

Arctostaphylos heath community ecology in the Burren, Western Ireland

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Abstract. *Arctostaphylo-Dryasetum* is a rare sub-type of Alpine and Boreal Heath which is known to occur only in Ireland on the limestone karst Burren, in County Clare. Relevés were taken across the Burren region and three groups were distinguished: *Empetrum nigrum* group; *Erica cinerea* group, *Juniperus communis* group. Altitude and soil conditions were found to be the main ecological factors responsible for the variation in the data set, especially pH, and the organic and mineral content. Winter grazing appears to maintain this habitat. In some areas *Calluna vulgaris* has encroached on the rarer plant species cutting trials are underway in an attempt to restore the habitat to good conservation status.

Key words: Alpine heath, *Arctostaphylos uva-ursi*, *Empetrum nigrum*, environmental variables, plant community.

1. Introduction

Alpine and Boreal heaths (EU Habitats Directive code: 4060) are a rare and protected habitat type in Europe and their management is a priority. There are two main sub-types of Alpine heath in Ireland: one is a community occurring at 350–400m on acidic slopes, dominated by *Calluna vulgaris* and characterised by dwarf shrubs, largely restricted to uplands in western counties Kerry, Galway (Connemara), Mayo and Donegal.

The other, the subject of this study, is the *Arctostaphylo-Dryadetum* where the presence of *Dryas octopetala* distinguishes it from other variants of this plant community and is only known to occur in Ireland in the limestone karst Burren, County Clare (NPWS, 2013). There it occurs on higher ground and in the ‘low Burren’ of south-east Galway and north Clare. *Arctostaphylos*-rich heaths form an important part of the vegetation on high ground in the Burren (Ivimey-Cook & Proctor, 1964; Webb & Scannell, 1983; Proctor, 2013) and are often associated with *Empetrum nigrum* (Parr et al., 2009). The objective of this

study is to compare alpine heath plant communities associated with *A. uva-ursi* in the upland and lowland areas within the Burren region.

2. Study area: The Burren

From the Gaelic: *Boireann* meaning ‘rocky place’, the Burren is a region of karst landscape covering approximately 250km² of counties Clare and Galway on Ireland’s mid-western seaboard. To the west the ‘high Burren’ is composed of terraced hills of 300–330m altitude and to the east the ‘low Burren’ limestone plains are just 20–30m in altitude. The Burren is internationally acclaimed for its unique assemblages of flora: the only place in the world where Arctic-Alpine and Mediterranean species grow side-by-side (Webb & Scannell, 1983).

The area has an oceanic climate, characterised by mild winters with few frosts, cool moist summers, high rainfall throughout the year and frequent strong winds (Webb & Scannell, 1983). This last factor is conducive to the presence of sclerophyllous species.



Figure 1. Example of lowland heath community with *Arctostaphylos uva-ursi* and exposed limestone

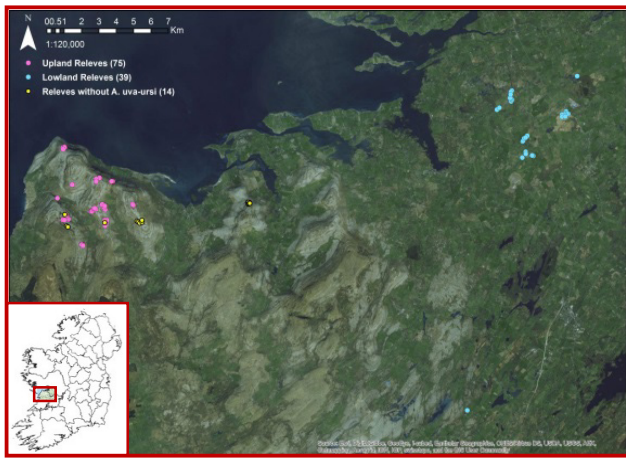


Figure 2. enlarged aerial photo of study area with relevé sites marked. Pink dots: upland; blue dots: lowland. NB the extent of exposed limestone throughout the region; (inset) map of Ireland showing Study Area

3. Methodology

Sample sites in the Burren were selected for the presence of *A. uva-ursi* and/or *E. nigrum* (Parr et al., 2009). In total 114 relevés were taken from 2m x 2m quadrats during 2013 and 2014 field seasons; 39 in the ‘low Burren’, and 75 in the ‘high Burren’, see Figure 2. Although this habitat is more widespread above 200m OD (Ordnance Datum) it is also present at 30m OD in the low east Burren. The quadrats were located within pastures grazed during winter months. Environmental variables such as slope, aspect, altitude were recorded and soils were collected for analysis of pH and organic content. Data were analysed using TWINSpan (Two Way Indicator Species Analysis)

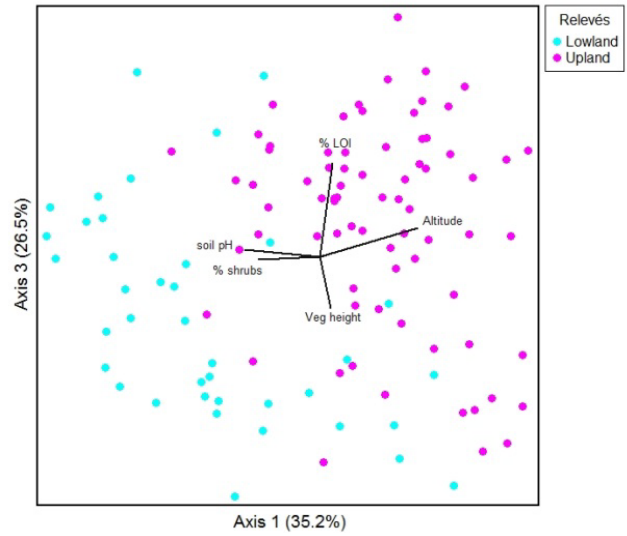


Figure 3. Non-metric Multidimensional Scaling plot of relevés summarised in Table 1. Vectors show variables most correlated with the data; LOI = Loss-on-ignition (organic matter)



Figure 4. Winter grazing in the Burren uplands

and Non-metric scaling (NMS) ordination plots (McCune & Mefford, 2006). Although issues have been highlighted with TWINSpan (Perrin et al., 2006) it was nevertheless used for this preliminary analysis, as it has been used for many other vegetation studies in the Burren (Parr et al., 2009).

4. Preliminary Results

Calluna vulgaris, *Dryas octopetala* and *Arctostaphylos uva-ursi* are dominant across all relevés, however plant communities can be placed in three distinct groups as shown in Table 1: Upland relevés are placed in Groups

Table 1. Abridged constancy table for Arctic-Alpine heath in the Burren: Roman numerals: I = 1–20%, II = 21–40%, III = 41–60%, IV = 61–80%, V = 81–100% (Rodwell, 1991)

No. of Relevés per group	31	24	33
No. of Species per group	90	105	111
Mean soil pH	6.87 ± 0.50	6.23 ± 0.47	7.06 ± 0.48
Mean % Loss on Ignition (LOI)	75.71 ± 15.90	49.21 ± 22.27	35.70 ± 15.50

1. Empetrum nigrum group

Empetrum nigrum	V	I	
Tortella tortuosa	V	II	III
Solidago virgaurea	IV	II	III
Hypnum lacunosum	IV	I	III
Frullania tamarisci	III	I	III

2. Erica cinerea group

Erica cinerea	II	V	R
Lathyrus linifolius	I	V	+
Anthoxanthum odoratum	II	IV	II
Pteridium aquilinum	II	IV	I
Hypnum jutlandicum	II	IV	+
Rosa pimpinellifolia	II	III	II
Rhytidiadelphus triquetrus	I	III	II
Festuca rubra	+	III	II
Thuidium tamariscinum	+	III	+
Cirsium dissectum		III	R

3. Juniperus communis group

Juniperus communis	+	III	V
Teucrium scorodonia	II	I	V
Briza media	I	I	IV
Dicranum scoparium	III	III	III
Corylus avellana	R	+	III

Constant species

Calluna vulgaris	V	V	IV
Dryas octopetala	V	IV	IV
Arctostaphylos uva-ursi	III	V	V

1 and 2: 1 – *E. nigrum* is dominant, *A. uva-ursi* is absent from some plots. Lowest species richness; found on slightly acidic peaty soils with high organic content; 2 – *Erica cinerea* and *Lathyrus linifolius* are the dominant species; lower soil pH than group 1, less peaty soils with higher mineral content. Lowland relevés are placed in Group 3: *Juniperus communis* and *Teucrium scorodonia* are dominant; soils are neutral to slightly basic and are mineral-rich.

The ordination plot (Fig. 3) shows the separation of upland and lowland relevés. Upland relevés are positively correlated with high % LOI, and negatively correlated with soil pH and % shrub cover; lowland relevés are positively correlated with soil pH, % shrub cover and vegetation height, and negatively correlated with % LOI.

5. Discussion

Preliminary results show that the *Arctostaphylo-Dryasetum* can be further classified into three sub-types each of which can be related to differences in altitude and soil conditions. In terms of conservation, it is therefore essential to note that broad prescriptive land management strategies are not sufficient for managing habitats of conservation importance (Dunford, 2002), since sites vary in terms of both vegetation and soils. While winter grazing, see Figure 4, is key to maintaining this habitat (Parr et al., 2009), where *Calluna* has encroached cutting may be required to restore it to a good conservation status. In order to determine optimum cutting time for regrowth of less vigorous alpine

heath species experimental cutting trials are underway in selected sites in the Burren uplands.

References

- Dunford B., 2002, *Farming and the Burren*. Teagasc Publications.
- Ivimey-Cook R.B. & Proctor M.C.F., 1964, The plant communities of the Burren, Co. Clare. Proceedings of the Royal Irish Academy. Section B: Biological, Geological, and Chemical Science, 64: 211–302.
- McCune B. & Mefford M.J., 2006, PC-ORD. Multivariate Analysis of Ecological Data, Version 5.10, MjM Software, Glenden Beach, Oregon, U.S.A.
- NPWS, 2013, The Status of EU Protected Habitats and Species in Ireland: Habitat Assessments, Vol. 2, National Parks & Wildlife Service, Department of Arts, Heritage and Gaeltacht, Dublin, Ireland.
- Parr S., O'Donovan, G., Ward S. & Finn J.A., 2009, Vegetation analysis of upland Burren grasslands of conservation interest, *Biology and Environment: Proceedings of the Royal Irish Academy*, 109 B: 11–33.
- Perrin P.M., Martin J.R., Simon J.B. & Roche J.R., 2006, A cluster analysis approach to classifying Irish native woodlands, *Biology and Environment: Proceedings of the Royal Irish Academy*, 106B: 261–275.
- Proctor M., 2013, *Vegetation of Britain and Ireland*, Collins, London.
- Rodwell J.S., 1991, *British Plant Communities*, vol. 1, Cambridge University Press, Cambridge, UK.
- Webb D.A. & Scannell M.J.P., 1983, *Flora of Connemara and the Burren*, Cambridge University Press, Cambridge.