
Introduction and Overview

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INTRODUCTION AND OVERVIEW

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Stony seaboard, far and foreign,
Stony hills poured over space,
Stony outcrop of the Burren,
Stones in every fertile place...

'Ireland with Emily', John Betjeman

In recent years there has been a plethora of popular books and articles on the Burren, many of which quote similar facts and tell a familiar story. Much emphasis has been placed, quite rightly, on the unusual geological landscape and the cultural, archaeological and biological importance of this area (see Fehan *et al.* 1991; Nelson and Walsh 1991; Cabot 1999; Pilcher and Hall 2001). For a botanist the relevant statistics now almost roll off the tongue. The large and diverse range of species present in such a small land area; the increased abundance of some species compared to anywhere else in Ireland or abroad; the occurrence of plants in habitats often atypical of their distribution either in Ireland or elsewhere; and the close association of plant species that are normally thought to have different climatic requirements. Clearly, it is these statistics, coupled with the archaeological, geological and cultural heritage, that make the Burren so unique.

The widely available *descriptive* biological detail could, however, lull us into a false sense of security, suggesting that we *understand* the factors that have shaped the present communities associated with the Burren. The truth is we don't! There is still considerable debate about the origins of the Burren flora, and we know very little about the factors, biotic or abiotic, that underlie the mosaic of vegetation patterns present in this locality or their relationship to animal or microbial communities. The real challenge, in our view, is to provide a causal explanation for the unusual plant communities found in this region. This information will also be of much wider international significance, providing an understanding of the way that local or regional ecological drivers can override broad climatic controls on the distribution of plants. Such an understanding will be important in providing refined projections of the likely outcome of alterations in land use and of future

climates on the distribution of plants and perhaps other organisms.

In large part our inability to provide even basic information on causal factors associated with community structure and dynamics in the Burren is related to the absence of experimentally based studies, using laboratory and field-based approaches. The application of new ecophysiological and molecular techniques for work on plants, animals and microbes should allow us to address some of the more fundamental questions relating to community structure and function in the Burren. As well as being of fundamental interest, such information will be essential for formulating appropriate management plans for this region. Clearly current human-related activities, coupled with future changes in climate, may have considerable impacts on the native flora and fauna. These impacts can be considerable and rapid, requiring careful monitoring and assessment. So what of the future? How can we best manage this important resource?

Proper management of Burren communities is clearly dependent on information from many sources, and the more we learn, the more we realise the many gaps still to be filled. One of the first steps we recommend is the initiation of a Burren data acquisition system for collating biological and environmental data, coupled with a mapping programme that includes an integrated inventory of resources. The motive behind these initiatives is to assess, at a range of scales, the consequences of pressures associated with agriculture, tourism and climate change. There is a strong case for installing additional instrumentation for routine assessments of water and nutrient budgets. Phenological observations on plants initiated by O'Donovan (1987) should be continued and expanded to include invertebrates, mammals and birds. The establishment of permanent monitoring plots will also enable assessments of the fine detail of vegetation composition to be continued into the future. What we need to recognise is that the Burren can be

The spelling of all place names used in this issue is taken from the Ordnance Survey of Ireland Discovery Series maps, with the exception of quotations, where the spelling remains unchanged.

justifiably regarded as part of the national cultural estate and that funding for these initiatives is a logical way to enhance tourism, while retaining all of the qualities the region currently has to offer. While we have argued that the ecology of the Burren is unique, if only for the sheer quantity of plants uncommon in Western Europe, comparisons may be made with other similar areas. A natural extension of any work on the Burren would be to encompass any investigations within a European context directed towards the conservation and management of glaciated karstic regions.

Currently four main areas of the Burren are designated as candidate Special Areas of Conservation (cSAC) under the 1992 'Habitats Directive' (Table 1). Each of these relatively large sites represents a complex set of habitats, including grassland and heaths on limestone pavement, seasonally flooded grassland, dune communities and woodland. Most of the land is privately owned, and the state-owned sites located within the East Burren complex (Burren National Park and the national nature reserve at Slievacarran) represent less than 3% of the cSAC sites. The total designated area of all these sites (45,120ha) presents a large and extremely complex management problem, requiring an increased ecological understanding, as well as a need to account for the requirements and interests of landowners. The significance of agricultural management practices, particular those associated with cattle grazing and the spread of hazel (*Corylus avellana*), is of considerable contemporary interest (Dunford 2002). While grazing can have a significant role in the persistence of many herbaceous plant communities, there are large tracts of the Burren where colonisation by hazel is unlikely. Despite variations in grazing pressure, the persistence of similar plant associations, coupled with the difficulty of providing even a plausible explanation for how grazing can result in the selective persistence of uncommon or unusual plant species, indicates that grazing per se is unlikely to *explain* the diverse range of plant communities that persist

over large areas of the Burren. Although more attention should be directed at the impact of grazing *sensu lato*, this should not divert us from investing resources in answering the more fundamental aspects of Burren biology and ecology. New research will be required to establish the benefits, if any, of pasture improvements and the value, in particular, of old unimproved pastures with a higher biodiversity and moderate yields but greater tourism potential. In the future farm incomes may depend almost equally on cattle and tourism, so that these apparently conflicting interests will need to be resolved. The existing Rural Environmental Protection Scheme (REPS) is probably the main vehicle for ensuring the appropriate management of ecologically important areas. This scheme, administered by the Department of Agriculture, Food and Rural Development, provides additional payments to farmers with land in designated SAC sites. Collectively the cSAC sites dominate the Burren landscape. This level of landscape protection is only a small step from the nomination of the whole Burren as a UNESCO World Heritage Site.

The papers included in this special issue provide some idea of the range of largely experimentally based studies currently associated with the Burren. One of the crucial eco-physiological questions associated with the occurrence of the diverse range of plant communities is the identification of factors that may be important in limiting plant productivity and distribution. Both David Jeffrey and Bruce Osborne and co-workers argue a case for water limitation as an overriding determinant. The unusual ectotrophic fungal associations identified by Tom Harrington could also be important for both water and nutrient use, given their well-described role in increasing the capture of a range of resources by plant roots. A related paper by Richard Moles and co-authors covers the impact of environmental factors on plant diversity in grassland communities. While the Burren landscape may represent a dry environment, there are several seasonally significant water bodies and

Table 1—Candidate sites in the Burren proposed for designation as SAC sites under the Habitats Directive. Data courtesy of Dúchas.¹

<i>Code</i>	<i>Site Name</i>	<i>County</i>	<i>Area (ha)</i>
20	Black Head/Poulsallagh Complex	Clare	5772
54	Moneen Mountain	Clare	6070
268	Galway Bay Complex	Galway/Clare	14458
1926	East Burren Complex	Clare/Galway	18820

¹ The National Parks and Wildlife Service (Dúchas) is now the National Parks and Wildlife Section of the Environment Infrastructure and Services Division of the Department of the Environment, Heritage and Local Government.

streams, as well as more permanent lakes. A particular feature of the Burren landscape is the frequent occurrence of turloughs. Not only are these of botanical significance, they are also an important area for grazing animals, further emphasising the importance of harmonising agronomic activities with botanical interests. Deirdre Lynn and Steve Waldren examine the effects of hydrology on the occurrence of plant communities in turloughs, while Breda Ní Bhriain and co-workers provide an assessment of altered land-use practices in relation to the conservation of the flora of turloughs.

Dealing with more permanent water bodies, Mary Kelly-Quinn and co-workers provide an analysis of the macroinvertebrate community of the Caher River, the only river that rises in the Burren, in relation to its water chemistry, and Colin Pybus and colleagues present a new comparative assessment of the phytoplankton and charophytes of Lough Bunny. Both conclude that these systems are oligotrophic and have not, as yet, been influenced significantly by human activities.

Although there is a justification for regarding the Burren as unique in terms of its plant communities, we have less justification for making this claim for any of the microbial or zoological elements. However, the discovery of the only Irish location of the land snail *Pomatias elegans* by Elizabeth Platts in the Burren in 1976 and the survey of the colony reported in this issue suggest that there may be other unforeseen features of the biology and ecology of the Burren that await discovery.

The following eclectic mix of papers provides a taste of the range of current research that is leading to a deeper understanding of the biology of the Burren. In turn they should raise a range of new issues that can only be answered by further experimental investigations in this unique habitat.

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