the south-west and joined with togher EDC 26 (see below). Like EDC 10, the reasons for the shift in alignment of EDC 31 are unclear but again could be indicative of a deliberate re-orientation of the site towards a particular location or may be the result of the site having been built from two different directions.

In contrast to EDC 1b/29 and EDC 26, which lay at each end of EDC 31, the condition of the wood within the togher was poor and toolmark analysis was difficult (Moore 2008b, 10–11). This was also the case with split timbers from the site, which were characterised by gnarly, striated pieces of split wood, few of which retained clear or definite woodworking evidence. Toolmark analysis did, however, suggest that iron axes had been used on wood from the site (ibid.), which again may be representative of the very early use of such tools (see above). The predominant wood species used in the construction of EDC 31 were hazel and ash; however, small amounts of alder, apple-type, birch, willow, oak, holly and elm were also used (see Stuijts 2021).

At its north-west end, EDC 31 clearly merged with the lower layers of EDC 1b/29 and the two were inextricable (Illus. 4.16). Insect remains from beneath EDC 31 indicated that the substructure of the togher was drier than the peat on which it was constructed, with slightly wetter conditions occurring at the north-west end of the site (Reilly 2008a, 24). This supports the evidence from EDC 1b/29 and it seems that the area in which these toghers merged was particularly wet, probably causing them to sink.

Scientific dating of EDC 31 has produced complex results. A piece of birch brushwood from the south-east end of the site, where

it merged with EDC 26, returned a date of 390–180 BC (Wk-20197). An oak timber from the same part of the site, which had 176 annual growth rings but no heartwood/sapwood boundary, failed to produce a reliable dendrochronological date (see Q11036, Appendix 2). Rings 70 to 79, just under halfway through the sequence, were subsequently radiocarbon-dated to 890–674 BC (UBA-31954), while rings 130 to 170 were dated to 900–760 BC (Wk-25191). The lack of sapwood on the timber, however, means that the tree could have been felled many years after the latest date, probably more than 50 but less than 100 years. The radiocarbon dates for the timber from EDC 31 are consistent with the date for the basal layer of EDC 1b/29 (see above), which came from a piece of hazel brushwood just below the point where the two toghers joined. Even allowing for the lack of sapwood on the timber, the evidence strongly points to EDC 31 being Late Bronze Age/Early Iron Age in date.

The later date of 390–180 BC (Wk-20197) for a piece of birch brushwood from the south-east end of EDC 31, corresponds with that of EDC 26 (see below) with which the togher converges at this location. This was a haphazard area of both sites and the stratigraphic relationship between EDC 31 and EDC 26 was not as structured as that between EDC 31 and EDC 1b/29. The two toghers certainly joined but it is possible that the piece of birch brushwood originated in EDC 26, but found its way down to the lower, earlier EDC 31. Insect remains from close to the convergence of the sites contained species indicative of a vegetation-rich pool, which might explain the unusual character and orientation of the structures in this area (see below). The same sample also contained the remains of dung beetles, possibly the result of animals accessing the pool. EDC 31 was similar to a corduroy road and although its structure was somewhat degraded it may originally have been suitable for the passage of animals and/or wheeled vehicles.

Almost directly opposite the convergence of EDC 31 and EDC 1b/29 was the point where the latter merged with EDC 10. The scale and structure of EDC 10 and EDC 31 are somewhat similar and their positioning mirrors that of EDC 10 and EDC 19 further to the north-west. EDC 10 is believed to have been built in 760–640 BC (Beta-217356), just a few years after the latest dates returned for the oak timber from EDC 31. Given that the timber had no sapwood, it is possible that the two sites were contemporary.

The stratigraphic and chronological questions presented by EDC 31 are compounded by the fact that the oak sample from the site (Q11036) was from the same tree as two timbers used in the small platform EDC 27 (see below), located above the south-western end of EDC 26 (Illus. 4.1). Stratigraphically, EDC 27 should be considerably later than EDC 31 but the scientific dating is contradictory and this anomaly is discussed further below.

EDC 26

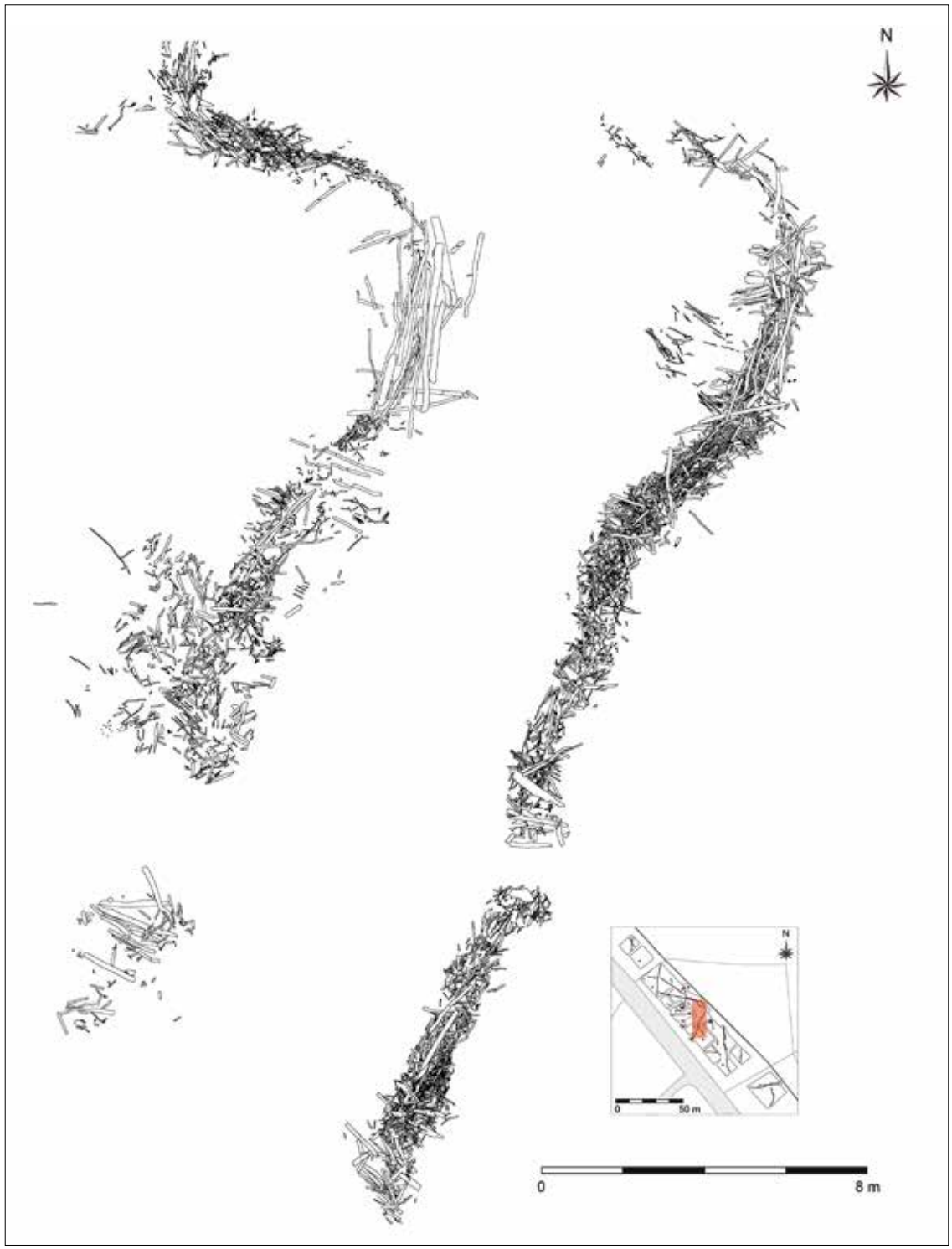
The final large Iron Age trackway to be built at Edercloon was EDC 26 (L34 m min.; W3.3 m; D1.53 m), a large togher which extended across the entire width of the excavation area (Illus. 4.1). For the most part, it was quite well defined and, although it curved along its length, it was clearly orientated north-east–south-west. This changed dramatically at its north-east end, where it took a sharp turn west and ran in an S-shaped bend to join the south-east end of EDC 31. EDC 26 was composed of three to four layers and at its

north-east end, just before its turn west, was well built with an upper layer of longitudinal timbers and roundwoods overlying transverse supports (Illus. 4.19). This portion of the site extended for 5 m south-west whereupon the composition changed for several metres, with no upper longitudinals present, although the transverse supports continued. It is uncertain whether this part of the togher was unfinished or if perhaps the upper longitudinal pieces were removed in antiquity. The longitudinally laid wood was in an exceptionally good state of preservation and appeared to have suffered little to no use or exposure. In contrast, the lower layers of the togher, while still well defined, were jumbled and fragmentary, suggesting reasonably heavy use (Illus. 4.20). Built with a combination of longitudinal and transverse elements, EDC 26 had an average surface width of 1.5 m. It is thus unlikely that it was ever intended for wheeled vehicles or animals but could have functioned as a footpath through the bog. Analysis of almost 500 pieces of wood from the togher identified a wide variety of species used in its construction. Hazel, of which almost 300 pieces were identified, was clearly the preferred material, with only small amounts (i.e. fewer than 50 pieces) of birch, willow, alder, ash, oak, holly, yew, apple-type and heather also present (see Stuijts, Chapter 7).

The most striking feature of EDC 26 was the distinct turn west at its north-east end (Illus. 4.21). This section of the togher was structurally quite different and was very narrow in places, with no sense of a cohesive structure. The layers were poorly defined but clearly continued from the north-east–south-west orientated layers of the togher. It is questionable whether this westward spur could have functioned as a togher; however, it clearly served to connect the lower layers of EDC 26 with EDC 31 and thus ultimately EDC 1b/29. The reasons for its curving shape are less clear. One possible explanation is that it took this dramatic turn to avoid or demarcate a pool of open water. Insect remains from this end of the site identified a dominance of vegetation-rich pool species, which compares well with a nearby sample from EDC 31 (Reilly, Chapter 7). In general, however, the insect remains from EDC 26 were species poor, with little diversity, and, as has been seen in other sites at Edercloon, the surface of the togher appears to have been drier than the peat beneath it.

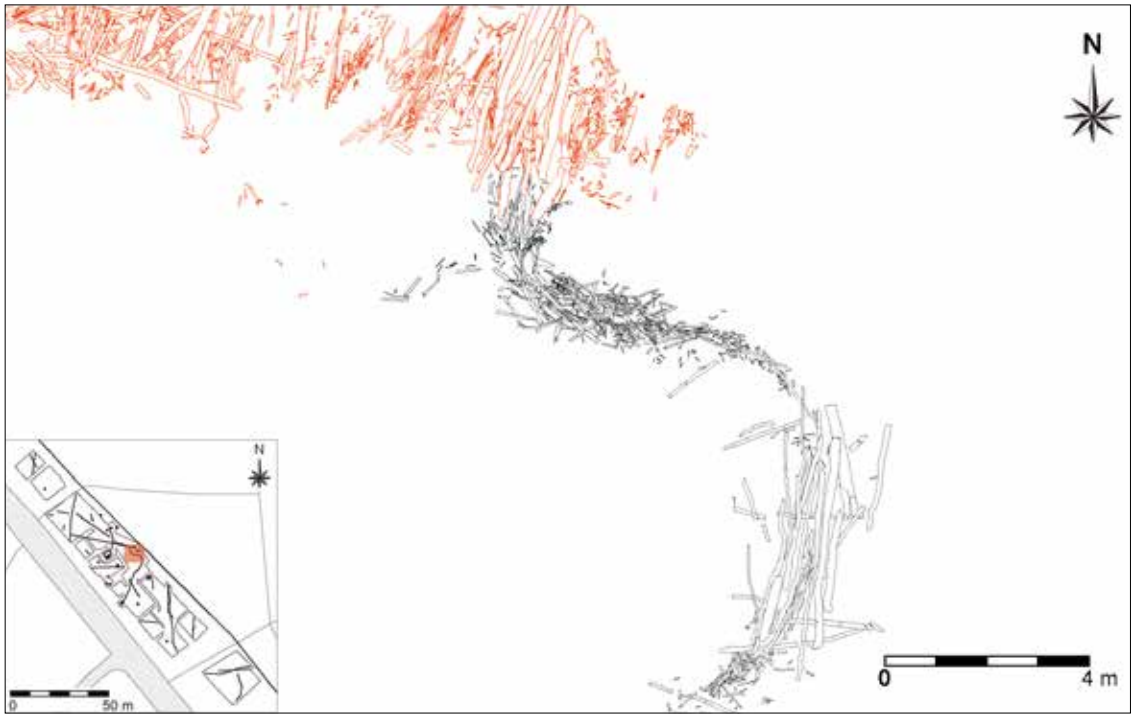
Ten wooden objects, including spears, mallets, and a bowl, were recovered from EDC 26 (see Chapter 6). Buried throughout all of the layers, the finds were concentrated in the central and north-east end of the site, close to the convergence with EDC 31. This mimics the pattern of deposition in EDC 12/13 and EDC 1b/29, suggesting a particular significance to this part of the site.

A piece of ash from EDC 26 has been radiocarbon-dated to 390–170 BC (Wk-20201). This sample was taken from the well-structured upper layer at the north-east end, just before the turn west. It is almost identical to the date for a piece of birch from togher EDC 31, taken from the area where the two sites converged. As discussed above, EDC 31 is believed to date to the Late Bronze Age/Early Iron Age and it is possible that the piece of birch originated from EDC 26. Nonetheless, EDC 26 and EDC 31 did connect, albeit in a highly unusual S-shaped bend. EDC 26 was 1.53 m deep and occasionally along its length quite deep deposits of peat had encroached between the elements. At no point during its excavation was it felt that the layers represented different sites and it was common for lower material to be visible when excavating that



Illus. 4.19 Plan of the upper (left) and lower layers of the Iron Age togher EDC 26. The gap near the southern end denotes the position of an excavation baulk (CRDS Ltd).

Illus. 4.20 Aerial view looking south-west along the lowest layers of EDC 26 (CRDS Ltd).



Illus. 4.21 Plan showing the distinctive S-bend at the north-east end of togher EDC 26 and the junction with togher EDC 31 (in red) (CRDS Ltd).

above it. Nonetheless, given the extensive date ranges of EDC 12/13 and EDC 1b/29, it is possible that the lower layers of EDC 26 were earlier than the final upper layer. This would also make more sense with regard to the relationship with EDC 31.

EDC 26 was orientated just off the north–south axis favoured by the other large toghers in Edercloon but was roughly parallel with them. It too represents a clear need and desire of people to travel through Edercloon bog in this direction. Like EDC 12/13 and EDC 5, it was also the subject of repeated artefact inclusion, predominantly at its north-east end (see Chapters 6 and 8).

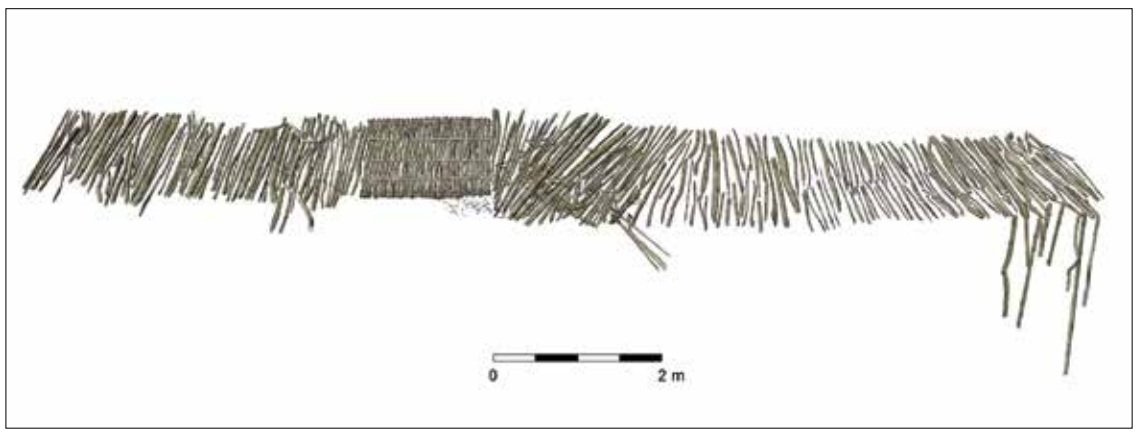
Shorter paths and tracks

The centuries of the Late Bronze Age and Early Iron Age at Edercloon also saw the construction of several shorter toghers and a number of small isolated platforms. Most of these were built in the Iron Age between 400 BC and 160 BC and could have been contemporary with the final layers of toghers EDC 12/13, EDC 1b/29 and EDC 26. Given the broad date ranges of sites from this period, it is impossible to unequivocally state which of the diminutive structures, if indeed any, were contemporary, nor is it possible to determine the precise order in which they were built. These sites, however, do seem to represent a different building tradition characterised by the construction of smaller, lighter sites orientated both north–south and east–west. This change corresponds with an increase in activity on the dryland and evidence, albeit slight, of a local farmed landscape (Plunkett, Chapter 2).

EDC 7

EDC 7 (L12 m min.; W4 m; D0.15 m) was a narrow togher orientated east–west, the remains of which were quite scant (Illus. 4.1). At its east end, it was composed of transverse brushwood, roundwoods, twigs and the damaged remains of a hurdle. The transverse elements, in particular, were very sparsely laid with gaps of up to 3 m recorded between them. At the centre of the site, they were underlain by a dense deposit of fragmentary brushwood and bark confined to an area of 1.3 m by 1.4 m. The western end of EDC 7 was built with a layer of irregularly laid heavily fragmented brushwood and occasional pieces of transverse brushwood. In this area, at the northern edge of the togher, were several longitudinal roundwoods and 16 pegs up to 2.83 m in length (Illus. 4.22). The hurdle close to the centre of EDC 7 was made from hazel, ash and apple-type wood, while the remainder of the site contained small amounts of alder, birch, hazel, ash, willow and holly (see Stuijts 2021).

EDC 7 was one of the few trackways excavated at Edercloon that was orientated east–west. Its western end appeared to extend beyond the excavation area but it terminated at its east end. The remains of the site were very sparse; however, its dimensions and the inclusion of such longs pegs suggests that it was originally a substantial structure. Located just below the field surface, drainage and compression may account for its poor condition; however, gaps of up to 3 m suggest that material might have been robbed out. The dismantling or removal of wood in antiquity may also have occurred in EDC 10 and EDC 26. Dated to 380–160 BC (Beta-217358), EDC 7 could have been contemporary with several other sites at Edercloon, including the large togher EDC 26. These two sites have almost identical radiocarbon dates; however, while EDC 7 was 0.3 m below the field surface EDC 26 was up to 1.15 m below it. The reasons for this are unclear but it may in part have been caused by the drainage and reclamation of the bog. A small alder bark disc (E3313:7:95) was recovered from the substructure of EDC 7. This was initially thought to have been deliberately manufactured but it is possible that this is a naturally occurring object. Platform EDC 9, dating to the Late Bronze Age (see below), lay 0.28 m below EDC 7 (Illus. 4.1).



Illus. 4.22 Suggested reconstruction of togher EDC 7, looking south (Chiara Chiriotti, CRDS Ltd).

EDC 37

EDC 37 (L11.2 m min.; W4.8 m; D0.34 m) was a well-structured togher orientated east–west (Illus. 4.1). At each end, it was composed of a surface of closely laid longitudinal roundwoods, with intermittent transverse brushwood overlying and underlying these (Illus. 4.23). No longitudinal roundwoods occurred in the central area for a length of 2 m, where only occasional transverse brushwood and roundwoods were present. A piece of apple-type wood from the site has been dated to 390–160 BC (Wk-20957). Other wood species used in EDC 7 included alder, birch and ash (see Stuijts 2021). Like EDC 7, the eastern terminus of EDC 37 was within the road corridor but to the west it extended beyond the limits of excavation. The site's level of preservation was adversely affected by the drainage associated with the adjacent N4. Despite this, the surviving evidence is of a well-constructed togher, although the lack of material at its centre is somewhat curious. The gap may be due to displacement or perhaps material was robbed out. To this end, it is interesting to speculate that EDC 40, a deposit of worked wood 2.8 m to the north-east and dated to 400–200 BC (see below), may have been intended for inclusion within EDC 37. Although EDC 37 was not particularly close to the adjacent

Illus. 4.23 Togher EDC 37, looking east (CRDS Ltd).

dryland, its east–west orientation could suggest that it was built to facilitate access out into the bog.

EDC 6

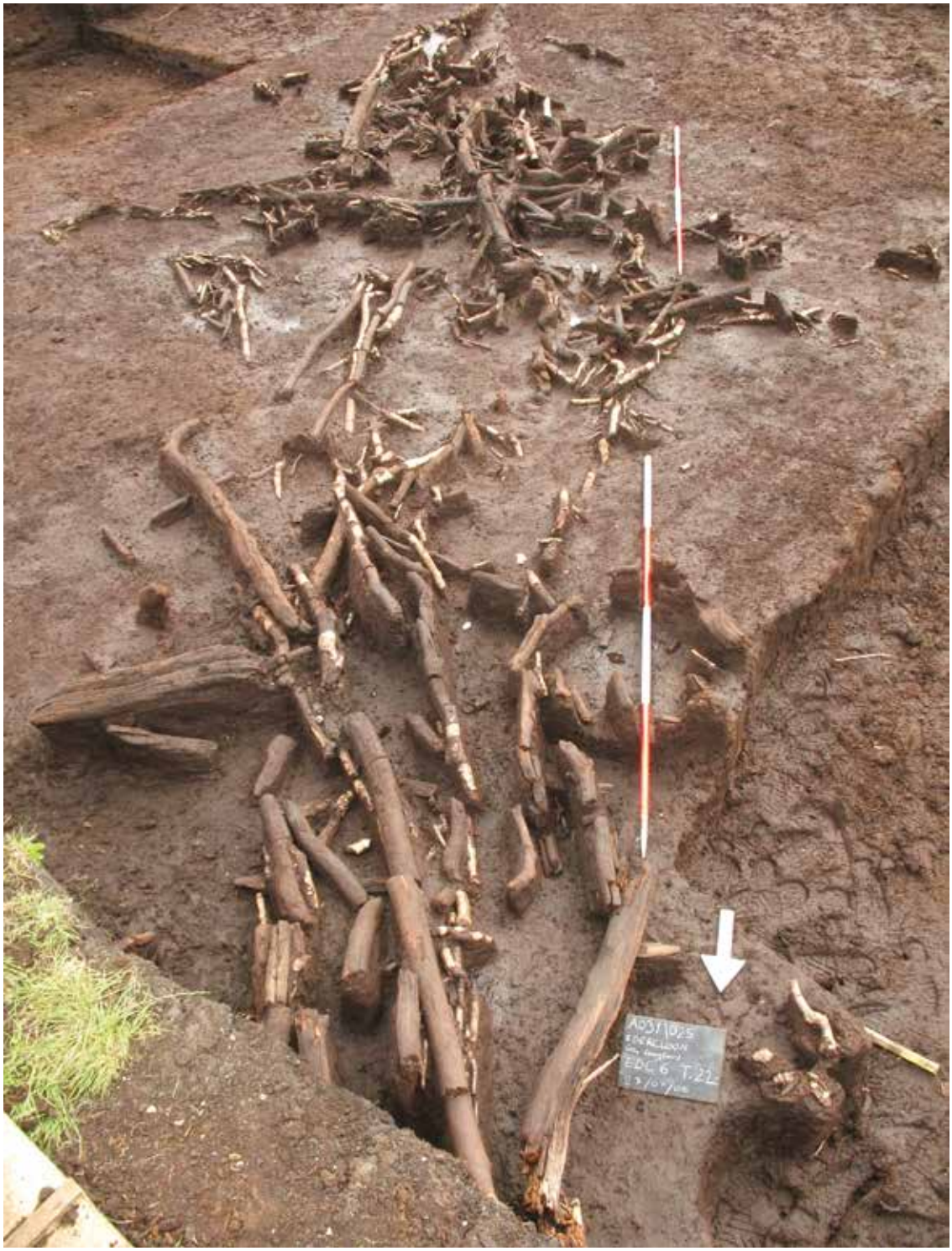
EDC 6 (L10.5 m; W3.6 m; D0.3 m) was a short togher orientated north–south and composed of sparsely laid longitudinal roundwoods, brushwood and twigs (Illus. 4.1 and 4.24). Throughout the entire site, but particularly towards the southern end, were fragmentary and irregularly laid brushwood and twigs and, at the northern end, there was a scatter of wood chips. Analysis of a small sample of wood from EDC 6 indicated that alder and birch were used in its construction (see Stuijts 2021). Dated to 397–203 BC (Wk-21257), EDC 6 was quite scant and, although it had a clear orientation, the elements did not form a cohesive structure or surface. Its north–south orientation is interesting as it demonstrates a continued preference for movement in this direction. EDC 6 was of similar date and form to EDC 28 (see below) and is one of 12 small toghers which appear to have been constructed to aid passage over quite short distances in the bog. In contrast to the communal undertaking represented by sites such as EDC 5 or EDC 12/13, the building of a trackway such as EDC 6 was more likely the work of an individual or small group and would have been completed with relative ease and speed. EDC 6 lay 5 cm above the Late Bronze Age platform EDC 44 (see below).

EDC 28

EDC 28 (L8.1 m; W4.2 m; D0.28 m) was a short togher consisting of a linear spread of brushwood, occasional roundwoods, twigs, wood chips and a single timber (Illus. 4.25). The elements were predominantly longitudinally laid, with the roundwoods concentrated in the central portion of the site. At the south-west end there was a deposit of very closely laid brushwood, the scale and density of which suggested that it may have been the remains of a hurdle. A sample of 23 pieces of wood from EDC 28 was found to contain 10 pieces of birch and occasional (one to four) pieces of alder, hazel, willow, ash and apple-type wood (see Stuijts 2021).

Although the togher was sparse and poorly structured, the edges of EDC 28 were well defined and it had a clear north–south orientation. Dated to 390–200 BC (Wk-20953), it could have been contemporary with the later levels of the large toghers EDC 12 /13, EDC 1b/29 or EDC 26, the latter being approximately 5 m to its north. EDC 28 lay approximately 0.5 m above the Late Bronze Age platform EDC 34. A withy fragment (E3313:28:29) was recovered from EDC 28, suggesting that artefact deposition was also a feature of smaller sites.

During toolmark analysis, a possible blade signature match was identified between a piece of wood from EDC 28 and a sample from the lower layers of togher EDC 1b/29. (A signature in this context refers to striations on a facet of cut wood that are caused by imperfections in the blade edge.) Casts were taken of facets on the two best preserved pieces and while the tool signatures were very similar, an unequivocal match could not be established (Moore 2008b, 658). The base of EDC 1b/29 has been dated to the Late Bronze Age while the upper layers are Iron Age (see above). Given the stratigraphic and chronological complexity surrounding EDC 1b/29, the possibility that the signatures were made by the same tool cannot be entirely discounted.



Illus. 4.24 Togher EDC 6, built with sparsely laid longitudinal roundwoods, brushwood and twigs, looking south (CRDS Ltd).

Illus. 4.25 Togher EDC 28, looking east (CRDS Ltd).

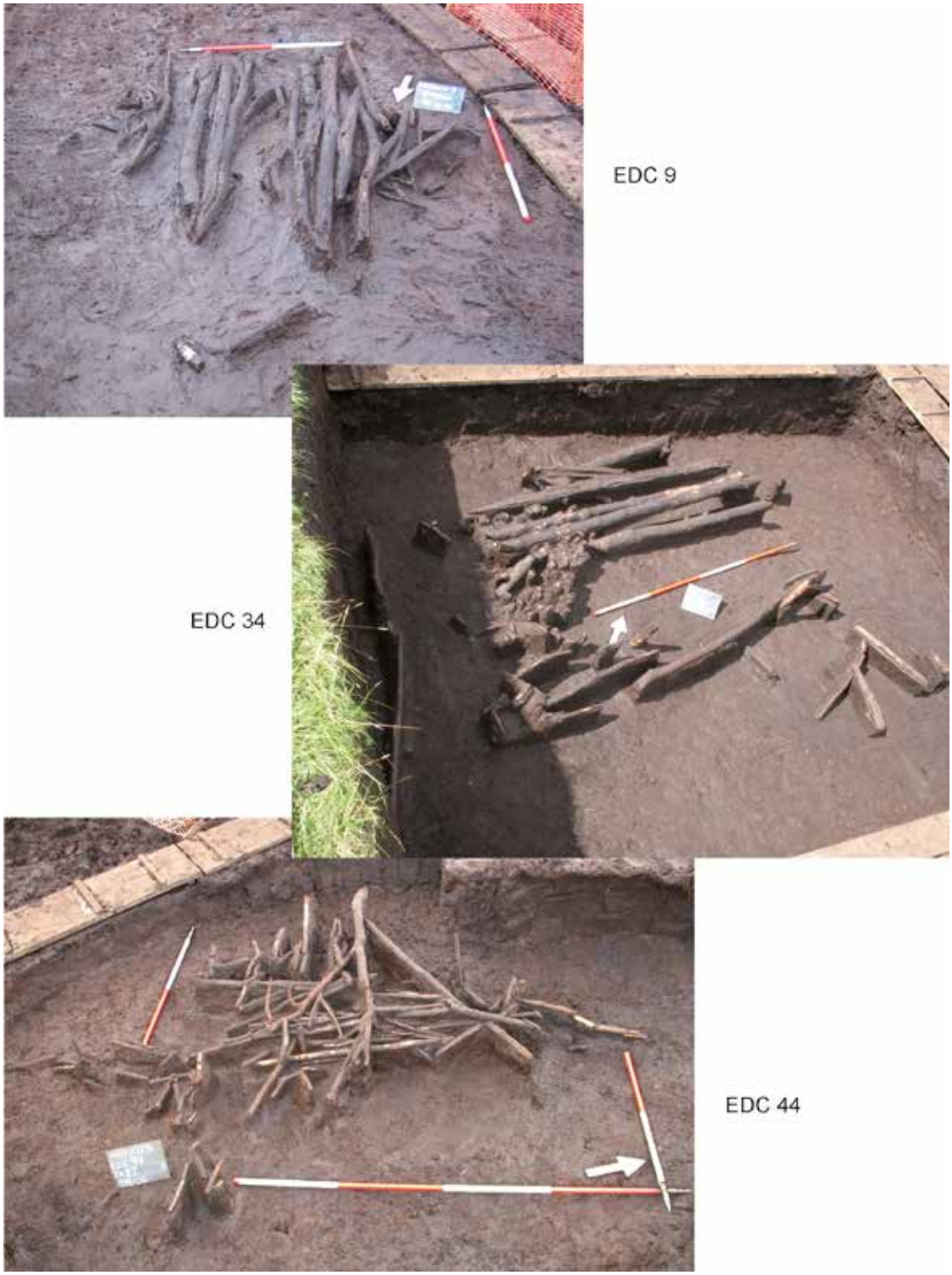
EDC 25

EDC 25 (L11 m; W4.6 m; D0.36 m) was a short togher orientated NNW–SSE (Illus. 4.1). Composed of roundwoods and brushwood, the NNW end was quite irregularly laid, with many pieces set at 45–90° angles. In contrast, the SSE end of the site was much more structured and comprised closely laid longitudinal brushwood and occasional roundwoods. Almost 100 pieces of wood from EDC 25 were analysed as to their species. Alder and hazel formed the majority of the sample, with lesser amounts of birch, willow, apple-type, yew, ash and oak also present (see Stuijts 2021). Insect remains from the SSE end of EDC 25 have suggested drier conditions than normal and that the site may have been built on a hummock (Reilly 2008a, 25–6). Dry stable conditions could account for why this part of the togher was more structured and less fragmented. Two samples from EDC 25 were dated with widely differing results. A piece of ash from the NNW end has returned a date of 370–50 BC (Wk-25200), while a piece of blackthorn from the SSE end dated to 760–400 BC (Wk-20200). EDC 25 lay 0.2–0.3 m above the central portion of EDC 26, which has been radiocarbon-dated to 390–170 BC. The later date for EDC 25 overlaps significantly with that of EDC 26 and considering the range of both, this date is stratigraphically and chronologically possible. The earlier date, however, is problematic. As discussed above, there is a possibility that some sites in Edercloon contained reused wood, but while the reuse of an oak timber is feasible, it is perhaps less likely for a piece of brushwood. Toolmark analysis on samples from EDC 25 was largely inconclusive, indicating that while the majority of the toolmarks appeared to have been made with iron axes, some pieces with characteristic marks of Late Bronze Age axes were also present. The precise reasons for the dating anomaly in EDC 25 remain unknown but it does form part of a group of sites from which problematic dates have been returned.

Platforms

EDC 9

EDC 9 (L2.8 m; W2.25 m; D0.2 m) was a small, almost square, platform of parallel



Illus. 4.26 Small platforms EDC 9, EDC 34 and EDC 44 (CRDS Ltd).

roundwoods and brushwood pegged in position (Illus. 4.1 and 4.26). A gap in the central part of the site suggests some disturbance or movement in antiquity and the wood was in a notably poor condition, suggestive of prolonged exposure or use. The predominant wood species used was willow, of which 23 pieces were identified, with lesser amounts of birch, hazel, ash and apple-type wood also encountered (see Stuijts 2021). EDC 9 was physically isolated but, dating to 1040–830 BC (Wk-20949), could have been contemporary with several sites including the lower levels of toghers EDC 12/13, EDC 1b/29 and EDC 34, the last a small platform of similar form c. 20 m to the south-east. EDC 9 lay approximately 0.28 m beneath the Iron Age togher EDC 7. EDC 9 would have been very simple and quick to build, and likely represents the work of maybe one or two individuals. Common throughout Ireland's raised bogs, small platforms like EDC 9 are generally interpreted as structures built to facilitate hunting and seasonal gathering (McDermott 2001, 18; Cross May et al. 2005c, 353–4; Whitaker 2006a, 14). A potential ritual role has also been suggested for these sites (Coles & Coles 1986, 81; McDermott 2001, 18).

EDC 34

EDC 34 (L3.05 m; W3.91 m; D0.17 m) was a small platform of eight parallel roundwoods and occasional brushwood (Illus. 4.1 and 4.26) of alder and hazel (see Stuijts 2021) orientated north-east–south-west. The north-east corner contained a deposit of bark fragments and each corner was secured by a brushwood peg. Like EDC 9, a gap in the centre of the site may have been due to displacement or removal of some elements in antiquity. Dated to 980–800 BC (Wk-20954), EDC 34 could have been contemporary with platforms EDC 9 and EDC 44 and also the early phases of toghers EDC 12/13 and EDC 1b/29. It lay approximately 0.5 m beneath the Iron Age togher EDC 28.

EDC 44

EDC 44 (L3.7 m; W1.5 m; D0.15 m) was a small but well-structured platform of widely spaced east–west orientated brushwood, overlying densely laid north–south orientated brushwood (Illus. 4.1 and 4.26). Pegged in position, the main part of the site was approximately 1.5 m^2 but the overall site dimensions were skewed by outlying material to the south and east. It was predominantly composed of hazel, with occasional pieces of ash and alder also used (see Stuijts 2021). Of lighter and somewhat less ordered construction than EDC 9 or EDC 34, it would still have functioned well as a small bog platform. EDC 44 has been radiocarbon-dated to 900–790 BC (Wk-20959) and it lay 0.05 m below togher EDC 6.

EDC 27

EDC 27 (L2.9 m; W3.2 m; D0.54 m) was a small platform at the south-western edge of the excavation area adjacent to the former N4. It was very well structured, consisting of three layers of overlapping roundwoods, brushwood and split timbers pegged in position (Illus. 4.1 and 4.27), but the preservation of the wood was quite poor owing to the proximity of the road and an adjacent drain. The species used in the site were dominated by ash and birch, with occasional (one to two) pieces of hazel, alder, oak, willow and apple-type wood also present (see Stuijts 2021). EDC 27 was a small but solid platform, its deep and well-

Illus. 4.27 The well-structured platform EDC 27 (CRDS Ltd).

built structure possibly a direct response to particularly wet conditions indicated by the presence of aquatic insect species in peat between the layers of the site (Reilly 2008a, 25). Wet conditions in this area were also indicated in samples from togher EDC 26, the south-west end of which lay 0.4 m below EDC 27 (ibid.). Nearby open water, which would have attracted various animals, may have been the focus of the site, providing a safe, dry place from which to hunt.

Scientific dating of wood from EDC 27 has produced complex results. A piece of hazel brushwood from the base of the platform was radiocarbon-dated to 900–770 BC (Wk-20952). Two oak timbers from the upper layers of the platform had neither sapwood nor sapwood-heartwood boundaries and failed to produce reliable dendrochronological dates. Both timbers did, however, have significant correlation values with the oak timber from togher EDC 31 and are believed to be from the same tree. One of these samples (see Q11035 in Appendix 2) had 162 annual growth rings of which rings 74 to 84, in approximately the centre of the sample, were radiocarbon-dated to 898–777 BC (UBA-31953). As was the case for the sample from EDC 31, the lack of sapwood means the felling date for the tree could be many years later. Accepting these limitations, the radiocarbon dates from the oak and the hazel are nonetheless in accord.

EDC 27 was located 0.4 m above togher EDC 26, the uppermost layer of which has been dated to the Iron Age and which converged with togher EDC 31. Analysis of testate amoebae from Edercloon has indicated that the rate of peat growth in the bog between the years 1410 BC and AD 65 was 0.01 m per 20 years (Bermingham 2009). This would mean that the 0.4 m of peat between EDC 27 and EDC 26, and by association EDC 31, represents c. 800 years. Even allowing for some distortion due to drainage, at the very earliest, EDC 27 should date to the later Iron Age. While it is possible that old timbers were used or reused in Edercloon, it is difficult to understand how timbers from the same tree could have been used in sites so clearly separated by space and thus presumably also time. Furthermore, as stated above with regard to togher EDC 25, which lay just 5 m north-east of EDC 27, the reuse of small pieces of brushwood seems somewhat unlikely.

EDC 40

EDC 40 (L3.4 m; W3.1 m; D0.19 m) comprised a deposit of seven roundwoods and eight pieces of brushwood, all except one of which were orientated east–west (Illus. 4.1 and 4.28). The elements were widely spaced, with gaps of up to 0.5 m between them; however, the site was roughly square in plan and, had the wood been more densely laid or pegged in position, it might have been classified as a platform. In the absence of such evidence, it was categorised as a deposit of archaeological wood, but it may once have formed a more cohesive structure which

Illus. 4.28 EDC 40, a small deposit of archaeological wood (CRDS Ltd).

became displaced over time. Alternatively, EDC 40, which has been dated to 400–200 BC (Wk-20958), may have been outlying material from the nearby togher EDC 37 (see above). A section of the upper surface of EDC 37 appeared to be missing and it is possible that EDC 40 represents this material, either having been removed in antiquity or never put in its intended position. Analysis of insect remains from EDC 40 showed a dominance of ant species indicative of dry ground conditions; however, other indicators were for pool conditions and overall quite a varied local environment is evident (Reilly 2008a, 24–5). Seven pieces of wood from EDC 40 were identified as to species, five were birch, one was alder and one was ash (see Stuijts 2021). A carved peg or stopper of ash (E3313:40:88) was recovered from EDC 40, once more demonstrating the inclusion of artefacts in seemingly small or insignificant sites.

Undated sites

In the area where toghers EDC 1b/29, EDC 10, EDC 31 and EDC 26 converged (Illus. 1.9) were several small sites which have not been scientifically dated but for which some dates can be inferred owing to their position relative to the larger structures. It is important to note that while peat growth between two structures indicates a degree of separation in time, it is not possible to accurately estimate how much time given that the bog at Edercloon had been subject to drainage.

The earliest of the undated sites in this area was EDC 47, an unstructured deposit of roundwoods and brushwood on which metal toolmarks were present. Located 0.45 m below the south-east end of probable Late Bronze Age togher EDC 31 (see above), and 0.2 m above the east end of the Early Bronze Age togher EDC 36 (see Chapter 3), EDC 47 must be Bronze Age. EDC 3 was a small deposit of brushwood 0.1 m above EDC 10, near the junction of EDC 1b/29 and EDC 10. While it clearly post-dates the Late Bronze Age/Early Iron Age EDC 10 (see above), it could still be prehistoric and relate to EDC 1b/29, the upper layer of which is Iron Age. A little further north-west was EDC 8, a small deposit of archaeological wood 0.49 m above EDC 10. Its position above EDC 10 suggests it is Iron Age or perhaps even later in date.

EDC 21 (L3.3 m min.; W2 m min.; D0.2 m) was a larger but quite dispersed deposit of brushwood, twigs, small pieces of split wood and a single roundwood. Its exact original form is unknown. EDC 21 lay just above the centre of the bend in the Iron Age togher EDC 26, and the single roundwood dived into the underlying peat and abutted the south-east end of EDC 31, which lay 0.1–0.2 m below. EDC 21 post-dates toghers EDC 26 and EDC 31 but, like EDC 3, could still be prehistoric and date to the Iron Age. Also in this area, close to the north-west end of EDC 26, was EDC 46 of which only a very small portion lay within the excavation

limits. Despite this, it appeared to be a sizeable construction of parallel timbers and brushwood and was likely related to the complex of prehistoric structures in this part of Edercloon.

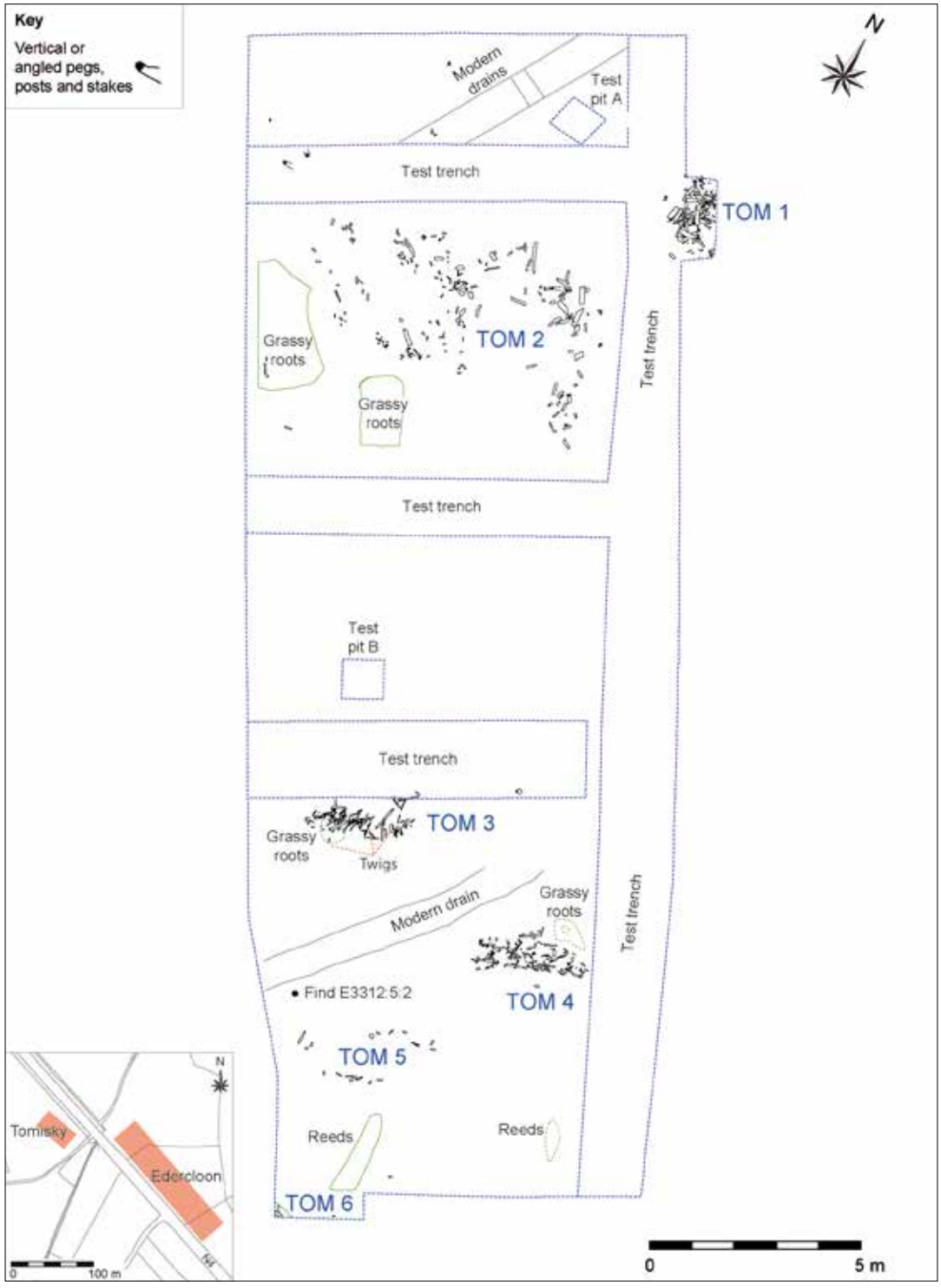
Close to the south end of togher EDC 12/13 lay EDC 18, a poorly preserved togher of parallel brushwood and roundwoods, which ran west beyond the limits of excavation. It lay at a similar level as the upper layers of EDC 12/13; however, given that the latter appeared to have sunk in this area, it is difficult to gauge whether the two sites may have been contemporary. Approximately 8 m north-west of EDC 18 was EDC 35, a well-structured site of two distinct layers including a hurdle panel (Illus. 4.29). EDC 35 was classified as a togher; however, it was severely truncated by both the adjacent road and associated drainage and its exact form remains unknown. Situated at a substantially lower level than EDC 18, it seems reasonable to suggest that EDC 35 was prehistoric and likely contemporary with some phase of EDC 12/13.

Iron Age Tomisky

TOM 3

One short togher in Tomisky has been dated to the Iron Age. TOM 3 (L4.72 m min.; W0.88 m; D0.05 m), composed of a single layer of transverse brushwood, occasional

Illus. 4.29 EDC 35, a probable togher built using a hurdle panel (CRDS Ltd).



Illus. 4.30 Plan of excavated structures at Tomisky, Co. Longford (CRDS Ltd).

twigs and wood chips, was orientated north-east–south-west (Illus. 4.30). The site was considerably truncated and desiccated owing to modern drainage and agriculture. This had particularly impacted on the north-western edge of the site. Woodworking in TOM 3 was evidenced by metal-cut toolmarks on over 20 pieces and a small sample of wood was found to contain alder, birch, ash and holly (see Stuijts 2021). A piece of birch brushwood from the site was radiocarbon-dated to 390–170 BC (Wk-25190). This is the only dated site from Tomisky, where most of the structures were heavily truncated and disturbed (see below). Given the chronological complexity of the sites in Edercloon, the date for TOM 3 cannot be used as a clear indicator that the other Tomisky sites are prehistoric. These sites did, however, all occur in close proximity and it is likely that at least some were of similar date. The date for TOM 3 does indicate that this short togher was contemporary with several structures within the wider Edercloon complex.

Discussion

The centuries of the Middle Bronze Age, taken to be approximately 1700–1200 BC, were generally a period of muted activity at Edercloon. The pollen record for the period indicates human activity in the area (Plunkett, Chapter 2); however, conditions on the bog were becoming increasingly wet and from 1500–900 BC the water level rose to a new high culminating in a bog burst after which Dry Shift 2 (c. 900–50 BC) occurred (Bermingham, Chapter 2). While these circumstances are likely to have discouraged much incursion into the wetlands, the lowest levels of togher EDC 12/13 and a little later the construction of togher EDC 5 were completed at this time. The wet conditions, which prevailed until c. 900 BC, could explain the huge scale of EDC 5 as an attempt to conquer a very wet bog surface and, ultimately, may have contributed to its rapid submersion. The same might be said of EDC 12/13, although the rebuilding of this site into the Iron Age suggests that it was the result of a longer-lived tradition and inter-generational focus. These two toghers were the first large-scale attempts to traverse Edercloon bog and are indicative of a communal effort, the goal of which was to access the wider wetlands and move through them. They also represent the start of a clear tradition of building large north–south orientated toghers, many of which would become interconnected in the later centuries of the Late Bronze Age and Iron Age.

The shift from wet to drier conditions around the start of the first millennium BC would have allowed easier access to the bog and likely accounts, at least in part, for the resurgence of trackway building during this time. This was a period which saw unparalleled human activity in Edercloon bog. The most significant sites built during this time were the large interconnected toghers, at least two of which were rebuilt and maintained over long periods. One of the key features of these large sites was their north–south-trending orientation, with EDC 12/13, EDC 1b/29, EDC 26 and EDC 5 forming four near parallel routes across the bog. While EDC 5 was slightly earlier than the others, it is likely to have coexisted with the basal layers of EDC 12/13. Why there was a need for two large sites, 65 m apart with an identical orientation is unknown. It is possible that they were the undertakings of different groups of people, with the same overall aim or destination. Conversely, they could have had different ultimate destinations. EDC 12/13, visible in the peat

faces of active turbary plots to the north, is believed to have continued beyond the excavation area for at least 50 m out towards the wider expanse of bog, while geophysical prospection has identified EDC 5 extending north for an additional 19 m (Bonsall et al. 2016).

Evidence suggests that the large togher EDC 5 was short lived (Chapter 8) and it was probably submerged and abandoned by 970–800 BC when the construction of EDC 1b/29 began. The basal layers of EDC 1b/29 were presumably contemporary with some level of EDC 12/13 and so once more there were two parallel toghers with a common orientation, this time c. 25 m apart. What is different about these two sites is that they were important enough to be rebuilt and maintained into and through several centuries of the Iron Age. The presence of EDC 10 reinforces the sense that these were sites of some significance. Likely to have been built in or before 760–640 BC, EDC 10 appeared to form a substantial route between and possibly beyond these two toghers. EDC 12/13 and EDC 1b/29 were orientated north–south and so appear to have provided access through the bog rather than to or from the adjacent dryland. Their link via EDC 10 further demonstrates this desire and need for access through, rather than just across, the wetlands.

Somewhat later in the Iron Age, togher EDC 26 was built. Just off the north–south bearing, it nonetheless forms another parallel route across the bog. Its upper layer is dated to 390–170 BC so was likely contemporary with some level of EDC 1b/29, the upper layer of which dated to 350–20 BC. Furthermore, the upper levels of EDC 12/13 were possibly in use at this time so there may have been three large parallel routes across the bog in the Iron Age. It is noteworthy that the lower layers of EDC 26, although undated, are likely to be Late Bronze Age/Early Iron Age and were clearly connected to the lower layers of EDC 1b/29 by togher EDC 31. Therefore, the three parallel routeways also existed in the Late Bronze Age/Early Iron Age and were possibly connected at some point via EDC 10 and EDC 31.

The pattern of large interconnecting trackways at Edercloon has no real parallels in the Irish archaeological record and only occasionally have smaller toghers been seen to interconnect in this manner. In Derryoghil, Co. Longford, sites Derryoghil 3 and 4, both reasonably small brushwood and roundwoods paths of Late Bronze Age date, were seen to converge and form a single route way (Raftery 1996, 122). Interestingly, Derryoghil 4 followed a distinct S-shaped bend prior to merging with Derryoghil 3. This was similar to the connection of EDC 26 and EDC 31, and was also interpreted as denoting the avoidance of a particularly wet area (ibid., 198). Also excavated in Derryoghil were six brushwood trackways which criss-crossed and overlapped each other in very close proximity (ibid., 145–51). At Walton Heath in the Somerset Levels, a similar situation was seen at Garvin's Track (c. 2400 BC) where two brushwood paths conjoined to form a single heavier structure (Coles & Coles 1986, plate 33).

A second unusual feature of the Late Bronze Age and Iron Age sites at Edercloon is the great depth of construction evident in almost all of the large toghers. Parallels for this are few, particularly in the case of EDC 5. Conversely, EDC 12/13, EDC 1b/29 and also probably EDC 26 had multiple phases of construction. The only known Irish parallels for such longevity are a small number of toghers of medieval date in County Offaly, all built using gravel, clay or flag stones. These include a trackway at Lemanaghan, which had five phases and an accumulated

depth of c. 1.7 m (O'Carroll 1996), and another at Daingean South Bog, which varied from 0.30 m to 0.62 m in depth and had a maximum of five recorded layers (Irish Archaeological Wetland Unit 2002d, 55–6). Another example excavated in Bloomhill Bog in counties Offaly and Westmeath had a depth of over 1 m (McDermott 1995, 59–66). All of these structures date to the early medieval period, so while they do not provide a chronological parallel for the Edercloon toghers, they demonstrate that the practice of rebuilding and replenishing the same route way over centuries is not entirely unique to Edercloon.

It is also possible that the convergence of EDC 12/13, EDC 19 and EDC 10, and EDC 1b/29, EDC 10, EDC 31 and EDC 26 were in fact platform areas which could be reached by people travelling from different locations. Whether interpreted as platforms or crossroads, it seems clear that these were significant or important places, to which people wished to travel over long periods of time. To this end, it is suggested that while performing a functional role as route ways, these sites may also have played a part in ritual life. This is further supported by the recovery of multiple artefacts from these areas (see Chapters 6 and 8). Prehistoric ritual activity in wetlands is well attested in both the Irish archaeological record (Bourke 2001; Kelly 2006, 26–30; van de Noort & O'Sullivan 2006; Becker 2008, 12–15) and that of mainland Europe (van der Sanden 1999, 223–4; Coles & Coles 1989, 173–97).

Pollen records for these centuries indicate low-level human activity in the landscape surrounding Edercloon (Plunkett, Chapter 2). This is somewhat surprising given the scale of activity on the bog and suggests that extensive settlement, farming and crop cultivation were taking place at some remove from Edercloon itself.

North of Edercloon, excavations at Moher 1, Co. Leitrim, uncovered two burnt mounds dating to the centuries of the Middle and Late Bronze Age (Collins & O'Connor 2009, 15–17). This site, and indeed the other earlier burnt mounds excavated on the road scheme (Chapter 1) demonstrate repeated human activity along the margins of and within the wetlands.

The landscape surrounding Edercloon has no monuments of known Late Bronze Age or Iron Age date, although a small number of enclosures in the broader geographical area may date to these periods. At a regional level, however, truly monumental linear earthworks such as the Doon of Drumsna and the Black Pig's Dyke indicate the presence of significant Iron Age communities in Leitrim, Longford, and Roscommon (Raftery 1994, 83–8). The greatest evidence for activity in County Longford at this time is to be found in the bogs, where numerous sites of the period have been identified. These include the large corduroy roads of Derryoghil 1, 938 ± 9 BC (ibid., 107–15), and Corlea 1, 148 BC (ibid., 7–55), both of which are indicative of sizeable communal effort to traverse the wetlands. Closer to Edercloon, but across the Shannon in County Roscommon, several substantial toghers in Cloonshannagh Bog tell the same tale (Coughlan & Whitaker 2019, 69–70). The ability of archaeological investigations in raised bogs to dramatically increase site distributions in areas previously thought to be devoid of monuments has been well documented (Raftery 1996, 414–15; Moore et al. 2003, 126) and this is clearly the case at Edercloon. The centuries of the Late Iron Age saw increased wet conditions on the Edercloon bog, which correspond to a decrease in activity, and it was not until the fifth century AD that people once more began to venture out into the wetlands.

CHAPTER 5

Early medieval Edercloon and undated sites

by Caitríona Moore

Early medieval Edercloon and undated sites

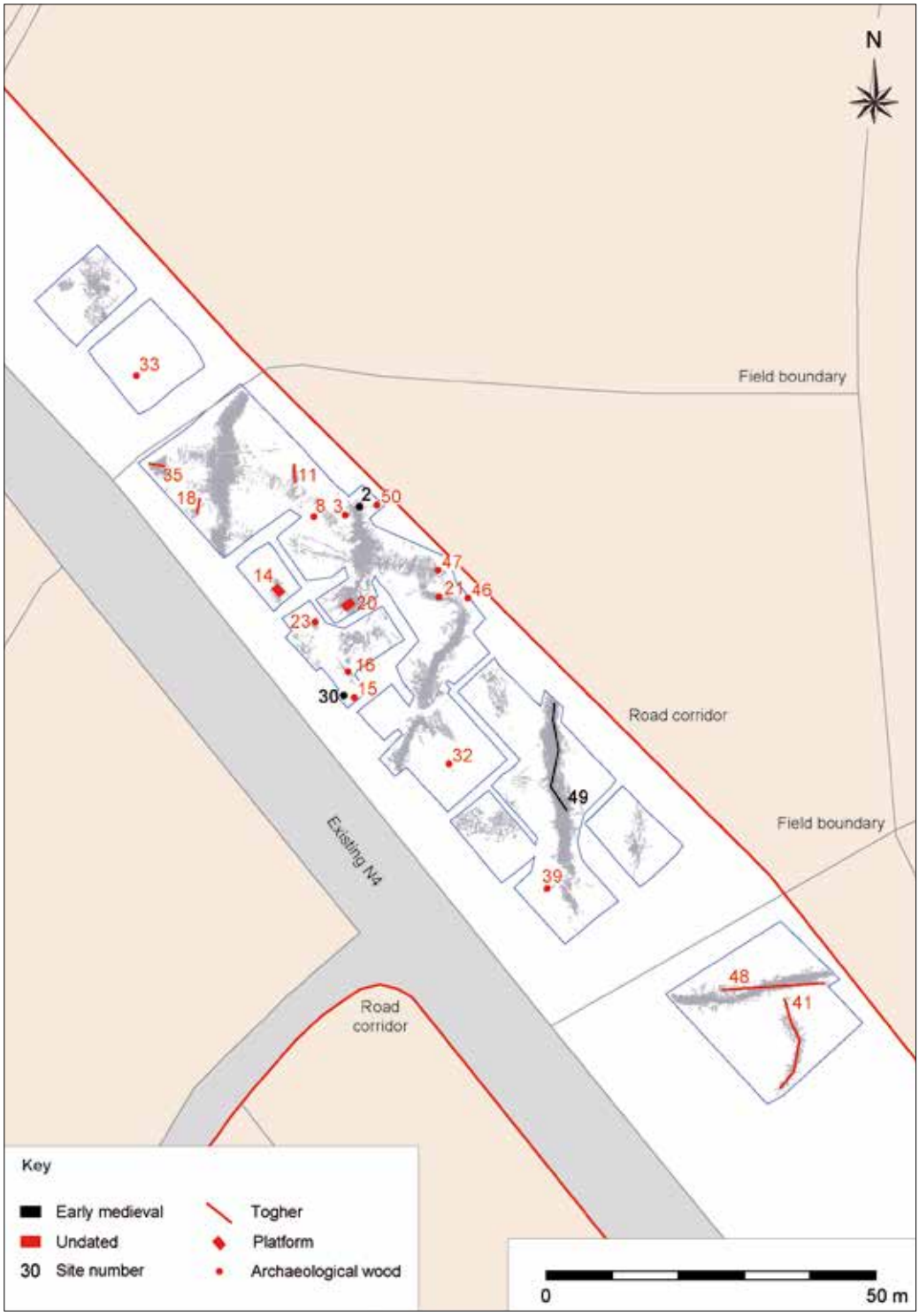
Early medieval Edercloon

Following the intensive building of the Late Bronze Age and Iron Age came a period during which there appears to have been no human activity on the bog. The uppermost ranges of EDC 25 and EDC 1b/29 extend to 50 and 20 BC, respectively, and no sites have been dated to the subsequent 400 years (Illus. 1.8). It is possible that some of the undated sites may have been built in this period; however, this was a time of increasingly wet conditions which may have hampered activity in the wetlands. Pollen evidence further suggests muted human activity at this time, with a resurgence of woodland in the surrounding landscape (Plunkett, Chapter 2). From AD 500–950, the water table in the bog dropped and drier conditions prevailed on the surface. The pollen record for this period, however, indicates only a slight increase in human activity. Three sites have been dated to the early medieval period (Illus. 5.1), only one of which was a substantial structure. Early 20th-century reclamation and drainage of the bog may have impacted on its upper levels, however, potentially destroying any other early medieval and later sites that may once have existed at Edercloon.

EDC 49

EDC 49 (L17.3 m min.; W3.68 m; D0.32 m) was a well-structured togher orientated north–south, the southern end of which terminated within the excavation area, while its northern end extended beyond the road corridor (Illus. 5.1). It was built with two layers, the uppermost of which lay directly beneath the topsoil and was poorly preserved. This layer had also been impacted on during pre-development test-trenching and was disturbed for a short section at the centre of the site. Like many of the earlier sites in Edercloon, EDC 49 curved slightly and its composition changed along its length. At its northern end, the upper layer was composed predominantly of closely laid transverse roundwoods and brushwood. At the opposite end, this layer was dominated by longitudinal and irregular brushwood, with occasional larger roundwoods laid transversely and longitudinally. The second layer of the site was better preserved and contained predominantly longitudinal brushwood, occasional roundwoods, and twigs overlain by occasional transverse roundwoods (Illus. 5.2). A small sample of wood from EDC 49 was found to contain predominantly birch, with small amounts (five or fewer pieces) of alder, hazel, holly, apple-type wood, oak and willow (see Stuijts, Chapter 7).

EDC 49 was located 0.3 m above and on the same alignment as EDC 5 (Illus. 4.2 and 4.5). This may not have been coincidental as it is likely that the large earlier site would



Illus. 5.1 Schematic plan of excavated early medieval and undated sites (CRDS Ltd).

Illus. 5.2 The upper layer of togher EDC 49, looking south. The alder bowl E3313:49:28 (circled in white) is visible in the background (CRDS Ltd).

have created a dry zone or route within the bog, presenting an obvious location for the position of the later structure. A similar situation was suggested for the Neolithic and Early Bronze Age toghers EDC 38 and EDC 42 at the northern end of the excavation area. The orientation of EDC 49 suggests that in the early medieval period movement in a north–south direction across Edercloon bog was still desirable. A piece of birch from the upper layer of the togher has been radiocarbon-dated to AD 400–560 (Beta-217357). A piece of hazel from the lower layer has dated to AD 680–880 (Wk-25203). While dating anomalies have been encountered elsewhere in Edercloon they all occurred in sites of Late Bronze Age and Iron Age, many of which were part of the intricate network of interconnected sites. The reasons for this are poorly understood but some dismantling and reuse of sites has been suggested (see Chapter 4). Chronologically and physically isolated from these, it is somewhat surprising that a similar situation occurred in EDC 49. The hazel sample, taken from a well-structured and undisturbed part of the togher, was physically more secure than the piece of birch from the degraded upper layer. The date of AD 680–880 must be considered the date of EDC 49 as, while it is conceivable that a piece of old wood was used or reused in the upper layer, it is not possible for the reverse to have occurred and a younger piece to be present in the lower layer.

Two artefacts were recovered from EDC 49, a wheel rim fragment (E3313:49:42) and a carved alder bowl (E3313:49:28) (see Chapter 6). The only known parallel for the former is the wheel fragment from the upper Late Bronze Age or Iron Age levels of togher EDC 12/13. While this could be indicative of a very local and long-lived manufacturing tradition, when considered in conjunction with the dating anomaly outlined above, the possibility that this artefact was reused or re-deposited must be considered. The bowl from EDC 49 is of a type typical of the first–fourth centuries AD (Earwood 1993, 67) and so it too is somewhat anachronistic. Further discussion of the potential for the redeposition of objects at Edercloon is provided in Chapter 8.

Despite dating to some 700 years later than the period of intense Late Bronze Age and Iron Age activity, EDC 49 demonstrates that north–south movement through the bog and object inclusion were still characteristic of trackways at Edercloon.

EDC 2

EDC 2 (L2.57 m min.; W1.54 m; D0.15 m) was a deposit of archaeological wood comprising 28 pieces of brushwood, two roundwoods and six small pegs (Illus. 5.1). These were irregularly laid and no cohesive structure was apparent. Occasional toolmarks of metal axes were present on the wood. Located just 0.16 m below the field surface, EDC 2 was the highest site excavated at Edercloon and has been dated to AD 640–860 (Wk-20950). It lay c. 2 m west of undated EDC 50, a similar deposit of worked wood, and it is possible that the two were associated, perhaps originally forming a small togher or platform. Furthermore, EDC 2 also extended beyond the limits of excavation and so its full extent and form are unknown. The north end of togher EDC 1b/29 lay 0.35 m below EDC 2. EDC 2 was one of 15 sites classified as deposits of archaeological wood (see below), the function of which is poorly understood. Further discussion of this site type is provided in Chapter 8.

EDC 30

EDC 30 (L2.35 m min.; W1.1 m; D0.12 m) was a small, irregular deposit of worked and unworked wood, which was very fragmentary. It was located at the western edge of the excavation area, adjacent to the former N4 and a drainage ditch (Illus. 5.1). The site has been dated to AD 660–870 (Wk-20951), but a broken post-medieval shovel (E3313:30:20) recovered from within it indicates later disturbance. A fragment of an oak vessel lid or base (E3313:30:27), also found in the site, may date from the early medieval period, but could also be a later intrusion. EDC 30 extended beyond the excavation area; thus the excavated remains may represent only a small portion of a larger site.

Discussion

Few dryland sites in close proximity to Edercloon date from the early medieval period. On the Leitrim section of the Dromod–Roosky Bypass, north-west of Edercloon, excavations at Aghnahunshin revealed evidence of activity—possibly scrub burning—dating to AD 890–1030 (Wk-22724) (Seaver & O'Connor 2009a, 26) and at Moher 4 the burnt fill of a post-hole was radiocarbon-dated to AD 660–780 (Wk-22719) (Collins & O'Connor 2008b, 13–14). In the wider landscape, a church and associated features (LE037-004001) at Cloonmorris, Co. Leitrim, approximately 1 km to the north-east, indicate the presence of an established community in the area at the time. This is further demonstrated by a proliferation of ringforts to the south, around the village of Newtown Forbes, Co. Longford, close to which, in the south-east part of Lough Forbes, is a crannóg (LF008-003). West of this in Kilbarry, Co. Roscommon, is a gravel and stone togher (RO037-017) associated with the early medieval Kilbarry Church (RO024-016001).

Undated sites at Edercloon

Nineteen sites excavated at Edercloon have not been scientifically dated (Illus. 5.1). However, the relative dates of some, such as platform EDC 20, toghers EDC 11, EDC 35 and EDC 48 or small deposits of archaeological wood such as EDC 47 (see Chapters 3 and 4), can be inferred from their association with other dated structures. There remain, however, seven sites for which it is more difficult to estimate a date. Summary descriptions of these are provided below; a full record of each is available in Moore & O'Connor (2009b).

Relatively isolated within the Edercloon complex was EDC 41 (L15.3 m; W3 m; D0.4 m), a togher orientated north–south which, like many others in the complex, curved along its length. EDC 41 was composed of closely laid longitudinal roundwoods and brushwood, held in position with occasional pegs (Illus. 5.3). It was the southernmost site within the excavation area, located almost 2 m above and just south of the Neolithic toghers EDC 45 and EDC 48 (Illus. 3.1). A split and carved bowed ash timber (E3313:41:97) recovered from this site may have been part of a slipe or sled (see Chapter 6).

EDC 14, EDC 15, EDC 16, EDC 23 and EDC 32 formed a group of sites located along the western edge of the excavation limits, adjacent to the former N4. With the exception of EDC 14, which was classified as a platform, all were deposits of archaeological

Illus. 5.3 Togher EDC 41, which was orientated north–south but curved along its length (CRDS Ltd).

wood. These sites were poorly preserved and, in most cases, truncated. Scientific dating of other structures at comparable levels in the vicinity, such as the early medieval EDC 30 and Late Bronze Age/Early Iron Age EDC 25 (Illus. 4.1), has produced widely differing results (see above and Chapter 4) and so it is difficult to estimate the dates of these deposits. Similarly, EDC 39, a small deposit of worked wood, 5 m north-west of and at a higher level than the southern end of EDC 5, remains of unknown date.

Undated sites at Tomisky

One togher and four deposits of archaeological wood excavated in Tomisky are undated. TOM 4 was a short east–west orientated togher of fragmented and irregularly laid brushwood, a single roundwood and occasional twigs. Like the sites around it (see below), the togher contained a wide variety of wood species, including hazel, alder, birch, ash willow, apple-type wood and ivy (see Stuijts 2021).

The remaining undated sites—TOM 1, TOM 2, TOM 5 and TOM 6—were deposits of archaeological wood consisting of very dispersed and fragmentary spreads of brushwood, roundwoods and twigs. Analysis of wood from TOM 1 and TOM 2 identified a dominance of ash, followed by small amounts of alder, willow, birch, hazel and apple-type wood (see Stuijts 2021).

Although heavily disturbed by modern drainage and agriculture, the sites excavated at Tomisky are significant. Given both the scale and proximity of Edercloon, it seems likely that they formed part of the same complex (see Illus. 2.1). Alternatively, the sites at Tomisky may represent small outliers, contemporary with, but physically separate from the Edercloon sites. Dense complexes of archaeological sites with contemporary outlying sites have been found previously in Ireland's raised bogs (e.g. O'Carroll 2003, 77; Cross May et al. 2005b, 343).

TOM 3 and TOM 4 were classified as toghers, based primarily on the presence of structure and a degree of linearity; however, it should be noted that either site could have originally formed part of a larger togher or platform destroyed prior to excavation. The four deposits of archaeological wood may represent displaced material from elsewhere within the excavation area or the remains of more substantial structures. Alternatively, they may always have been simple deposits of worked wood, the function of which is inscrutable, but likely mundane.

One wooden artefact (E3312:5:2), a piece of split and highly dressed yew brushwood, was recovered from an *ex situ* position close to TOM 5 (Illus. 4.30) and the original location or circumstances of its deposition are unknown. Its discovery is, however, significant in the context of the highly structured artefact deposition recorded at Edercloon (see Chapter 8) and adds further weight to the suggestion that the Tomisky sites formed part of the Edercloon complex.

CHAPTER 6

The artefact assemblage

by Caitríona Moore
with contributions by I Stuijts and J Wilmink

The artefact assemblage

The Edercloon excavation produced a total of 77 artefacts, those not made from wood were items typical of most Irish archaeological sites and were recovered from the topsoil above the trackways (Moore & O'Connor 2009b, 643–8). Seventeen pieces of ceramic included sherds of medieval and post-medieval pottery and fragments of clay tobacco pipes. Four pieces of post-medieval glass were also recovered. Metal finds included nails, a possible pin or piece of scrap wire, and a modern religious medal. Parts of three post-medieval shoes were recovered from the topsoil and a fragment of stitched leather was found in EDC 32. Artefacts made from stone included a possible polishing stone (E3313:12/13:33) from above togher EDC 12/13 and the stray chert flake (E3313:1b/29:67) from peat adjacent to the base of trackway EDC 1b/29. The latter appears to be a roughly made Bann Flake of Mesolithic date and its recovery from the vicinity of a Late Bronze Age togher is anachronistic and poorly understood.

Wooden artefacts

Comprising 46 individual finds, this assemblage is one of the largest collections of wooden artefacts ever recovered in association with toghers in an Irish raised bog, paralleled in size only by that from the Iron Age trackway Corlea 1 (Raftery 1996, 231–62). The variety of objects is remarkable and includes vessels, wheel fragments, tools, spears, mallets, and many items the function of which is currently unknown (Moore & O'Connor 2009b, 580–91). The recovery of artefacts from Irish raised bogs is well documented (Halpin 1984); however, their inclusion within archaeological sites is relatively rare and at Edercloon appears to represent a distinct tradition of votive deposition (see Chapter 8).

Bowls, dishes, tubs and troughs

With nine examples, wooden vessels were the most common artefacts found at Edercloon. Only one of the vessels was complete and several are represented only by small fragments of handles or lids. Eight were carved from alder and the ninth was of oak. With the exception of one bowl found in isolation, all were recovered from within structures and the majority are believed to date from the Late Bronze Age or Iron Age.

Two objects (E3313:5 and E3313:26:18) were classified as bowls, both being the fragmentary remains of apparently wide and relatively shallow vessels. One of these (E3313:5) comprised 19 fragments of a carved alder bowl and was the only wooden object at Edercloon deposited in isolation. Although largely incomplete, several fragments fit together and it seems to have had a shallow, rounded shape with a carved,

everted rim. Based on this evidence, possible parallels for the bowl include several Late Iron Age Irish bowls, in particular one from County Armagh that was wide and shallow with a turned out rim (Earwood 1993, 64) and a globular alder cauldron from the north of Ireland (Coles et al. 1978, 15–16, fig. 7.1). The second bowl (E3313:26:18) was recovered from the S-bend of togher EDC 26, a site dated to the Iron Age but likely has Late Bronze Age origins (see Chapters 4 and 8). Consisting of approximately half of an alder bowl, it has an oblong shape with a flat base and gradually sloping sides (Illus. 6.1). A carved feature on the outer wall is similar in appearance to the handle on a tub (E3313:12/13:34) from togher EDC 12/13 (see below). This may be an unfinished handle, indicating that the original design was quite different. Alternatively, it could be a very simple feature designed to make handling the vessel easier. The bowl was clearly used prior to deposition, evidenced by heavy abrasion and patches of charring on its interior and exterior surfaces. A similar bowl dated to the Neolithic was recovered from a bog at Timoney, Co. Tipperary (Raftery et al. 1966, 23–4; Earwood 1993, 289), while a second, almost identical, example dating from the early centuries of the first millennium AD was recovered at Loch Glashan crannóg in Scotland (Crone 2005, 33–4). That the best parallels for this bowl should be of significantly different dates is not overly surprising; the design of wooden bowls and many other vessel types is a response to a specific need, and basic forms can have a long chronological lifespan.

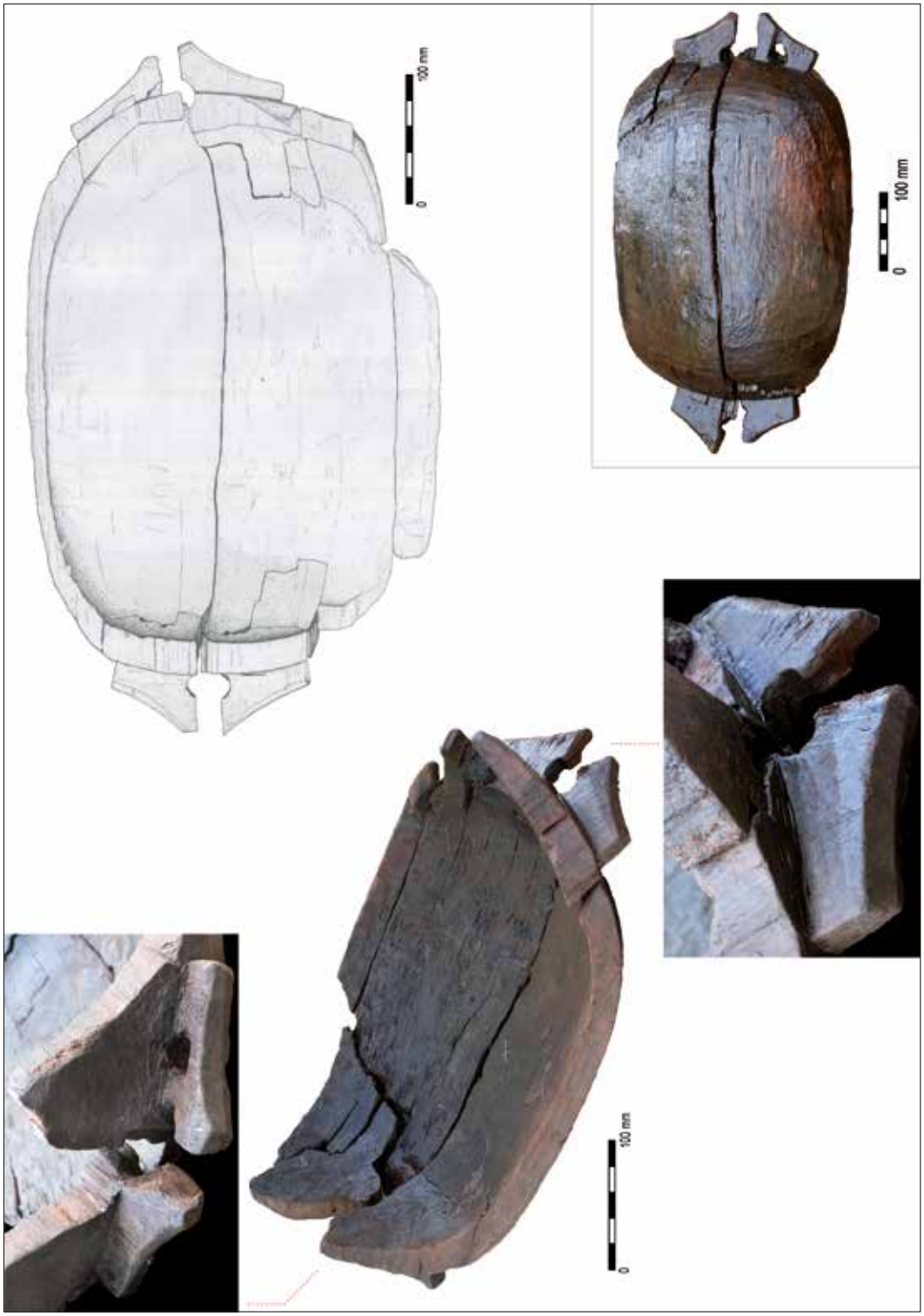
A carved bowl or dish (E3313:49:28) from early medieval togher EDC 49 is larger and has a shallower, open shape. It is oblong with a flat base, shallow walls and a simple

Illus. 6.1 A carved alder bowl (E3313:26:18) from Iron Age togher EDC 26, which was scorched and heavily worn before its inclusion in the trackway (John Sunderland).

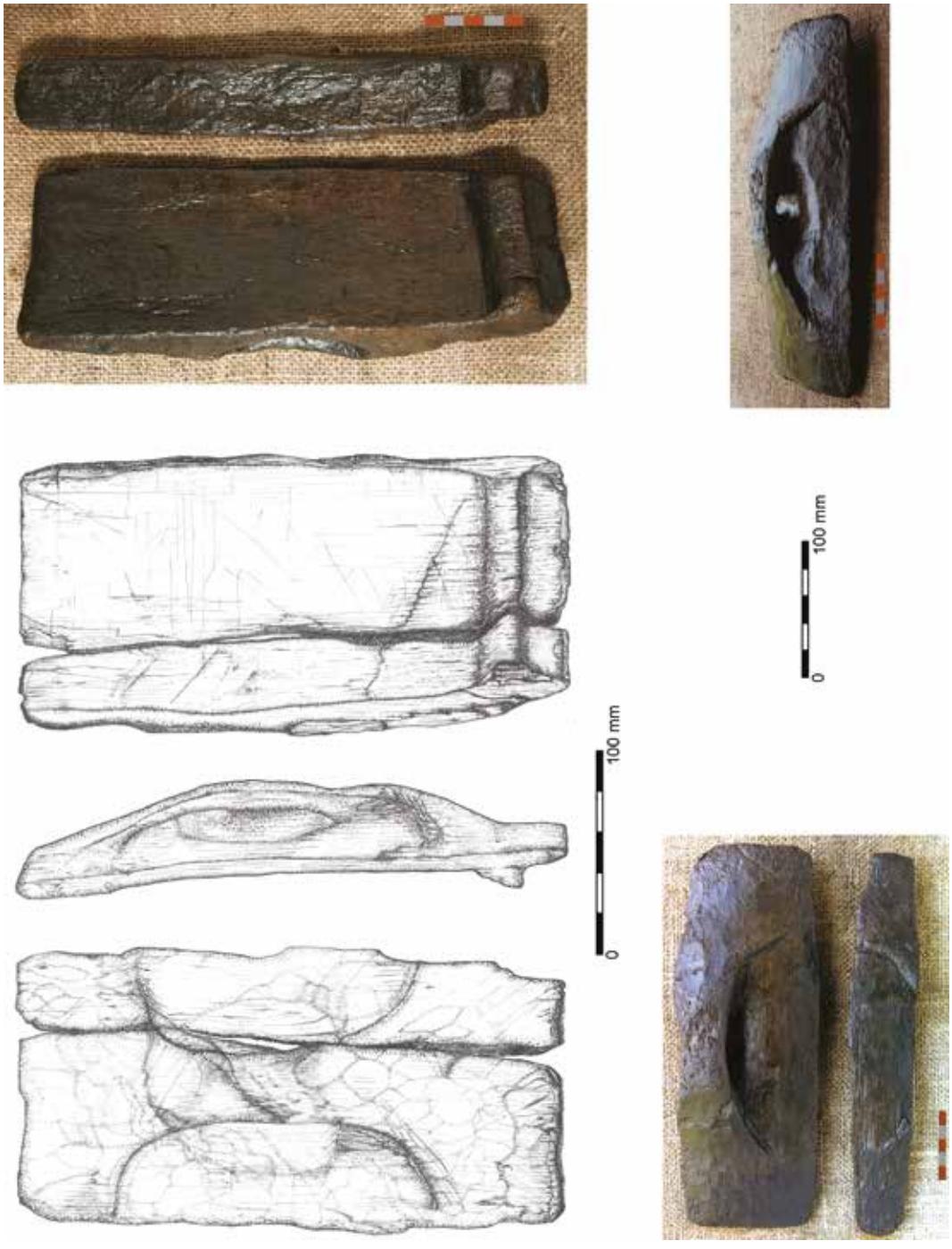
rounded rim (Illus. 6.2). On its exterior are symmetrical bands of toolmarks, likely a simple form of decoration. At each end of the dish is a lozenge-shaped handle with a bevelled edge. Both handles have a centrally placed perforation but in one there is a second perforation set just slightly off-centre. Despite being incomplete and fragmented into 17 pieces, this is the finest vessel from Edercloon. Its form is typical of the first–fourth centuries AD and has several very close parallels, most notably Shasmore, Co. Leitrim, where six examples of varying size were found (Halpin 1984, 76) and Coolnagun, Co. Westmeath (Raftery & Ryan 1971, 237), where one example was recovered. Further afield, several are known from the north of Ireland (Earwood 1993, 67) and from Skye in Scotland (ibid.). The similarity between all of these bowls is remarkable and the key characteristics are not only their overall form and distinctive handles, but also the proliferation of fine toolmarks on the interior and exterior surfaces. The fragments of the EDC 49 vessel were scattered throughout the togher, radiocarbon dating of which returned anomalous results of fourth–fifth and sixth–eighth centuries AD (see Chapters 5 and 8). Thus, it seems that the dish may have been quite old at the time of its deposition or possibly an archaic form that survived in the locality.

Fragments of tubs were recovered from five sites at Edercloon dating from the Late Bronze Age through to the medieval and perhaps early modern period. The largest and most diagnostic were two pieces of a tub (E3313:12/13:34) uncovered in the Late Bronze Age/Early Iron Age levels of togher EDC 12/13 (Illus. 6.3). These form part of a type of two-piece container made by carving a portion of a tree trunk into a hollow cylinder then furnishing it with a separate disc base set within a recess cut into the interior of the vessel wall. A distinctive feature of the EDC 12/13 tub is the beautifully carved handle on its exterior, a parallel for which may be seen on a Late Bronze Age tub from Altanagh, Co. Tyrone (Williams 1983, 150–1; Earwood 1993, fig. 32.1). Also significant is a small flange carved on the interior close to the vessel base. Many two-piece vessels of this type do not have a flange but rather a rectangular recess or groove, unevenly cut to allow the insertion of the base. In the case of the Edercloon tub, the base would have sat beneath the flange and so how it stayed in position is unclear (Illus. 6.4). There are few parallels for this; a tub from Lough Eskragh, Co. Tyrone, was manufactured in this manner and had a dished base attached using wooden dowels (Williams 1978, 43; Earwood 1993, 57). While there is no evidence for such an arrangement on E3313:12/13:34, only a small portion of the vessel was recovered so how the base was secured is uncertain. It seems likely that it had additional handles and, being quite small, may have functioned as a drinking vessel similar to methers of later centuries (Kinmonth 1993, 199–200). The well-preserved toolmarks on the exterior and apparent lack of a mechanism with which to secure a base, might, however, indicate that this vessel was unfinished.

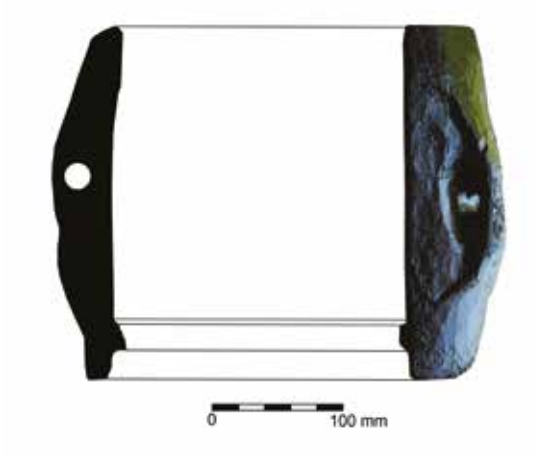
A variation on two-piece containers was the introduction of vertical handles extending above the rim at either side. This is thought to be a development of the Iron Age (Earwood 1997, 27) but two finds from Edercloon suggest that this handle type may have been introduced in the Late Bronze Age. The first of these is a handle fragment (E3313:20:15) found within platform EDC 20, which, although undated, is believed to be of Late Bronze Age date (see Chapter 4). It consists of a heavily worn piece of



Illus. 6.2 A very finely carved alder dish (E3313:49:28) with perforated handles found in early medieval togher EDC 49 (photographs by John Sunderland; drawing by Eamonn Russell, CRDS Ltd).



Illus. 6.3 Two fragments of an alder tub with a carved handle (E3313:12/13:34) found in the Late Bronze Age/Early Iron Age levels of togher EDC 12/13 (photographs by John Sunderland; drawing by Marianna Ripa, CRDS Ltd).



Illus. 6.4 Suggested reconstruction of the tub based on the fragments found in togher EDC 12/13 (photograph by John Sunderland; drawing by Johnny Ryan).

alder, trapezoidal in shape, with an oblong perforation through its widest end (Illus. 6.5). This appears to be a worn handle fragment, similar to one recovered at Corlea 1 (Raftery 1996, 239). Measuring over 250 mm in length and almost 30 mm thick, this object probably formed part of quite a large tub or bucket. The second item is a lid (E3313:5:71) from the Late Bronze Age togher EDC 5 (Illus. 6.6). Almost complete, it consists of an alder disc with a small trapezoidal notch cut into one side, which would have fitted around a vertical handle. Several Iron Age tubs or kegs with identical lids and containing bog butter have been found in Ireland (Earwood 1997, 27; Moore et al. 2003, 132).

The remaining tub fragments were recovered from the large togher EDC 12/13 (E3313:12/13:26) and brushwood deposit EDC 30 (E3313:30:27). The former is a very small fragment of a carved alder handle but, measuring almost 70 mm wide and 28 mm thick, was probably part of a large tub used for domestic storage. The exact form of this vessel is unknown. The handle could have been carved on the exterior of the tub, extended upwards from the rim, or perhaps it lay horizontally on a lid. Recovered from the upper levels of EDC 12/13, where it merged with togher EDC 19, this object could have been deposited within either trackway and is likely to be of Early Iron Age date. The tub fragment (E3313:30:27) from EDC 30 appears to be part of a lid or base consisting of a finely split oak board, the intact edge of which is curved and chamfered. The curvature of the edge suggests that this was part of a large vessel with a diameter of approximately

Illus. 6.5 Alder tub handle (E3313:20:15) from the small platform EDC 20 (John Sunderland).

Illus. 6.6 A portion of an alder lid (E3313:5:71) found in Late Bronze Age togher EDC 5 (John Sunderland).

Illus. 6.7 Heavily fragmented alder trough (E3313:5:75) found in EDC 5 (CRDS Ltd).

400 mm. EDC 30 has been dated to the early medieval period (see Chapter 5) but was disturbed by post-medieval intrusions, which included the dumping of a broken shovel (E3313:30:20; see below). Thus, this lid/base could relate to the construction of the site in the early medieval period or to the later intrusion. This is the only vessel fragment from Edercloon that was made of oak, a species quite commonly used by medieval coopers (Morris 2000, 2241; Comey 2010, 99) and, until recent times, by coopers in Britain (Earwood 1993, 170).

The final wooden vessel from Edercloon is a complete but heavily fragmented alder trough (E3313:5:75) deposited in the base of EDC 5 (Illus. 6.7). Over 1,300 mm long and 190 mm in depth, it has a narrow oblong shape similar to a modern window box. Its manufacture was quite crude and rough toolmarks and occasional patches of bark cover much of its exterior. There are no known contemporary parallels for this and the object with which it is most similar is an early medieval trough of similar size from Loch Glashan in Scotland (Crone 2005, 50).

The bowls, dish, and small tub fragments from Edercloon were likely domestic vessels used for the preparation and presentation of foodstuffs. In contrast, the larger tubs and the trough may have been made for food storage.

Wheels

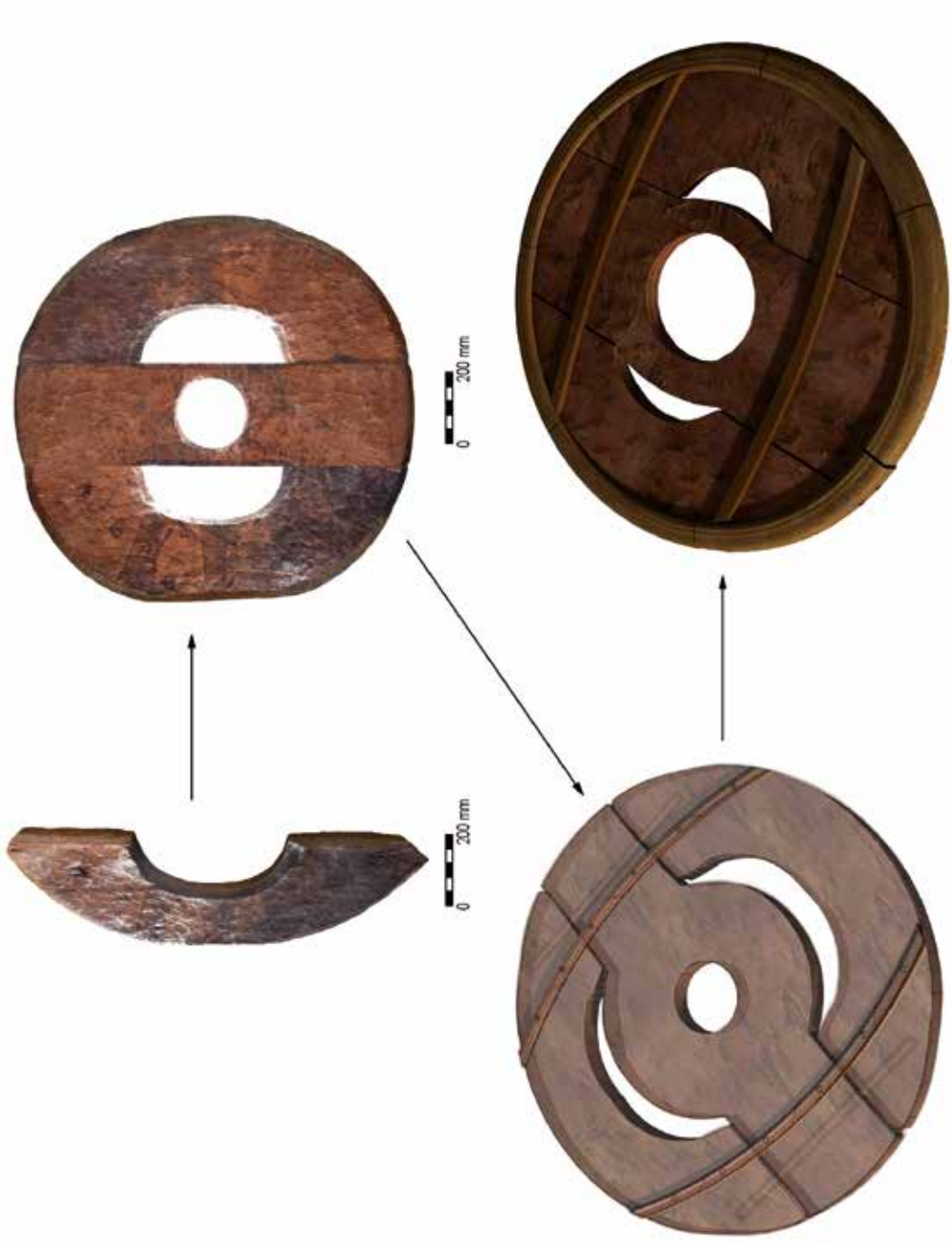
The remains of three wheels, of widely varying form and date, were recovered from three separate trackways at Edercloon and represent the first discovery in Ireland of wheels and trackways in direct association (Moore & Chiriotti 2010). The oldest of the three fragments is approximately one third of a tripartite block wheel (E3313:5:69) and can be described simply as a large, roughly C-shaped piece of alder wood (Illus. 6.8). It was found in the basal layer of EDC 5 (Illus. 6.9) and a piece of brushwood directly overlying it was radiocarbon-dated to 1260–970 BC (Wk-20961), making it Ireland's earliest known wheel. Tripartite wheels are known in Western Europe from the third millennium BC (Piggott 1983, 51), with Bronze Age and Iron Age examples found in Germany, Denmark, the Netherlands, and Britain (ibid., 107–8, 197–8; van der Waals 1964, 121–6; Taylor 2001, 213–16; Anon.

Illus. 6.8 The portion of an alder block wheel (E3313:5:69) following excavation from togher EDC 5 (John Sunderland).

2016). The best-known Irish examples date from the Iron Age and were recovered in a bog at Doogarymore, Co. Roscommon, c. 20 km west of Edercloon (Lucas 1972). Tripartite wheels generally consist of two outer C-shaped boards, like the Edercloon example, between which is a central board with a perforation for an axle (Illus. 6.10). The three pieces are then secured with transverse dowels (wooden pegs) and occasionally also braced on their exterior. A curious feature of the Edercloon block wheel is its outer edge, which is imperfectly shaped and, at its widest point, cut straight for a length of 405 mm. This occurs at a point which would have been the outermost part of the tree, just beneath the bark and so may be due to a miscalculation during manufacture. Furthermore, it has two distinctly different sides, one dressed with over 100 toolmarks, the opposite simply cleaved and poorly finished. Clearly, this object was never finished as a functional component, possibly due to the aforementioned error in production or perhaps deliberately, with deposition in EDC 5 its sole purpose (see Chapter 8).

The two other wheel fragments from Edercloon appear to be pieces of wheel rims or felloes and, in contrast to the block wheel portion, both exhibit signs of use. (A fello is the part of the wheel rim into which the outer ends of the spokes are inserted.) One of the wheel rims (E3313:12/13:50) was found in the upper levels of togher EDC 12/13, adjacent to a piece of brushwood

Illus. 6.9 The portion of the alder block wheel as discovered at the base of togher EDC 5 (CRDS Ltd).



Illus. 6.10 Suggested reconstructions of the block wheel (top left photograph by John Sunderland; top right photographic reconstruction by Conor McDermott; reconstruction drawings by Chiara Chiriotti, CRDS Ltd).

Illus. 6.11 An alder fello or wheel rim (E3313:12/13:50) from the upper levels of togher EDC 12/13 (John Sunderland).

dated to 750–390 BC (Wk-25204). This fragment consists of a slightly curved piece of alder, U-shaped in profile with a narrow groove cut into its upper edge (Illus. 6.11). Seven dowel holes, five with dowels *in situ*, run vertically through it and the outer edge or rolling surface has evidence of use-wear, including small pieces of embedded gravel. The second wheel rim (E3313:49:42) is a smaller fragment of identical type to that from EDC 12/13 (Illus. 6.12). This fragment was recovered from togher EDC 49, which has been dated to the early medieval period. It is carved from ash and has the remains of a linear groove through its upper edge and a dowel hole through one end. On its intact outer surface, 10 mm from the upper edge, is a horizontal line that appears to be a simple decorative motif. The rolling surface is also worn and embedded with gravel.

Illus. 6.12 A small fragment of an ash fello (E3313:49:42) found in the early medieval togher EDC 49. Note the gravel fragments embedded in the outer wheel surface (John Sunderland).

Illus. 6.13 Suggested reconstructions of how the two wheel rims may have been used (photographs by John Sunderland; reconstruction drawings by Chiara Chiriotti, CRDS Ltd)

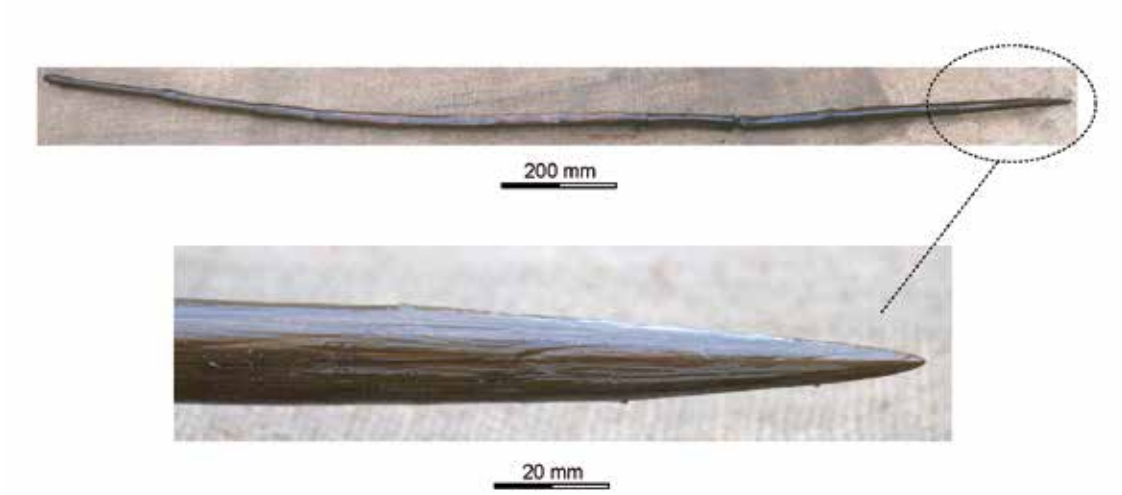
These two objects are thought to be fragments of wheel rims or felloes but, quite remarkably given their widely varying dates, have no known parallels. Using 3D modelling, digital reconstruction, and comparison with wheels from across the world, suggestions as to how these wheel rims functioned range from variations on spoked wheels to a possible hybrid of a tripartite-type wheel with an outer rim (Illus. 6.13) (Moore & Chiriotti 2010). The latter does not suggest that the two types were associated at Edercloon but merely provides a hypothesis for how these finds may have functioned.

Tools, weapons and withies

Two almost identical spears (E3313:26:56 and E3313:26:60) were found in close proximity at the northern end of the Iron Age togher EDC 26. The spears comprise slightly bowed lengths of yew brushwood all along the length of which tiny branches and knots have been trimmed off (Illus. 6.14). The butt of both has been worked to a smooth rounded terminus, while the opposite ends taper significantly towards a narrow tip. In the case of spear E3313:26:56, the very point of the tip is missing and, at a distance of 330 mm from this, the spear is cracked and torn as if someone had tried, but failed, to break it in two. In contrast, spear E3313:26:60 has an intact and finely pointed tip, 610 mm from which, the spear is completely broken in two. The manner in which this was deposited in the trackway indicates that this damage occurred in antiquity. Had it been intended for these objects to operate as spear shafts, topped with a separate metal spearhead, their very finely pointed tips would have been unnecessary, and so it seems likely that they are intact spears, suitable for the hunting of small animals or possibly for fishing. Excavations at Prumplestown Lower, Co. Kildare, recovered a similar spear (Long & McCarthy 2009, 69–70), while two items interpreted as spear shafts were found in Derryville Bog, Co. Tipperary (Buckley et al. 2005, 313, 317).

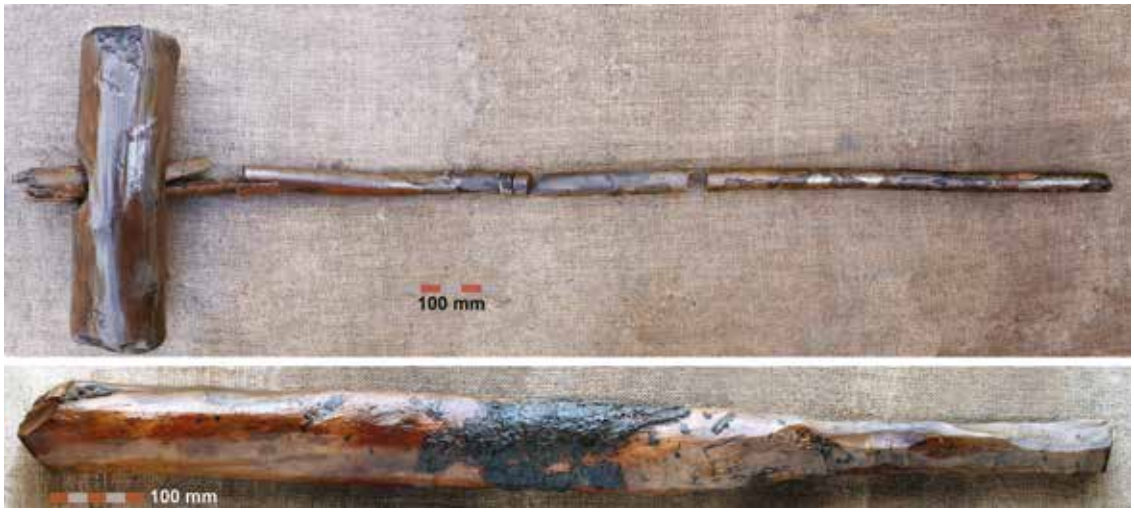
A carved oak shaft with a slightly bowed shape (E3313:26:89) was also found in EDC 26. It tapers dramatically in diameter from one end to the other, the narrowest end being damaged and dried due to exposure, at least some of which occurred in antiquity. At the opposite end, the terminus is cut flat, with a neatly trimmed bevelled edge (Illus. 6.15). Being carved from oak, the manufacture of this shaft represents considerable effort and woodworking skill. Oak does not have the elastic properties of yew and is an unusual choice for this type of object. Without evidence of a finely pointed end, like the two spears, this object may have functioned as a spear shaft rather than a complete object in its own right. All three artefacts were found in the lowest level of EDC 26, which may date to the Late Bronze Age/Early Iron Age.

Two mallets of very different form were also recovered from trackway EDC 26 (Illus. 6.16). The first mallet (E3313:26:64) is made from a long handle of hazel brushwood inserted and wedged into an hourglass-shaped perforation through a heavy roundwood of apple-type wood. In appearance, this object looks very much like a croquet mallet and similar but smaller two-piece mallets, thought to have been used for woodworking, have been found in Iron Age contexts in Britain (Britnell & Earwood 1991, 169; Earwood 1993, 35–6). The long thin handle and large head of this mallet would have made it difficult to swing and so whether it was functional is uncertain. In relatively recent times in Ireland, wooden mallets called mells were used to break clods



Illus. 6.14 One (E3313:26:60) of two yew spears from togher EDC 26, with a close-up of the finely pointed tip (John Sunderland).

Illus. 6.15 A close-up of the trimmed end of the oak shaft (E3313:26:89) also recovered from EDC 26 (John Sunderland).



Illus. 6.16 Top: a possible composite mallet (E3313:26:64) from EDC 26 made with a long hazel handle and a head of apple-type wood. Bottom: a large single piece mallet carved from willow (E3313:26:94) also found in EDC 26 (John Sunderland).

during the preparation of lazy beds (Evans 1957, 148, fig. 1). A mell recovered from the townland of Barney, Co. Longford (Museum accession no. F:1969.19), is almost identical to the Edercloon find in both scale and form. It is possible that this artefact had a similar agricultural purpose or it could have been used to drive splitting wedges into trunks. A comparable artefact made from a single piece of sloe wood was recovered from a Bronze Age battleground in Tollense Valley in northern Germany and is interpreted as a weapon (Jantzen et al. 2011, 422–3). The second Edercloon mallet (E3313:26:94) is of very different form, made from a single piece of willow. Quite crudely and minimally worked, it is carved at one end into a short handle beyond which the expanded cylindrical head is only occasionally trimmed, with patches of bark still intact. Single piece mallets are known throughout Europe from the Bronze Age to the medieval period (Casparie 1984, 62–3; 1986, 190; Smedstad 2001, 196–7). Irish examples of Iron Age date include one from Lisnacroghera, Co. Antrim (Wood-Martin 1886, 104), and one from Corlea 1 (Raftery 1996, 273). The Edercloon example could have had a variety of uses, including use with wedges to split trunks and the driving of posts into the ground. Alternatively, given the possibility that several objects from Edercloon may have been simple wooden weapons (see below), a function as a club could also be considered.

A tool handle (E3313:19:41) was found at the junction of toghers EDC 12/13 and EDC 19 and is likely to be of Early Iron Age date (see Chapter 4). It consists of a carved alder shaft, one end of which is carved into a short rounded hook shape. The opposite end is carved into an expanded flat semi-circular shape (Illus. 6.17). Quite roughly worked, this may be an unfinished handle for a small tool, probably an axe, the wider end being where it would have been hafted. Although somewhat more elaborate, several Iron Age tool handles from the Glastonbury Lake Village in Somerset (Bulleid 1968, 47–9, pl. 17) had carved terminals reminiscent of the hooked end of the Edercloon find. A

Illus. 6.17 An alder tool handle (E3313:19:41) recovered at the junction of toghers EDC 19 and EDC 12/13 (John Sunderland).

Illus. 6.18 Carved sloe shaft (E3313:12/13:63) from EDC 12/13 (John Sunderland).

narrow cylindrical shaft (E3313:12/13:63) carved from sloe was among the other finds from EDC 12/13. Broken at one end, the opposite end expands to a flat terminus (Illus. 6.18). An object of broadly similar design (E3313:26:86) was found in EDC 26. This too was incomplete and was made from a piece of hazel brushwood, the intact end of which was cut flat with a narrow bevelled edge. These artefacts may have functioned as tool handles or perhaps they are the ends of walking sticks. Excavation of a deposit of Late Bronze Age wood in Ballybeg Bog, Co. Offaly, recovered a carved shaft also of sloe and almost identical to E3313:12/13:63 (O'Carroll 2003, 16; Moore 2019, 18). In this respect, it is interesting to note that sloe—also known as blackthorn—is traditionally used in the manufacture of walking sticks (Stuijts 2005, 142).

A further two possible tools or hafts (E3313:12/13:70 and E3313:12/13:73) were found in EDC 12/13. These comprise cylindrical shafts at one end of which is a rounded terminus much like the shape of a modern baseball bat. Both are incomplete but a key difference between them is that shaft E3313:12/13:70 (Illus. 6.19) is carved from a larger piece of sloe, while E3313:12/13:73 is made from a piece of hazel brushwood. Measuring almost 900 mm in length, the former compares favourably with an axe haft from the Bronze Age site of Flag Fen, near Peterborough in Britain (Taylor 1992, 494–6, fig. 21). Alternatively, these objects could have functioned as pounders or beetles, used in the preparation of food, which could account for the slight wear on the rounded ends of both. A third suggestion is that they (like mallet E3313:26:64 discussed above) were weapons similar to shillelaghs, which, perhaps significantly, were traditionally made from blackthorn/sloe (Watts 2007, 38–9). Excavation of the Tollense Valley Bronze Age battlefield, Germany, unearthed two wooden clubs, one described as having the shape

Illus. 6.19 A club-like object carved from sloe (E3313:12/13:70) found in EDC 12/13 (John Sunderland).

Illus. 6.20 The small yew hoop (E3313:5:58) from togher EDC 5 (John Sunderland).

of baseball bat, while the second was like a croquet mallet (Jantzen et al. 2011, 422–3).

Withies are simple wooden ropes made by twisting a young shoot of green wood, often hazel, willow or yew, until the grain splits and it becomes pliable. Three fragmentary hazel withies (E3313:1b:29:11, E3313:21:72 and E3313:28:29) were found in trackways EDC 1b/29, EDC 21 and EDC 28 and while they could have had a variety of functions they may simply have ended up in the sites after being used to carry bundles of wood out onto the bog. In Ireland, withies have been found to date from at least the Middle Bronze Age (Irish Archaeological Wetland Unit 2002c, 51; Moore & Stuijts 2007), while in Britain an example was found in a Neolithic hurdle trackway at Walton Heath, Somerset (Coles & Coles 1986, 105). A narrow stem of yew bent into a circular shape (E3313:5:58), but not twisted or split along its grain, was found in the Late Bronze Age trackway EDC 5 (Illus. 6.20), and is slightly different to the three withies. It too might have been used to carry wood to the bog or, alternatively, could have encircled a small wooden vessel such as tub E3313:12/13:34 (see above) to prevent splitting and breakage.

Decorative staffs or walking sticks?

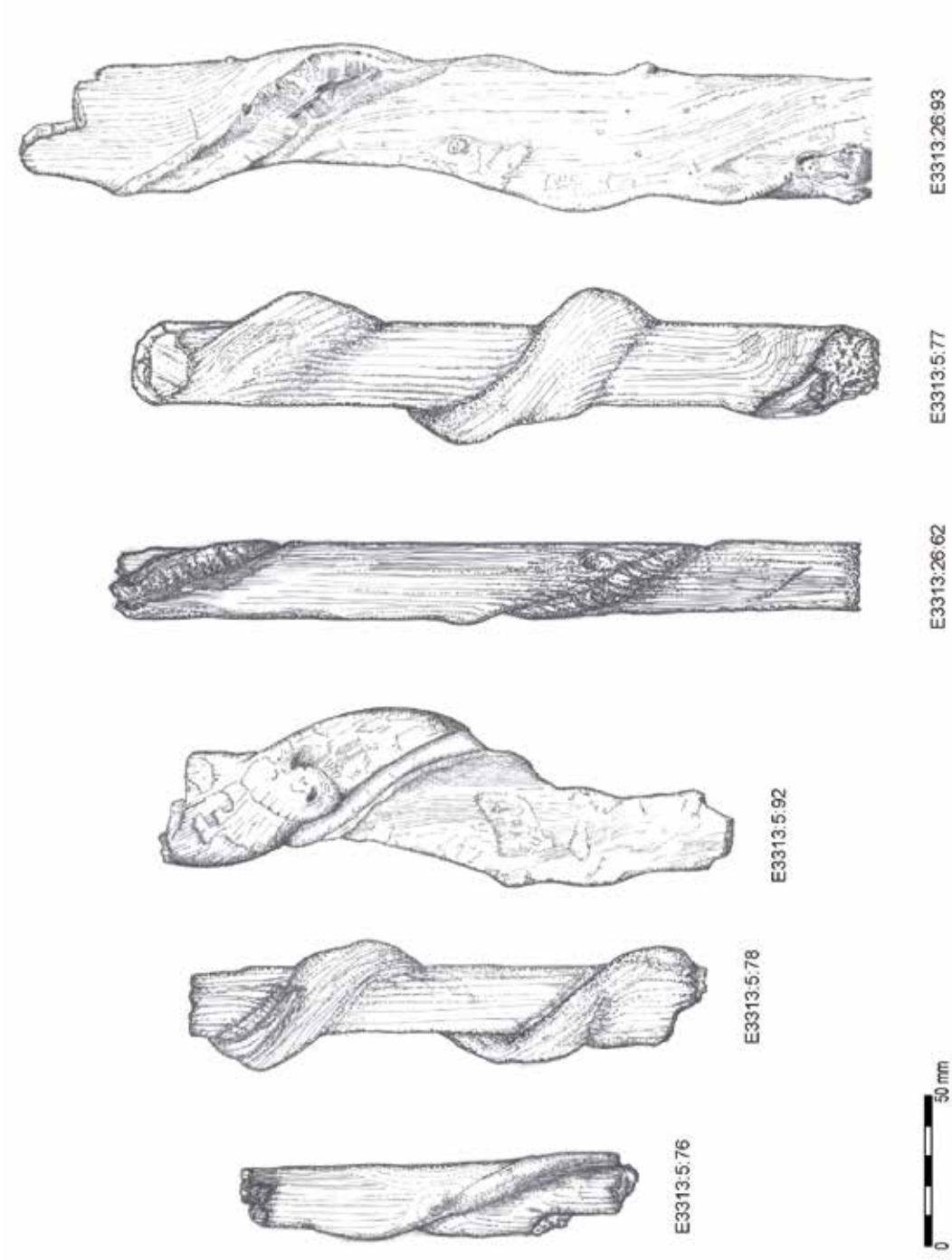
Ingelise Stuijts, Jan Wilmink and Caitríona Moore

Found within the Late Bronze Age EDC 5 and the Late Bronze Age/Early Iron Age EDC 26 were six objects (E3313:26:62, E3313:5:76–8, E3313:5:92 and E3313:26:93) for which few parallels are known. These comprise short pieces of hazel brushwood with either spiral grooves or spiral ridges around their lengths (Illus. 6.21). All of the pieces were broken prior to deposition; however, one example (E3313:5:77) has an intact end which has been trimmed to a rounded shape, and has also been trimmed occasionally along its length, as has E3313:5:78 (Illus. 6.22). On three of these objects (E3313:26:62, E3313:5:76 and E3313:26:93) the outer brushwood has been removed leaving only a shallow indentation. Undoubtedly decorative, a definite function for these artefacts is unknown but a suggestion is that they are portions of walking sticks or staffs.

Originally, when examining these pieces it was thought they represented a deliberate training of two hazel rods (Moore 2008a, 8–9). This would have been previously unparalleled in the archaeological record, but the training of still-growing wood into a variety of shapes for staffs and crooks is known to have been practised in relatively modern times (Seymour 2001, 147).

While on a visit to the eastern Netherlands in the region of Twente, the first author recognised an identical twisted piece in the form of a walking stick hung on a chimney as a decorative item. It transpired that this walking stick formed part of a very old tradition in this area, recognised in November 2019 as unique and included in the National Inventory of Intangible Cultural Heritage in the Netherlands. The second author is the only walking stick maker in the Netherlands using this old tradition and he regularly demonstrates the manufacturing and preparation of the so-called Twentsche 'goa-stok'. Further research indicates that using twisted and contorted rods for making walking sticks is also practised elsewhere, such as Britain. In Edercloon, only contorted hazel was identified, but Wilmink (2012), during his years of goa-stok manufacturing, has used a variety of species, including alder, ash, birch, rowan-type and willow.

The contorted spiral pattern on the modern-day Dutch rods is caused by



Illus. 6.21 The pieces of hazel brushwood with spiral grooves or ridges caused by honeysuckle from toghers EDC 5 and EDC 26 (Mariana Ripa and Eamonn Russell, CRDS Ltd).

Illus. 6.22 Finds E3313:5:77 (right) and E3313:5:78 from EDC 5. Both pieces of hazel have spiral ridges caused by honeysuckle and have been additionally trimmed and polished (John Sunderland).

Illus. 6.23 Left: Honeysuckle growing around a trunk in a spiral pattern (Ingelise Stuijts). Right: Four Dutch goa-stok or walking sticks and two honeysuckle stems that grew around a piece of hazel brushwood (Caitríona Moore).

the growth of honeysuckle (*Lonicera periclymenum*) around the wood (Illus. 6.23). Honeysuckle is a deciduous woody climber that twines itself around shrubs in a clockwise pattern and commonly grows in hedges. The vines gradually harden over time and thereby the growth of the rods is distorted, hence the name 'woodbine' is often used for honeysuckle. In fact, it is common to find pieces of honeysuckle completely hidden inside wood. Interestingly, the contorted artefacts from Edercloon indirectly indicate the presence of honeysuckle in the local area and hint at a Late Bronze Age craft hitherto unknown. The artefacts also suggest either the presence of a specific type of woodland with coppiced hazel—a traditional method of woodland management whereby young trees are cut down to a stump known as a stool, from which new stems then grow and are harvested in a regular cycle—or an organised landscape of ditches, dykes and/or hedges around agricultural fields.

For a modern-day Dutch walking stick a tapering straight rod of regular growth is needed. It should be 1200 mm long, with a diameter of c. 20 mm at the thinnest end and c. 30 mm at the thickest end. The honeysuckle must have had the time to grow along with the rod and also be old enough to harden and squeeze itself into the wood. A number of years are needed for this process, though not too many, as then the wood would be either strangled and die off or too thick to be used for a walking stick. Thus a coppice cycle in managed woodland, where hazel is regularly felled every seven years or so, would be an ideal setting for the development of contorted hazel rods. A number of years are needed after felling/coppicing of the area to ensure vigorous growth of rods from hazel stools. An alternative source would be hedges around fields maintained on a regular basis.

The contorted artefacts, along with the finds of domestic artefacts, are an indication of well-organised permanent settlement and landscape management around Edercloon. It is more difficult to prove the existence of managed hedgerows near Edercloon during the Late Bronze Age. At present, the main source of contorted rods in Twente—an area with a long agricultural history—are hedgerows which are managed on a yearly basis. The tradition of hedgerow maintenance is declining in the area, however, making the opportunity to find contorted wood less common and more intensive search is now required.

The rods for walking sticks are usually harvested between November and January, when there are no leaves but honeysuckle can be spotted as they are the first to show some green lustre. The pieces are cut and debarked and then left for a year or more to allow for shrinkage of the wood. Then the honeysuckle is removed and the stick is sanded and lacquered with oil or wax. The top can be provided with a handle, if wished, but the traditional goa-stok has no handle (Wilmink 2012).

In the Netherlands the goa-stok was known in medieval times. It became very popular around 1750 and was used not only as a walking stick but for a range of traditions, including the announcement of weddings, births and deaths, and the leading of dances. The holder of the goa-stok was called a 'lulleman' (ibid.). Owning one was a sign of distinction and signified status.

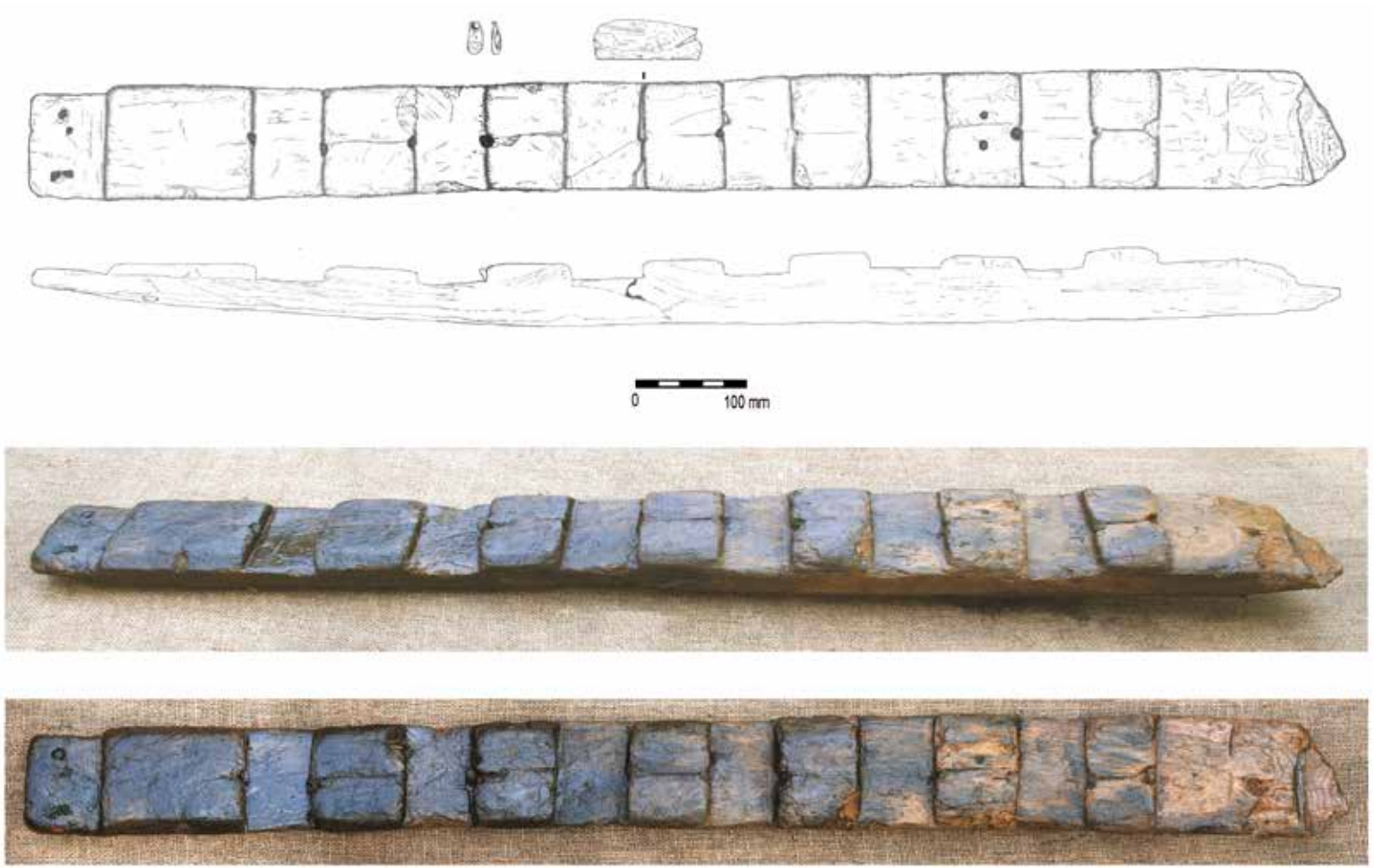
The six contorted artefacts from Edercloon may thus represent a hitherto unknown early manifestation of the manufacture of walking sticks. Several other hazel and sloe items from Edercloon might also have been used as walking sticks. An alternative suggestion as to their function is the proposal that they were created for use in ritual activities, in particular sacred kingship rites (E Kelly, pers. comm.), perhaps echoing their special status in the Netherlands.

Examination of the Edercloon artefacts has indicated that they were grown over a four- to seven-year period. Given how relatively easy the spiralling nature of the objects would have been to replicate by carving, the care and patience taken in their creation may indeed be indicative of particular significance beyond the mere functional. To this end, it is perhaps significant that a piece of wood with a similar spiralling indentation was found within an Iron Age trackway at Annaholty, Co. Tipperary (Taylor et al. 2008; Moore 2009b, 10).

Miscellaneous objects

The largest group of artefacts from Edercloon are those for which a definite classification or function remains unknown. Many of these are incomplete but have features indicating that they are part of composite wooden objects. Others are intact but are unparalleled and without clear application.

A bowed ash timber into one surface of which are cut six equidistant recesses or half-laps (E3313:1b/29:57) was recovered from the lowest layer of togher EDC 1b/29 (Illus. 6.24). Pairs of dowel holes, some with dowels *in situ*, are located at the edge of most of the recesses and in the raised area between two is a pair of *in situ* dowels. The opposite surface of the timber is flat and, although some surface dressing is apparent, much of it is heavily worn and eroded. The artefact is broken at one end but at the opposite there is a thin tenon through which run two pairs of dowels. This is clearly part of a composite wooden object or frame—the dowels,



Illus. 6.24 The notched and dowelled ash timber (E3313:1b/29:57) found in togher EDC 1b/29 (drawings by Eamon Russell, CRDS Ltd; photographs by John Sunderland).

recesses and tenon indicating where it was attached to additional separate pieces. It has no definite parallels in the archaeological record but a suggested reconstruction of a possible wagon of the third millennium BC from Lower Saxony in Germany comprised a frame of horizontal boards, the ends of which were set into side pieces with evenly spaced mortice holes (Hayen 1987b, 211). It is not difficult to see how the timber from Edercloon could have functioned in a similar manner, with horizontal boards set within each recess and dowelled in position. The heavily worn opposite surface of the piece, however, may be the result of it being dragged along the ground and so it could have been part of a sled or slipe. Slipes are composed of a rectangular platform supported by two runners (Evans 1957, 172). The timber from EDC 1b/29 is quite light and the dowels are very small, being typically less than 10 mm in diameter. This suggests a less robust function and it may have been part of an entirely different kind of composite frame, perhaps an item of furniture or a loom. Interestingly, a possible slipe runner made from ash (E3313:41:97) was recovered from the undated togher EDC 41 (Moore & O'Connor 2009b, 66).

A second find tentatively suggested to have an association with vehicles is a hazel roundwood with flat, trimmed terminals and adjacent oval perforations (E3313:12/13:49) (Illus. 6.25). Found in the upper layers of EDC 12/13, close to wheel rim fragment E3313:12/13:50 (see above), this is suggested to be a swingle tree. Swingle trees are a mechanism used behind animals in draught that allow the draught pole to swivel freely and transfer the power of traction to the front axle (Hayen 1987b, 214; Raftery 1996, 220). The reins are threaded through the swingle tree perforations and are thus held apart and prevented from becoming entangled. Hayen (1987b, 214) has suggested that swingle trees first appeared around 300 BC. Several objects described as 'perforated wooden beams' have been found in Ireland's bogs (Halpin 1984, 34, 98) and while some of these could be the remains of mechanisms such as horizontal mills or carts, it is possible that some functioned as swingle trees. A second object from EDC 12/13 that may have had an association with animals is a length of dressed hazel brushwood, the diameter of which increases from one end to the other (E3313:12/13:43). The widest end is trimmed flat and just below it the surface of the rod is slightly indented and worn. The narrow end is also cut flat but is eroded. This artefact is very similar to a yew rod found within Corlea 1, which also had evidence of increased wear at its widest end (Raftery 1996, 260). Raftery likened the Corlea object to a similar find from Germany, interpreted as having been used in the construction of wagons, but also suggested the more prosaic function of a switch for driving cattle (ibid., 288–9). The hazel rod from Edercloon is not very extensively worked and may well have been a

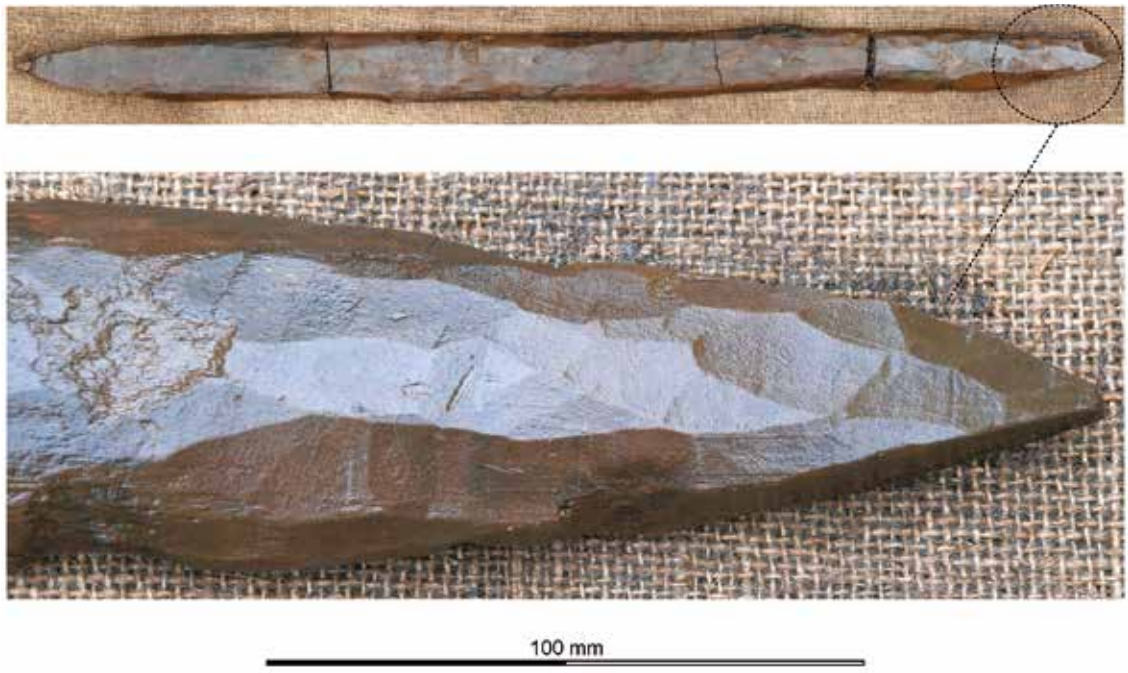
Illus. 6.25 A possible swingle tree (E3313:12/13:49) of hazel recovered from the upper layers of togher EDC 12/13 (John Sunderland).

Illus. 6.26 A hazel handle (E3313:5:74) from the base of EDC 5 (CRDS Ltd).

simple walking stick.

EDC 5 contained an object of hazel wood with a natural L-shape (E3313:5:74), the bend of which is rounded and knotty (Illus. 6.26). Extending from this are two lengths or arms towards each end of which is a small oval perforation. This may have been used with a rope as a handle for carrying sizeable bundles of brushwood or reeds. It was probably specifically selected due to its shape, demonstrating an awareness and utilisation of natural forms evident in woodcraft since the Neolithic (Earwood 1993, 145–9). Similar objects have been recovered from bogs at Derrymahon, Co. Kildare (Museum accession no. IA 1943:30), and Mountdavis, Co. Longford (Museum accession no. IA 1958:17–19), with the latter items being described as 'V-shaped wooden objects transversely perforated near both ends . . . angular in cross-section, perforations are oval'. Somewhat similar was an artefact found during excavations at Cooleeny, Co. Tipperary, consisting of a straight hazel shaft with expanded perforated terminals. Although this is of different form and scale, it is reminiscent of the L-shaped find from Edercloon and was also interpreted as having been used to carry wood (Buckley et al. 2005, 318).

A half-split roundwood of sloe with symmetrical pointed ends (E3313:20:16) was found in two pieces within platform EDC 20, which is thought to be of Late Bronze Age date. Semi-circular in cross-section, the surfaces of the object have been very carefully worked and are covered with fine toolmarks (Illus. 6.27). Clearly, a great deal



Illus. 6.27 The finely carved and pointed object of sloe (E3313:20:16) from platform EDC 20 (John Sunderland).

of care was invested into the creation of this item; however, its function remains unknown. Somewhat similar objects were found at the Late Bronze Age settlement site of Clonfinlough, Co. Offaly. These comprised two concave timbers, possibly of oak, with tapering ends and very finely worked surfaces (Moloney et al. 1993b, 125). A tiny fragment of pointed and dressed yew wood (E3313:5:91) found in EDC 5 appears to be a small fragment of an object similar to this.

The remaining wooden artefacts from Edercloon include a possible stopper (E3313:40:88) of ash from wood deposit EDC 40, which may have been used in conjunction with a wooden vessel. A poorly preserved piece of alder in which were drilled two holes (E3313:12/13:59) was found in EDC 12/13. Fragmentary and incomplete, the original function of this object remains unknown. Small pieces of dressed brushwood were found in EDC 5 (E3313:5:90) and EDC 26 (E3313:26:87) and a small carved disc of alder bark (E3313:7:95) was found in EDC 7. An unusual item from togher EDC 31 was a piece of worked hazel brushwood around which a strand of grass or rush had been wrapped and tied in a knot (E3313:31:96).

One artefact from Edercloon tells quite a different story to the others—a broken shovel with a metal blade and wooden handle, of a type still in use today (E3313:30:20). It was found in the disturbed remains of EDC 30, an irregular deposit of wood and stone, which has been dated to the early medieval period. Shovels of this date were made entirely of wood, occasionally with an iron shoe around the blade edge (Morris 2000, 2313–15), and so this must be an intrusive object, associated with the

disturbance of the site. EDC 30 lay beside the former N4 national road and the disturbance of the site and abandonment of the shovel may have occurred during the original road construction works.

Conclusions

The wooden objects recovered at Edercloon provide evidence of many aspects of life for those who lived in the vicinity of and used the sites. Wooden vessels are part of domestic life and the everyday activities of food preparation and consumption. Tools, spears, and perhaps even weapons tell of the basic need for survival—through hunting for food or self-defence. Wheels and several other objects provide a glimpse of the great woodworking skill and technological advancement of the prehistoric community at Edercloon, and are evidence of these people's drive to move through the landscape. Finally, the pieces of contorted hazel brushwood suggest very specific woodland management but also an interest and investment in the aesthetic. The inclusion of so many artefacts within the sites at Edercloon is unusual and suggests that object deposition at the site was a highly structured activity (see Chapter 8).

CHAPTER 7

The local site environment: evidence from insect and wood species analyses

by Eileen Reilly and Ingelise Stuijts

The local site environment: evidence from insect and wood species analyses

The habitat-specific nature of insects, such as beetles and ants, provides an opportunity for site-specific environmental reconstruction. Analysis of peat from under, within and above trackways enables reconstruction of local conditions at the time a trackway was laid down. Linking sampling to trackway sites ensures that insects inadvertently imported either with building materials or through use of a trackway by humans or animals may be recovered. Consequently, another picture of the wider landscape can emerge from the insect record.

The peat that enveloped the trackways at Edercloon is rich in microscopic remains but the trackways themselves provide a store of palaeoenvironmental data in the wood used in construction. Wood studies involve the identification of tree species used and age analysis of the wood. These data reveal the character of the local landscape and as wood was a very important raw material throughout the past, its exploitation is intrinsically linked to human activity at a variety of scales and for a wide range of purposes.

Insects

Eileen Reilly

This analysis entailed sampling for insect remains concentrated on the peat immediately below—but in contact with—the individual sites and within the substructures of those sites. Insect analysis gives insights into the local environment of each site or group of sites at particular periods in the past, as well as into the length of time they were exposed. All of this may help to explain the extraordinary density of sites, their orientations and the reasons behind their construction.

Insect analysis in such environments in Ireland and Britain has, in the past, provided important insights into local landscape dynamics including the transition from fen to raised bog, fluctuations in local woodland cover, and the presence of farming activity on the dryland margin (Buckland 1979; 1981; Ellis et al. 2002; Girling 1976; 1977; 1979; 1980; 1982a; 1982b; 1984; 1985; Reilly 1996; 2005; 2006; 2009b; Robinson 1992; Whitehouse 1997a; 1997b; 2004).

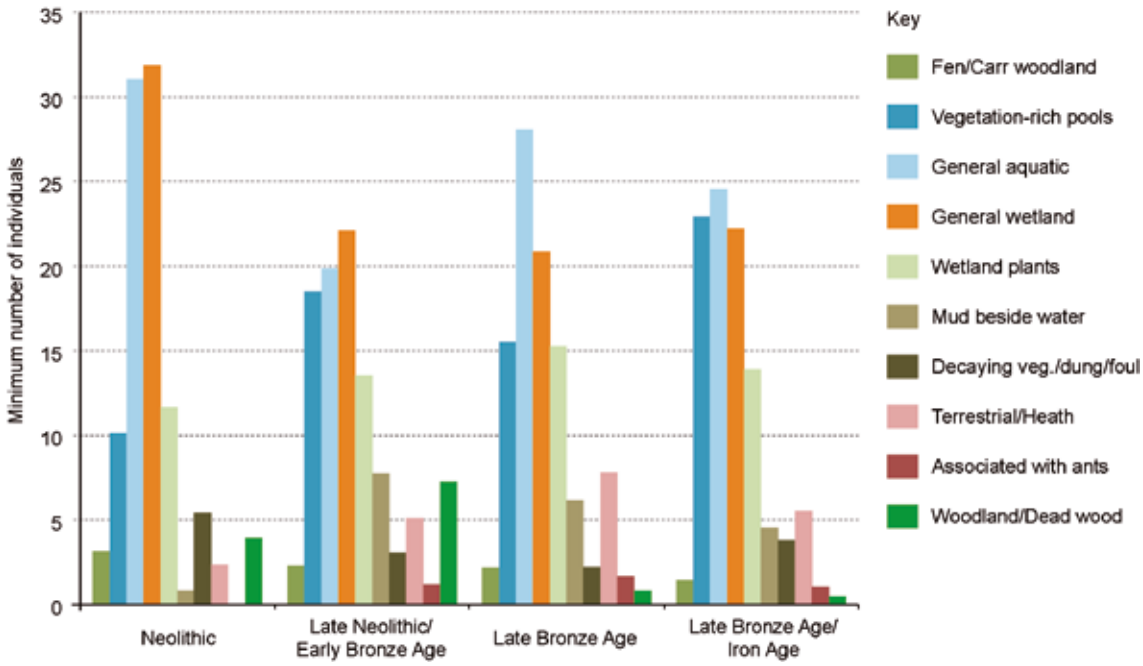
Forty-seven samples in all were examined for insect remains, although this chapter concentrates on results from the dated Neolithic, Bronze Age and Iron Age sites as per Chapters 3 and 4. No dated medieval sites were examined for insect remains. Samples were processed for insect remains using the Paraffin Flotation method (Coope & Osborne 1968; Kenward 1980; Kenward et al. 1986) and identifications were carried out using published keys, the writer's own collection of comparative material, and the comparative collections of British Coleoptera (beetles) housed in the Oxford University Museum of

Natural History. Habitat data were gleaned from various published sources and the BUGS database (Buckland 2007; Buckland & Buckland 2006). A full species list is available in Reilly (2008a), with taxonomy following Lucht (1987).

Analysis of samples involved summing the insects into ecologically related habitat groups on a sample-by-sample basis. Summary habitat data for each period under discussion are presented in Illustration 7.1. Data are analysed in this way to generate a general picture of change in the relative proportion of each habitat group across the site and through time. This helps to elucidate changes in the wider environment (Reilly 2005; 2006; Robinson 1991; Whitehouse 2004). However, it is not intended to represent direct proportional representation of such habitats in nature (see Smith & Whitehouse 2005).

Neolithic

One site from this period—togher EDC 45 (Moore, Chapter 3)—was analysed for insect remains. It was constructed at a time when wooded fen dominated the local landscape (Plunkett, Chapter 2). This is reflected clearly in the beetle assemblages, which were dominated by generalist open water and wetland species, including *Cyphon* spp., *Lesteva heeri*, *Coleostoma orbiculare* and *Pterostichus strenuus*. Wetland plants, such as reeds and sedges were indicated by the presence of *Plateumaris sericea* and *Limnobaris t-album*. Beetles such as *Agabus melanarius, A. bipustulatus, Hydraena britteni/riparia* and *Anacaena globulus* suggested that vegetation-rich pools of water were present within the trackway substructure. Evidence for the woodland element of the local fen/carr came from beetles like *Pterostichus*



Illus. 7.1 Summary habitat data presented by chronological period (Eileen Reilly).

Illus. 7.2 (a) *Rhyncolus ater* (right and left elytra) (b) *Xyloborus dispar* (pronota and elytra) (c) *Chilocorus bipustulatus* (left elytron) and (d) *Myrmica* cf. *ruginodis/scabrinodis* (heads and lateral alitrunks) (Eileen Reilly).

gracilis, *Staphilinus erythropterus*, *Abax parallelepipedus* and *Phosphuga atrata*. One important wood species recovered from EDC 45 was *Rhyncolus ater* (Illus. 7.2). This beetle was also found in surface samples from the Neolithic trackway Corlea 9, 21 km south of Edercloon (Reilly 1996). *R. ater* is not on the current Irish list of Coleoptera (Anderson et al. 1997). It is now generally confined to pine woodlands in Great Britain, mostly in northern Scotland (Alexander 2002), but in Ireland is generally known from oak in palaeoenvironmental contexts (Reilly 2011). A small number of dung beetles were also recorded at EDC 45 suggesting that the area was accessible to grazing animals at this time.

Late Neolithic and Early Bronze Age

Three sites date from this period and display slightly different habitat characteristics, reflecting the changes in the local bog environment and their geographical location within the basin. Togher EDC 42 (2780–2490 BC) had a larger woodland signal than EDC 45. Further examples of *Rhycolus ater*, along with *Scolytus mali*, *Curculio pyrrhoceras* and *Xyleborus dispar* (Illus. 7.2), were recorded. Except for *C. pyrrhoceras*, none of the other species occur in Ireland today (Anderson et al. 1997). *S. mali* is generally found under bark in thin branches of various fruit tree species but also in elm, while *Xyleborus dispar* is generally

found in freshly dead oak, birch and hazel wood (Alexander 2002). *C. pyrrhoceras* is a canopy beetle generally found on oak leaves (Bullock 1993; Philips 1992). None of these species re-occur in later sites at Edercloon, which suggests that their recovery from these samples is not simply due to the presence of trackway wood. Rather it is likely that they represent locally occurring carr woodland. The loss of this local habitat type as the raised bog developed leads to the gradual loss of a woodland signal from the insect assemblages, apart from an ant species (see below). This is mirrored at other sites in Britain and Ireland (Girling 1976; 1977; Reilly 2005; Whitehouse 2004).

Peat stratigraphy survey results indicate that this site was close to the dryland margin, while dating from the pollen profile would also suggest that the transition from fen to raised bog may have occurred north of EDC 42 by the mid-third millennium BC (see Chapter 2). Both factors may account for the unusual number of terrestrial/heath insect species present in what is ostensibly a fen/carr woodland environment: for example, *Micrelus ericae* (the 'heather weevil'); *Chilocorus bipustulatus*, a ladybird species found on heather and ling in dry upland heath (Illus. 7.2); and beetles *Ctenicera cuprea*, which occurs at the roots of plants in grassland and heath, *Phyllopertha horticola*, frequently encountered in bog marginal environments, occurring at the roots of vegetation in wet meadows and grassland and *Byrrhus pilula*, which again occurs at the roots of plants in wetland margins (Jessop 1986; Koch 1989; Majerus 1991). The finding of *B. pilula* and *C. bipustulatus* at Edercloon is the first record of either species from a palaeoenvironmental context in Ireland and neither is particularly common here today (Alexander 1993; Duff 1993; Majerus et al. 1997).

Two samples from EDC 36 (2470–2200 BC), a large togher lying in the middle of the complex, were examined. It lay in what was, by this stage, raised bog peat. The assemblages were dominated by generalist aquatic and vegetation-rich pool species. However, the latter group included beetles *Hydroporus tristis*, more commonly found in fen/marshes and woodland pools, and *Enochrus affinis*, more typical of *Sphagnum* pools in raised bogs (Friday 1988; Hansen 1987). It suggests that the underlying fen peat may have influenced the insect assemblage below EDC 36 at this location, while open acidic *Sphagnum* pools were also present. The influence of raised bog peat is suggested by the presence of *Micrelus ericae* and *C. bipustulatus*. Two dung beetle genera, *Geotrupes* sp. and *Aphodius* sp., were also recovered from this location, suggesting the presence of animals in the vicinity.

Lastly, EDC 38 (2200–1920 BC) was a degraded togher, above EDC 42, in the north of the complex. Initial examination suggested that the ecological profile of the peat within which EDC 38 lay was like EDC 36. However, it is more species rich and numerically rich than EDC 36 and is in fact most similar to EDC 42. The assemblage contained a number of fen/carr and muddy ground species. The leaf beetle *Neogalerucella tenella* occurs on tall waterside vegetation, more typical of marshes and fens than raised bogs (Bullock 1993). Within the vegetated-pool group, there is a greater variety of species present, which is more typical of fens. The most frequently occurring species in this group, *Hydraena britteni/riparia*, is also the most frequently occurring beetle species in the peat below EDC 42. In addition, the so-called 'whirligig' beetle, *Gyrinus substriatus*, occurs here. It is generally found on the surface of ponds, where it is predatory on other aquatic

invertebrates (Koch 1989). So, while EDC 38 is built within raised bog peat, the peat below its substructure is fen-like in character. This would suggest that raised bog growth had perhaps only just begun in this area at the time of the construction of EDC 38, but was more developed further south in the vicinity of EDC 36. One other notable find from this peat was *Rhopalomesites tardyi*, a large weevil that lives in the dead heartwood of various broadleaved trees, most notably oak and holly (Alexander 2002).

Late Bronze Age

Togher EDC 5 (1260–970 BC; 1120 ± 9 or later BC) stands alone in this period as, unlike many of the other trackways dating from the Bronze Age, it does not appear to have had a rebuilding phase in the Early to Developed Iron Age (see below). EDC 5, located in the southern part of the bog basin, was orientated north–south and was up to 1.3 m deep and over 3 m wide in places (Illus. 7.3), with many wooden artefacts incorporated into the substructure (Moore, Chapter 8). The togher was sampled at several locations along its length and the assemblages reflect differences in the underlying ground conditions prevailing, particularly at its northern and southern ends. Generalist aquatic beetles, with moderately high numbers of generalist wetland and wetland plant feeding species, dominated assemblages from the northern end. *Hydroporus gyllenhalii*, a water beetle preferring acid pools (Friday 1988), also occurred here. Muddy or pool-edge conditions were also suggested in this location by the presence of *Heterocerus fenestratus* and *Dryops* cf. *luridus* (Duff 1993; Foster 2000; Merritt 2006). A small number of terrestrial/heath species were present, which included *Micrelus ericae* and *Byrrhus pilula*. However, the assemblages gave the overall impression of wet ombrotrophic ('rain fed') conditions here. From the southern end of the togher, however, there was a higher presence of fen/carr woodland species and the variety of vegetation-rich pool species was higher than the northern end, similar to EDC 38 and EDC 42. Muddy ground or pool-edge conditions were suggested at this end of the trackway also and may relate to the weight and depth of the togher's construction pushing it into the soft, deep, fen peat below.

The ant species *Myrmica* cf. *ruginodis/scabrinodis* (previously misidentified as *Tetramorium caespitum*) was present in moderate numbers all along EDC 5 (Illus. 7.2). It generally builds nests in dead wood,

Illus. 7.3 Photomosaic of Late Bronze Age togher EDC 5 (CRDS Ltd).

logs or under stones, and is also known from heath and moorland (Bolton & Collingwood 1975, 17). They may have occupied the upper exposed layers of wood in the togher seasonally or simply utilised the trackway during dry periods as pathways for foraging and eventually became incorporated into the insect death assemblages in the substructure over time. Two notable species from EDC 5 were *Cidnopis aeruginosus,* a click beetle that occurs at the roots of vegetation in grasslands and heath (Koch 1989), and the bark beetle, *Leperisinus varius/fraxini*, which occurs in thin branches of ash primarily (Alexander 2002). Ash was frequently identified in wood samples taken from this togher (see below). *C. aeruginosus* is not on the current Irish list of Coleoptera and the status of *L. varius/fraxini* is uncertain (Anderson et al. 1997). The latter has been found previously in Derryville Bog, Co. Tipperary, Derrycunihy Wood, Co. Kerry, Back Lane and Clancy Barracks, Dublin, so was clearly once widespread in Irish woodlands (Reilly 2003; 2005; 2008b; 2009a).

Late Bronze Age and Early and Developed Iron Age

Ten sites dating from these periods were analysed for insect remains. Many of these sites interlinked and the stratigraphical relationships between them were difficult to disentangle (Moore, Chapters 4 and 8). The key point, however, is that this period represents the most intense phase of trackway-building activity within the bog. The analysis of the insect remains here, therefore, will draw out general environmental trends from several key sites from this timespan.

The assemblages from togher EDC 12/13 (see Moore, Chapter 4), lying in the northern part of the bog, were dominated by vegetation-rich pool, generalist wetland and aquatic beetle species. Acid-water-loving species like *Hydroporus gylenhalii* and *Laccobius minutus* were common. Proximity to the dryland margin might explain the presence of species like *Nebria brevicollis*, *Ctenicera cuprea* and *Selatosomus aeneus*. The latter two click beetles are found at the roots of plants in grassland and meadows, as well as dry heath (Koch 1989). From the northern end of the togher two woodland beetles, *Pterostichus niger* and *Rhynchaenus quercus*, were present. *R. quercus* is a leaf-miner of oak and may indicate that leaf litter or branches with leaves attached were incorporated into the togher substructure (Bullock 1993; Morris 1993). An assemblage from the southern part of the togher contained a small number of beetles suggesting fen or marsh conditions, including *Donacia vulgaris*, usually found on bur-reed, sedge and reeds, and *Plateumaris braccata*, found on reeds (Bullock 1993). This is the only sample from Edercloon where these two species occur and suggests standing reed beds once occurred in this area. EDC 12/13 was built in raised bog but lay close to the fen/raised bog transition, which might explain this slight fen/marsh influence (Bermingham, Chapter 2). Pollen of bur-reed and bull-rush was also noted in the vegetation record at this time (Plunkett, Chapter 2).

Beetles characteristic of acidic waters and generalist aquatic/wetland species dominated assemblages from togher EDC 10 (see Moore, Chapter 4), which may have joined with EDC 12/13 at its north-western end. However, large numbers of *Myrmica* ants were also recovered. Dung/foul species like *Geotrupes* sp., *Tachinus/Tachyporus* sp. and *Aphodius* sp. were recorded giving hints of an animal

presence along the bog margin or perhaps even on the trackway surface. A number of decaying vegetation/wood litter species, like *Clambus* spp., and a wood fungi feeder, *Cis boleti* (Alexander 2002), were recorded alongside the ground beetle, *Nebria brevicollis*, usually indicative of drier woodlands or open ground (Luff 2007). All of this suggests that the trackway was lying on somewhat drier peat, especially at its northern end, allowing sufficient dry foothold for species that might not otherwise make their home in raised bog. This might also explain the more degraded nature of the trackway wood in EDC 10 (Moore, Chapter 4). Vegetation-rich pool and generalist wetland plant feeders, however, dominated peat from beneath the southernmost end of the trackway. This suggests wetter pool-like conditions at this location.

Various overlapping layers of wood linked toghers EDC 1b/29, EDC 26 and EDC 31. EDC 10 also appears to have joined EDC 1b/29 at some point (see Moore, Chapter 4, for details of stratigraphy and relationships).

Myrmica ants dominated the single assemblage from below the superstructure of EDC 1b/29, along with a significant number of the heather weevil *Micrelus ericae* and the sedge-cottongrass-*Sphagnum* feeder *Plateumaris discolor. Hydroporus gyllenhalii* and *Ilybius fuliginosus* suggested the presence of acidic *Sphagnum* pools. The overall impression from the assemblage is of typical hummock-and-hollow raised bog peat. Samples from within the substructure and beneath the superstructure in EDC 31 produced different signatures from each other. From within the substructure, *Myrmica* ants dominated assemblages, suggesting the surface wood of the trackway was dry enough at certain times to allow colonies to become established or to allow ants to utilise the trackway as foraging pathways. The two samples from beneath the togher at either end suggest underlying wet conditions even though different ecological groups dominate them (Illus. 7.4). From the south-eastern end, vegetation-rich pool species dominated. Curiously, the insect assemblage from this location also contained a variety of dung beetles, *Aphodius*

Illus. 7.4 Looking north-west along togher EDC 31 (CRDS Ltd).

sticticus, *A. ater* and *A. fimentarius*. There is no obvious explanation for this; the site was not close to the dryland margin and the rest of the assemblage suggested that the ground surface was very wet at this location. However, an S-bend in EDC 26 at this point, where it met EDC 31, may have been constructed to avoid an open pool, a pool that may have attracted grazing animals.

The three samples from EDC 26 suggested very similar wet underlying ground conditions. All three were species poor, which is typical of wet ombrotrophic peat. One of the suggestions for the unusual bends in EDC 26, as noted above, was that they were attempts to avoid open pools (Moore, Chapter 4). Certainly, the assemblages of these three samples are dominated by vegetation-rich pool and generalist aquatic species. There is a slight terrestrial and woodland signal in assemblages from the north-eastern end indicated by *Micrelus ericae* and *Myrmica* ants. These assemblages came from within the substructure rather than from beneath the togher and the presence of these insects is probably due to the surface of the togher being drier than the peat beneath it.

Discussion

The insect assemblages from Edercloon demonstrate changing underlying ground conditions from the Neolithic to the Iron Age. The earliest sites were built within fen woodland, but fen conditions continued to exercise an influence on beetle assemblages until the Late Bronze Age in certain locations. The change to raised bog is clearly reflected in many of the assemblages dating from the Early Bronze Age through to the Iron Age, with the great majority of sites built in this type of peat.

Neolithic sites would appear to have been constructed primarily for access to the fen, as already suggested by the archaeological and peat stratigraphic evidence. Iron Age sites, like EDC 26, appear to have crossed the bog, but also avoided very wet areas. The large number of sites dating from the Iron Age may be due to attempts to deal with these very wet areas. However, the insect evidence does not necessarily shed light on the unusual orientation of the sites at Edercloon—the fact that many did not cross the basin from dryland margin to dryland margin. The insect assemblages would indicate that the bog surface was accessible to animals at various times in the past, suggesting that perhaps this area was never very treacherous as a crossing point. Coupled with the extremely uneven surfaces of some of the trackways, especially EDC 5, the purpose of at least some of the toghers and platforms may have been non-utilitarian.

The ubiquitous presence of the ant species *Myrmica* cf. *ruginodis/scabrinodis* from the Late Bronze Age onwards would also suggest that the surface of many of the toghers was exposed for prolonged periods of time. This would appear to correlate with a prolonged dry phase observed in the hydrological and peat stratigraphic record (Bermingham, Chapter 2). Lemanaghan 3, an early medieval single-plank walkway in Lemanaghan Bog, Co. Offaly, and the Bronze Age stone and wood trackway Killoran 18 in Derryville Bog, Co. Tipperary, had similarly high numbers of ants, suggesting prolonged exposure at times and accessibility of trackway surfaces for colony building or for use as foraging pathways (Reilly 2005; 2009b).

Once again, Irish peatlands have demonstrated their role as 'archives' of now locally extirpated and rare fauna. A number of beetle species that no longer occur in

Ireland or whose current distribution status is uncertain were recovered at Edercloon, particularly from Neolithic and Bronze Age sites (Table 7.1). While most are dead wood feeders, in particular, bark beetles, a small number are indicative of changing hydrological conditions (i.e. changes from fen to raised bog) and changes on the dryland margin (i.e. removal of tree cover, loss of natural grassland/meadows). This is in keeping with findings from many other Irish palaeoenvironmental sites—Derryville Bog, Corlea Bog, Lemanaghan Bog—and, indeed, woodland peaty hollow sites in Derrycunihy and Camillan Woods, Co. Kerry, and Brackloon Wood, Co. Mayo (Reilly 1996; 2005; 2008b; 2009b).

Wood species analysis

Ingelise Stuijts

Archaeological excavations tell us about our ancestors, their lives, deaths and environment. Depending on the location of a site, one or several aspects of the past are discovered. In time everything will decompose and turn into the elementary building blocks of life. Under certain circumstances, however, the decomposing process cannot be completed and organic and inorganic material remains are preserved for us to glean an insight into the past, a glimpse of a world for which no written history remains. The excavations in Edercloon were located in a stretch of reclaimed bog. The acid conditions combined with the wet quality of the bog here preserved the wood that was

Table 7.1—Locally extirpated beetles recorded at Edercloon

Species	Ecology	Red Data Book Status (UK)	Other locations in Ireland
Agabus melanarius Aube	Spring-fed pools in woods, seepage ponds	Notable B	Derrycunihy Wood, Kerry; Camillan Wood, Kerry; Clancy Barracks, Dublin
Cidnopus aeruginosus (Ol.)	Grassland, heaths	—	No previous Irish sites
Rhyncolus ater (L.)	Dead wood – pine, oak	—	Corlea Bog, Longford; Derryville Bog, Tipperary; Back Lane, Dublin; Lemanaghan, Offaly; Barronstrand Street, Waterford
Scolytus mali (Bech.)	Under bark of fruit tree species mainly – dying, dead and felled	Notable B	Back Lane, Dublin; Clancy Barracks, Dublin
Lepersinus varius (F.)	Under bark of recently dead ash primarily, also occasionally oak, beech, hazel	—	Derryville Bog, Tipperary; Derrycunihy Wood, Kerry; Back Lane, Dublin; Clancy Barracks, Dublin
Xyleborus dispar (F.)	Under bark of a wide variety of tree species – stumps, debilitated, recently dead or fallen wood	Notable B	Derryville Bog, Tipperary

laid down intermittently by people from the Neolithic until medieval times.

It is not unusual to find wood in bogs and fen, as people in the past visited these areas and their margins for a multitude of purposes, and wood was often used to make a walking surface. What is unusual is the sheer quantity of trackways, platforms and smaller deposits and the number and quality of worked objects in a small narrow stretch of wetland, over such a long period of time. Bermingham (Chapter 2) suggests that tracks were constructed every 70 years or so, with some periods showing more activities than others. Yet, over time, people still came back to this same stretch of wetland to build their undulating pathways.

The wood research tells us about the species that were used on site for the building of the walking surfaces and the objects, and the site conditions as engraved in the wooden structures. Each site has its own history as to construction, period of usage and—of course—function, the latter aspect, however, is not always clear. The diameter of the timbers, stems, branches and twigs from the trackways, combined with other observations on ring counts, age and measurements, quality and preservation and even colour carry information on the site conditions in the past and present, and the nature of the woodlands that were used by our ancestors.

The findings related below follow the wooden structures through time and highlight noteworthy aspects from particular sites. Wood identifications from individual sites and artefacts are incorporated in Chapters 3–6, in which the various deposits are discussed in detail.

Methodology

The sites were visited several times in 2006 to examine the excavation process and advise on the sampling procedure to be put into place. No charcoal was recorded on site. At least 33% of the wood was sampled from each structure, with separate samples taken for dating, woodworking, and identification, when possible. Owing to the sheer volume of material, many samples were taken as bulk, for example when a row of vertical pegs were found they were collectively sampled in one bag. Layers were sampled separately and superstructures and substructures were separated. The artefacts were recovered and packed individually and housed off-site.

More than 5,000 elements[16] from both Edercloon and Tomisky were analysed and identified using standard microscopic methodologies and comparative literature following Tjaden (1919), Greguss (1945), Schweingruber (1978), and Hather (2000). The wood was prepared by analysing thin sections under microscope (Olympus) using transmitted light with magnifications of 100–400x.

Ring measurements and ring counts were observed with 10–40x magnifications, and sections were made of cross-sections to measure each ring. When needed, several overlapping sections were used. Ideally, both bark and pith were present for ring measurements but measurements were also taken when these were absent. Timbers, branches and twigs were all recorded in this way to gain an insight into the minimum age of the wood used.

16 This text presents 5,063 identifications, an additional 300 identifications completed at a later date are included in Stuijts (2021), which also contains additional information on composite artefacts for which there may be more than one species.

Wood identification results

Traditionally, the difficult subfamily of Maloideae was distinguished from other members of the rose family Rosaceae. However, recent molecular research has indicated that Maloideae along with other subfamilies of Spiraeoideae and Amygdaloideae should be included into the subfamily Spiraeoideae (Evans & Campbell 2002; Potter et al. 2007). For the purpose of this publication, the name Maloideae or apple-type will be used unless otherwise specified.

It is generally impossible to differentiate between genera and species of the Maloideae (apple-type) based on wood anatomical characteristics. Identification to genus level was therefore cf. (Latin *confer* = 'similar to'; the wood resembles a specific known taxon, but they differ in details). However, based on the presence of thorns one fragment of hawthorn (*Crataegus*) was most likely present. Based on the bark, colour and semi-ring porous cross-section several elements were identified as rowan-type (cf. *Sorbus*). Where this was not clear, identification was onto apple-type (Maloideae) only, meaning that this group could include not only hawthorn and rowan-type/whitebeam/service tree but also apple and pear. Leaves and fruits are needed to confirm the identifications.

The two native birch species, downy birch (*Betula pubescens*) and silver birch (*B. pendula*), cannot be distinguished anatomically. Two native oak species are found in Ireland, namely pedunculate oak (*Quercus robur*) and sessile oak (*Q. petraea*), and these cannot be differentiated either. These two species have distinctly different ecological preferences: the pedunculate oak is most common on acid soils and in mountain districts, whereas the sessile oak prefers richer soils in lowlands (Webb et al. 1996).

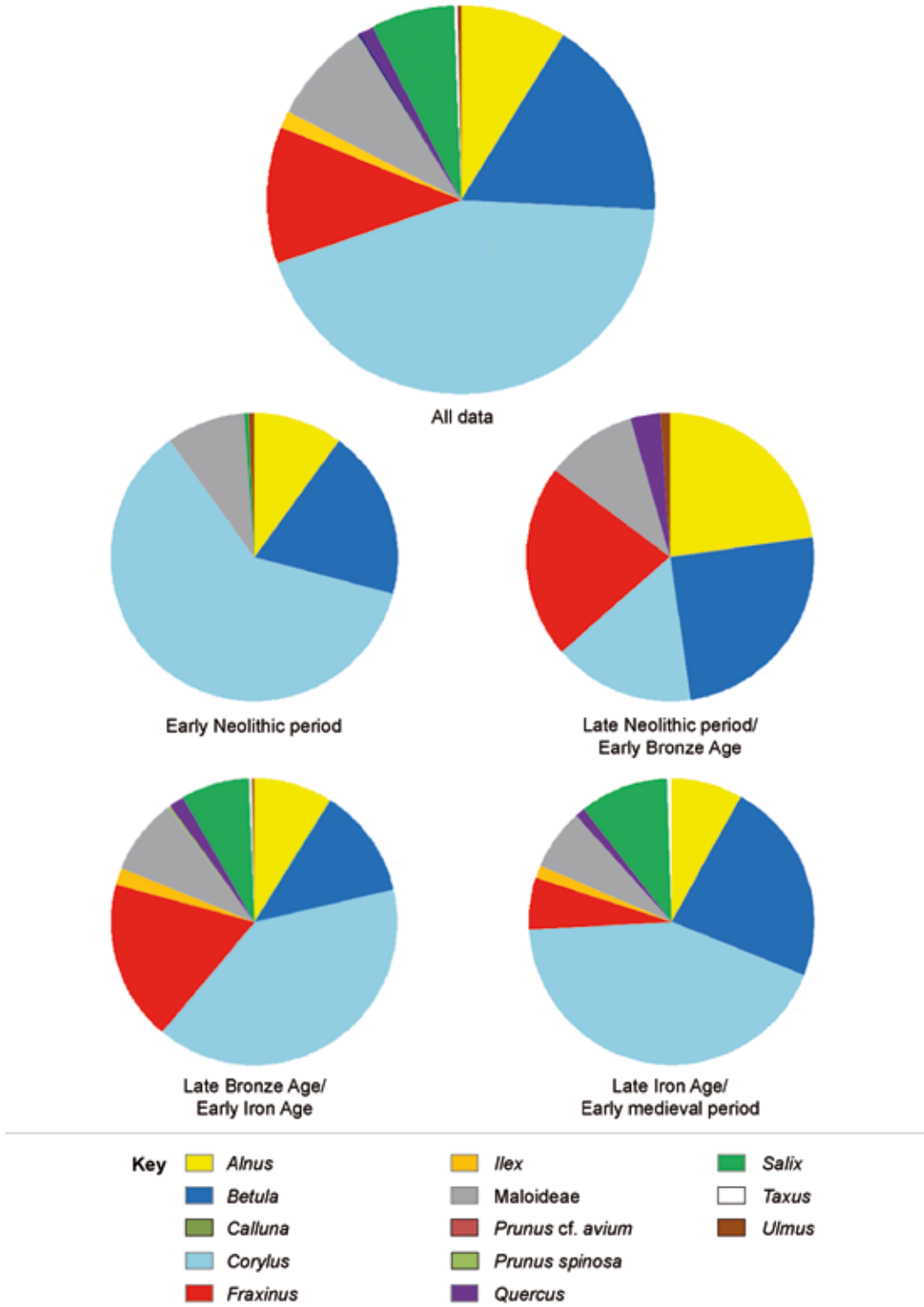
The taxa identified are presented in Table 7.2 (N = 5,063). The identifications are further summarised in Illustration 7.5 according to the chronological periods, with sites grouped to fit to those periods (Maloideae have been grouped together to facilitate the use of pie charts). Overall identifications of a selection of sites are presented in Illustration 7.6. This selection represents the sites with the highest number of identifications and the most interesting results. In addition, these sites are well discussed in the other environmental sections. Tomisky is treated as a separate unit. In the text, the wood species are described by their English names, except for the Maloideae group.

The total results (Illus. 7.5) show the predominant use of hazel (*Corylus*) in the wooden structures. A range of other species is represented with the main players being birch (*Betula*), alder (*Alnus*), ash (*Fraxinus*), willow (*Salix*) and the apple-type group. Other species, including oak (*Quercus*) and elm (*Ulmus*), often taken to indicate usage of wood from nearby dryland, are only barely represented.

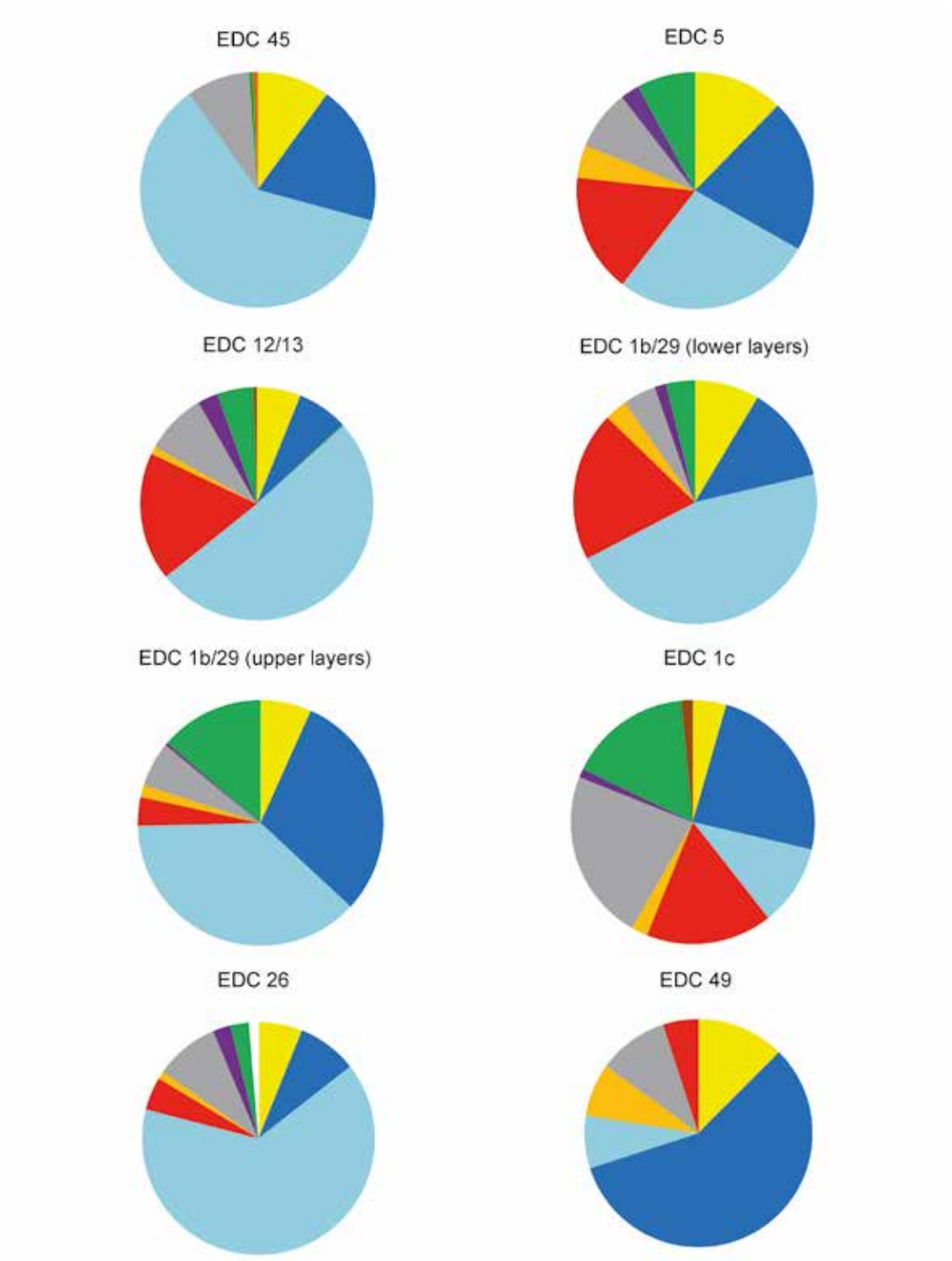
Illustration 7.5 shows the total identification results according to chronological periods (it excludes undated sites for which relative dates can be suggested). There is only one site scientifically dated to the Neolithic period, namely EDC 45, with a total of 770 identifications. The Late Neolithic/Early Bronze Age period is under-represented with only 88 identifications (sites EDC 36, EDC 38 and EDC 42). The Late Bronze Age/Early Iron Age transition, in contrast, is well represented with 2,306 identifications (sites EDC 1c, EDC 5, EDC 9, EDC 10, EDC 12/13, EDC 19, EDC 25, EDC 27, EDC 29, EDC 31, EDC 34 and EDC 44).

Table 7.2—Wood species identified at Edercloon and Tomisky (nomenclature follows Stace 1997)

Wood species	English name	Early Neolithic	Late Neolithic/ EBA	LBA/EIA transition	IA/Early medieval	Undated	Tomisky	Frequency	Percentages
Alnus	Alder	77	20	202	127	16	15	457	9.03%
Betula	Birch	*148*	22	293	368	9	12	852	16.83%
Calluna	Heather	0	0	1	2	0	0	3	0.06%
Corylus	Hazel	469	14	912	685	123	12	2215	43.75%
Fraxinus	Ash	0	19	419	91	17	31	577	11.40%
Hedera	Ivy	0	0	0	1	0	1	2	0.04%
Ilex	Holly	0	0	47	23	1	1	72	1.42%
Maloideae	Apple-type	17	5	144	86	5	4	261	5.16%
Maloideae cf. *Crataegus*	Hawthorn	0	0	0	0	1	0	1	0.02%
Maloideae cf. *Sorbus*	Rowan	50	4	54	24	42	1	175	3.46%
Prunus cf. *avium*	Wild cherry	0	0	1	0	0	0	1	0.02%
Prunus spinosa	Sloe	0	0	4	0	1	0	5	0.10%
Quercus	Oak	0	3	41	19	1	0	64	1.26%
Salix	Willow	4	0	175	161	5	4	349	6.89%
Taxus	Yew	0	0	6	7	0	1	14	0.28%
Ulmus	Elm	5	1	8	0	0	1	15	0.30%
Total identifications		**770**	**88**	**2,307**	**1,594**	**221**	**83**	**5,063**	**100.00%**



Illus. 7.5 Overall wood species identifications and species by chronological period (Ingelise Stuijts).



Illus. 7.6 Wood species identifications (see key in Illus. 7.5) for EDC 1c, EDC 1b/29, EDC 5, EDC 12/13, EDC 26, EDC 45 and EDC 49 (Ingelise Stuijts).

The Late Iron Age/early medieval period has 1,504 identified pieces (sites EDC 1b/29, EDC 2, EDC 6, EDC 7, EDC 26, EDC 28, EDC 30, EDC 37, EDC 40 and EDC 49). A total of 220 samples from undated sites were examined (EDC 11, EDC 18, EDC 20, EDC 21, EDC 35, EDC 41, EDC 46 and EDC 48), with the Tomisky sites producing 83 identifications. It is clear that the numbers from the Late Neolithic/Early Bronze Age period are too low to allow many conclusions.

The most obvious fact shown from the species distribution is the absence of ash in the Early Neolithic period. Low values for ash pollen in the Neolithic period are observed at other archaeological sites from this period, such as in Corlea Bog (Caseldine & Hatton 1996), and coincide with the relatively late arrival of ash in Ireland. In pollen diagrams values for ash seem to fluctuate in later periods coinciding with increases and decreases in (local) human habitation (Caseldine et al. 2005). In Edercloon, pollen identifications also point to the virtual absence of ash during the Early Neolithic period (Plunkett, Chapter 3). Species diversity is low during this period (seven species) and willow is virtually absent. No oak was found in the trackway though it must have been present on the nearby dryland. The preferred wood species for EDC 45 was without any doubt hazel and this shrub must have been present abundantly and locally. Noteworthy is also the good representation of both birch and wood from the apple-type (including a large element of the above discussed rowan-type wood) indicating the utilisation of a specific woodland area.

As mentioned above it is difficult to draw many conclusions about the Late Neolithic/Early Bronze Age period, because of the limited number of identifications (eight species represented). Ash makes a prominent entrance along with some oak. Willow is absent and hazel was used much less.

The following Late Bronze Age/Early Iron Age period sees an increase in the number of wood species (14) and the entrance of willow as an important constituent of the wooden structures. Values for alder and birch decline slightly, whereas hazel regains high values. Holly (*Ilex*) is found in the wood assemblage but values for oak remain low. There is one sample of heather (*Calluna*).

At first glance there is not much difference with the following period, the Late Iron Age/early medieval. Here, 12 species are identified. Birch has slightly higher values with ash somewhat lower values. Elm is absent. Two pieces of heather were found.

Taken as a whole, the general picture of the latter two periods are quite consistent. The main difference with the older periods lies in the virtual absence of willow and complete absence of ash in the Early Neolithic period, and the appearance of ash in the later Neolithic/Early Bronze Age period. Later, willow was very commonly used in trackway construction. Characteristic for Edercloon is the consistent use of apple-type wood during all times. In Tomisky, 11 species are represented of which ash is the most common.

The Edercloon tracks—selected age pattern and quality aspects

The Edercloon tracks and platforms are detailed in Chapters 3–5, in which the various wood species that were used in the sites are included. Additional significant aspects of wood identification are age pattern distribution and quality of the wood.

Early Neolithic EDC 45

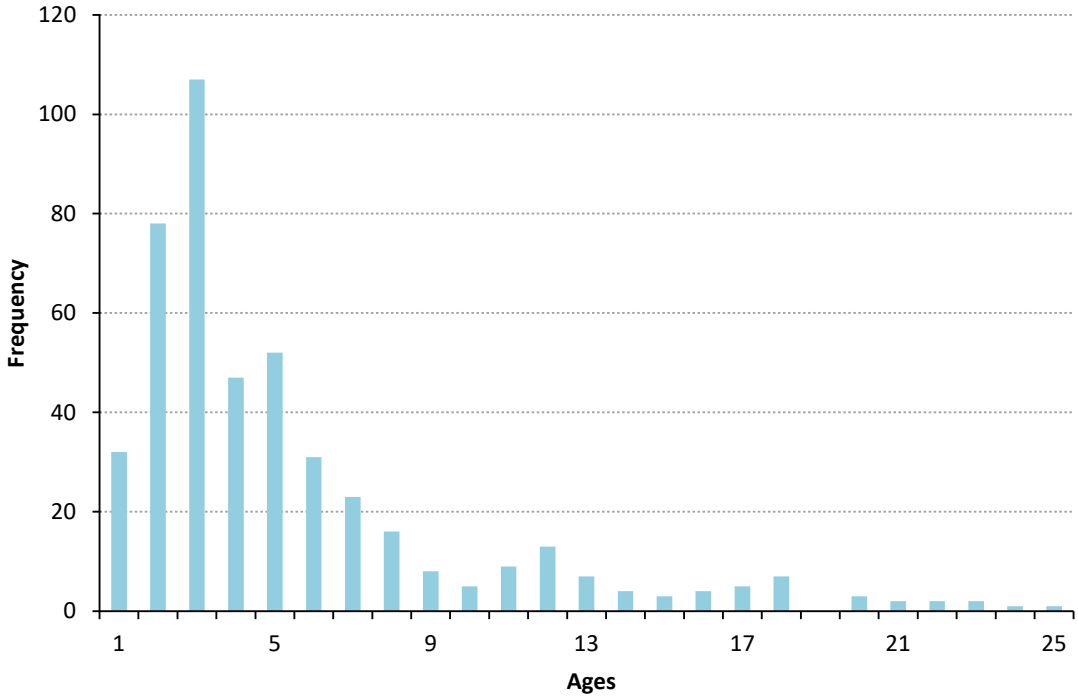
Most wood for building this trackway was obtained from the dryland with only minor use of alder and willow, which would be commonly found on wetland margins. The wood was of relatively small size with knotty twigs as well as straight rods present, along with some roots (Illus. 7.7). Bark was often absent. Finds of seeds of bogbean (*Menyanthes*) and roots of horsetail (*Equisetum*) within the wood point to wet local conditions consistent with the fen environment suggested for this time period (Chapter 2; see also above). The wood was soft but the inside looked fresh.

Alder from this site was mostly quite young, less than 20 annual rings with only two older pieces of 30 and 48 rings. The age pattern varied greatly but it all suggests the use of very young and insubstantial stands of wood.

This site included much birch wood (almost 20%), with a variety of material from roots to brushwood and longer roundwoods. It seems as if the wood was procured from a scrubby area with everything taken into consideration. The wood was not always of great quality either. The number of rings varied from 1 to 37, but only three pieces had more than 30 rings. Most wood was less than 20 years old, thus quite young.

More than 60% of EDC 45 was made of hazel. Much of the wood was squashed on

Illus. 7.7 A section cut through togher EDC 45 for wood sampling (CRDS Ltd).



Illus. 7.8 EDC 45 frequency and ages of hazel (Ingelise Stuijts).

one side, likely a result of deposition. All of the hazel was younger than 25 years, and the bulk of the material was younger than nine years, with the majority three years, thus very young wood (Illus. 7.8).

The apple-type was well represented including the variety that may suggest the presence of rowan-type. The apple-type was mixed material including twigs as well as brushwood. The age distribution varied greatly between seven and 43 years, but there was no consistent pattern. The rowan-type wood was similarly varied between eight and 48 years, similar to the general wood of the apple-type. It seems as if a whole area with these trees was cut down to provide the material for EDC 45. The quantities of willow (four) and elm (five) are too small to draw conclusions.

In conclusion, the bulk of EDC 45 was made from hazel taken from a particular area that hints at a very young age following a harvesting episode. The apple-type and rowan-type wood was collected from a different section of land that was probably quite natural. Birch was similarly of mixed age but was not of great quality and might have been harvested from a marginal setting. Alder fell into the similar age range as the birch and most likely came from a marginal setting too. A few pieces of elm were the only elements that came from a real dryland setting.

Late Neolithic EDC 42

Only 26 pieces of wood from this track were identified, mostly birch and hazel, thus not many conclusions can be drawn from its material. The insect assemblage indicates a significant wood signal including a possible indication of the presence of oak leaves.

However, no oak was found in the analysed wood.

It was difficult to count the annual rings on the birch pieces, these were mostly distorted and not of great quality indicating a local carr-like origin. Some of the birch may have been roots indicating that they grew locally near or even on the track. The ages varied between 16 and 44 years where counting was possible. The hazel was very young, less than 13 years old, and four pieces were just four years old. It was thin brushwood. As mentioned above, hazel did not grow in marginal areas but rather on dryland.

Two ash pieces were larger, one over 46 years old. One apple-type fragment was a fairly substantial piece with 56 countable rings and was degraded on one side, perhaps from being walked upon. One elm roundwood fragment was substantial and deviated in that it was relatively young, 18 years, and of very fast growth. This wood originated on the dryland in an open situation where it could grow well and fast, maybe indicative of a cleared area.

Early Bronze Age EDC 36

Only three wood species—alder, ash and hazel—were analysed from this site. The wood fragments were often degraded on one side and had some roots growing into the wood, indicating that the track was used over some time. Both alder and ash had a similar age pattern mostly between 10 and 20 years. Yet much of the wood was fairly substantial, thus growth was fast. This would point to their origin in open woodland where clearance had taken place some 20 years before. Ash in particular needs light to germinate. This open woodland could very well have been quite near to the track on the margins of the dryland. Two hazel fragments were pieces of brushwood of 15 and 27 rings, thus their origin was not in managed woodland.

Early Bronze Age EDC 38

Only 25 pieces, representing seven species, were identified from this site, thus more varied than EDC 36 and EDC 42. Alder and birch could have had a local origin on the margin of the wetland which at this time was transitioning into raised bog. The alder fragments were substantial and one piece was approximately 51 years old. The birch was of smaller dimensions, both twigs and brushwood of various ages without a consistent pattern, and of fast growth. The ages vary between eight and 35 years. One substantial roundwood was only 19 years old. The fast growth of the ash elements indicates good growing conditions in a fairly open situation (i.e. clearance could have taken place a generation earlier).

Four pieces of hazel brushwood were of varying age less than 15 years old. In contrast, two ash roundwoods were 56 and 82 years old, indicating origins in older woodland, different from the alder, birch or hazel locations. The apple-type is represented with four fragments of intermediate age, 32 to 54 rings, whereas the rowan-type-type wood is between 14 and 26 years old. This mixed age pattern points to a natural growth rather than managed location. Three oak identifications, including two possible plank fragments, were of fast growth but no sapwood was present and no age could be established. However, indirectly the fast growth may point to a location on dryland (not marginal) with an open character.

Late Bronze Age EDC 5

EDC 5 was a large togher with two substantial layers of wood separated by wood-rich peat, with long heavy pegs pinning the wood layers in place (Illus. 7.3). The road was probably built in one episode and, based on its generally good preservation, was likely only exposed for a short period of time. Its northern end was built in raised bog whereas the southern end was in fen/carr woodland with some vegetation-rich pools.

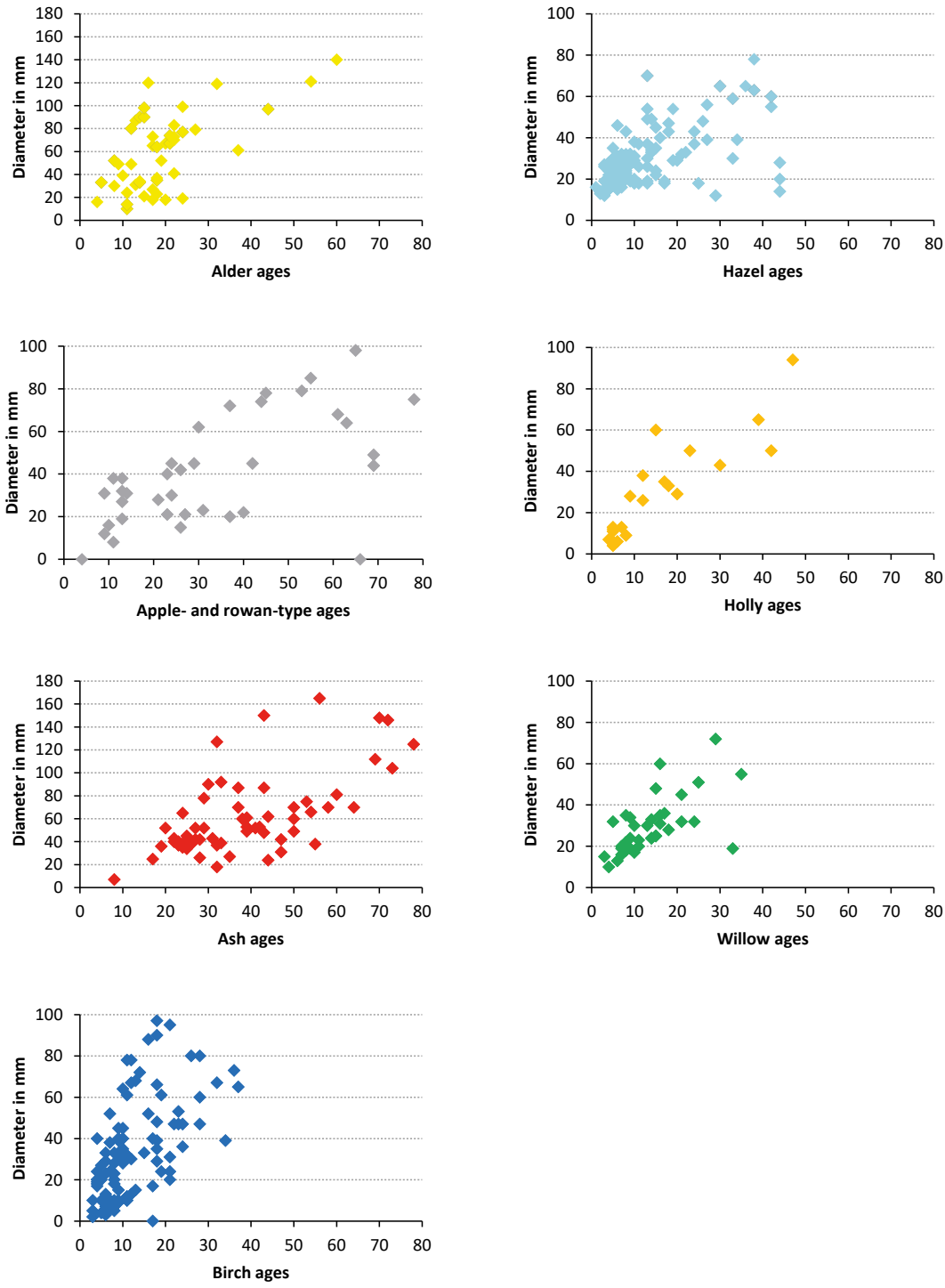
Nine species were identified in this site including 11 wooden objects. Hazel and birch were the most common species used, followed by ash (Illus. 7.9). Interesting is the regular occurrence of holly. These were mostly found in a twig layer below the first layer of longitudinal elements. The sample included holly leaves thus it is likely that whole branches were laid down there. The ages of the holly twigs varied between four and eight years. Other twigs found in this layer include ash (1x), oak (2x), willow (2x), apple-type (5x, most likely the rowan-type) and birch (6x). It is likely that these were procured close to the site as it is not easy to drag branches and twigs a long distance.

Several pegs from EDC 5 were identified, with the majority either hazel or ash. The hazel pegs varied considerably in age, between six and 34 years. The ash pegs were of medium age, between 17 and 47 years, with some of very fast growth. One peg was birch (22 years) and one of alder (17 years). Though it is suggested that the pegs were inserted shortly after the site's construction, the pegs seem to have been made at random, as needed.

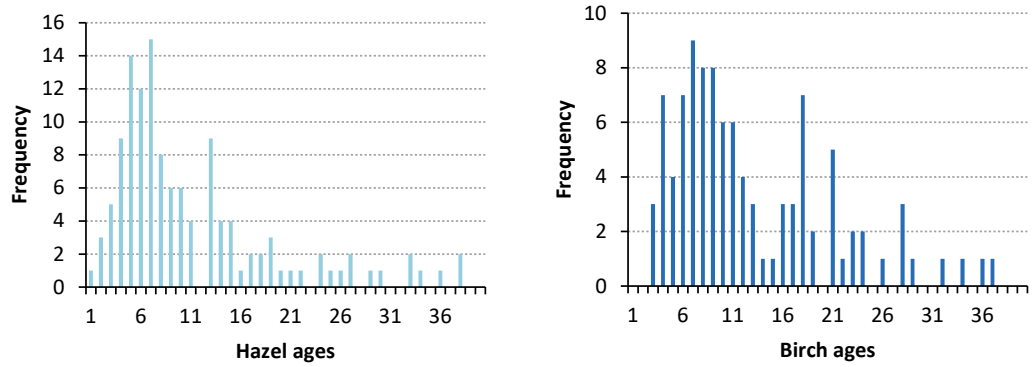
The alder fragments identified from EDC 5 (63 pieces; Illus. 7.9) were of mixed character. Most were less than 30 years old, but a few larger split timbers were over 100 years old. This would suggest the presence of marginal woodland in which there was little interference.

Pieces of birch (107 identifications; Illus. 7.9) show a considerable age range from three to 37 years, with a tendency to use younger wood less than 15 years old. The condition of the birch varied greatly, as did the growth pattern and growth speed, from very fast to slow, equally represented. There is a suggestion of challenged growth conditions in many pieces with traumatic tissue occurring in the wood. In 11 fragments, beetle channels were found in the wood indicating the use of fragile, maybe dead, wood. The data presented in Illustration 7.10 may suggest the use of two different stands of wood, one younger than about 15 years, the second slightly older, up to about 40 years. The wood most likely came from a carr location close to the trackway, with varying stressed growth conditions and trees of mixed quality and size. Perhaps this reflects the complete clearing of an area with relatively young birch trees that would then facilitate movement of other wood fragments.

Hazel was the most frequent species in EDC 5 (140 identifications, including artefacts; Illus. 7.9). Though the tendency was for use of young wood less than 15 years, there were considerable outliers up to 44 years. Illustration 7.10 seems to show the use of two different types of woodland, an area with young, smaller sized hazel versus woodland of mixed character with young, old, thin and larger sized hazel. The EDC 5 assemblage suggests a preference for younger, smaller sized wood. Combined with the finds of contorted hazel rods, possibly used as walking sticks (Chapter 6), it does seem that the hazel used in EDC 5 was harvested on a regular basis. Most was



Illus. 7.9 Age versus diameter for seven of the wood species from EDC 5. Fragments older than 80 years old not shown (Ingelise Stuijts).



Illus. 7.10 EDC 5 frequency and ages of hazel and birch suggesting the use of two different stands of wood (Ingelise Stuijts).

of fast growth, which would also suggest open growth conditions away from the bog margins.

On the other hand, the ash used in the trackway (83 identifications; Illus. 7.9) seems to originate from a different location. The data suggest no selection of a particular age range but a preference for medium age wood more than 20 years old and of various sizes. A considerable number of fragments were older than 50 years, and some more than 100 years old (where measurements were possible). Some wood had evidence for beetle channels. Most was of medium to slow growth and a marginal woodland location is suggested.

As mentioned above, holly branches with leaves attached were used in an intermediate layer of the site. Other larger fragments were also found; these were between 12 and 47 years old with one substantial roundwood outlier of 113 years. One would usually expect holly to grow in dryland conditions.

The apple-type and rowan-type occurred regularly (42 identifications). Illustration 7.9 shows that the ages of these elements varied between nine and approximately 78 years, with no preference evident. This suggests an origin in a natural environment with mature trees (wild apple and rowan trees generally do not reach high ages like oak and ash, 70 would be old for these trees). The possibility cannot be excluded that two stands were exploited or that a selection occurred for wood younger than about 15 years and for wood that was more than 20 years old, similar to the birch used, although the wood seems to be of slightly different composition.

Willow occurred regularly in EDC 5 (41 identifications; Illus. 7.9) and in age varied between three and 38 years, including one peg. There are no indications for selection from a managed situation though the tendency was for use of trees younger than 16 years but of no particular size.

Only 13 pieces of oak were found in EDC 5. In general, the number of oak identifications in Edercloon is quite low and reflective of the preference for other locally grown tree species. Apart from the twigs, the fragments varied in age between 11 and 36 years and included brushwood but no larger pieces.

In conclusion, the material for EDC 5 seems to have been collected close to the site in the bog marginal woods that included trees of generally medium age and mixed quality. This would mean these woodlands were not interfered with on a regular basis and may only have been visited incidentally.

On the other hand, the artefacts, especially the contorted hazel pieces, indicate the organisation of the dryland into areas that were maintained (and used) on a regular basis and produced good quality wood for a multitude of domestic purposes.

Middle Bronze Age/Iron Age EDC 12/13

EDC 12/13 was a multi-phased site combining various elements including deep layers in the northern end with a degraded hurdle, a wider area in the middle, and a wet and unstable sunken southern part, which according to archaeological observations needed to be rebuilt on a fairly continuous or seasonal basis in order to keep it passable. With pools in the north, reed beds in the south and built on raised bog (Chapter 2), there were varying degrees of wetness along this track. In total 652 pieces of wood were identified from this site, including split timbers, the hurdle, approximately 100 pegs and 10 artefacts. Insect remains from the northern end of the trackway point to woodland beetles that fed on oak leaves so it can be assumed that oak trees were growing on the nearby dryland, although, as with the other sites in Edercloon, the proportion of oak in the total wood assemblage is quite low (2% in EDC 12/13).

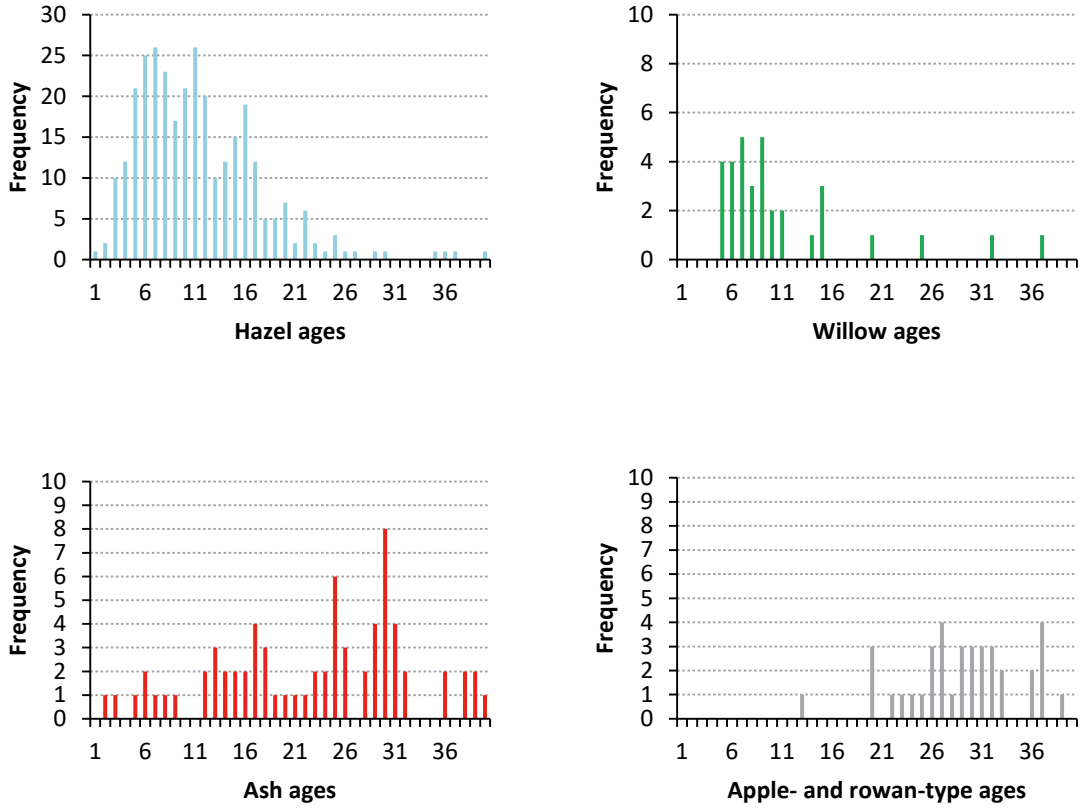
Half of the wood assemblage from EDC 12/13 was hazel (Illus. 7.6). Ash amounted to 18% but the other 10 wood species were less common (fewer than 10%). Interestingly, one fragment of heather was identified, suggesting an origin in a local patch of dry heath or raised bog.

Equally interesting was the presence of sloe which is absent from almost all other Edercloon sites. Sloe is a thorny shrub or low tree from wood margins that is valuable for many purposes, but certainly not known for its building qualities. Two artefacts found in EDC 12/13 were made from sloe (E3313:12/13:63 and E3313:12/13:70), a third object also of sloe was found in EDC 20 (E3313:20:16). This is a reminder of the fact that wooden tracks found in bogs are made of a limited number of wood species that are suitable for quick and easy building, and conveniently transported to the site. These species do not, however, reflect the true composition of the exploited woods. This is why multi-proxy research is such a fine approach for building a fuller understanding of the local environmental situation.

It is a challenge to extract useful information from EDC 12/13 from a wood identification perspective, as the chronological span of the site is difficult to discern. If EDC 12/13 was indeed rebuilt over hundreds of years, the local woodlands during that time would have seen considerable changes in appearance, age, composition, etc., all depending on what happened over that time and how local people used the resources.

A good number of pieces from EDC 12/13 were split or worked timbers that did not lend themselves to ring counts. Moreover, most wood species are not suitable for dendrochronological dating, and so the dating of various layers in the site depends completely on the few oak pieces, which are under-represented in Edercloon, or radiocarbon dates that often span decades or centuries.

With these limitations in mind, the number of rings/ages and the size of the wood does give us a limited way forward (Illus. 7.11 and 7.12). The age distribution of the various species in general shows a wide spread of data. Though admittedly the numbers are relatively low, this picture is not

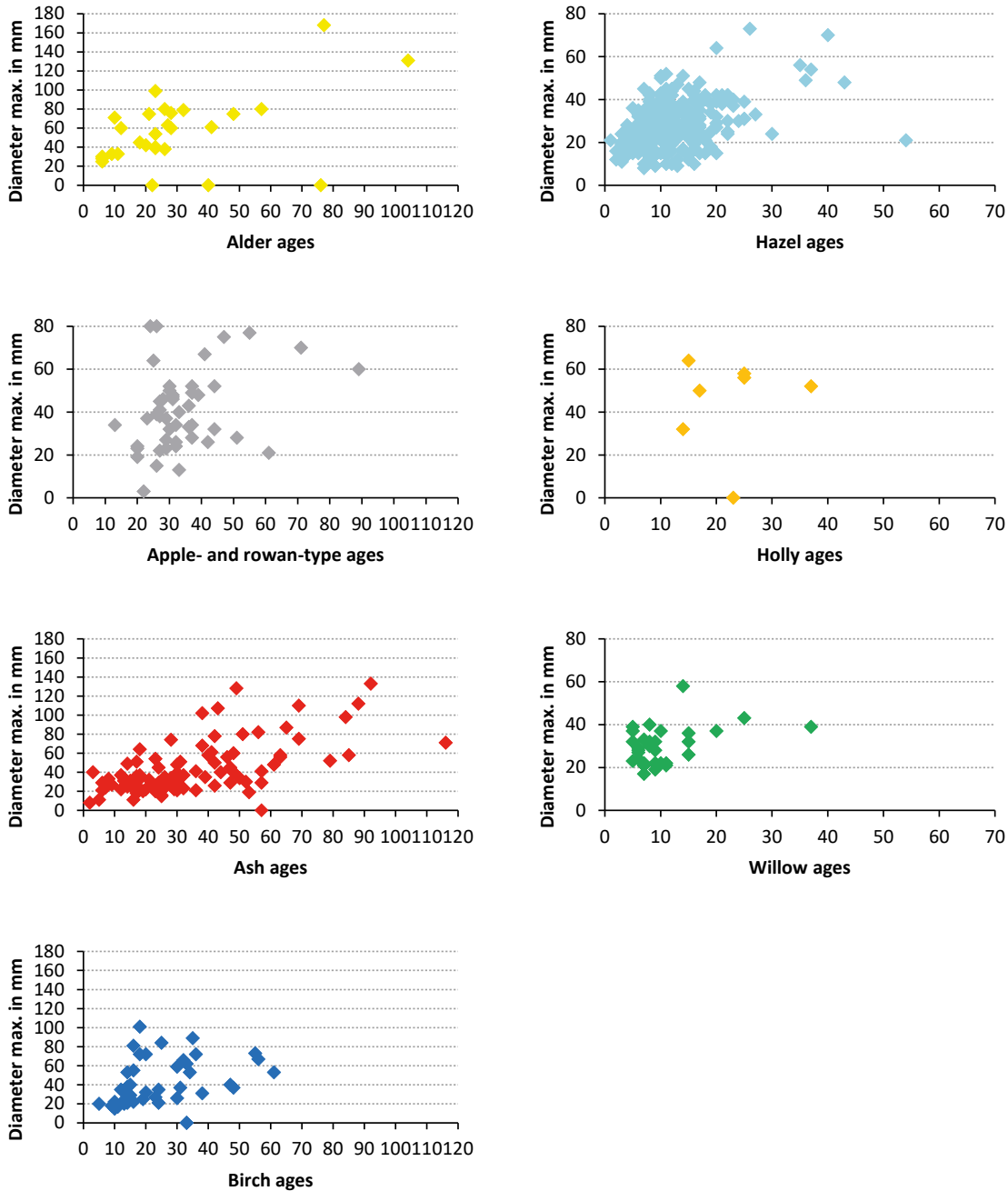


Illus. 7.11 EDC 12/13 frequency and ages of hazel, ash, willow and apple/rowan-type (Ingelise Stuijts).

suggestive of a managed woodland situation. The wide spread of data for ash, with several smaller peaks around 17, 25 and 30 years, may be suggestive of different harvesting periods. In contrast, the apple- and rowan-type seem to point to the collection of wood particularly between 20 and 40 years old, and the avoidance of younger pieces. Willow, on the other hand, was generally younger than 11 years though admittedly there are some outliers.

Most data from the site derived from hazel (Illus. 7.6 and 7.11). This shows consistent use of wood from a young age, less than 10 years and hardly any above 20 years. There are also peaks at 7/8, 11 and 16 years. These peaks might support a suggestion of various harvesting periods. The degraded hurdle in the north of EDC 12/13 was made of young hazel wood, with a preference for pieces of four to seven years and a few older sails between nine and 25 years. There were insect channels, some containing excrement, in the rods and it can therefore be suggested that this was a discarded hurdle dumped into the site.

Illustration 7.12 shows the ages of the various wood species in EDC 12/13 plotted against the maximum diameter. Alder and birch are of medium age, with a spread of sizes suggesting a natural woodland of medium age. The data for ash are widespread and include some old specimens. There is a clustering of data between 20 and 40 mm



Illus. 7.12 Age versus diameter for seven of the wood species from EDC 12/13 (Ingelise Stuijts).

representing brushwood, but it is difficult to discern a pattern otherwise. The apple- and rowan-type elements are also widespread, but younger pieces were avoided, while some older fragments point to the presence of mature trees. Willow, on the other hand, is more clustered to brushwood between 20 and 40 mm, and between 5 and 11 years, with four fragments more than 20 years old. This pattern does not suggest active management but rather harvesting of quite young wood probably growing close to EDC 12/13 in wet localities.

The majority of data is from hazel, which sees a spread of mostly young wood up to 30 years, with a handful of outliers. It is not tightly clustered as would be the case in a managed woodland situation, though in general the fact that the harvested wood was less than 30 years does suggest young woodland. If, as the archaeology and chronology suggest, EDC 12/13 was maintained and added to over centuries, then the hazel diagram could reflect the continuous use of hazel woodland in the area. This may have been harvested on a regular basis maybe every four to five years, assuming that production woodland—a woodland set aside specifically for the production of coppice wood, charcoal etc.—had a permanent location and was maintained by communal effort over multiple generations.

The excavation found that EDC 12/13 was built in several layers which may represent different periods of activity. The wood identifications were therefore separated according to these four layers. Remarkably, there were barely any differences between the layers. A minimal difference might be evident in Layer 1 where there was no elm, holly or oak and where birch was a minor component. This suggests the exploitation of woods that did not see many changes over time, or, alternatively, that the building phases were in fact not that far apart in time.

Late Bronze Age/Early Iron Age EDC 1b/29

Like EDC 12/13, the archaeological interpretation of togher EDC 1b/29 points to a multi-phased site which was added to over centuries. The track had four layers that may have been rebuilt on a regular basis, EDC 1b representing the top layer and EDC 29 the base. In addition, a distinct area (Feature 2) was identified at the western edge which consisted of an irregular dump of unworked brushwood overlain by five pieces of brushwood orientated east–west. Whereas the southern area was built of heavy wood that slumped into the wet underground, lighter brushwood dominated the northern part of the track.

The overall results of the lower layer, EDC 29, are remarkably similar to that of EDC 12/13 (Illus. 7.6). This contrasts with the wood from the upper layer, EDC 1b, which sees a much larger representation of birch and willow and less ash and hazel. The upper layer could thus represent a different (later) building phase, or, alternatively, the use of a different resource area. Therefore, the results of the wood identifications are further discussed separately.

The lower section of this togher is almost identical to EDC 12/13. This layer included some large and old pieces of alder wood. The wood was very soft, with many roots, and very discoloured. Bark was often absent. These observations suggest that local aerobic conditions existed to allow for partial degradation of the wood fragments and ingrowth of roots. The ages were between 60 and 80 years. The smaller alder wood

was young, mostly less than 25 years. A few holly brushwood fragments, partly worked, were less than 20 years old. Holly leaves were attached to some of these fragments.

In contrast to alder, most bark was preserved on the birch fragments. The wood was also soft and included many roots, again suggesting aerobic local conditions for some time. Some samples included mixed twigs of birch, willow and holly leaves, which may have been the result of preparing timbers on the spot.

The lower layer of the togher was dominated by hazel, which was generally less than 25 years old, with a few outliers. There is no indication for the use of managed wood though the picture seems mixed. A total of 335 pieces were identified from Feature 2, a distinct dump of wood off the western edge of the upper layers of EDC 1b. The assemblage of this dump is dominated by hazel (84%). The other major Edercloon wood species are all there but in small quantities. Birch and willow are the most common.

The upper layers (EDC 1b) show a completely different picture, dominated by birch that forms almost half of the assemblage, and a large percentage of willow (21%). A total of 462 fragments from this layer were identified. Here, hazel is unimportant (only 9%). Thus, it seems that these two aspects of the top layer represent different deposit episodes.

The age pattern of the Feature 2 hazel suggests the use of very young wood, with the majority two to four years old. Several wood fragments were identified as hazel rods; the picture from these rods does not deviate in essence from the other hazel fragments. This wood could very well have been harvested from managed wood on a short cycle of only a few years. The birch from Feature 2 was very similar in size, but in age varied between five and 30 years, suggesting harvesting of young thin brushwood.

The upper layers of the togher were dominated by birch, with a wide age span from three to 60 years, with a notable 22 pieces of 12 years. Though the majority were brushwood less than 20 mm, there are a considerable number of larger pieces. It is a mixed picture, with some pieces of fast growth indicative of light and open conditions. It could suggest that these layers represent two building episodes or that the wood was collected from different localities. Willow shows a similar irregular pattern of young wood between two and 18 years, and a few outliers. Most of the willow is young wood less than 20 years old. As with birch, most is of small size, with a particular component that is much more substantial. The willow data may equally suggest two building episodes or a different harvesting strategy. There are fewer data available for the apple- and rowan-type wood in the upper layers. The ages stretch from eight years to more than 45 years and smaller sizes were preferred.

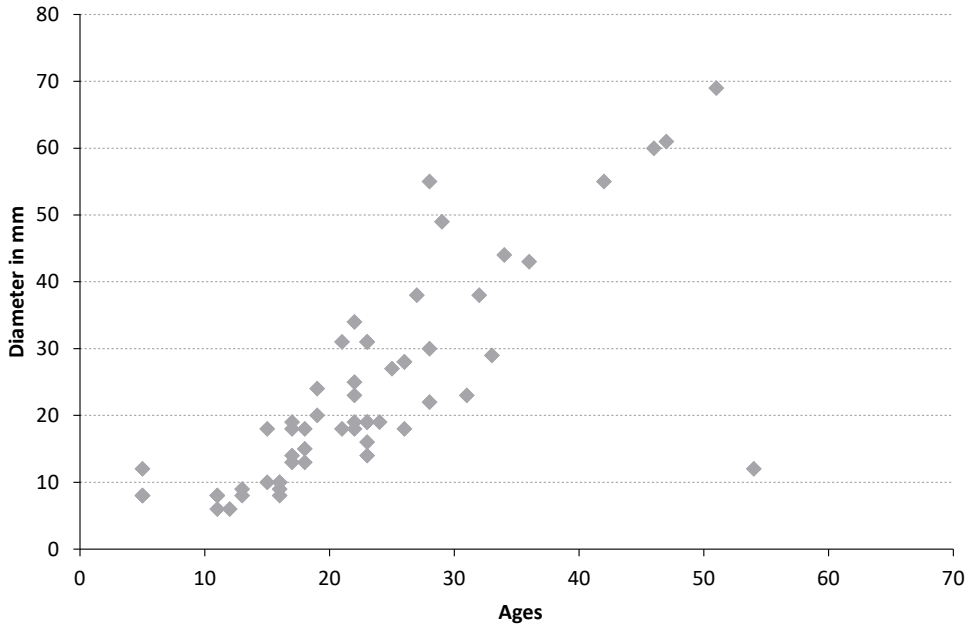
In summary, togher EDC 1b/29 seems to represent several building episodes. The lower layer (EDC 29) is very similar to EDC 12/13. The top layer (EDC 1b) deviates remarkably by the extensive use of birch and the separate deposit of mainly hazel from managed young wood in Feature 2. The distribution pattern of the age versus size may suggest either more building episodes or the use of different resources. In general, the wood is of young to medium age, with some apple/rowan-type fragments representing mature trees. A few oak pieces are more than 90 years old. The lower layers may have been exposed for some time, which would explain the root penetration and degradation of the wood.

Late Bronze Age/Early Iron Age EDC 1c

Platform EDC 1c was built with various timbers, roundwoods, brushwood and twigs. Almost 270 pieces of this structure were analysed with 11 wood species identified of which birch and combined apple/rowan-type wood were the most used (Illus. 7.6).

The condition of the birch wood was quite good, with bark mostly preserved intact. The elements consisted of gnarly brushwood and roundwoods with side branches still attached. This suggests that the birch was felled quite close to the site and was simply brought to the location and dumped without further preparation. Because the bark was so well preserved it also indicates that there was little movement over the wood as otherwise the branches would have been broken and the bark loosened. When the rings could be counted the pieces of birch varied between four and 53 years. A few younger pieces of brushwood between eight and nine years were also present but overall the birch component of EDC 1c seems to have derived from a very local source of a marginal quality and of no great age, maybe one or two generations.

Interestingly, the ash component of the site (45 fragments) also indicated a natural rather than managed origin. When the age of the elements is plotted against the diameter of the wood, a diverse picture emerges with a great spread of data. Many ash fragments were of medium age and size, a few over 100 years and between 100 and 200 mm in diameter. The wood was on average larger in size than the birch component of the site. This all suggests the ash was collected from a different location than the birch. It is highly possible that ash grew in a marginal situation where it stood for some 50 to 100 years. Bark was often absent and root penetration was evident, which would mean that (in contrast to birch), ash was exposed to the elements for



Illus. 7.13 EDC 1c age versus diameter of apple- and rowan-type (Ingelise Stuijts).

some time.

Though the apple- and rowan-type (61 fragments) had a similar age range as the birch, up to 54 years, the age versus diameter distribution is very different (Illus. 7.13). It suggests that birch grew at a different location from the apple- and rowan-type. As mentioned before, it is generally not possible to distinguish apple- and rowan-type on anatomical grounds; however, the colour, bark and semi-ring porousness evident in the Edercloon material made it possible to plausibly state that at least part of the material represents rowan-type wood. In EDC 1c the distribution pattern of the ages and sizes is an additional source of information to suggest that in this site, all the material might be the rowan-type wood.

There were no indications for managed hazel wood (only 29 identifications) being used in the platform. Willow (44 fragments), which prefers wet growing conditions, included pieces between four and 31 years. The data suggest the use of a natural resource. Similarly, the alder used in the site most likely had a marginal woodland growing situation, with a large age spread between 11 and 100 rings noted. The number of identifications is too small for much more speculation; however, the pieces of alder between 60 and 70 years suggest that it grew for more than two generations, like the ash. The elm fragments in contrast were very young and must have derived from the dryland.

Iron Age EDC 26

The last substantial togher of the Iron Age was EDC 26, which may have had earlier origins (see Chapter 4). Almost 500 wood identifications included 11 wood species, but hazel was by far the most used with almost 300 pieces identified (Illus. 7.6). Ten wooden artefacts were also found. In general, the condition of the wood was quite good, there were few indications of discolouration and it was tough to cut through. Bark was often present and only occasionally were roots present. This indicates that the wood in general was not exposed for a long period of time.

Several identifications (N = 118) were of the pegs used to keep the structure together. A mixture of species was used for this purpose, thus there was no specific selection. These included hazel, alder, ash, birch, apple/rowan-type, oak and willow. Most pegs were hazel of relatively young age, mostly six–eight years, with a few outliers between 16 and 29 years, and one of 36 years. Sizes varied between 20 and 40 mm, with outliers of 13 and 45 mm. This suggests the material was procured from woodland of relatively young age, which was felled irrespective of size, in short an origin in some form of coppice wood.

In contrast, the pegs of other wood species varied greatly in age, from seven to more than 100 years, with a great spread of ages. Thus, the wood for these pegs came from elsewhere and was taken from unmanaged woodland that might have included a range of species. Willow was less than 30 years old, but the oak pegs were more than 30 years and these two wood species most likely came from different locations as willow prefers wet growth conditions, whereas oak prefers drier situations.

EDC 26 also contained brushwood, of which 161 items were of hazel. The age pattern from the hazel brushwood deviates slightly from that of the pegs being between four and 23 years, with one outlier of 31 years. Interestingly, there is a similar lack in use of wood from 14 and 15 years old. The

hazel brushwood figure suggests an origin in a similar type of wood from which the pegs were taken though admittedly the pegs were more uniform in age.

Early medieval EDC 49

Togher EDC 49 was one of the few substantial sites of the early medieval period. Only 45 fragments were identified, mainly birch, but also alder, hazel, holly, apple-type, oak and willow (Illus. 7.6). Characteristic for this site was the general bad condition of the wood. It was quite degraded and fell apart upon handling. Therefore, it was not often possible to examine the number of rings, although it was always possible to identify the fragments to wood species, including an alder bowl (E3313:49:28).

The three hazel fragments were between 20 and 30 years old, were of fast growth and of medium size, between 40 and 54 mm in diameter. The four apple-type pieces varied between 30 and 40 years, though the exact number of rings could not be established. Two oak fragments were 18 and 42 years old, the latter was used as a peg. The hazel, apple-type and oak pieces were located in the northern part of the site and were heavily degraded. In contrast three holly pieces of 23, 35 and 38 years old and of good size, with diameters of 75 and 78 mm, were found in the southern part of the site and in much better condition. This might reflect the local site conditions determining the preservation of the wood. All the species mentioned could grow in dryland conditions. The environmental evidence from pollen and testate amoebae (Chapter 2) suggests drier local conditions at this period, with woodland regrowth. The observations on the wood fragments from EDC 49 support these suggestions. The wood analysis suggests a reasonable fast growth (i.e. fairly open situations with much light, but not a mature old wood, which would comprise trees of more than 80 or 100 years). The wood of EDC 49 is just a generation or so old, no more. Moreover, there is no evidence in the assemblage of wood from coppice woodland, but rather the harvesting of random wood growing locally close to the bog.

Birch was best represented throughout EDC 49; five fragments from the northern end were in bad condition whereas the remaining fragments were in better shape. The fragments from the northern end were all younger than 20 years. The other fragments were between 10 and 30 years. They represent young trees most likely felled quite close to EDC 49. As birch is a light-demanding tree, this could indicate that the area close to the site was quite open as well.

The wood used to build this trackway was taken from the immediate surroundings of the site (birch), with the northern end of the site supplemented with wood taken from somewhat drier and slightly older situations including hazel, apple-type and holly. Given the overall young age of the wood fragments, the woodland seems to have been fairly young.

Origin of the wood species

The wood species analysed in Edercloon show a predominant use of hazel. This species is ubiquitous in the palaeoenvironmental record of Ireland and is usually the most common wood species found in archaeological sites. At present it grows either as undergrowth in mixed oak woodlands, in areas set aside for coppicing and lining fields, or in shrubby lands. Hazel is uncommon in bog marginal areas and prefers slightly drier situations.

Much of the wood used in Edercloon is of rather slender diameter and young age, and often straight appearance, all characteristics not found in marginal woodland. Thus, most hazel wood used for building the Edercloon tracks was taken from the dryland.

The contorted artefacts made of hazel (see Chapter 6), which may represent parts of discarded walking sticks, are an indication, along with the finds of other domestic artefacts, of a well-organised society and landscape near to Edercloon. They also indirectly point to the presence of honeysuckle in hazel woods. Moreover, as discussed in Chapter 6, it strongly suggests that woodland was managed to produce fast grown, straight rods that could be used for multiple purposes. The woodland may have consisted of hazel only, but it is also possible that it grew as an understorey layer with larger trees, such as oak, as standards. The artefacts suggest a cycle of about seven years for the cutting of hazel rods. Thus, the society that built the tracks of Edercloon were managing local hazel woods on a regular basis, and these woods must have had a permanent location to be used over multiple generations.

Around a quarter or more of the wood samples were birch and apple-type including cf. rowan-type. These were often of similar age, between 20 and 40 rings generally, and most likely were growing in the bog marginal areas. It is a combination that has no modern parallels and must have formed a distinct environment. The fact that many of the wood elements were long and straight, almost rod-like in appearance, begs the question whether this indicates woodland that was felled a generation ago and regrew with vigour. In any case it produced wood that was very suitable and available for track building.

The ash was prominent in the later periods, and was often of considerable age and size. Yet the growth of most ash was rather slow and distorted, something that usually indicates growth in a closed forest. In Derryville Bog (Casparie 2005) mature mixed oak/ash trees were found in several areas on the bog margins, thriving on freshly exposed ground after local bog bursts. So, ash and oak can grow in marginal situations, and the pedunculate oak is particularly happy in such. There are thus two possible origins for the ash in Edercloon: local bog marginal woods or dryland. Ash has pioneering qualities, germinating in open conditions and it is worth considering whether the use of so much ash in later periods points to intermittent felling of the margins, leaving them alone afterwards for considerable periods. It is very likely that holly was also found in these woods.

Oak hardly features in Edercloon yet undoubtedly must have been growing locally. Maybe the local bog margins did not include much oak. Trees growing on the dryland may have been used for other purposes as it is a preferred building material. Willow and alder together amount to almost 20% of the wood assemblage in the later periods. These wetland trees no doubt had their place on the local margins, willow in places that were wetter. There was thus a mosaic of woodland on the fringes of Edercloon bog, providing most of the material for the trackways and platforms. The artefacts found during the excavations were all made of local wood; however, the wood here was clearly selected for a specific purpose and it is unlikely that crooked wood from the margins was used for these.

Conclusion

There are relatively few wood species in Ireland compared to the Continent. In wetland excavations from the last 20 years, even less wood species appear. This is no surprise, as wood was often selected for a specific purpose. In a bog this purpose is rather limited, namely to access or cross a wet area. Thus, the number of wood species encountered in such excavations, by their very nature will always be limited. The value of wood research lies beyond species identification, in the detailed examination of wood elements to elucidate the archaeological site situation as well as the nature of the woodlands surrounding these wet areas.

One of the most obvious aspects of the Edercloon sites was the quality of much of the preserved wood, with fresh colours, firmly attached bark and well-preserved toolmarks, as neat as if they were made yesterday. The colour and bark presence helped to support the identification of some wood as cf. *Sorbus*, probably rowan-type or *Sorbus aucuparia* as this is the most common wood species in Ireland. On wood anatomical grounds this is usually impossible. It indicates the presence of mixed rowan-type woodland on the margins of Edercloon. It is difficult to find a modern parallel for such a forest, hence it deserves more attention.

The presence of well-preserved bark and the fresh colours informs us that many tracks were not in use for a long period of time. When people walk over woody surfaces, they tend eventually to break, especially when the surface consists of brushwood or hurdles. If the local conditions are dry, bark will quickly loosen and fall off. In the case of prolonged dry periods where surfaces of the track are exposed to air, wood weathers quickly (the smaller fragments go first), decomposition sets in and paves the way for grassy plants, mosses and other small plants to use the wood as their food and foothold.

The longer a wooden road lies exposed, the more it is integrated in the surface vegetation and it gradually rots away. On the other hand, when the walking surface is very wet and almost below the water table, oxygen cannot access the wood and decomposition is halted. Degradation of wood on a cellular level is caused by various bacteria and fungi. Bacterial decomposition occurs mostly in waterlogged anaerobic situations. Fungal decomposition occurs in moist, but variable aerobic situations. In Edercloon, much of the wood showed dark discolouring in the outer layers, so much so that often the outermost rings were barely distinguishable. It is suggested that fungi, rather than bacteria, caused this discolouration, indicating wet, but not waterlogged, aerobic local conditions. Taken together, the absence of rootlets, the presence of bark and the general fresh appearance all points to wet local conditions. Many of these trackways, platforms and wood deposits were not used intensively or for a prolonged period. They were probably made in one single event and in use for just one or a few seasons. Several of the larger routeways, however, do appear to have been rebuilt/replenished over several centuries (see Chapter 8) but each episode may have been short lived.

The society that built the tracks of Edercloon, however, must have had a long-term presence and investment in the area. This is evidenced by the finds of the many wooden artefacts that point to a well-organised community with wheeled transport, various domestic activities, including the use of containers, hunting equipment, decorative and practical walking sticks, and dedicated areas for managing woodland for their daily needs.

CHAPTER 8

Discussion

by Caitríona Moore

Discussion

The excavations at Edercloon uncovered a large complex of trackways, platforms and smaller deposits of wood dating from the Neolithic to the early medieval period. While dense distributions of structures are not uncommon in Irish raised bogs (Raftery 1996; McDermott et al. 2002; Murray et al. 2002; Gowen & Ó Néill 2005, 1) such a proliferation of large sites in a small area is unusual. Some of the sites, in particular those of Neolithic and Early Bronze Age date, have strong parallels. In contrast the very large toghers are unusual in scale, structural design and longevity. The intricate network of Late Bronze Age and Iron Age structures is unique and suggests a different approach to the wetlands—they were not merely a barrier to be traversed. Apparent chronological discrepancies between stratigraphically entangled structures have raised questions of reuse and potential dismantling of old sites. The artefact assemblage is almost unrivalled in scale and is certainly unique in terms of its spatial and chronological distribution. Combined, these issues raise important questions about the Edercloon complex and the communities who built, maintained and used it for almost 5,000 years.

Site classification

The majority of the sites at Edercloon were linear trackways, clearly made to allow access into and movement through the bog. The classification and interpretation of smaller toghers, platforms and occasionally also deposits of archaeological wood is, however, less straightforward. Sites such as EDC 34 and EDC 9, being roughly square and well arranged, were easily classified as platforms. EDC 40 was not that dissimilar to these but being marginally less structured, possibly as a result of post-depositional movement or disturbance, was designated as archaeological wood. Short toghers such as EDC 18 could have functioned as platforms and the distinction between these two site types can at times be hard to make. The question for which we have no answer is whether people walked onto or across these sites? In many ways this is perhaps not overly important and it is quite possible that sites at Edercloon, both large and small, had multiple functions (see below). It is, however, pertinent that the excavation of small sites has not always been conclusive with regard to their function. Small deposits of archaeological wood are the most numerous site type in Ireland's raised bogs (McDermott 2007, 24; van de Noort et al. 2013, 29–30), yet are probably the least understood. These sites vary from a single piece of worked wood to larger unstructured deposits. While some of those at Edercloon may represent material scattered during the construction of larger sites, or the remains of dispersed and disturbed structures, their proliferation in

bogs throughout Ireland indicates that these sites do exist in their own right and indicate frequent, low-level activity and repeated human presence in the peatlands.

Trackway building at Edercloon: structure or chaos?

Publications on excavations of a similar nature and scale to Edercloon have addressed in detail the typical trackway types that occur in raised bogs in Ireland and beyond (Casparie 1987; Raftery 1996, 197–230; Cross May et al. 2005d, 209–83). While massive corduroy roads are relatively rare, large toghers are always well built, highly structured and often incorporate a large number of planks and timbers. The largest toghers at Edercloon—EDC 5, EDC 1b/29, EDC 12/13 and EDC 26—had clear orientations and (less so regarding EDC 1b/29) well-defined limits, but were internally chaotic. Within all of these sites were well-structured sections with clear layers representing specific construction episodes, but for the most part they consisted of haphazard and dense deposits of wood (Illus. 8.1). During the excavation of these toghers, the designation of structural layers was often somewhat arbitrary and divisions were made based on the practical requirements of excavation and recording. The difficulty in disentangling the structural sequences was compounded by a tendency in almost all of the sites for a large number of elements to be set at shallow angles, obscuring their true chronological position within the togher.

While environmental factors are likely to have played a part in determining the manner in which these sites were built and indeed survived, the deep stratigraphy of EDC 12/13 and EDC 1b/29 was clearly the result of repeated rebuilding and deposition of wood over several centuries. This may also have been the case for EDC 26. In contrast, EDC 5 does not appear to have had the same longevity and it seems that deep structure was integral to its intended design. The only real parallels for such great depth of construction are a small group of medieval toghers all of which had very clear and distinctive phases of construction (see discussion in Chapter 4). Very deep stratigraphy has, however, been identified previously in Curraghalassa and Roscore Bogs, Co. Offaly (McDermott 2001, 15; Bermingham 2001, 41–2). In both locations successive horizons of archaeological material were identified and recorded in the sections of Bord na Móna drains. These were interpreted as individual sites with chronologies spanning up to 1,000 years, but being unexcavated they are not fully understood. In Britain, trackways and platforms with deep stratigraphy were excavated at the Bell-Baker complex in the Somerset Levels and again the dating sequence indicated activity over at least a millennium (Coles & Coles 1986, 81). Perhaps significantly, the Bell-Baker complex appears to have comprised several converging trackways and a platform, possibly providing a structural parallel for the similarly designed sites in Edercloon.

An alternative possibility, which may explain the great depth of stratigraphy encountered in the Edercloon toghers, is that they were designed as boundaries, which does not exclude their use as pathways. As boundaries they may not have been defensive, but rather could have served to delineate a particular territory or geographical area. One aspect of the Edercloon toghers that may have resonance

Illus. 8.1 The well defined but internally haphazard togher EDC 26 (CRDS Ltd).

with this is the high level of object inclusion encountered. Recent research into the location of Irish bog bodies and other artefacts suggests that deposition on townland boundaries and in particular those in wetland locations such bogs, lakes and rivers, was a highly structured activity in the Early Iron Age (Kelly 2006, 26–30; see also below).

Shorter and/or smaller toghers at Edercloon were of much simpler construction and EDC 36 and EDC 45, in particular, have very clear parallels. Both of these sites were built to a distinct structural model, identical in form and date to two sites of County Longford's Mountdillon Bogs (see discussion in Chapter 3).

A somewhat unusual feature of the Edercloon toghers at every scale was the paucity of split timber used in their construction. From an excavation which produced over 7,000 pieces of worked wood only 256 split timbers were recovered. A great many of these measured less than 1 m in length and the vast majority had no further woodworking evidence other than having been roughly cleft from the primary trunks or branches. While timber is not always used in smaller toghers and platforms, it is often a primary component of large toghers. Why the opposite is the case at Edercloon is unclear as both pollen and wood studies have indicated local mature woodland with oak and ash suitable for timber production (Chapters 2 and 7).

Twists, turns and destinations

The manner in which the toghers of Edercloon frequently twisted, turned and also converged is almost without comparison, the only excavated parallels (see Chapter 4) being on a much smaller scale. Relatively modern rural, tertiary roads in Ireland frequently follow winding routes in order to avoid and/or respect natural and manmade topography. Environmental evidence from Edercloon suggests that areas of open water on the bog may have influenced the location and the alignment of at least some of the sites. Thus, this unusual feature of some of the toghers may simply reflect responses to local ground conditions.

While environmental factors may account for some of the unusual changes in orientation, the sharp turn in EDC 26 (see Illus. 4.12 and 4.21) appears to have had an additional motivation. Turning west at its north-east end, the lower layers of this togher clearly joined with EDC 31, itself linked to EDC 1b/29. It has been suggested previously (see Chapter 4) that the points at which toghers at Edercloon converged may have functioned as platforms (see below).

The continual north–south orientation of toghers at Edercloon is one of the most intriguing and least well-understood aspects of the complex. The excavation area occupied a relatively narrow point in the wider bog complex with dryland located approximately 50 m to the east (Bermingham 2008b, 12). Very few sites, however, appeared to take advantage of this and of the 24 excavated toghers, 13 ran in a north–south or north-east–south-west direction. These were built at every scale and dated from the Neolithic to the early medieval period. This indicates that despite the clear peak of activity during the Late Bronze Age and Iron Age, there was a persistent direction of movement by people over four millennia on Edercloon bog. As stated above, previous excavations, particularly those of large toghers, have demonstrated that these sites were usually built to traverse bogs, very often running

from dryland to dryland. Smaller structures are, however, commonly seen to provide entry and access into and through the wetlands (Raftery 1996, 197; Cross May et al. 2005c, 353–4; McDermott 2007, 24).

The ultimate destination(s) of the large toghers at Edercloon remains unknown and there are few parallels for sites of this scale with no apparent relationship to dryland. At Clonad Bog, Co. Offaly (Irish Archaeological Wetland Unit 2002e, 2; Corcoran 2004), a large Late Bronze Age plank togher originated on dryland, crossed the expanse of the bog and terminated at a sub-peat gravel ridge in its centre. No features of this nature have been identified in the vicinity of Edercloon (Bermingham 2008b, 6), making the dominant north–south orientation of the sites all the more curious and poorly understood.

Chronological complexity

The construction of toghers and platforms at Edercloon began almost 6,000 years ago and continued for over four millennia (Illus. 1.8). During the centuries of the Neolithic and Early Bronze Age there were only occasional advances into the wetlands, with sites built every few hundred years, most probably seeking to access and use the still developing fen. This was followed by approximately 500 years of seemingly total inactivity during which Edercloon bog was relatively dry but evidence of humans is absent. By the end of the Middle Bronze Age, when conditions on the bog had become wetter, people began to construct very large toghers. These sites mark the start of the most intensive period of building at Edercloon which continued well into the Iron Age and corresponded with a swing towards drier conditions. Characterised by unusually large, interconnected toghers, this is possibly the most interesting yet complex period of activity at Edercloon. Intricate stratigraphic relationships between structures and conflicting dating evidence suggest that old wood or perhaps earlier sites were used and reused in trackway construction. Currently, while the exact chronological sequence of site construction during the Late Bronze Age and Iron Age is somewhat distorted, it is clear that at this time Edercloon was a very important focal point in the local landscape.

The final episode of construction evident at Edercloon was during the early medieval period. That such few sites of this era were encountered may be due in part to post-medieval and later reclamation, drainage and turf cutting. The recovery of several post-medieval leather shoes and fragments of modern ceramics and glass indicate the continued, albeit much later, presence of humans in the wetlands.

Society and community

Trackways and platforms are a common archaeological site type in the raised bogs of Ireland and Western Europe. As such, the discovery of the Edercloon complex, in a county already noted for its significant wetland archaeological heritage, is not overly surprising. The results of the excavation have, however, raised interesting questions regarding the people who built these sites and what encouraged, in some periods at least, such intensive and unusual activity and use of the bog.

The landscape surrounding Edercloon is not densely populated with known archaeological sites and, with the exception of a number of undated enclosures to

the south, there is little evidence of past settlement. The discovery, however, of these 44 structures with a chronological span over 4,000 years indicates a human presence in the area and the likelihood of unknown settlements in the vicinity of Edercloon bog. The pollen record suggests that these may have been located at some remove from the bog, rather than within its immediate locale.

During the Late Bronze Age and Iron Age, Edercloon became the focus of what appears to have been a long-lived community with a distinct togher-building tradition and a clear, continual need and desire for access into and throughout the bog. Characterised by very large sites and a high level of object deposition for which few parallels exist, the period raises the question of who these people were. While the earlier sites of EDC 36 and EDC 45 suggest regional contact or movement, the unique qualities of the Late Bronze Age and Iron Age activity suggest local customs and perhaps an insular community with distinct traditions.

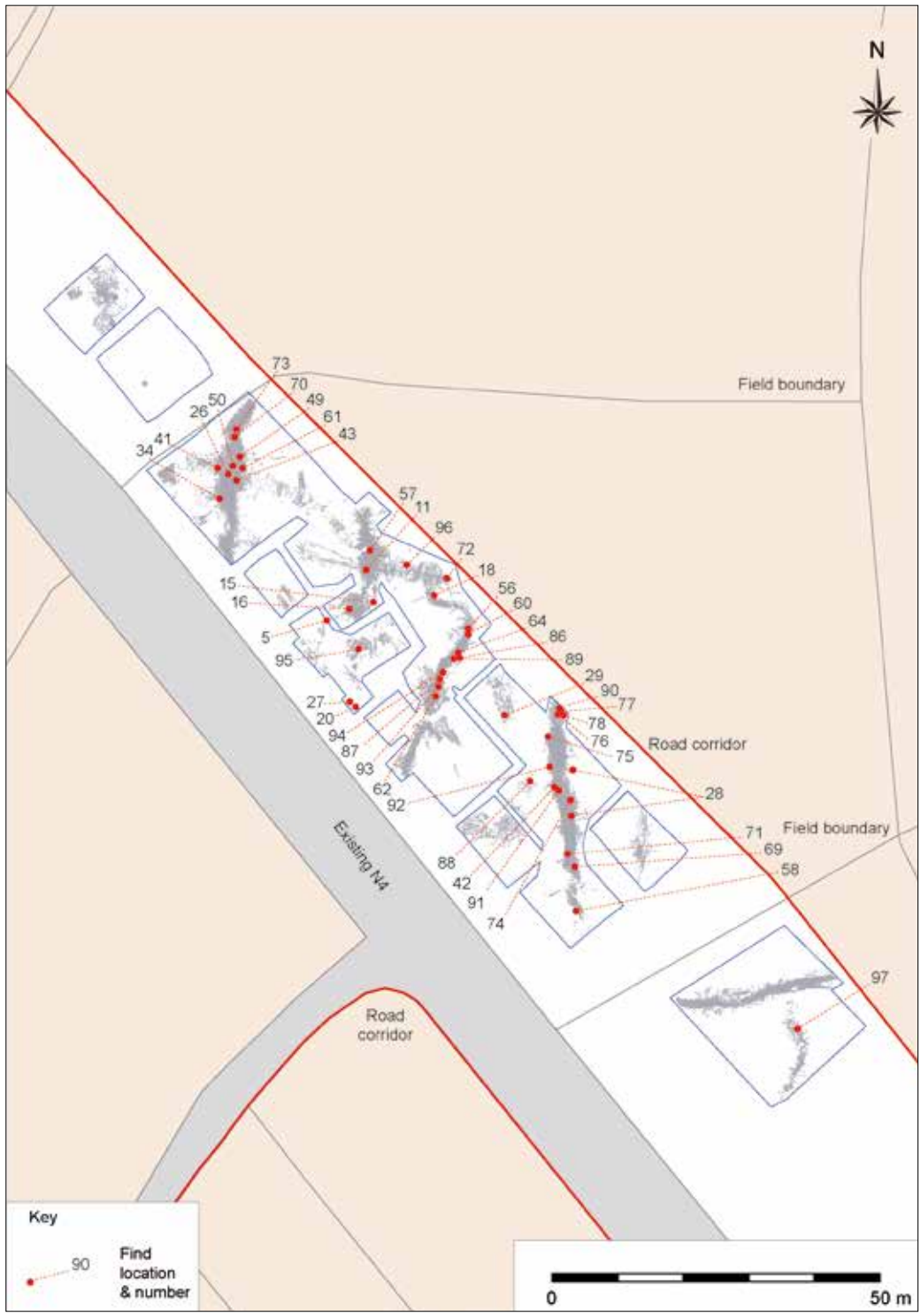
Although no site at Edercloon was on the scale of the massive Corlea 1 (Raftery 1996), many toghers were of a scale indicative of considerable effort, which likely involved a community of people with a common goal. Consequently, it can be inferred that during several millennia the wider area surrounding Edercloon bog was home to communities who organised the building of these toghers and platforms. This is, of course, particularly pertinent for the centuries of the Late Bronze Age and Iron Age when sites such as EDC 12/13 and EDC 1b/29 were episodically rebuilt and maintained, with knowledge and tradition passed from generation to generation.

Artefact deposition at Edercloon

One of the most significant and extraordinary aspects of the Edercloon complex was the recovery of 46 wooden objects, all but one of which were found buried within structures. Over the years Irish bogs have yielded a very high number of artefacts (Halpin 1984); however, they are rarely found in association with structures (Raftery 2003, 206) and are only occasionally recovered by archaeologists (Stanley 2003, 63). This is generally accepted as being due to the fact that toghers and platforms in bogs are by their very nature transient sites and so do not yield high numbers of artefacts, such as might be found on settlements or within burials. The recovery of artefacts from toghers and platforms is not, however, without parallel and almost all campaigns of work in peatlands, whether survey or excavation, have yielded objects from within sites and in isolation (Raftery 2003, 206; Moore et al. 2003, 129–33; Buckley et al. 2005, 311–19; Whitaker 2006a, 13–23). Excavations in several raised bogs particularly Mountdillon, Derryville, Annaholty and Cloonshannagh (Raftery 1996, 231–62; Buckley et al. 2005, 311–20; Taylor 2008; 2010; 2012; Moore 2017, 47–55), have all yielded wooden objects with parallels in the Edercloon assemblage.

Artefact chronology

The vast majority of the 46 artefacts recovered at Edercloon were found within sites of the Late Bronze Age or Iron Age (Illus. 8.2). Furthermore, 31 of these objects were recovered from the largest toghers EDC 5, EDC 12/13 and EDC 26. EDC 5 and the lowest layers of EDC 12/13 date to the end of the Middle Bronze Age or start of



Illus. 8.2 Distibution of artefacts at Edercloon (CRDS Ltd).

the Late Bronze Age. Although the EDC 12/13 assemblage is sizeable, most of it was found in the upper, later levels of the site and only two possible tools or handles (E3313:12/13:70 and 73) appear to have been deposited during its early years of existence. Thus, the distinctive tradition of artefact inclusion at Edercloon can be seen to begin with EDC 5 when a variety of objects were buried within the basal layer of this large togher.

EDC 12/13 appears to have been continually or frequently rebuilt and reused throughout the centuries of the Late Bronze Age and Iron Age. It was during these latter years that the majority of the artefacts were included in the site and while definitive dates for individual objects are unknown, the EDC 12/13 assemblage is believed to be predominantly of Late Bronze Age/Iron Age date. That the dates of these artefacts cannot be more closely defined is in part due to the broad span of the radiocarbon dates returned from this level of the site. Issues of dating, however, are compounded by the fact that many of the finds have either no strong parallels, or parallels from several periods of the past, making typological dating difficult.

Broadly contemporary with the phase of artefact deposition in EDC 12/13, was the construction of EDC 1b/29, also a togher with periodical rebuilding and reuse. EDC 1b/29 contained only two objects, one well buried within the base, the second in the upper layer. Its lowest levels may, however, have been associated with EDC 20, a small platform that also contained two artefacts. The objects from EDC 20 and that from the base of EDC 1b/29 are believed to be of Late Bronze Age date. EDC 26, the uppermost layer of which has been dated to the Iron Age, was a substantial and deep structure and may also have had a wide chronological span with Late Bronze Age origins. Ten objects recovered from the togher were found in all three layers and may have been deposited over several centuries.

The large toghers of Edercloon were not the only sites that contained artefacts; smaller structures, several probably contemporary with the larger sites, also contained objects.

Following the Iron Age there was a period of inactivity at Edercloon to which no sites have been dated. The construction of EDC 49 and EDC 30 in the early medieval period signified a resurgence in human activity on the bog, the continued practice of artefact inclusion, and the potential redeposition of old objects.

The scale and quality of the Edercloon assemblage are outstanding and the recovery of so many wooden artefacts from such a geographically small area and relatively few sites is remarkable. Although no individual objects were scientifically dated, approximate dates for most can be inferred from the associated site dating. The discovery of the EDC 5 block wheel portion (E3313:5:69; Illus. 8.3) has demonstrated the use of the wheel in Ireland some 600 years earlier than previously known (Moore & Chiriotti 2010). Prehistoric wheels are few in Ireland and the date of this find, while extremely significant, is perhaps not overly surprising. Toghers suitable for wheeled vehicles have been recorded in several locations in the country and date from the Neolithic through to the medieval period (Raftery 1996; McDermott 1995, 59–66; Irish Archaeological Wetland Unit 2002e, 3; Murray et al. 2002, 16–17). The partial remains of two vessels (E3313:5:71 and E3313:20:15) of the same style were recovered from EDC 5 and EDC 20. Two-piece containers of this type have many parallels and their evolution and form

Illus. 8.3 The alder block wheel portion (E3313:5:69) being lifted from the base of togher EDC 5 (CRDS Ltd).

have been the subject of extensive research (Earwood 1993; 1997). Issues of chronology have also been raised by the small number of early medieval artefacts from Edercloon, in particular the bowl (E3313:49:28) and wheel rim fragment (E3313:49:42) from EDC 49. The former is of a type dated to the centuries preceding the construction of the site, suggesting that either the form was in existence for a long period in the locality, or that it was an old object at the time of deposition. Either suggestion may also be made with regard to the wheel rim, the only parallel for which, from EDC 12/13, dates from a site almost 1,000 years earlier. Even allowing for the fact that wooden objects are a relatively rare occurrence in archaeological contexts, it is still remarkable that the Edercloon assemblage has produced such chronologically significant results.

Were the artefacts used?

While many of the Edercloon artefacts are heavily fragmented, much of this appears to be the result of post-depositional factors and only a small number were clearly deposited in several pieces. Whether these objects were deliberately broken is uncertain but it remains a possibility. Evidence of damage and/or use in antiquity varies amongst the assemblage and although several objects appear never to have been used others have clear indications of wear. Broken edges and missing pieces indicate that almost half of the artefacts are incomplete (Illus. 8.4). Eight

Illus. 8.4 Part of a carved alder bowl (E3313:26:18) being excavated from the Iron Age togher EDC 26 (CRDS Ltd).

of the nine wooden vessels are incomplete and at least two show definite signs of use such as charring or heavy wear. All except one were found within structures and the single exception (bowl E3313:5) was the only artefact to be recovered in isolation at Edercloon. Part of a tub (E3313:12/13:34) from EDC 12/13 had very well-preserved toolmarks on the exterior and, combined with an apparent lack of a mechanism with which to secure a base, might indicate that this vessel was unfinished. The five recovered tool handles include one or possibly two which appear to be unfinished (E3313:19:41 and E3313:12/13:63) and three (E3313:26:86, E3313:12/13:70 and E3313:12/13:73) which are incomplete but show little evidence of use or abrasion prior to deposition. Of the three recovered spears (E3313:26:56, 60 and 89), two were broken before inclusion in the togher, but were deposited in their entirety and have no obvious signs of use. The third is incomplete and while showing little evidence of use was degraded due to exposure, at least some of which is believed to have occurred in antiquity. Portions of three wheels were recovered from three separate sites. Wheel rim fragments E3313:12/13:50 and E3313:49:42 are broken and incomplete but have unequivocal evidence of use in the form of gravel deeply embedded within the wood. The block wheel fragment (E3313:5:69) is unfinished and therefore unused.

Withies, or the remains thereof, were found within three separate sites. Extremely fragmentary and fragile they cannot truly be assessed for evidence of use or wear. Their presence within the structures may be evidence of their having been used in preparations for site construction. The same could be argued for the two mallets recovered from EDC 26, both of which were complete, although neither displayed any evidence of use. The remaining 20 artefacts include several possible cart or vehicle pieces, possible walking sticks and decorative staff fragments, and a small number of objects to which no definite function can currently be assigned. The latter include several pieces of dressed brushwood and a piece of worked brushwood around which a strand of grass or rushes was firmly looped and tied in a knot. Despite being of ambiguous function, broken ends and worn surfaces attest that some of these artefacts, though incomplete, were subject to some form of use or wear in antiquity. Conversely, a small number are complete but appear to be unused. The issue of whether or not the Edercloon artefacts were complete and/or used is crucial to the interpretation and understanding of object inclusion at the site (see below).

Patterns of deposition: artefact types

The 46 objects in the Edercloon artefact assemblage have been categorised, insofar as possible, as to their type and function. While clear patterns of spatial distribution have been recognised at the site (see below), the same does not really apply to the deposition of particular artefact types. The wide variety of objects recovered was, for the most part, distributed throughout the complex in both space and time. An exception to this appears to be the almost exclusive deposition of tool handles or hafts in EDC 12/13. These were recovered from all levels of the togher and, while in close physical proximity, were deposited over almost a millennium. To a somewhat lesser extent, the inclusion of spears and mallets within EDC 26 may also be indicative of the selection of particular objects for inclusion within this site.

Conversely, the nine wooden vessels in the assemblage were found at seven locations and within six sites, deposited over a broad chronological span and distributed throughout the complex. Like these vessels, the inclusion of wheel parts transcended physical and chronological boundaries, with three examples of varying type and vastly differing date recovered from within three separate structures. Similarly, the trained hazel brushwood fragments were deposited several centuries apart, but only in EDC 5 and EDC 26. In general, the scale and variety of the assemblage is such that a wide range of objects was deposited in a relatively small number of sites. Indeed, to attempt to categorise the assemblage or isolate particular artefact types in this manner can oversimplify the picture, and the best opportunity for really understanding this assemblage is to treat it as a group.

Patterns of deposition: spatial distribution

Without doubt the spatial distribution of the artefacts (Illus. 8.2) at Edercloon is one of the most striking aspects of the assemblage and was particularly pertinent regarding the largest toghers EDC 5, EDC 26 and EDC 12/13. EDC 5 was the first site in which objects were clearly quite deliberately deposited and had within its base artefacts placed at an average interval of 1–1.5 m. A

slight deviation from this was seen at the northern end of the site where a cluster of objects, three of which were twisted hazel fragments, were deposited in very close proximity.

North of EDC 5, the distribution of artefacts in EDC 26 was more diverse and variations between the layers were apparent. All the objects deposited in the basal layer of EDC 26 were laid in close proximity in the middle and NNE end of the site, just before it turned sharply west. In contrast, artefacts within the middle layer were confined to the central part of the togher and again were laid in very close proximity to each other. Within the uppermost layer, however, two objects were set quite far apart, one occurring in the distinctive S-bend, close to the convergence of EDC 26 and EDC 31, and the other in the central part of the site.

It is noticeable that all the EDC 26 artefacts were concentrated towards the middle and NNE end of the togher, as it approached the junction with EDC 31 and subsequently EDC 1b/29. The latter did not produce a high number of artefacts but those that were recovered were laid within its centremost area where it converged with several other sites. Analysis of insect remains from the junction of EDC 26 and EDC 31 has identified a dominance of vegetation-rich pool species (Reilly 2008a, 23–4), suggesting open water in the vicinity. This may account for the unusual orientation and dramatic turn in EDC 26, but equally may have been the focus of artefact deposition in this particular area, and finds from EDC 20, EDC 1b/29, EDC 31 and EDC 26 (and possibly also EDC 7 and bowl E3313:5) may have been intentionally deposited around the edges of a pool.

The spatial distribution of artefacts in EDC 12/13 shows a marked concentration of objects in the central part of the site, close to where it merged with EDC 19 and possibly also EDC 10. All the finds from EDC 12/13 and/or EDC 19 were deposited in this area, but throughout all of the layers. These large toghers displayed very clear evidence of deliberate and regular artefact deposition, particularly within areas of convergence, or, as in the case of EDC 5, throughout the entire structure. The identification of distribution patterns is not applicable for smaller sites with fewer artefacts. Inclusion of artefacts within such sites, many of which were contemporary with the large toghers, does, however, indicate that this practice was integral to the use of Edercloon bog at every apparent level and scale.

Artefact deposition at Edercloon: interpretation and meaning

The deposition of thousands of artefacts in Ireland's raised bogs has been well documented (Halpin 1984; Feehan & O'Donovan 1996, 449–70; Raftery 2003, 206–8). However, the association of these objects with structures is far less common than their occurrence in isolation (Raftery 2003, 206). An example of just how great this disparity is may be seen in an examination of Halpin's (1984) catalogue, which lists c. 1,300 objects found in bogs, only 10 of which are clearly indicated to have been recovered from structures within peatlands. Archaeological surveys and excavations of the past 30 years have produced a relatively small number of associated finds (Raftery 2003, 206; Buckley et al. 2005, 311–19; Whitaker & OCarroll 2009, 119–23; van de Noort et al. 2013, 43; Coughlan & Whitaker 2019, 64). Thus, while there exist many individual objects with which the Edercloon assemblage may be compared, in terms of the pattern of

deposition it has very few parallels.

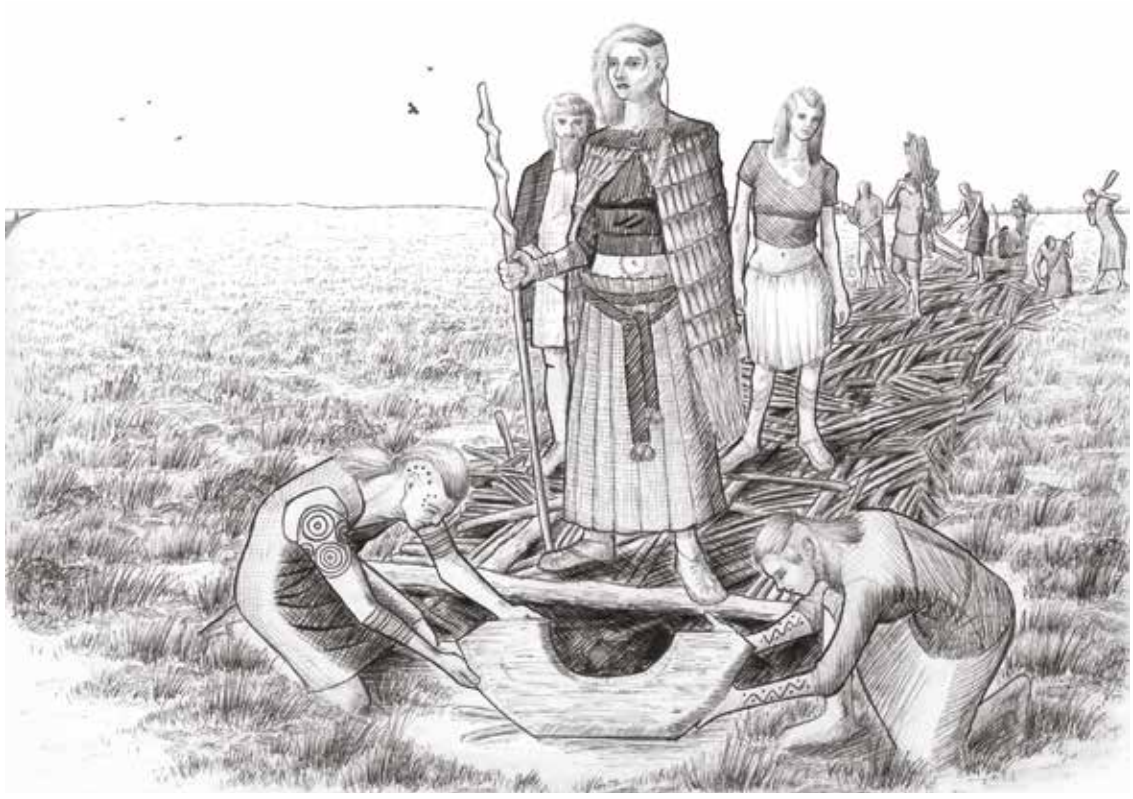
The inclusion of objects in toghers has traditionally been interpreted as discard of useless or broken items (Raftery 1996, 204; Moore et al. 2003, 132) or of ambiguous deposition (Cross May et al. 2005c, 352). In Britain, artefacts from the Somerset Levels trackways have been interpreted as both the result of loss and as votive offerings (Coles & Coles 1986, 57–9). The latter assemblage was, however, Neolithic and included 'high status' items such as imported axes (ibid., 57) which stands in contrast to the wooden and, in some ways, more prosaic assemblage from Edercloon. Interestingly, in a discussion of ritual artefact deposition at Flag Fen, no reference is made to the assemblage of wooden artefacts from the site (Pryor 2001, 427–8). In mainland Europe, ritual has been ascribed to many finds, including the prosaic, from bogs of the Netherlands (van der Waals 1964, 108–9; van der Sanden 1999, 223–4; 2001). Thus, it would appear that the deposition of artefacts at Edercloon was not only a highly structured activity, but one for which there are few parallels in the archaeological record.

Artefact deposition in wetlands, in both Ireland and beyond, has long been recognised by archaeologists as having played a significant role in the lives of past societies (Bradley 1990; Coles & Coles 1989, 173–97; Cooney & Grogan 1994; van der Sanden 2001; van de Noort & O'Sullivan 2006). Much of this evidence, comprising as it does high status material of bronze, gold and copper (Bourke 2001), has been interpreted as ritual, votive deposition. Somewhat more prosaic finds of wood and stone have, however, been identified by some archaeologists as also being ritual deposits (Cooney & Grogan 1994, 71–2; Larsson 2001; Kelly 2006; Becker 2008).

The interpretation of such deposition is commonly that of offerings to gods and spirits, a practice well referenced in Classical literature (Bradley 1990; Raftery 1994, 182–5; Bourke 2001; Becker 2008, 12). The selection of wet places for what was clearly an important part of ritual life, is suggested to have been made due to the presence of water and its life-giving, generative properties (Larsson 2001, 169), but equally may have sometimes been due to its dangerous, uncontrollable nature (Kilfeather 2003). Furthermore, wetland locations—whether rivers, lakes or bogs—form natural boundaries in the landscape and may be regarded as marginal and therefore liminal places (van de Noort & O'Sullivan 2006, 55–7; O'Sullivan 2007, 183). Such locations, and particularly the edges of wet and dry land, have been suggested to have signified in the prehistoric past, the boundaries between different worlds or life and death, and to have been the intentional location of ritual foci (Evans & Hodder 1987, 191; Kelly 2006).

The labelling of such places as marginal or liminal is not, however, to suggest that they were totally isolated locations where secluded or private activities took place and it has been demonstrated that sites where votive deposition occurred were often crossing points (van de Noort & O'Sullivan 2006, 58; Yates & Bradley 2010, 410–13).

The Edercloon complex on the very edge of a large raised bog system was certainly in a physically marginal location and while the many trackways and platforms undoubtedly served as practical routes into and through the bog, the deliberate deposition of such a high number of artefacts indicates that they perhaps held a dual role as ritual structures (Illus. 8.5). As has been suggested earlier, patterns of converging, merging and turning toghers in Edercloon may indicate the



Illus. 8.5 A reconstruction of the block wheel fragment (E3313:5:69) being deposited within the base of togher EDC 5 (JG O'Donoghue).

significance of certain locations within the complex and the use of these by separate groups travelling in different directions. The likely dual function of the Edercloon structures suggests that the boundary or division between ritual and practical was not necessarily very clear. Furthermore, Brück (1999a, 153) has suggested that the practice of rubbish disposal along the boundaries and edges of settlements, may have in part been to draw attention to the transitional nature and significance of such places. This theory could be applied to the Edercloon material, and indeed to several of the other trackway assemblages, already interpreted as refuse and which are discussed above.

That the Edercloon artefact assemblage is apparently so unusual within the archaeological record may in part be due to the location of the complex in a liminal zone. Archaeologists have rarely had the chance to examine such locations (McDermott 2001, 19; 2007, 23–4), a fact which has been offered as an explanation for the lack of archaeological recovery of exotic and more traditionally votive finds. Much of the excavation at Derryville, Co. Tipperary, was, however, centred on structures within the bog margins but produced little ritual evidence (Cross May et al. 2005c, 351–3).

Two noted and documented aspects of wetland deposition, which may have some resonance with the Edercloon assemblage, are the practices of pinning down and deliberately breaking objects. Many of the Edercloon artefacts were located deep in

Illus. 8.6 The notched ash timber (E3313:1b/29:57) *in situ,* well hidden in the base of togher EDC 1b/29 (CRDS Ltd).

Illus. 8.7 The tapered and dressed hazel rod (E3313:12/13:43) within togher EDC 12/13 (CRDS Ltd).

the lowest layers, seemingly concealed and secured within the structures, and were so similar to the surrounding matrix of brushwood and roundwoods that their recognition was not always immediate (Illus. 8.6 and 8.7). While this may in part be attributed to the physical nature of some objects, it may also have been intentional. Such practice has been identified in more clearly ritual deposits such as staked down bog bodies in Ireland and mainland Europe (Ó Floinn 1988, 96; van der Sanden 1996, 97–100; Kelly 2012, 9) and anthropomorphic wooden figures uncovered in the bogs of east County Offaly (Corcoran 2003, 12–13; Stanley 2007, 183–90; 2012, 37). Perhaps less inherently ritual, it may also have been an aspect of the deposition of a large Iron Age vessel in Toar Bog, Co. Westmeath (Moore et al. 2003, 134–6; van de Noort & O'Sullivan 2006, 105–7).

The deliberate breaking of objects prior to deposition has been identified by archaeologists as an intentional ritual act (Bradley 1990; Brück 1999b, 332; Pryor 2001, 427) and while it cannot be unequivocally identified within the Edercloon assemblage, it may explain the occurrence of broken or incomplete, yet seemingly unused objects. The two spears from EDC 26 and the extensively worked and pointed wooden object from EDC 20 were all highly finished but clearly broken prior to deposition. These are probably the best candidates for the deliberate breaking of objects at Edercloon, although some of the other finds may also

have been subject to this process.

A further aspect of wetland depositional practices that may have resonance with Edercloon is the retrieval of objects from earlier sites and redeposition in later structures. This has been proposed by Becker (2008) as having played an integral part in the votive deposition of Bronze Age gold. As discussed above, the dating anomalies encountered in several sites might suggest that later prehistoric communities at Edercloon were exploiting material of up to several hundred years old for use within sites. At least two of the excavated structures, EDC 7 and EDC 10, appeared to have had material removed in antiquity, and given the additional evidence of inter-generational and long lasting traditions, it is perhaps likely that locations of earlier structures were known and made use of. Moreover, redeposition could account for the seemingly anachronistic artefacts recovered from EDC 29 and EDC 49.

Although wetland ritual deposition was undoubtedly practised by prehistoric societies (Bradley 1990; Bourke 2001), it did persist into the early medieval period, often Christianised such as, for example, the 'rebranding' of springs as holy wells (Lucas 1963; Bourke 2001, 129–32). At Edercloon, evidence of medieval activity was scarce; however, two sites of the period produced artefacts and the practice of object inclusion in medieval peatland structures is paralleled elsewhere in Ireland (O'Carroll & Condit 2000; Irish Archaeological Wetland Unit 2002b; Moore et al. 2003, 129–33). In the Netherlands, the retrieval of large numbers of medieval artefacts from bogs has been interpreted as clear evidence of the continuance of votive deposition into the later medieval period (van der Sanden 1999, 223–4; van Vilsteren 2001).

Whether early medieval artefacts from Edercloon are evidence of a conscious ritual act or signify lasting folk memory and tradition is unknown. However, given the longevity and scale of prehistoric activity at the site, which strongly indicates continuing local traditions and practices, it is possible that the custom of artefact deposition remained in the local consciousness and continued to be practised, albeit with potentially altered motives.

Woodworking at Edercloon

The archaeological sites excavated at Edercloon were made almost exclusively of wood and were for the most part exceptionally well preserved. During the excavation over 7,000 samples of worked wood were taken for further analysis (Illus. 8.8). In order to deal with such a large sample, a two-stage approach was adopted. The first stage involved the basic recording of the worked ends which followed methodologies developed in the Somerset Levels in Britain (Coles & Orme 1985, 25–50) and the Mountdillon Bogs of County Longford (O'Sullivan 1996, 291–357). These studies analysed and identified the key characteristics of tool facets—the individual marks left on a piece of wood each time it is struck—necessary to understand and extrapolate the types of tools used. The size and profile of the facets, the angles at which they were cut, and the junctions between them can all reflect the nature and utility of the blade used. Once these features were recorded, each sample was assessed and graded on a scale of one to five for quality and the presence of tool signatures. Tool signatures are raised or incised lines caused by irregularities in the edge of the blade

Illus. 8.8 Worked ends from togher EDC 7 (CRDS Ltd).

(Illus. 8.9). Detailed study of these marks has demonstrated the ability to trace individual signatures across an archaeological site and use them to build associations and aid in phasing (Sands 1997). The dense nature of the Edercloon complex combined with the likelihood that several sites were contemporary meant that the same tools could have been used to build different sites.

Stage 2 analysis was more focused, with two key objectives. Using a combination of information gathered in Stage 1 and the scientific dates, Stage 2 sought to predominantly examine sites of the Late Bronze Age/Iron Age transition in the hope of identifying precisely the types of tools used in their construction. The second focus was on tool signatures and the possibility of identifying a match between separate structures or within different layers of larger sites. This included a programme of detailed recording and casting aided by Dr Robert Sands of the UCD School of Archaeology. To make casts of the tool signatures, dental putty (Elite HD) was mixed with a catalyst until pliable and was then applied to the selected toolmarks (Illus. 8.10). While it was still soft a rubber stamp was used to imprint the sample number. When the layer of putty had hardened (approximately 10 minutes) it was removed and a finer layer (Elite Fine Wash) was applied to its inner face and it was repositioned on the toolmark. When this had set it was removed and a reverse cast of the toolmark and signatures could be seen. A small dam of plasticine and tinfoil

Illus. 8.9 Tool signatures on a worked roundwood in togher EDC 26 (CRDS Ltd).

was then built around the putty cast to allow positive casts to be made. These were made using dental stone (Economic Model Stone) which set within approximately 20 minutes. The casts of the toolmarks were then pared down to allow for close comparison of the signatures.

Stage 1 of the analysis identified most of the woodworking evidence as pieces of brushwood and roundwoods, the ends of which were cut to a variety of point shapes. Chisel points, cut on one face only, and wedge points, cut on two opposing or adjacent faces were the most common shapes. Pencil points which are worked on three or more faces were encountered only occasionally. This is quite simple woodworking and most of these worked ends are representative of the axe blows required to cut the stems from larger trunks or branches and trim them to the required size. Some pieces, such as the pegs from EDC 10, were more carefully worked, with shallow, sharp points suitable for driving them into the ground. Also recorded during Stage 1 were split timbers, which were infrequent and generally crude and of low quality. Stage 1 generated a record of toolmarks spanning four millennia and ranging from Neolithic stone axes to early medieval iron tools. An interesting result of Stage 1 was the identification of marks of both stone and metal tools in the Late Neolithic togher EDC 42 (see Chapter 3).

Stage 2 analysis identified the marks of bronze axes on material from EDC 10 and EDC 19. EDC 12/13, with which both sites

Illus. 8.10 Tool signature casting: (a) dental putty is applied to the facet; (b) the site code and sample number is imprinted with a rubber stamp; (c) once set a finer layer of putty is applied to the inner face of the first layer; (d) both layers are repositioned on the facet; (e) reverse casts of the facets are surrounded by a dam of plasticine and tinfoil and dental stone is poured in; (f) once the dental stone is set the dam is removed; (g) the positive cast of the facet is revealed; (h) the casts are paired down to allow for close comparision of signatures; (g) matching tool signatures from EDC 12/13 (CRDS Ltd).

Illus. 8.11 Contrasting toolmarks from EDC 12/13: (left) wide flat facets from an iron axe; (right) small concave facets from a bronze axe (CRDS Ltd).

were associated, contained wood worked by both bronze and iron tools (Illus. 8.11). This concurs with the dating results for the togher; however, both toolmarks and signature matches on samples from the site suggested that early iron axes were used on wood from different layers, some of which have been dendrochronologically dated to the start of the Late Bronze Age. These axes were not in use in Ireland at this time and it is likely that the issue lies in the haphazard nature of the internal site stratigraphy, whereby clearly demarcated structural layers were rare. There were few diagnostic samples from EDC 31, but analysis suggested the use of iron axes in the site. Marks of apparent iron axes were also identified within EDC 1b/29, the lowest level of which has been dated to 970–800 BC (Wk-25201). This suggests the very early use of iron at Edercloon. Given the chronological and stratigraphic complexity evident in this part of Edercloon, the results of the woodworking analysis should be viewed with some caution. More recent analysis of large assemblages of prehistoric worked wood from counties Offaly and Roscommon has demonstrated that the facets produced by bronze tools in particular, but also those of iron, can vary greatly (Moore 2016; 2017). Factors such as hafting, blade quality, wood species and the strength and skill of the wood worker all affect the marks produced.

The signatures of individual axes were traced within several sites, occasionally between different layers and/or dispersed

along the length of the structure. A definite match, however, between separate sites was not made. A tentative match between a sample from the base of EDC 1b/29 and EDC 28 seems unlikely considering the dates for each site. However, the chronological complexity surrounding EDC 1b/29 means that it cannot be entirely discounted.

CHAPTER 9

Conclusions

by Caitríona Moore

Conclusions

When the excavation at Edercloon commenced in the cold April of 2006, no one predicted the scale and complexity of the discoveries that would be made over the following six months. That this small tract of bog contained such a wealth of perfectly preserved sites and artefacts was, and remains, quite remarkable. The excavation was, however, just the beginning of the discoveries. The subsequent multi-disciplinary post-excavation programme sought to study the sites, the artefacts within them, and the past landscape in which they existed. As we have seen throughout this volume, the combined results of these analyses are often complex and many questions remain about Edercloon. While the site at Edercloon may have been the most dramatic discovery made in advance of the construction of the N4 Dromod–Roosky Bypass, all of the investigated sites add to the story of this landscape and how people lived in it throughout several millennia. Central to much of this story have been the bog margins and wetland–dryland interface, a unique part of the landscape used frequently and repeatedly by the people who lived close by.

Neolithic and Bronze Age communities who left monumental tombs and standing stones in the wider landscape, have, through these excavations, been revealed at a much more prosaic and local level. Modest wooden toghers, small platforms, and *fulachtaí fia* tell stories of basic human endeavour, simple but effective structures built to meet the practical challenges of daily life. In contrast, during the Later Bronze Age and Early Iron Age there is less trace in the surrounding area of the population who were so active at Edercloon. The excavated sites of this period varied from small paths and platforms to the network of large interconnected toghers which were far from simple, and may have had multiple functions and meaning for those who built them. Evidence for medieval activity was relatively low among the excavated sites, but those that have been dated to this period demonstrate the continued use of the bog margins and, at Edercloon in particular, the extension of traditions seen in earlier prehistoric sites.

In tandem with the archaeological discoveries, the palaeoenvironmental research too owes much to the wetlands and the high level of preservation therein. The synthesis of such extensive environmental evidence is one of the richest facets of the Edercloon story. These results have revealed a wooded landscape in which people lived, farmed, and managed the forests. The bog at Edercloon formed a distinct and important part of this landscape, a unique environment through which people moved and in which they spent time. The palaeoenvironmental results have been crucial in understanding the development of the landscape and its relationship to the excavated sites (Chapters 2 and 7). During some periods, the strands

of evidence have tallied neatly. In the Early Neolithic, for example, as the landscape began to be cleared for agriculture, people made their first incursions onto the bog at Edercloon with the construction of toghers EDC 48 and EDC 45. In later periods, the picture has often been more nuanced. In the Late Bronze Age and Early Iron Age, when construction at Edercloon peaked and people were clearly managing the woods in very specific ways, their impact on the wider landscape was relatively muted.

Edercloon bog was a dynamic environment, developing from a wet wooded fen to a raised bog on which a fluctuating water table had a sometimes dramatic effect. The ground conditions in which the toghers and platforms were constructed varied, with sites built over both relatively dry areas and within very wet zones. Open pools of water may have attracted animals and in some locations might explain the unusual structural forms, orientations and even deposition of artefacts (see Chapter 8). Throughout prehistory and into the early medieval period Edercloon was surrounded by a wooded landscape in which a range of native trees flourished, growing on both the dryland and within the wetter bog margins. These woodlands were the source of the raw materials used to build the sites and to provide high-quality timber for object manufacture. They were wholly exploited by those who built the sites at Edercloon and managed for generations to provide large quantities of regular, straight branches ideal for trackway construction.

Archaeological sites have been identified in their thousands in Irish bogs (van de Noort et al. 2013); however, they have rarely been excavated on the same scale as at Edercloon. There are few projects with which it can be compared and no other wetland survey or excavation has uncovered a complex quite like it. While some parallels can be drawn between sites at Edercloon and elsewhere, these are predominantly early prehistoric toghers or smaller sites. The Late Bronze Age and Early Iron Age network of very large interconnected toghers is unique. Many of these showed no regard for the adjacent dryland indicating that movement within the bog was their goal. The junctions between the sites formed crossroads and possibly platforms where people could congregate. Many of these sites were built to depths of over 1 m and dating results suggest episodic rebuilding. Disentangling and dating these structures has proved difficult and stratigraphic relationships have been complicated by complex and seemingly unfeasible dating results. This phase of building at Edercloon appears to have been the work of several generations of a community with distinct practices, and it is possible that some sites were dismantled and elements reused. It is also possible that these very deep sites functioned as boundaries, perhaps marking the territory of those who built them.

The highly structured pattern of artefact inclusion at Edercloon is entirely without parallel. Forty-six wooden artefacts, the majority recovered from the largest toghers of the Late Bronze Age and Early Iron Age, were buried at regular intervals or specific locations—at the convergences of sites, in particular (Chapter 8). This perhaps more than any other aspect of Edercloon sets it apart and elevates it from a place of purely functional activity to one of ritual. During the Late Bronze Age and Early Iron Age, Edercloon was clearly a place of significance, with structures built and maintained by a society whose traditions included regular artefact deposition. We will never truly

know the meaning or intention behind this practice; the objects may have been offerings to gods or territorial markers at a marginal boundary. We will also never know whether the burial of artefacts was a highly ritualised performance or a simple understated act. Whatever the intention or manner of execution, the inclusion of so many artefacts in such a structured manner cannot be interpreted as anything but deliberate.

Beyond the manner of their deposition, the wooden artefacts offer rare insights into the lives of those who built the toghers and platforms at Edercloon. These people were experts in woodland management and master wood workers, skilled in sophisticated carpentry and high-quality carving. They made practical items such as wheels, hafts, spears and weapons alongside beautifully finished domestic vessels and the highly decorative twisted hazel rods. Through these artefacts, we can experience a community in which people worked felling trees and crafting objects. They hunted animals, used carts for transport, prepared, stored and shared food. This was a rural society, living on the dryland but frequenting the bog through which they sought to travel, but to also spend time and find an expression for their beliefs.

Toghers or boundaries, functional or ritual, Edercloon is all of these things. Perhaps one of the greatest lessons learnt from this excavation is that archaeological sites in raised bogs, and indeed the bogs themselves, may have had much more nuanced and complex functions than are readily apparent today. In recent centuries, bogs have largely become marginal places, regarded at best as resources to be exploited, at worst as wastelands and dumping grounds. Edercloon has demonstrated that in the past they could be a vibrant and important part of daily life.

Appendix 1 Radiocarbon dates

All of the radiocarbon dates cited in the main text are calibrated date ranges equivalent to the probable calendrical age of the sample and are expressed as BC or AD dates, calibrated at the two-sigma (2σ) (95% probability) level of confidence.

Radiocarbon ages are quoted in the table below in conventional years BP (i.e. 'before present' at AD 1950) and the errors for these dates are expressed at the one-sigma (1σ) (68% probability) level of confidence. Calibrated date ranges are expressed at one- and two-sigma levels of confidence. The $\delta^{13}C$ value indicates the difference between the sample's $^{13}C/^{12}C$ ratio and that of a standard. It can indicate if there is contamination in the sample or processing when the value is compared to similar material.

The dates obtained from Beta Analytic, Florida (Beta lab. code), were calibrated using the IntCal98 calibration dataset (Stuiver et al. 1998) and the Talma & Vogel (1993) calibration progamme. Dates obtained from Waikato Laboratory, New Zealand (Wk lab. code), were calibrated using IntCal04 (Reimer et al. 2004) and the OxCal v.3.10 calibration programme (Bronk Ramsey 1995; 2001). Waikato lab. codes with an asterisk denote Accelerator Mass Spectrometry (AMS) dates. AMS dates obtained from the ^{14}Chrono Centre, Queen's University Belfast (UBA lab. code), were calibrated using IntCal04 and OxCal v.3.10 for UBA-9364 to UBA-9369 and using IntCal13 (Reimer et al. 2013) and the CALIB Rev 7.0.0 calibration programme (Stuiver & Reimer 1993) for UBA-31953 and UBA-31954.

Lab. code	Site	Sample/Context	Years BP	$\delta^{13}C$ ‰	Calibrated date range
Beta-217355	EDC 1c	A piece of birch (*Betula*) from the superstructure of the platform	2390 ± 40	-28.9	500–460 and 430–400 BC (1σ) 750–700 and 540–390 BC (2σ)
Beta-217356	EDC 10	A piece of ash (*Fraxinus*) from the togher	2410 ± 40	-29.0	520–400 BC (1σ) 760–640 BC and 560–390 BC (2σ)
Beta-217357	EDC 49	A piece of birch (*Betula*) from the togher	1590 ± 40	-28.7	AD 420–530 (1σ) AD 400–560 (2σ)
Beta-217358	EDC 7	A piece of ash (*Fraxinus*) from the togher	2200 ± 40	-30.6	360–190 BC (1σ) 380–160 BC (2σ)

Lab. code	Site	Sample/Context	Years BP	$\delta^{13}C$ ‰	Calibrated date range
Beta-261504	Aghamore 2	Charcoal from primary fill (F146) of pit F145	3890 ± 40	-26.4	2460–2300 BC (1σ) 2480–2220 BC (2σ)
Beta-261505	Aghamore 2	Charcoal from uppermost fill (F15) of pit F25	3800 ± 40	-25.6	2290–2150 BC (1σ) 2390–2310 BC (2σ)
UBA-9364	Core EDC3	Twig fragments	5249 ± 23	-28.6	4220–3990 BC (1σ) 4230–3970 BC (2σ)
UBA-9365	Core EDC3	Twigs and plant macrofossils	4910 ± 32	-33.0	3710–3650 BC (1σ) 3770–3640 BC (2σ)
UBA-9366	Core EDC3	Wood	3756 ± 21	-28.0	2200–2140 BC (1σ) 2280–2040 BC (2σ)
UBA-9367	Core EDC3	Wood	3143 ± 23	-30.9	1440–1400 BC (1σ) 1500–1320 BC (2σ)
UBA-9368	Core EDC3	*Sphagnum*	1945 ± 22	-20.1	AD 30–80 (1σ) AD 1–130 (2σ)
UBA-9369	Core EDC3	Wood	1465 ± 18	-30.0	AD 570–620 (1σ) AD 560–650 (2σ)
UBA-31953	EDC 27	Oak (*Quercus*) timber, rings 74–84 (see Q11035, Appendix 2)	2644 ± 43	—	837–792 BC (1σ) 898–777 BC (2σ)
UBA-31954	EDC 31	Oak (*Quercus*) timber, rings 70–9 (see Q11036, Appendix 2)	2615 ± 36	—	815–787 BC (1σ) 890–674 BC (2σ)
Wk-20192	Moher 5	Hazel (*Corylus*), birch (*Betula*), alder (*Alnus*) and ash (*Fraxinus*) charcoal from burnt spread F33	3915 ± 82	-26.2	2570–2280 BC (1σ) 2620–2140 BC (2σ)
Wk-20193	Moher 1	Hazel (*Corylus*) charcoal from fill of post-hole at corner of trough of Burnt Mound 1	2812 ± 46	-25.9	1020–900 BC (1σ) 1120–840 BC (2σ)
Wk-20194	Moher 1	Ash (*Fraxinus*) charcoal from compacted peat layer below burnt stone deposit of Burnt Mound 2	3208 ± 51	-26.7	1525–1425 BC (1σ) 1610–1390 BC (2σ)

Lab. code	Site	Sample/Context	Years BP	$\delta^{13}C$ ‰	Calibrated date range
Wk-20195	Moher 1	Ash (*Fraxinus*) charcoal from primary fill within wood-lined trough of Burnt Mound 2	3038 ± 43	-27.3	1390–1250 BC (1σ) 1420–1130 BC (2σ)
Wk-20196	Moher 1	Hazel (*Corylus*) charcoal from primary fill beneath wood-lined trough of Burnt Mound 2	3116 ± 44	-28.5	1440–1310 BC (1σ) 1500–1260 BC (2σ)
WK-21256	Moher 1	Hazel (*Corylus*), apple-type (Maloideae) and ash (*Fraxinus*) charcoal between Burnt Mound 1 and 2	2733 ± 39	-25.2	910–830 BC (1σ) 974–807 BC (2σ)
Wk-20197	EDC 31	A piece of birch (*Betula*) from the togher	2212 ± 41	-30.4	370–200 BC (1σ) 390–180 BC (2σ)
Wk-20198	EDC 12/13	A piece of ash (*Fraxinus*) from the uppermost layer of the togher	2342 ± 42	-30.4	510–370 BC (1σ) 730–230 BC (2σ)
Wk-20199	EDC 19	A piece of hazel (*Corylus*) from the togher	2508 ± 39	-29.4	770–540 BC (1σ) 800–420 BC (2σ)
Wk-20200	EDC 25	A piece of blackthorn or sloe (*Prunus spinosa*) from the togher	2446 ± 39	-27.9	740–410 BC (1σ) 760–400 BC (2σ)
Wk-20201	EDC 26	A piece of ash (*Fraxinus*) from the uppermost layer of the togher	2200 ± 39	-29.3	360–200 BC (1σ) 390–170 BC (2σ)
Wk-20202	EDC 36	A piece of alder (*Alnus*) from the togher	3868 ± 43	-30.3	2460–2290 BC (1σ) 2470–2200 BC (2σ)
Wk-20949	EDC 9	A piece of ash (*Fraxinus*) from the platform	2786 ± 40	-27.9	1010–890 BC (1σ) 1040–830 BC (2σ)
Wk-20950	EDC 2	A piece of ash (*Fraxinus*) from archaeological wood deposit	1302 ± 45	-30.3	AD 660–770 (1σ) AD 640–860 (2σ)

Lab. code	Site	Sample/Context	Years BP	$\delta^{13}C$ ‰	Calibrated date range
Wk-20951	EDC 30	A piece of alder (*Alnus*) from archaeological wood deposit	1273 ± 36	-27.1	AD 680–775 (1σ) AD 660–870 (2σ)
Wk-20952	EDC 27	A piece of hazel (*Corylus*) from the platform	2638 ± 39	-29.4	835–790 BC (1σ) 900–770 BC (2σ)
Wk-20953	EDC 28	A piece of birch (*Betula*) from the togher	2232 ± 38	-28.6	380–200 BC (1σ) 390–200 BC (2σ)
Wk-20954	EDC 34	A piece of hazel (*Corylus*) from the platform	2729 ± 39	-27.7	905–830 BC (1σ) 980–800 BC (2σ)
Wk-20955	EDC 38	A piece of birch (*Betula*) from the togher	3668 ± 42	-27.9	2140–1970 BC (1σ) 2200–1920 BC (2σ)
WK-20956	EDC 42	A piece of hazel (*Corylus*) from the togher	4087 ± 43	-27.7	2850–2500 BC (1σ) 2870–2490 BC (2σ)
Wk-20957	EDC 37	A piece of apple-type (Maloideae) from the togher	2193 ± 38	-30.5	360–190 BC (1σ) 390–160 BC (2σ)
Wk-20958	EDC 40	A piece of birch (*Betula*) from archaeological wood deposit	2266 ± 38	-28.1	400–230 BC (1σ) 400–200 BC (2σ)
Wk-20959	EDC 44	A piece of hazel (*Corylus*) from the platform	2661 ± 39	-29.2	890–795 BC (1σ) 900–790 BC (2σ)
Wk-20960	EDC 45	A piece of apple-type (Maloideae) from the togher	4758 ± 43	-30.8	3640–3510 BC (1σ) 3650–3370 BC (2σ)
Wk-20961	EDC 5	A piece of birch (*Betula*) brushwood from base of togher, directly overlying block wheel fragment E3313:5:69	2909 ± 39	-28.5	1190–1020 BC (1σ) 1260–970 BC (2σ)
Wk-21257	EDC 6	A piece of birch (*Betula*) from the togher	2544 ± 41	-28.5	388–230 BC (1σ) 397–203 BC (2σ)

Lab. code	Site	Sample/Context	Years BP	$\delta^{13}C$ ‰	Calibrated date range
Wk-22716*	Georgia 1	Apple-type (Maloideae) charcoal from burnt stone deposit of a *fulacht fiadh*	787 ± 30	-28.4	AD 1220–1265 (1σ) AD 1185–1280 (2σ)
Wk-22718	Cloonturk 2	Ash (*Fraxinus*) charcoal from burnt stone deposit	3775 ± 30	-26.0	2280–2140 BC (1σ) 2300–2050 BC (2σ)
Wk-22719*	Moher 4	Ash (*Fraxinus*) charcoal from fill of post-hole	1284 ± 30	-24.5	AD 675–770 (1σ) AD 660–780 (2σ)
Wk-22720*	Clooncolry 1	Apple-type (Maloideae) charcoal from shallow spread beneath burnt mound	3005 ± 30	-25.3	1370–1130 BC (1σ) 1380–1120 BC (2σ)
Wk-22721*	Clooncolry 1	Elm (*Ulmus*) charcoal from primary fill of D-shaped trough	3890 ± 30	-26.4	2460–2340 BC (1σ) 2470–2280 BC (2σ)
Wk-22722*	Aghnahunshin	Alder (*Alnus*) charcoal from primary fill of Mound 1 trough	3864 ± 30	-28.8	2460–2280 BC (1σ) 2470–2200 BC (2σ)
Wk-22723*	Aghnahunshin	Hazel (*Corylus*) charcoal from main deposit of burnt stone at Mound 1	3803 ± 30	-26.1	2290–2200 BC (1σ) 2350–2130 BC (2σ)
Wk-22724*	Aghnahunshin	Elm (*Ulmus*) charcoal from primary fill of Mound 2 trough	1066 ± 30	-24.8	AD 900–1020 (1σ) AD 890–1030 (2σ)
Wk-22725	Cloonturk 2	Ash (*Fraxinus*) charcoal from charcoal-rich deposit	3976 ± 30	-24.1	2565–2465 BC (1σ) 2580–2400 BC (2σ)
Wk-22726	Clooncolry 1	Ash (*Fraxinus*) charcoal from fill of pit underlying burnt stone deposit	3825 ± 59	-25.8	2440–2150 BC (1σ) 2470–2060 BC (2σ)

Lab. code	Site	Sample/Context	Years BP	$\delta^{13}C$ ‰	Calibrated date range
Wk-22729	Clooncolry 1	Alder (*Alnus*) charcoal from basal fill of a pit underlying a burnt deposit	3765 ± 39	-26.9	2280–2130 BC (1σ) 2300–2030 BC (2σ)
Wk-25190	TOM 3	A piece of birch (*Betula*) from the togher	2204 ± 39	-27.2	360–200 BC (1σ) 390–170 BC (2σ)
Wk-25191	EDC 31	Oak (*Quercus*) timber, rings 130–70 (see Q11036, Appendix 2)	2632 ± 40	-25.5	830–785 BC (1σ) 900–760 BC (2σ)
Wk-25199	EDC 1b/29	A piece of willow (*Salix*) from the uppermost layer of the togher	2106 ± 39	-28.1	180–50 BC (1σ) 350–20 BC (2σ)
Wk-25200	EDC 25	A piece of ash (*Fraxinus excelsior*) from the togher	2157 ± 50	-29.5	360–110 BC (1σ) 370–50 BC (2σ)
Wk-25201*	EDC 1b/29	A piece of hazel (*Corylus avellana*) from the base of the togher	2730 ± 34	-29.8	905–830 BC (1σ) 970–800 BC (2σ)
Wk-25202*	EDC 12/13	Ash (*Fraxinus excelsior*) brushwood from base of the togher	3043 ± 30	-30.9	1380–1260 BC (1σ) 1410–1210 BC (2σ)
Wk-25203	EDC 49	Hazel (*Corylus avellana*) brushwood from the base of the togher	1241 ± 36	-28.4	AD 680–860 (1σ) AD 680–880 (2σ)
Wk-25204	EDC 12/13	A piece of hazel (*Corylus avellana*) from the top layer of the togher, adjacent to wheel rim E3313:12/13:50	2397 ± 39	-28.9	520–400 BC (1σ) 750–390 BC (2σ)

Appendix 2 Dendrochronological dates

All of the dendrochronological dates were supplied by David Brown of the Department of Archaeology and Palaeoecology, School of Natural & Built Environment, Queen's University Belfast (Brown 2008).

Lab. code	Sample/context	Tree-ring series	Felling date range
Q11026	Sample 6601 from trackway EDC 5	1292–1152 BC	1120 BC ± 9 years or later
Q11027	Sample 3798 from trackway EDC 12/13	—	No correlation
Q11028	Sample 5453 from trackway EDC 12/13	1196–1128 BC	1096 BC ± 9 years or later
Q11029	Sample 5463 from trackway EDC 12/13	1229–1142 BC	1110 BC ± 9 years or later
Q11030	Sample 8175 from trackway EDC 12/13	—	No correlation
Q11031	Sample 11006 from trackway EDC 12/13	1193–1037 BC	1038/1037 BC
Q11032	Sample 4001 from trackway EDC 26	—	Insufficient tree-rings
Q11033	Sample 5124 from trackway EDC 26	—	No correlation
Q11034	Sample 1180 from platform EDC 27	—	No correlation
Q11035	Sample 11015 from platform EDC 27	—	No correlation
Q11036	Sample 6320 from trackway EDC 31	—	No correlation

Note on Q11034–Q11036

Oak samples from platform EDC 27 (Q11034 and Q11035) and trackway EDC 31 (Q11036) were identified as having come from the same tree. There was no sapwood or sapwood-heartwood boundary on any of the samples. Regarding Q11034 and Q11035, there was no correlation when compared with a suite of tree-ring chronologies from Ireland;

however, Q11036 did provide significant correlation values. An estimated felling date of 166 BC ± 9 years or later was originally given for Q11036, with a recommendation for confirmation by radiocarbon dating owing to a concern that this date might be erroneous. Being from the same tree, the dendrochronological dating of Q11034 and Q11035 relied upon the estimated felling date from Q11036 (Brown 2008).

Sample 6320 (Q11036) had a total ring count of 176 annual growth rings. Rings 130–170 were radiocarbon-dated to 900–760 BC (Wk-25191; see Appendix 1), which led to the original dendrochronological dates for Q11034–Q11036 being withdrawn. Subsequent independent research by David Brown in 2016 led to rings 70 to 79 from sample 6320 being radiocarbon-dated to 890–674 BC (UBA-31954); however, 96 years must be added to this date to get the end of the measured sequence. As there is no heartwood-sapwood boundary the felling date could be much later, by probably more than 50 but less than 100 years.

Sample 11015 (Q11035) from EDC 27 had a total of 162 annual growth rings. Rings 74 to 84 were radiocarbon-dated to 898–777 BC (UBA-31953; see Appendix 1) as part of Brown's independent research. These are the same annual growth rings as those dated from EDC 31 (Q11036). As with Q11036, a number of years (78 in this instance) must be added to get the end of the measured sequence, and the felling date could be much later.

The radiocarbon dating results prove that the oak timbers used in EDC 27 and EDC 31 date from the Late Bronze Age.

Bibliography

Abbreviations used in the text

AC Freeman, A M (ed.) 1944 *Annála Connacht: the annals of Connacht (A.D. 1224–1554)*. Dublin Institute for Advanced Studies, Dublin.

ALC Hennessy, W M (ed. & trans.) 1871 *Annals of Loch Cé: a chronicle of Irish affairs, 1014–1690*, 2 Vols [1939 reprint]. London.

References

Alexander, K N A 1993 'Observations from an Irish mountain summit', *Coleopterist*, Vol. 2, 42–4.

Alexander, K N A (comp.) 2002 *The Invertebrates of Living and Decaying Timber in Britain and Ireland: a provisional annotated checklist*. English Nature Research Reports No. 467. English Nature, Peterborough.

Anderson, R, Nash, R, & O'Connor, J P 1997 'Irish Coleoptera: a revised and annotated list', *The Irish Naturalists' Journal*, Vol. 25, Special Entomological Supplement, 1–81, i–iv.

Anon. 2016 'Dig diary 19: discovering Britain's oldest, complete wheel', Must Farm project website (http://www.mustfarm.com/progress/site-diary-19-discovering-britains-oldest-complete-wheel/, accessed March 2016).

Barber, K E, Chambers, F M & Maddy, D 2003 'Holocene palaeoclimates from peat stratigraphy: macrofossil proxy climate records from three oceanic raised bogs in England and Ireland', *Quaternary Science Reviews,* Vol. 22, 521–39.

Becker, K 2008 'Left but not lost', *Archaeology Ireland*, Vol. 22, No. 1, 12–15.

Bennett, K D 2002 *Documentation for psimpoll 4.10 and pscomb 1.03. C Programs for Plotting Pollen Diagrams and Analysing Pollen Data*. University of Cambridge, Cambridge.

Bermingham, N 2001 'The peat stratigraphic record of the IAWU', *in* B Raftery & J Hickey (eds), *Recent Developments in Wetland Research: proceedings of a conference held by the Department of Archaeology, University College Dublin and the Wetland Archaeology Research Project (WARP) 26th–29th August 1998*, 37–42. Department of Archaeology, University College Dublin, Monograph Series Vol. 2 and WARP Occasional Paper 14. Department of Archaeology, University College Dublin, Dublin.

Bermingham, N 2005 *Palaeohydrology and Archaeology in Raised Mires: a case study from Kilnagarnagh*. Unpublished Ph.D thesis, University of Hull.

Bermingham, N 2008a 'Appendix 21. Preliminary report: testate amoeba and plant macrofossil analyses, Edercloon, Co. Longford', *in* C Moore & D J O'Connor

2009b, *N4 Dromod Roosky Bypass, advance archaeological works contract*, *Edercloon. Ministerial Direction A31 (A031-025/ E3313).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.5q485352c).

Bermingham, N 2008b 'Appendix 23. Mapping the development of part of the mire at Edercloon, Co. Longford', *in* C Moore & D J O'Connor 2009b, *N4 Dromod Roosky Bypass, advance archaeological works contract*, *Edercloon. Ministerial Direction A31 (A031-025/E3313).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.5q485352c).

Bermingham, N 2009 *Final Report: Testate Amoebae and Plant Macrofossil Analyses*, *Edercloon*, *Co. Longford.* Final Report for CRDS Ltd (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.nc58d9238)

Bermingham, N 2016 'Going over the same old ground? Archaeological re-survey of a raised mire at Kinnegad, Co. Meath, Ireland: Implications for the accurate identification of archaeological sites', *Journal of Wetland Archaeology*, Vol. 16, No. 1.

Bermingham, N & Delaney, M 2006 *The Bog Body from Tumbeagh.* Wordwell, Bray.

Bolton, B & Collingwood, C A 1975 *Hymenoptera: Formicidae.* Handbooks for the Identification of British Insects, Vol. VI, Part 3(c). Royal Entomological Society of London, London.

Bonsall, J, Fry, R, Gaffney, C, Pope-Carter, F & Armit, I 2016 'Overcoming methodological challenges for the geophysical prospection of wooden trackways: an example from Edercloon, Ireland', Presentation given at WARP30: Wetland Archaeology Research Project, 30th Anniversary Meeting, 28 June–2 July 2016, School of Archaeological Sciences, University of Bradford (https://www.academia.edu/26604527/Overcoming_Methodological_Challenges_for_the_Geophysical_Prospection_of_Wooden_Trackways_An_example_from_Edercloon_Ireland, accessed December 2019).

Bourke, L 2001 *Crossing the Rubicon: Bronze Age metalwork from Irish Rivers.* Bronze Age Studies 5. Department of Archaeology, NUI Galway, Galway.

Bradley, R 1990 *The Passage of Arms.* Cambridge University Press, Cambridge.

Britnell, W J & Earwood, C 1991 'Wooden artefacts and other worked wood from Buckbean Pond', *in* C R Musson, *The Breiddin Hillfort*; *a Later Prehistoric Settlement in the Welsh Marches.* Council for British Archaeology Research Report 76, 162–72. Council for British Archaeology, London.

Bronk Ramsey, C 1995 'Radiocarbon calibration and analysis of stratigraphy: the OxCal program', *Radiocarbon,* Vol. 37, 425–30.

Bronk Ramsey, C 2001 'Development of the radiocarbon program OxCal', *Radiocarbon*, Vol. 43, 355–63.

Bronk Ramsey, C 2009 'Dealing with outliers and offsets in radiocarbon dating', *Radiocarbon,* Vol. 51, No. 3, 1023–45.

Brown, D M 2008 'Appendix 18. Dendrochronological report on the oak wood samples from Edercloon, Co. Longford', *in* C Moore & D J O'Connor 2009b, *N4 Dromod Roosky Bypass, advance archaeological works contract*, *Edercloon. Ministerial Direction A31 (A031-025/ E3313).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII

Digital Heritage Collections: https://doi.org/10.7486/DRI.5q485352c).

Brück, J 1999a 'House, lifecycles and deposition on Middle Bronze Age settlements in Southern England', *Proceedings of the Prehistoric Society,* Vol. 65, 145–66.

Brück, J 1999b 'Ritual and rationality: some problems of interpretation in European archaeology', *European Journal of Archaeology,* Vol. 2, No. 3, 313–44.

Brunning, R 2008 *Prehistoric Trackways and Bridges of England and Wales.* Unpublished pre-circulated paper presented at the Sixth World Archaeological Congress, University College Dublin, 1 July 2008.

Brunning, R & McDermott, C 2013 'Trackways and roads across the wetlands', *in* F Menotti & A O'Sullivan (eds), *The Oxford Handbook of Wetland Archaeology*, 359–84. Oxford University Press, Oxford, United Kingdom.

Buckland, P C 1979 *Thorne Moors: a palaeoecological study of a Bronze Age site.* Department of Geography, University of Birmingham, Occasional Publication No. 8. University of Birmingham, Birmingham.

Buckland, P C 1981 'The insect remains', *in* S McGrail (ed.), *The Briggs 'Raft' and her Prehistoric Environment*, 155–75. British Archaeological Reports, British Series 89. Archaeopress, Oxford.

Buckland, P I 2007 *The Development and Implementation of Software for Palaeoenvironmental and Palaeoclimatological Research: the Bugs Coleopteran Ecology Package (BugsCEP).* Ph.D thesis, University of Umeå, Sweden.

Buckland, P I & Buckland, P C 2006 *Bugs Coleopteran Ecology Package* (Versions: BugsCEP v7.63; Bugsdata v7.11; BugsMCR v2.02; BugsStats v1.22) (www.bugscep.com).

Buckley, L, Cross May, S, Gregory, N, Murray, C, Ó Néill, J, Roche, H & Stevens, P 2005 'Catalogue of finds', *in* M Gowen, J Ó Néill & M Phillips (eds), *The Lisheen Mine Archaeological Project 1996–8,* 311–28. Margaret Gowen & Co. Ltd Transactions Vol. 2. Wordwell, Bray.

Bulleid, A 1968 *The Lake-Villages of Somerset* (6th edn). The Glastonbury Antiquarian Society. Walton Press, Somerset.

Bullock, J A 1993 'Host plants of British beetles: a list of recorded associations', *Amateur Entomologist,* Vol. 11a, 1–24.

Butler, J 1935 'Our coal and iron fields: the mineral resources of north-west Connacht', *The Journal of Ardagh & Clonmacnoise Antiquarian Society*, Vol. 1, No. 4, 97–9.

Caseldine, C J & Gearey, B R 2005 'Multi-proxy approaches to palaeohydrological investigations of raised bogs in Ireland: a case study from Derryville, Co. Tipperary', *The Holocene*, Vol. 15, No. 4, 585–601.

Caseldine, C J & Hatton J 1996 'Early land clearance and wooden trackway construction in the third and fourth millennia BC at Corlea, Co. Longford', *Proceedings of the Royal Irish Academy*, Vol. 95B, 1–9.

Caseldine, C, Hatton, J & Caseldine, A 1996 'Palaeoecological studies at Corlea (1988-1992)', *in* B Raftery, *Trackway Excavations in the Mountdillon Bogs, Co. Longford, 1985–1991,* 379–92. Irish Archaeological Wetland Unit Transactions 3. Crannóg Publications, Dublin.

Caseldine, C, Hatton, J & Gearey, B 2005 'Pollen and palaeohydrological analyses', *in* M Gowen, J Ó Néill & M Phillips (eds), *The Lisheen Mine Archaeological Project 1996–8,* 83–136. Margaret Gowen & Co. Ltd Transactions Vol. 2. Wordwell, Bray.

Caseldine, C, Hatton, J, Huber, U, Chiverrell, R & Woolley, N 1996 'Palaeoecological work at Corlea (1992–1995)', *in* B Raftery, *Trackway Excavations in the Mountdillon Bogs, Co. Longford, 1985–1991,* 393–4. Irish Archaeological Wetland Unit Transactions 3. Crannóg Publications, Dublin.

Casparie, W A 1982 'The Neolithic wooden trackway XXI (Bou) in the raised bog at Nieuw-Dordrech, The Netherlands', *Palaeohistoria,* Vol. 24, 115–64.

Casparie, W A 1984 'Three Bronze Age footpaths XVI (Bou), XVII (Bou) and XVIII (Bou) in the raised bog of southeast Drenthe (The Netherlands)', *Palaeohistoria*, Vol. 26, 41–94.

Casparie, W A 1986 'Two Iron Age wooden trackways XIV (Bou) and XV (Bou) in the raised bog of southeast Drenthe (The Netherlands)', *Palaeohistoria*, Vol. 28, 169–210.

Casparie, W A 1987 'Bog trackways in the Netherlands', *Palaeohistoria*, Vol. 29, 35–65.

Casparie, W A 2005 'Peat morphology and bog development', *in* M Gowen, J Ó Néill & M Phillips (eds), *The Lisheen Mine Archaeological Project 1996–8,* 13–54. Margaret Gowen & Co. Ltd Transactions Vol. 2. Wordwell, Bray.

Casparie, W A 2006 'Tumbeagh Bog, Co. Offaly, an extremely wet landscape: 7500 years of peat growth reconstructed', *in* N Bermingham & M Delaney, *The Bog Body from Tumbeagh,* 119–54. Wordwell, Bray.

Charman, D, Blundell, A & Accrotelm Members 2007 'A new European testate amoebae transfer function for palaeohydrological reconstruction on ombrotrophic peatlands', *Journal of Quaternary Science*, Vol. 22, No. 3, 209–21.

Charman, D J, Hendon, D & Woodland, W A 2000 *The Identification of Testate Amoebae (Protozoa:Rhizopoda) in Peats.* Quaternary Research Association, London.

Charman, D J & Warner, B G 1992 'Relationships between testate amoebae (Protozoa: Rhizopoda) and microenvironmental parameters on a forested peatland in Northeastern Ontario', *Canadian Journal of Zoology*, Vol. 70, 2474–82.

Chiverrell, R 2001 'A proxy record of Late Holocene climate change from May Moss, Northeast England', *Journal of Quaternary Science*, Vol. 16, No. 1, 9–29.

Coles, B & Coles, J 1986 *Sweet Track to Glastonbury: the Somerset Levels in prehistory.* Thames & Hudson, London.

Coles, B & Coles, J 1989 *People of the Wetlands: bogs, bodies and lake-dwellers.* Thames and Hudson, London.

Coles, J & Orme, B 1985 'Prehistoric woodworking from the Somerset Levels: 2. Roundwood', *Somerset Levels Papers*, No. 11, 25–50.

Coles, J, Heal, S V E & Orme, B J 1978 'The use and character of wood in prehistoric Britain and Ireland', *Proceedings of the Prehistoric Society*, Vol. 1–45.

Collins, A & O'Connor, D J 2008a *N4 Dromod Roosky Bypass, advance archaeological works contract, Moher 5. Ministerial Direction A31 (A031-017/E3305).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.4455nv088).

Collins, A & O'Connor, D J 2008b *N4 Dromod Roosky Bypass, advance archaeological works contract, Moher 4. Ministerial Direction A31 (A031-016/ E3304).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII

Digital Heritage Collections: https://doi.org/10.7486/DRI.3x81m240d).

Collins, A & O'Connor, D J 2009 *N4 Dromod Roosky Bypass, advance archaeological works contract, Moher 1. Ministerial Direction A31 (A031-013/E3301).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.3b59dq36b).

Comey, M G 2010 *Coopers and Coopering in Viking Age Dublin.* Medieval Dublin Excavations 1962–81, Series B, Vol. 10. National Museum of Ireland, Dublin.

Cooney, G 1997 'Excavation of the portal tomb site at Melkagh, Co. Longford', *Proceedings of the Royal Irish Academy*, Vol. 97C, 195–244.

Cooney, G & Grogan, E 1994 *Irish Prehistory: a social perspective.* Wordwell, Bray.

Coope, G R & Osborne, P J 1968 'Report on the coleopterous fauna of the Roman well at Barnsley Park, Gloucestershire', *Transactions of the Bristol & Gloucestershire Archaeological Society*, Vol. 86, 84–7.

Corcoran, E 2003 'Bog enigmas', *Archaeology Ireland*, Vol. 17, No. 3, 12–13.

Corcoran, E 2004 *Archaeological Excavation Reports, Clonad Bog, Clonad and Rathfeston townlands.* Unpublished report by Archaeological Development Services Ltd for Bord na Móna.

Coughlan, T & OCarroll, E 2019 *Final Excavation Report for Killoran, Co. Tipperary, Lisheen Mine TMF extension.* Unpublished report by Irish Archaeological Consultancy Ltd for Golder Associates Ireland Ltd and Lisheen Mine.

Coughlan, T & Whitaker, J 2019 *Final Excavation Report Cloonshannagh Bog, Co. Roscommon, Bord na Móna Peatland Archaeological Services 2014–2017.* Unpublished report by Irish Archaeological Consultancy Ltd for Bord na Móna.

Coyle McClung, L 2013 'The Late Iron Age Lull—not so Late Iron Age after all!', *Emania*, No. 21, 73–83.

Crone, A 2005 'The conserved wood assemblage', *in* A Crone & E Campbell, *A Crannóg of the First Millennium AD Excavations by Jack Scott at Loch Glashan, Argyll, 1960*, 29–46. Society of Antiquaries of Scotland, Edinburgh.

Cross May, S, Murray, C, Ó Néill, J & Stephens, P 2005a 'Chronology', *in* M Gowen, J Ó Néill & M Phillips (eds), *The Lisheen Mine Archaeological Project 1996–8,* 55–77. Margaret Gowen & Co. Ltd Transactions Vol. 2. Wordwell, Bray.

Cross May, S, Murray, C, Ó Néill, J & Stephens, P 2005b 'Terrain Sensitivity', *in* M Gowen, J Ó Néill & M Phillips (eds), *The Lisheen Mine Archaeological Project 1996–8,* 341–9. Margaret Gowen & Co. Ltd Transactions Vol. 2. Wordwell, Bray.

Cross May, S, Murray, C, Ó Néill, J & Stephens, P 2005c 'Landscape context', *in* M Gowen, J Ó Néill & M Phillips (eds), *The Lisheen Mine Archaeological Project 1996–8,* 351–62. Margaret Gowen & Co. Ltd Transactions Vol. 2. Wordwell, Bray.

Cross May, S, Murray, C, Ó Néill, J & Stephens, P 2005d 'Wetland structures: typology and parallels', *in* M Gowen, J Ó Néill & M Phillips (eds), *The Lisheen Mine Archaeological Project 1996–8*, 209–21. Margaret Gowen & Co. Ltd Transactions Vol. 2. Wordwell, Bray.

Crowe, S 1938 'Local places names', *The Schools' Collection, Drumad, County Leitrim*, Vol. 214, 42 (https://www.duchas.ie/en/cbes/4649701/4648563/4651829, accessed April 2009).

Davies, S 2006 'Appendix 25. Edercloon – preliminary tephra investigation', *in* C Moore & D J O'Connor 2009b, *N4 Dromod Roosky Bypass, advance archaeological works*

contract, *Edercloon*. *Ministerial Direction A31* (A031-025/E3313). Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.5q485352c).

Delany, R 1987 *By Shannon Shores: an exploration of the river.* Gill and Macmillan, Dublin.

de Valera, R & Ó Nualláin, S 1972 *Survey of the Megalithic Tombs of Ireland, Vol. III: Counties Galway, Roscommon, Leitrim, Longford, Westmeath, Laois, Offaly, Kildare, Cavan*. The Stationery Office, Dublin.

Duff, A 1993 *Beetles of Somerset: their status and distribution.* Somerset Archaeological and Natural History Society, Taunton.

Earwood, C 1993 *Domestic Wooden Artefacts in Britain and Ireland from Neolithic to Viking Times*. University of Exeter Press, Exeter.

Earwood, C 1997 'Bog butter: a two thousand year history', *Journal of Irish Archaeology*, Vol. 8, 25–42.

Ellis, C, Crone, A, Reilly, E & Hughes, P 2002 'Excavations of a Neolithic wooden platform, Stirlingshire', *Proceedings of the Prehistoric Society*, Vol. 68, 247–56.

Evans, C & Hodder, I 1987 'Between the two worlds: archaeological investigations in the Haddenham Level', *in* J M Coles & A J Lawson (eds), *European Wetlands in Prehistory*, 180–91. Oxford University Press, Oxford.

Evans, E E 1957 *Irish Folk Ways*. Routledge, London.

Evans, R C & Campbell, C S 2002 'The origin of the apple-type (Maloideae; Rosaceae) is clarified by DNA sequence data from duplicated GBSSI genes', *American Journal of Botany*, Vol. 89, No. 9, 1478–84.

Faegri, K & Iversen, J 1989 *Textbook of Pollen Analysis* (4th edn). John Wiley & Sons, Chichester.

Feehan, J & O'Donovan, G 1996 *The Bogs of Ireland: an introduction to the natural, cultural and industrial heritage of Irish peatlands*. The Environmental Institute, University College Dublin, Dublin.

Foster, G N 2000 *A Review of the Scarce and Threatened Coleoptera of Great Britain. Part 3: water beetles.* UK Joint Nature Conservation Committee, Peterborough.

Friday, L E 1988 *A Key to the Adults of British Water Beetles.* Backhuys Publishers, Leiden.

Gearey, B, Griffiths, M, Mac Domhnaill, B, Moore, C & Power, O-P 2019 'Making, multi-vocality and experimental archaeology: the Pallasboy Project', *EXARC Journal*, No. 4 (https://exarc.net/issue-2019-4/ea/pallasboy-project, accessed March 2020).

Girling, M A 1976 'Fossil Coleoptera from the Somerset Levels: the Abbot's Way', *Somerset Levels Papers*, No. 2, 28–33.

Girling, M A 1977 'Fossil insect assemblages from Rowland's track', *Somerset Levels Papers*, No. 3, 51–60.

Girling, M A 1979 'The fossil insect assemblages from the Meare Lake Village', *Somerset Levels Papers*, No. 5, 25–32.

Girling, M A 1980 'The fossil insect assemblage from the Baker Site', *Somerset Levels Papers*, No. 6, 36–42.

Girling, M A 1982a 'Indications from Coleoptera of the local environment at Tinney's brushwood complex', *Somerset Levels Papers*, No. 8, 64–6.

Girling, M A 1982b 'The effect of the Meare Heath flooding episodes on the Coleopteran succession', *Somerset Levels Papers*, No. 8, 46–50.

Girling, M A 1984 'Investigations of a second insect assemblage from the Sweet Track', *Somerset Levels Papers*, Vol. 10, 79–91.

Girling, M A 1985 'An old forest beetle fauna from a Neolithic and Bronze Age peat deposit at Stileway', *Somerset Levels Papers*, No. 11, 80–3.

Gowen, M & Ó Néill, J 2005 'Introduction', *in* M Gowen, J Ó Néill, J & M Phillips (eds), *The Lisheen Mine Archaeological Project 1996–8,* 1–9. Margaret Gowen & Co. Ltd Transactions Vol. 2. Wordwell, Bray.

Gowen, M, Ó Néill, J & Phillips, M (eds) 2005 *The Lisheen Mine Archaeological Project 1996–8.* Margaret Gowen & Co. Ltd Transactions Vol. 2. Wordwell, Bray.

Greguss, P 1945 *The Identification of Central European Dicotyledonous Trees and Shrubs Based on Xylotomy.* Hungarian Museum of Natural History, Budapest.

Grimm, E C 1987 'CONISS: a FORTRAN 77 program for stratigraphically constrained cluster analysis by the methods of incremental sum of squares', *Computers and Geoscience*, Vol. 13, 13–35.

Grimm, E 1992 TILIA/TILIA.GRAPH, Illinois State Museum, Springfield.

Grimm, E 2011 TILIA 1.7.16, Illinois State Museum, Springfield.

Gwynn, A & Hadcock, R N 1970 *Medieval Religious Houses: Ireland.* Irish Academic Press, Dublin

Halpin, A 1984 *A Preliminary Survey of Archaeological Material Recovered from Peatlands in the Republic of Ireland.* Unpublished report for the Office of Public Works.

Hansen, M 1987 *The Hydrophioidea (Coleoptera) of Fennoscandia and Denmark.* Fauna Entomological Scandinavica Vol. 18. Brill, Leiden.

Hather, J G 2000 *The Identification of the Northern European Woods: a guide for archaeologists and conservators.* Archetype, London.

Hawkes, A 2018 *The Archaeology of Prehistoric Burnt Mounds in Ireland.* Archaeopress, Oxford.

Hayen, H 1987a 'Peatbog archaeology in Lower Saxony, West Germany', *in* J M Coles & A J Lawson (eds), *European Wetlands in Prehistory,* 117–36. Clarendon Press, Oxford.

Hayen, H 1987b 'New light on the history of transport', *Endeavour*, Vol. 11, No. 4, 209–15.

Hirons, K R & Edwards, K J 1986 'Events at and around the first and second *Ulmus* declines: palaeoecological investigations in Co. Tyrone, Northern Ireland', *New Phytologist*, Vol. 104, 131–53.

Irish Archaeological Wetland Unit 2002a *Peatland Survey 2001. Archaeological Survey Report: Cavemount, Esker & Derryhinch Bogs, Cos Meath, Offaly & Westmeath.* Unpublished report for *Dúchas* The Heritage Service.

Irish Archaeological Wetland Unit 2002b *Peatland Survey 2001. Supplementary Archaeological Survey Report.* Unpublished report for *Dúchas* The Heritage Service.

Irish Archaeological Wetland Unit 2002c *Peatland Survey 2002. Archaeological Survey Report: Cloncreen Bog, Co. Offaly.* Unpublished report for *Dúchas* The Heritage Service.

Irish Archaeological Wetland Unit 2002d *Peatland Survey 2002. Archaeological Survey Report: Daingean Bog, Co. Offaly.* Unpublished report for *Dúchas* The Heritage Service.

Irish Archaeological Wetland Unit 2002e *Peatland Survey 2001. Archaeological Survey Report of Clonad Bog, Co. Offaly.* Unpublished report for *Dúchas* The Heritage Service.

Irish Archaeological Wetland Unit 2003 *Peatland Survey 2002. Supplementary Archaeological Survey Report.* Unpublished report for *Dúchas* The Heritage Service.

Jantzen, D, Brinker, U, Orschiedt, J, Heinemeier, J, Piek, J, Hauenstein, K, Kruger, J, Lidke, G, Lubke, H, Lampe, R, Lorenz, S, Schult, M & Terberger, T 2011 'A Bronze Age Battlefield? Weapons and trauma in the Tollense Valley, North-Eastern Germany', *Antiquity*, Vol. 85, No. 328, 417–33.

Jessen, K 1949 'Studies in Late Quaternary deposits and flora-history of Ireland', *Proceedings of the Royal Irish Academy*, Vol. 52B, 85–290.

Jessop, L 1986 *Dung Beetles and Chafers. Coleoptera: Scarabaeidae.* Handbooks for the Identification of British Insects Vol. 5, Part 11. Royal Entomological Society of London, London.

Kelly, E P 2006 'Secrets of the bog bodies: the enigma of the Iron Age explained', *Archaeology Ireland*, Vol. 20, No. 1, 26–30.

Kelly, E P 2012 'The bog body from Cashel Bog, Co. Laois', *Ossory*, *Laois and Leinster*, Vol. 5, 1–18.

Kenward, H K 1980 'A tested set of techniques for the extraction of plant and animal macrofossils from waterlogged archaeological deposits', *Science and Archaeology*, Vol. 22, 3–15.

Kenward, H K, Engleman, C, Robertson, A, & Large, F D 1986 'Rapid scanning of urban archaeological deposits for insect remains', *Circaea*, Vol. 3, 163–72.

Kilfeather, A 2003 'Legend and wetland landscape in Ireland', *Journal of Wetland Archaeology*, Vol. 3, 37–50.

Kinmonth, C 1993 *Irish Country Furniture 1700–1950.* Yale University Press, New Haven & London.

Koch, K 1989 *Die Käfer Mitteleuropas. Ökologie*, *Vols 1–2.* Goecke and Evers, Krefeld.

Lewis, S 1837a *A Topographical Dictionary of Ireland*, *Vol. 1*. S Lewis & Co., London.

Lewis, S 1837b *A Topographical Dictionary of Ireland*, *Vol. 2,* S Lewis & Co., London.

Long, P & McCarthy, G 2009 'To the waters and the wild, ancient hunting in Co. Kildare', *in* M Stanley, E Danaher & J Eogan (eds), *Dining and Dwelling*, 65–72. Archaeology and the National Roads Authority Monograph Series No. 6. National Roads Authority, Dublin.

Lucas, A T 1963 'The sacred trees of Ireland', *Journal of the Cork Historical and Archaeological Society*, Vol. 68, 16–54.

Lucas, A T 1967 'National Museum of Ireland: archaeological acquisitions in the year 1964', *Journal of the Royal Society of Antiquaries of Ireland*, Vol. 97, 1–28.

Lucas, A T 1972 'Prehistoric block-wheels from Doogarymore, Co. Roscommon, and Timahoe, Co. Kildare', *Journal of the Royal Society of Antiquaries of Ireland*, Vol. 102, 19–49.

Lucht, W H 1987 *Die Käfer Mitteleuropas*, *Katalog.* Goeck und Evers, Krefeld, Germany.

Luff, M L 2007 *The Carabidae (Ground Beetles) of Britain and Ireland.* Handbooks for the Identification of British Insects Vol. 4, Part 2 (2nd edn). Royal Entomological Society of London, London.

Majerus, M E N 1991 'Habitat and host plant preferences of British ladybirds (Col., Coccinellidae)', *Entomologist's Monthly Magazine*, Vol. 127, 167–75.

Majerus, M E N, Majerus, T M O, Betrand, D & Walker, L E 1997 'The geographical distribution of ladybirds (Coleoptera: Coccinellidae) in Britain (1984–1994)',

Entomologist's Monthly Magazine, Vol. 133, 181–260.

McDermott, C 1995 'A paved way in Bloomhill Bog, Counties Westmeath and Offaly', *in* A Moloney, N Bermingham, D Jennings, M Keane, C McDermott & E OCarroll, *Blackwater Survey & Excavations, Artefact Deterioration in Peatlands*, *Lough More, Co. Mayo,* 59–66. Transactions of the Irish Archaeological Wetland Unit 4. Crannóg Publications, Dublin.

McDermott, C 2001 'Trekkers through time: recent archaeological survey results from Co. Offaly, Ireland', *in* B Raftery & J Hickey (eds), *Recent Developments in Wetland Research: proceedings of a conference held by the Department of Archaeology, University College Dublin and the Wetland Archaeology Research Project (WARP) 26th–29th August 1998,* 13–25. Department of Archaeology, University College Dublin, Monograph Series Vol. 2 and WARP Occasional Paper 14. Department of Archaeology, University College Dublin, Dublin.

McDermott, C 2007 ''Plain and bog, bog and wood, wood and bog, bog and plain!': peatland archaeology in Ireland', *in* J Barber, C Clark, M Cressey, A Crone, A Hale, J Henderson, R Housley, R Sands, & A Sheridan (eds), *Archaeology from the Wetlands: recent perspectives. Proceedings of the 11th WARP conference*, *Edinburgh 2005,* 17–30. WARP Occasional Paper 18. Society of Antiquaries of Scotland, Edinburgh.

McDermott, C, Murray, C, Plunkett, G & Stanley, M 2002 'Of bogs, boats and bows: Irish Archaeological Wetland Unit Survey 2001', *Archaeology Ireland*, Vol. 16, No. 1, 28–31.

McDermott, C, Moore, C, Murray, C, Plunkett, G & Stanley, M 2009 'A Colossus of roads: the Iron Age archaeology of Ireland's peatlands', *in* G Cooney, K Becker, J Coles, M Ryan & S Sievers (eds), *Relics of Old Decency: archaeological studies in later prehistory. Festschrift for Professor Barry Raftery*, 49–64. Wordwell, Dublin.

McGowan, L & O'Connor, D J 2008 *N4 Dromod Roosky Bypass, advance archaeological works contract*, *Cloonturk 1. Ministerial Direction A31 (A031-006/ E3293).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.1z410760d).

McGowan, L & O'Connor, D J 2009a *N4 Dromod Roosky Bypass, advance archaeological works contract*, *Clooncolry 1. Ministerial Direction A31 (A031-007/ E3295).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.25152128f).

McGowan, L & O'Connor, D J 2009b *N4 Dromod Roosky Bypass, advance archaeological works contract*, *Cloonturk 2. Ministerial Direction A31 (A031-005/ E3292).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.1r66xf922).

McGowan, L & O'Connor, D J 2009c *N4 Dromod Roosky Bypass*, *advance archaeological works contract*, *Aghamore 2. Ministerial Direction A31 (A031-022/ E3310).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.5425zr48w).

Merritt, R 2006 *Atlas of the Water Beetles (Coleoptera) and Water Bugs (Hemiptera) of Derbyshire*, *Nottinghamshire and South Yorkshire, 1993–2005.* Sorby Record

Special Series No. 14. Sorby Natural History Society, Sheffield.

Mitchell, F & Ryan, M 2007 *Reading the Irish Landscape*. Town House, Dublin.

Molloy, K 2005 'Holocene vegetation and land-use history at Mooghaun, south-east Clare, with particular reference to the Bronze Age', *in* E Grogan, *The North Munster Project, Vol. 1: the later prehistoric landscape of south-east Clare*, 255–87. Discovery Programme Reports No. 6. Wordwell, Bray.

Moloney, A, Jennings, D, Keane, M & McDermott, C 1993a *Survey of the Raised Bogs of County Longford*. Transactions of the Irish Archaeological Wetland Unit 1. Crannóg Publications, Dublin.

Moloney, A, Jennings, D, Keane, M & McDermott, C 1993b *Excavations at Clonfinlough County Offaly*. Transactions of the Irish Archaeological Wetland Unit 2. Crannóg Publications, Dublin.

Moloney, A, Bermingham, N, Jennings, D, Keane, M, McDermott, C & OCarroll, E 1995 *Blackwater Survey & Excavations, Artefact Deterioration in Peatlands Lough More, Co. Mayo*. Transactions of the Irish Archaeological Wetland Unit 4. Crannóg Publications, Dublin.

Moore, C 2008a 'Old routes to new research: the Edercloon wetland excavations in County Longford', *in* J O'Sullivan & M Stanley (eds), *Roads, Rediscovery and Research*, 1–12. Archaeology and the National Roads Authority Monograph Series No. 5. National Roads Authority, Dublin.

Moore, C 2008b 'Appendix 19. Report on worked wooden remains from Edercloon, Co. Longford', *in* C Moore & D J O'Connor 2009b, *N4 Dromod Roosky Bypass, advance archaeological works contract, Edercloon. Ministerial Direction A31 (A031-025/E3313)*. Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.5q485352c).

Moore, C 2009a *The Edercloon Artefact Assemblage: a study of the practice of object deposition at Edercloon, Co. Longford*. Unpublished MA thesis, University College Dublin.

Moore, C 2009b *Report on Worked Wooden Remains from Annaholty, Co. Tipperary E3530*. Unpublished report for TVAS (Ireland) Ltd.

Moore, C 2017 *Report on Worked Wooden Remains from Cloonshannagh Bog, Co. Roscommon*. Unpublished report for Irish Archaeological Consultancy Ltd.

Moore, C 2018 'A Neolithic trackway in Baunmore, Co. Kilkenny', *Old Kilkenny Review*, Vol. 70, 5–19.

Moore, C 2019 *Report on Worked Wooden Remains from Ballybeg Bog, Co. Offaly*. Unpublished report for Irish Archaeological Consultancy Ltd.

Moore, C & Chiriotti, C 2010 'Reinventing the wheel', *in* J O'Sullivan & M Stanley (eds), *Creative Minds*, 57–69. Archaeology and the National Roads Authority Monograph Series No. 7. National Roads Authority, Dublin.

Moore, C, Murray, C, Stanley, M & McDermott, C 2003 'Bogland surveys in Ireland: forty shades of brown', *in* J Fenwick (ed.), *Lost and Found: discovering Ireland's past*, 123–38. Wordwell, Dublin.

Moore, C & O'Connor, D J 2009a *N4 Dromod Roosky Bypass, advance archaeological works contract, Tomisky. Ministerial Direction A31 (A031-024/E3312)*. Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.5h743984w).

Moore, C & O'Connor, D J 2009b *N4 Dromod Roosky Bypass, advance archaeological works contract, Edercloon. Ministerial Direction A31 (A031-025/E3313).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.5q485352c).

Moore, C & O'Dowd, J 2007 'Mind-boggling wetland discoveries', *Archaeology Irelan*d, Vol. 21, No. 1, 34–5.

Moore, C & Stuijts, I 2007 'Bronze Age craftsmanship in Ireland: some unusual artefacts from County Meath', *in* J Barber, C Clark, M Cressey, A Crone, A Hale, J Henderson, R Housley, R Sands, & A Sheridan (eds), *Archaeology from the Wetlands: recent perspectives, 101–8. Proceedings of the 11th WARP conference, Edinburgh 2005.* WARP Occasional Paper 18. Society of Antiquaries of Scotland, Edinburgh.

Moore, M J 2003 *Archaeological Inventory of County Leitrim.* The Stationery Office, Dublin.

Moore, P D, Webb, J A & Collinson, M E 1991 *Pollen Analysis* (2nd edn). Blackwell Scientific, Oxford.

Morris, C A 2000 *Craft, Industry and Everyday Life: wood and woodworking in Anglo-Scandinavian and medieval York.* The Dorset Press, Dorset.

Morris, M G 1993 'A review of the British species of Rhynchaeninae (Col., Curculionidae)', *Entomologist's Monthly Magazine*, Vol. 129, 177–97.

Murray, C, Stanley, M, McDermott, C & Moore, C 2002 'Sticks and stones: Wetland Unit Survey 2002', *Archaeology Ireland*, Vol. 16, No. 4, 16–9.

O'Carroll, E 1996 '1996:327 - Lemanaghan, Offaly', Excavations.ie Database of Irish Excavation Reports website (https://www.excavations.ie/report/1996/Offaly/0002458/, accessed February 2013).

O'Carroll, E 2003 *Stratigraphic report for excavations in Ballybeg Bog in the townlands of Togher, Barrysbrook, Toberdaly and Clonin, Co. Offaly.* Unpublished report by Archaeological Development Services Ltd for Bord na Móna.

O'Carroll, E & Condit, T 2000 'Ireland's earliest crozier?', *Archaeology Ireland*, Vol. 14, No. 2, 24–5.

O'Carroll, F & O'Connor, D J 2008 *N4 Dromod Roosky Bypass, advance archaeological works contract, Clooncolry 3. Ministerial Direction A31 (A031-009/E3297).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.2j635k644).

O'Carroll, F & O'Connor, D J 2009 *N4 Dromod Roosky Bypass, advance archaeological works contract, Aghamore 1. Ministerial Direction A31 (A031-021/E3309).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.4x51wz80v).

O'Connell, M & Molloy, K 2001 'Farming and woodland dynamics in Ireland during the Neolithic', *Proceedings of the Royal Irish Academy*, Vol. 101B, 99–128.

Ó Floinn, 1988 'Irish bog bodies', *Archaeology Ireland*, Vol. 2, No. 3, 94–7.

Ó Maoldúin, R 2008 '2008:1039 - Cloonshannagh Bog, Northyard/Cordrumman/Caul/Cloonshannagh/Cullbeg/Corraun/Cloonmore/Dooslattagh/Newtown and Derrymoylan Bog, Ballymagrine/Cloonaufi, Roscommon', Excavations.ie Database of Irish Excavation Reports website (https://excavations.ie/report/2008/

Roscommon/0020052/, accessed February 2013).

O'Sullivan, A 1996 'Neolithic, Bronze Age and Iron Age woodworking techniques', *in* B Raftery, *Trackway Excavations in the Mountdillon Bogs, Co. Longford,* 291–343. Transactions of the Irish Archaeological Wetland Unit 3. Crannóg Publications, Dublin.

O'Sullivan, A 2007 'Exploring past people's interactions with wetland environments in Ireland', *Proceedings of the Royal Irish Academy*, Vol. 107C, 147–203.

Philips, W M 1992 'Assemblages of weevils (Curculionoidea) in the lower tree canopy of a mixed temperate woodland', *Entomologist*, Vol. 111, 61–78.

Piggott, S 1983 *The Earliest Wheeled Transport: from the Atlantic Coast to the Caspian Sea.* Thames and Hudson, London.

Plunkett, G 2006 'Tephra-linked peat humification records from Irish ombrotrophic bogs question nature of solar forcing at 850 cal yr. BC', *Journal of Quaternary Science*, Vol. 21, No. 1, 9–16.

Plunkett, G 2008 'Appendix 22. Palynological and chronological analysis of an off-site peat sequence at Edercloon, Co. Longford', *in* C Moore & D J O'Connor 2009b, *N4 Dromod Roosky Bypass*, *advance archaeological works contract*, *Edercloon*. *Ministerial Direction A31 (A031-025/ E3313)*. Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.5q485352c).

Plunkett, G 2009 'Land-use patterns and cultural change in the Middle to Late Bronze Age in Ireland: inferences from pollen records', *Vegetation History and Archaeobotany*, Vol. 18, 273–95.

Plunkett, G M, Pilcher, J R, McCormack, F G & Hall, V A 2004 'New dates for first millennium BC tephra isochrones in Ireland', *The Holocene*, Vol. 14, 780–86.

Plunkett, G, Whitehouse, N J, Hall, V A, Charman, D, Blaauw, M, Kelly, E & Mulhall, I 2009 'A multi-proxy palaeoenvironmental investigation of the findspot of an Iron Age bog body from Oldcroghan, Co. Offaly, Ireland', *Journal of Archaeological Science*, Vol. 36, 265–77.

Potter, D, Eriksson, T, Evans, R C, Oh, S, Smedmark, J E, Morgan, D R, Kerr, M, Robertson, K R, Arsenault, M, Dickinson, T A & Campbell, C S 2007 'Phylogeny and classification of Rosaceae', *Plant Systematics and Evolution*, Vol. 266, No. 1–2, 5–43.

Pryor, F 2001 *The Flag Fen Basin: archaeology and environment of a Fenland landscape.* English Heritage, Swindon.

Raftery, B 1994 *Pagan Celtic Ireland: the enigma of the Irish Iron Age.* Thames & Hudson, London.

Raftery, B 1996 *Trackway Excavations in the Mountdillon Bogs*, *Co. Longford.* Transactions of the Irish Archaeological Wetland Unit 3. Crannóg Publications, Dublin.

Raftery, B 2003 'The archaeology of Irish bogs', *in* M L Otte (ed.), *Wetlands of Ireland: distribution*, *ecology*, *uses and economic value*, 202–9. University College Dublin, Dublin.

Raftery, J & Ryan, M F 1971 'National Museum of Ireland: archaeological acquisitions in the year 1968: catalogue', *Journal of the Royal Society of Antiquaries of Ireland*, Vol. 101, 184–244.

Raftery, J, Ó Ríordáin, A B & Rynne, E 1966 'National Museum of Ireland: archaeological acquisitions in the year 1963: catalogue', *Journal of the Royal Society of Antiquaries of Ireland*, Vol. 96, 7–27.

Reilly, E 1996 'The insect fauna (Coleoptera) from the Neolithic trackways Corlea 9 and 10: the environmental implications', *in* B Raftery *Trackway Excavations in the Mountdillon Bogs, Co. Longford,* 1985–1991, 403–11. Transactions of the Irish Archaeological Wetland Unit 3. Crannóg Publications, Dublin.

Reilly, E 2003 'The contribution of insect remains to an understanding of the environment of Viking-age and medieval Dublin', *in* S Duffy (ed.), *Medieval Dublin IV,* 40–63. Four Courts Press, Dublin.

Reilly, E 2005 'Coleoptera', *in* M Gowen, J Ó Néill & M Philips (eds), *The Lisheen Mine Archaeological Project 1996–8,* 187–208. Margaret Gowen & Co. Ltd Transactions Vol. 2. Wordwell, Bray.

Reilly, E 2006 'The insects, the body and the bog', *in* N Bermingham & M Delaney, *The Tumbeagh Bog Body*, 155–71. Wordwell, Bray.

Reilly, E 2008a 'Appendix 20. Analysis of insect remains from a multi-period wetland complex at Edercloon, Co. Longford (N4)', *in* C Moore & D J O'Connor 2009b, *N4 Dromod Roosky Bypass, advance archaeological works contract, Edercloon. Ministerial Direction A31 (A031-025/E3313).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.5q485352c).

Reilly, E 2008b *Understanding Late Holocene Woodland Dynamics in Southwestern and Western Ireland through the Analysis of Sub-fossil Insect Remains.* Ph.D thesis, University of Dublin, Trinity College.

Reilly, E 2009a *Analysis of Sub-fossil Insect Remains from Clancy Barracks, Islandbridge, Dublin 8.* Unpublished report for Margaret Gowen & Co. Ltd.

Reilly, E 2009b 'Insect remains from Lemanaghan, 1996–2001', *in* J Whitaker & E OCarroll, *Peatland Excavations 1999–2000: Lemanaghan group of bogs, Co. Offaly,* 139–49. Wordwell, Bray.

Reilly, E 2011 'Wax or wane? Insect perspectives on human environmental interactions', *in* S Conran, E Danaher & M Stanley (eds), *Past Times, Changing Fortunes,* 85–99. Archaeology and the National Roads Authority Monograph Series 8. National Roads Authority, Dublin.

Reimer, P J, Baillie, M G L, Bard, E, Bayliss, A, Beck, J W, Bertrand, C J H, Blackwell, P G, Buck, C E, Burr, G S, Cutler, K B, Damon, P E, Edwards, R L, Fairbanks, R G, Friedrich, M Guilderson, T P, Hogg, A G, Hughen, K A, Kromer, B, McCormac, G, Manning, S, Ramsey, C B, Reimer, R W, Remmele, S, Southon, J R, Stuiver, M, Talamo, S, Taylor, F W, van der Plicht, J & Weyhenmeyer, C E 2004 'IntCal04 terrestrial radiocarbon age calibration, 0–26 cal kyr BP', *Radiocarbon*, Vol. 46, 1029–58.

Reimer, P J, Bard, E, Bayliss, A, Beck, J W, Blackwell, P G, Bronk Ramsey, C, Buck, C E, Cheng, H, Edwards, R L, Friedrich, M, Grootes, P M, Guilderson, T P, Haflidason, H, Hajdas, I, Hatté, C, Heaton, T J, Hogg, A G, Hughen, K A, Kaiser, K F, Kromer, B, Manning, S W, Niu, M, Reimer, R W, Richards, D A, Scott, E M, Southon, J R, Turney, C S M, van der Plicht, J 2013 'IntCal13 and MARINE13 radiocarbon age calibration curves 0-50000 years cal BP', *Radiocarbon*, Vol. 55, 1869–87.

Robinson, M A 1991 'The Neolithic and Late Bronze Age insect assemblages', *in* S Needham, *Excavation and Salvage at Runnymede Bridge, 1978: a Late Bronze Age*

waterfront site, 277–326. British Museum Publication, London.

Robinson, M A 1992 'The Coleoptera from Flag Fen', *Antiquity*, Vol. 66, 467–9.

Sands, R 1997 *Prehistoric Wood Working: the analysis and interpretation of Bronze and Iron Age toolmarks*. Wood in Archaeology Vol. 1. Institute of Archaeology, University College London, London.

Schweingruber, F H 1978 *Microscopic Wood Anatomy.* Swiss Federal Institute for Forest, Snow and Landscape Research, Birmensdorf, Switzerland.

Seaver, M & O'Connor, D J 2008 *N4 Dromod Roosky Bypass, advance archaeological works contract*, *Faulties. Ministerial Direction A31 (A031-023/E3311).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.sb39mq17n).

Seaver, M & O'Connor, D J 2009a *N4 Dromod Roosky Bypass, advance archaeological works contract*, *Aghnahunshin. Ministerial Direction A31 (A031-001/E3288).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.5b001j167).

Seaver, M & O'Connor, D J 2009b *N4 Dromod Roosky Bypass, advance archaeological works contract*, *Georgia 1. Ministerial Direction A31 (A031-019/E3307).* Final Excavation Report by CRDS Ltd for Leitrim County Council (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.4j03sd445).

Seymour, J 2001 *The Forgotten Arts and Crafts*. Dorling Kindersley, London.

Simms, K 1979 'The O Reillys and the Kingdom of East Breifne', *Breifne*, Vol. 5, No. 19, 305–19.

Smedstad, I 2001 'Research on wooden trackways in Norway', *in* B Raftery & J Hickey (eds), *Recent Developments in Wetland Research: proceedings of a conference held by the Department of Archaeology*, *University College Dublin and the Wetland Archaeology Research Project (WARP) 26th–29th August 1998*, 191–200. Department of Archaeology, University College Dublin, Monograph Series Vol. 2 and WARP Occasional Paper 14. Department of Archaeology, University College Dublin, Dublin.

Smith, D N & Whitehouse, N J 2005 'Not seeing the trees for the woods: a palaeoentomological perspective on Holocene woodland composition', *in* D N Smith, M B Brickley & W Smith, *Fertile Ground: papers in honour of Susan Limbrey*, 136–62. Oxford Books, Oxford.

Stace, C 1997 *New Flora of the British Isles* (2nd edn). Cambridge University Press, Cambridge.

Stanley, M 2003 'Archaeological survey of Irish bogs: information without understanding?', *Journal of Wetland Archaeology*, Vol. 3, 61–74.

Stanley, M 2007 'Anthropomorphic wooden figures: recent Irish discoveries', *in* J Barber, C Clark, M Cressey, A Crone, A Hale, J Henderson, R Housley, R Sands, & A Sheridan (eds), *Archaeology from the Wetlands: recent perspectives. Proceedings of the 11th WARP conference*, *Edinburgh 2005,* 183–90. WARP Occasional Paper 18. Society of Antiquaries of Scotland, Edinburgh.

Stanley, M 2012 'The 'red man' of war and death?', *Archaeology Ireland*, Vol. 26, No. 2, 34–7.

Stanley, M, McDermott, C, Moore, C & Murray, C 2003 'Throwing off the yoke', *Archaeology Ireland*, Vol. 17, No. 2, 6–8.

Stanley, M & Moore, C 2004 'Medieval peatland dwellings', *Archaeology Ireland*, Vol. 18, No. 4, 12–4.

Stockmarr, J 1971 'Tablets with spores used in absolute pollen analysis', *Pollen et Spores*, Vol. 13, 615–21.

Stoneman, R, Barber, K & Maddy, D 1993 'Present and past ecology of *Sphagnum imbricatum* and its significance in raised peat-climate modelling', *Quaternary Newsletter*, Vol. 70, 14–22.

Streefkerk, J G & Casparie, W A 1989 *The Hydrology of Bog Ecosystems: guidelines for management*. Staatsbosbeheer, Dutch National Forestry Service, Utrecht.

Stuijts, I 2005 'Wood and charcoal identifications', *in* M Gowen, J Ó Néill & M Phillips (eds), *The Lisheen Mine Archaeological Project 1996–8,* 137–85. Margaret Gowen & Co. Ltd Transactions Vol. 2. Wordwell, Bray.

Stuijts, I 2021 Wood Analysis Data Sheets (TII Digital Heritage Collections: https://doi.org/10.7486/DRI.nk32g2937).

Stuiver, M & Reimer, P J 1993 'Extended ^{14}C data base and revised CALIB 3.0 ^{14}C age calibration programme', *Radiocarbon*, Vol. 35, No. 1, 215–30.

Stuiver, M, Reimer, P J, Bard, E, Beck, J W, Burr, G S, Hughen, K A, Kromer, B, McCormac, F G, Plicht, J & Spurk, M 1998 'IntCal98 Radiocarbon Age Calibration, 24,000–0 cal BP', *Radiocarbon*, Vol. 40, No. 3, 1041–83.

Swindles, G, Plunkett G & Roe H M 2007a 'A delayed climatic response to solar forcing at 2800 cal. BP: multiproxy evidence from three Irish peatlands', *The Holocene*, Vol. 17, No. 2, 177–82.

Swindles, G, Plunkett G & Roe H M 2007b 'A multiproxy record from a raised bog in County Fermanagh, Northern Ireland: a critical examination of the link between bog surface wetness and solar variability', *Journal of Quaternary Science*, Vol. 22, No. 7, 667–79.

Talma, A S & Vogel, J C 1993 'A simplified approach to calibrating 14C dates', *Radiocarbon*, Vol. 35, No. 2, 317–32.

Taylor, K 2008 'At home and on the road: two Iron Age sites in County Tipperary', *Seanda*, No. 3, 54–5.

Taylor, K 2010 'Masters of their craft: worked wood from Annaholty, Co. Tipperary', *Seanda*, No. 5, 8–9.

Taylor, K 2012 'An Iron Age timber causeway in Annaholty Bog, Co. Tipperary', *in* C Corlett & M Potterton (eds), *Life and Death in Iron Age Ireland in the Light of Recent Archaeological Excavations*, 291–302. Wordwell, Dublin.

Taylor, K, Mulcahy, A & Ruttle, E 2008 *'Annaholty Bog: marginal landscape or major routeway'*, (Poster) Exhibited at 6th World Archaeological Congress 26th June to 4th July 2008 (http://www.tvasireland.ie/Reports/wac%20annaholty%20poster%20new%20copy.pdf, accessed December 2019).

Taylor, M 1992 'Flag Fen: the wood', *Antiquity*, Vol. 66, 476–98.

Taylor, M 2001 'The wood', *in* F Pryor, *The Flag Fen Basin: archaeology and environment of a fenland landscape*, 167–228. English Heritage, London.

Tjaden, M E H 1919 *Microscopisch Onderzoek Van Hout*. L J Veen, Amsterdam.

Tolonen, K 1986 'Rhizopod analysis', *in* B E Berglund (ed.), *Handbook of Holocene Palaeoecology and Palaeohydrology*, 645–66. John Wiley & Sons Ltd, London.

van de Noort, R & O'Sullivan, A 2006 *Rethinking Wetland Archaeology*. Duckworth, London.

van de Noort, R, Geary, B R, Bermingham, N & Moore, C 2013 *Review of Archaeological Survey and Mitigation Policy Relating to Bord na Móna Peatlands Since 1990.* Unpublished report for the National Monuments Service, Department of the Arts, Heritage and the Gaeltacht.

van der Sanden, W 1996 *Through Nature to Eternity: the bog bodies of northwest Europe.* Batavian Lion International, Amsterdam.

van der Sanden, W 1999 'Wetland archaeology in the province of Drenthe, the Netherlands', *in* B Coles, J Coles & M S Jørgensen (eds), *Bog Bodies, Sacred Sites and Wetland Archaeology: proceedings of a conference held by WARP and the National Museum of Denmark, in conjunction with Silkeborg Museum, Jutland, September 1996*, 217–27. WARP Occasional Paper 12. Wetland Archaeology Research Project, Exeter.

van der Sanden, W 2001 'From stone pavement to temple—ritual structures from wet contexts in the province of Drenthe, the Netherlands', *in* B Purdy (ed.), *Enduring Records: the environmental and cultural heritage of wetlands*, 132–47 Oxbow Books, Oxford.

van der Waals, J D 1964 'Neolithic disc wheels in the Netherlands, with a note on the Early Iron Age disc wheels from Ezinge', *Palaeohistoria*, Vol. 10, 103–46.

van Geel, B, Buurman J & Waterbolk H T 1996 'Archaeological and palaeoecological indications of an abrupt climate change in the Netherlands, and evidence for climatological teleconnections around 2650 BP', *Journal of Quaternary Science*, Vol. 11, No. 6, 451–60.

van Geel, B, Raspopov, O M, Renssen, H, van der Plicht, J, Dergachev, V A & Meijer, H A J 1999 'The role of solar forcing upon climate change', *Quaternary Science Reviews*, Vol. 18, 331–8.

van Leeuwen, P, Punt, W & Hoen, P 1988 'Polygonaceae', *in* W Punt, S Blackmore & G C S Clarke (eds), *The Northwest European Pollen Flora V*, 81–151. Elsevier, Amsterdam.

van Vilsteren, V 2001 'For hotchpot and the Devil: the ritual relevance of medieval bronze cauldrons', *in* Le Secrétariat du Congrès (eds), *Archaeology and History of the Middle Ages: acts of the XIVth UISPP Congress, University of Liège, Belgium, 2–8 September 2001,* 13–19. British Archaeological Reports, International Series 1355. Archaeopress, Oxford.

Waddell, J 2000 *The Prehistoric Archaeology of Ireland* (2nd edn). Wordwell, Bray.

Watts, D C 2007 *Dictionary of Plant Lore.* Academic Press, London.

Webb, D A, Parnell, J & Doogue, D 1996 *An Irish Flora.* Dundalgan Press, Dundalk.

Whitaker, J 2006a 'Peatland archaeology since 1999: results and areas for future research', *in* C A Farrell, *Peatland Utilisation and Research in Ireland 2006: proceedings of the 1st seminar of the Irish National Committee of the International Peat Society*, 13–19. Irish Peat Society, Gorey.

Whitaker, J 2006b *Peatland Survey 2005: Allen, Kilmurray & Coolnamóna Bogs Counties Kildare, Laois, Meath, Offaly & Westmeath.* Unpublished report by Archaeological Development Services Ltd for the Department of the Environment, Heritage and Local Government.

Whitaker, J 2009 *Peatland Excavations 2001–2002: Mountdillon Group of bogs, Co. Longford.* Archaeological Development Services Ltd, Dublin.

Whitaker, J & OCarroll, E 2009 *Peatland Excavations 1999–2000: Lemanaghan*

Group of bogs Co. Offaly. Archaeological Development Services Ltd, Dublin.

Whitehouse, N J 1997a 'Silent witnesses: an 'Urwald' fossil insect assemblage from Thorne Moors', *Thorne and Hatfield Moors Papers*, Vol. 4, 19–54.

Whitehouse, N J 1997b 'Insect faunas associated with *Pinus sylvestris* L. from the mid-Holocene of the Humberhead Levels, Yorkshire, UK', *in* A C Ashworth, P C Buckland & J P Sadler (eds), *Studies in Quaternary Entomology—an inordinate fondness for insects*, 293–304. Quaternary Proceedings No. 5. John Wiley and Sons, Chichester, UK.

Whitehouse, N J 2004 'Mire ontogeny, environmental and climatic change inferred from fossil beetle successions from Hatfield Moor, eastern England', *The Holocene*, Vol. 14, 79–93.

Whitehouse, N J, Schulting, R J, McClatchie, M, Barratt, P, McLaughlin, T R, Bogaard, A, Colledge, S, Marchant, R, Gaffrey, J & Bunting, M J 2014 'Neolithic agriculture on the European western frontier: the boom and bust of early farming in Ireland', *Journal of Archaeological Science*, Vol. 51, 181–205.

Williams, B 1978 'Excavations at Lough Eskragh, County Tyrone', *Ulster Journal of Archaeology*, Vol. 41, 37–48.

Williams, B 1983 'A wooden bucket found near Carrickmore, Co. Tyrone', *Ulster Journal of Archaeology*, Vol. 46, 150–1.

Wilmink, J 2012 *De Twentsche Goa-stok:van houtwaltot stok*. Van de Berg, Almere, The Netherlands.

Woodland, W A, Charman, D J & Sims P C 1998 'Quantitative estimates of water tables and soil moisture in Holocene peatlands from testate amoebae', *The Holocene*, Vol. 8, No. 3, 261–73.

Wood-Martin, W G 1886 *The Lake Dwellings of Ireland or Ancient Lacustrine Habitations of Erin*, *Commonly called Crannogs*. Hodges Figgis, Dublin.

Yates, D & Bradley, R 2010 'Still water, hidden depths: the deposition of Bronze Age metalwork in the English fenland', *Antiquity*, Vol. 84, No. 324, 405–15.

Index

Note: *Persons cited as authors are not included in the index; page references in bold denote principal references; page references in italics denote illustrations; 'n' following a page reference denotes a footnote.*

The bog in the townland of Edercloon, Co. Longford, first came to archaeological attention in 1964, when a local farmer discovered a prehistoric stone axe that retained a portion of its original wooden handle. Forty-two years later, during test excavations in advance of the construction of the N4 Dromod–Roosky Bypass, the preservative peat of Edercloon relinquished further ancient secrets in the form of a large network of wooden trackways and numerous artefacts. This proved to be one of the most remarkable archaeological complexes ever excavated in Ireland's wetlands.

Evidence for human activity at Edercloon extends back almost 6,000 years, when the first narrow track of branches and twigs was laid down on the wet bog surface. This practice would continue for four millennia as further structures were built and wheel fragments, spears, and vessels were deposited among them. The story of Edercloon is not limited to the sites and objects submerged within the peat, however, it is also the account of an evolving landscape. Volcanic ash, ancient pollen, microscopic organisms, deep accumulations of peat, beetles' wings, and the wood of the trackways themselves have been the subject of specialist palaeoenvironmental studies. Their findings greatly enhance and explain much about the archaeological tale recounted in *Between the Meadows*—the discovery of a potentially unique wetland ritual complex that was the focus of sustained activity over millennia.

Caitríona Moore studied archaeology at University College Dublin and graduated with a Bachelor of Arts degree in 1996 and a Master of Arts degree in 2009. She has worked on a wide range of archaeological projects across Ireland and specialises in the archaeology of wetlands, ancient woodworking and wooden artefacts. Caitríona is a Managing Director with Archaeology and Built Heritage Ltd.

An Roinn Iompair
Department of Transport

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

ISBN: 978-1-911633-30-3