H2
Calluna vulgaris-Ulex minor heath

Synonymy
Callunetum arenosum Tansley 1911 *p.p.*; *Calluna-Ulex-Erica* heath Fritsch & Parker 1913, Fritsch & Salisbury 1915, Haines 1926; *Callunetum arenicolum* Tansley 1939 *p.p.*; Dry heath assemblage Newbould 1960; Dry heath Harrison 1970 *p.p.*; *Calluna-Ulex minor* heaths Gimingham 1972 *p.p.*

Constant species
Calluna vulgaris, *Deschampsia flexuosa*, *Erica cinerea*, *Ulex minor*.

Rare species
Agrostis curtisii, *Genista pilosa*.

Physiognomy
The *Calluna vulgaris-Ulex minor* heath is generally dominated by *Calluna vulgaris*, though with both *Erica cinerea* and *Ulex minor* playing a very frequent and sometimes prominent role in the sub-shrub canopy and together providing an important floristic distinction from the more continental heath vegetation of much of East Anglia. The canopy is very variable in height, from 1 to 8 dm or more, and, as always where *Calluna* is an important species, its structure can be much affected by the growth phases of the heather plants, and whether the individuals in a particular stand are of even or uneven age. Where burning still occurs, as in parts of the New Forest, tracts of the community can show the characteristic patchwork of swales with the heather in various stages of recovery from pioneer through to building, though generally not beyond if burning is being judiciously practised to maximise grazing value. But, often now, burning has ceased or is accidental and sporadic and grazing not pursued, so many stands have a cover of very leggy *Calluna*.

Recovery of the vegetation after degeneration of the heather, or after an episode of burning, can also see marked changes in the proportions of the two other common sub-shrubs. *E. cinerea* is a prolific seeder and, particularly where patches of mineral soil have been exposed, as after fires, it can outstrip *Calluna* at first, even when most of its original plants have been destroyed (Fritsch & Salisbury 1915, Gimingham 1949, 1972). *Calluna* generally comes to dominate eventually, but *E. cinerea* can retain a co-dominant role, particularly perhaps on drier soils on slopes facing south or south-west (Fritsch & Parker 1913, Fritsch & Salisbury 1915), and it can tolerate some shade from heather (Bannister 1965). In some stands, however, its cover is very low and it can be totally absent, especially where there is a tendency for the soils to experience some seasonal waterlogging, as in the *Molinia* sub-community.

U. minor shows a similar variation in its abundance and, in some areas like the New Forest, where grazing still occurs, it seems to have been widely reduced in dry heaths of this kind so that they have taken on the composition of the much more widespread and largely northern *Calluna-Erica cinerea* heath. In its characteristic form, however, the *Calluna-Ulex minor* heath always has at least some dwarf gorse, being one of only two British heath communities in which this geographically restricted species plays a consistently frequent part. Not that the plants are always particularly dwarfed (e.g. Skipper 1922, Proctor 1965): procumbent individuals in open stretches of heath can form mats barely 5 cm tall and, after fires, there can be prolific production of low shoots from surviving stools, but the species is very plastic and bushes up to a metre or more can be found in more sheltered places, with the species showing local co-dominance with the *Calluna*. Usually, however, it plays a subsidiary role and, being relatively shade-tolerant, may form a patchy understorey beneath the level of the taller heather. In denser shade, it rarely flowers, which deprives the vegetation of a glorious splash of pale yellow, intermixed with the purples of the ericoids, in late summer and early autumn, and makes it difficult to tell this gorse from *U. gallii*. In fact, the latter is very scarce in this community, showing an almost exclusive

geographical vicarism with *U. minor*: it is mostly around Poole Harbour in Dorset that the two gorse species occur together in these kinds of heaths (Proctor 1965).

No other sub-shrub occurs frequently throughout the community as a whole. *U. europaeus* can be found occasionally, and sometimes with local abundance, often along disturbed tracks or around old settlements, though in parts of the New Forest a little more widely (Tubbs & Jones 1964). Of greater significance for defining floristic variation within the community are *Erica tetralix* and *Vaccinium myrtillus*, both fairly uncommon overall but each preferentially frequent in particular sub-communities, the former where this kind of heath extends on to seasonally-waterlogged soils, the latter perhaps where rainfall is somewhat higher. *Genista anglica* also occurs very occasionally throughout and in Ashdown Forest in Sussex the community provided the most inland locus for *G. pilosa*, now extinct there.

Other consistent floristic features of the community are also very few. Apart from the sub-shrubs, only *Deschampsia flexuosa* is constant and even that is somewhat patchy in its occurrence, being shade-tolerant, though tending to be depressed by accumulation of litter and thus often largely confined to areas between the woody plants. Where there is some grazing, its abundance in such accessible places can be encouraged and it can also spread extensively after burning (Tansley 1939). On wetter soils here, it tends to be replaced by *Molinia caerulea*, not usually present in much quantity, though prone to expand where there has been very frequent burning followed by heavy grazing on such damper ground. In marked contrast to heath with *U. minor* further to the west, however, *Agrostis curtisii* is only very occasional in this community: some of its Surrey occurrences are in this kind of heath but generally it is not an important species. And, compared with the more continental *Calluna-Festuca* heath of eastern England, *Festuca ovina* and *Agrostis capillaris* are scarce.

Among other herbaceous plants, only *Pteridium aquilinum* occurs with any frequency, being occasional overall and preferential for one particular sub-community. It is usually not very abundant but, when its fronds are fully unfurled by mid-summer, it can look conspicuous and thick patches of bracken, which would be classified in the *Pteridium-Galium* community, occur commonly in close association with the *Calluna-Ulex minor* heath. Scattered individuals of *Potentilla erecta* or *Galium saxatile* can sometimes be found in more open areas and one very distinctive plant that can be abundant after burning is *Cuscuta epithymum*, its very slender reddish stems able to attach parasitically to almost all the species mentioned above.

A further important element of the vegetation in some stands is seedling and sapling trees, with *Quercus* spp., particularly *Q. robur*, *Betula* spp. and *Pinus sylvestris*, especially able to gain a hold on more open areas of ground and quick to get away if there is no burning or grazing.

Often now, in the absence of such regular burning, the ground layer of the *Calluna-Ulex minor* heath is very patchy and more or less limited to the cores of degenerate heather bushes, where the characteristic sequences of mosses and lichens can be seen, *Dicranum scoparium* and *Hypnum jutlandicum* being the most frequent bryophytes overall, *Polytrichum piliferum* and *P. juniperinum* being less common, though showing local abundance in the early stages of colonisation of mineral ground. Peat-encrusting *Cladonia* spp., sometimes with larger taxa like *C. furcata* and *C. arbuscula*, can also figure in such places, together with *Hypogymnia physodes* on old heather stems (e.g. Watt 1955). On burned ground, a much more extensive sequence of colonisation can be observed (e.g. Fritsch & Salisbury 1915), with sequences of algae first to appear, then mosses such as *Ceratodon purpureus*, *Funaria hygrometrica* and *Polytrichum piliferum*, and *Cladonia* spp. developing as the sub-shrubs regenerate from sprouting stools and seed.

Sub-communities

Typical sub-community. In this kind of *Calluna-Ulex minor* heath, *Calluna* is generally strongly dominant with subsidiary amounts of *U. minor* and *E. cinerea*, the latter especially being very variable in its cover and sometimes absent, though both occasionally attaining co-dominance. Neither *V. myrtillus* nor *E. tetralix* occur among the sub-shrubs and *Molinia* is typically scarce. Indeed, no other plants occur consistently throughout, although *Deschampsia flexuosa* is quite common at usually low covers and sometimes accompanied or replaced here by *Festuca rubra*. *Pteridium* and tree seedlings or saplings are infrequent. Bryophytes and lichens can be locally conspicuous among older heather or after burning, with *Cladonia fimbriata*, *C. coccifera*, *C. chlorophaea* and *C. arbuscula* all showing a slight preference for this sub-community.

***Vaccinium myrtillus* sub-community.** *Calluna* is a little less overwhelmingly dominant here, the sub-shrub canopy usually consisting of mixtures of heather, with sometimes substantial amounts of *U. minor*, *E. cinerea* and, strongly preferential to this sub-community, *V. myrtillus*. *Pteridium* is also rather more frequent than elsewhere in the community and, among somewhat more open areas of this diverse cover, there is generally some *Deschampsia flexuosa* and occasionally a little *Molinia*. *Gaultheria shallon*, a North American shrub planted in Britain for game cover and naturalised, can be found quite widely in this vegetation in Surrey. Young trees are also strongly preferential, with oak and

birch seedlings and small saplings frequent and small pines locally prominent. *Hypnum jutlandicum* and *Dicranum scoparium* can occasionally be found but lichens are sparse.

***Molinia caerulea* sub-community.** Again, *Calluna* can be very abundant in this sub-community, usually with smaller amounts of *U. minor* and particularly of *E. cinerea*, which is sometimes joined or replaced by *E. tetralix*. More obviously preferential is *Molinia*, which almost totally displaces *Deschampsia flexuosa*. *Pteridium* is uncommon and young trees very rarely found. The ground layer, too, is particularly sparse in this kind of heath.

Habitat

The *Calluna-Ulex minor* heath is characteristic of impoverished acid soils, predominantly free-draining, in south-east and central southern England. The slight tendency towards an oceanic climate in this region is reflected in the general composition of the community, although in some areas the vegetation still takes much of its structural, and some of its floristic, character from the traditional burning and grazing treatments. Elsewhere, neglect of these activities means that this kind of heath is now in various stages of progression to woodland or found as small remnants, fragmented and isolated by improvement for agriculture or forestry.

With the geographical shift south and west from the range of the *Calluna-Festuca* heath, centred on East Anglia, the climate takes on a distinctly less continental character. Thus, though annual accumulated temperatures are within much the same range as there, mean annual maxima are generally lower, for the most part between 27 and 30 °C (Conolly & Dahl 1970). More importantly, the winters are considerably milder, with February minima often one or more degrees C above freezing (*Climatological Atlas* 1952), so the annual temperature range is considerably reduced. These more equable conditions are marked in the vegetation by the appearance of some of the Oceanic West European species that become a characteristic feature of the series of heaths running around the Atlantic seaboard of Britain. Among those typical of drier soils, *Erica cinerea* and *Ulex minor* show the most consistent eastward penetration south of the Thames: it is their constancy which provides the most obvious floristic distinction between this community and the *Calluna-Festuca* heath and probably their sensitivity to winter cold which sets the geographical boundary between the two (e.g. Bannister 1965, Gimingham 1972). Westwards, it is harder to see any climatic explanation for the limit to the range of the *Calluna-Ulex minor* heath. Beyond Poole, it is replaced on similar soils by the *Calluna-Ulex gallii* heath, a switch that essentially involves the replacement of one gorse by the other (Proctor 1965). This fairly sharp vicarism is also found in north-west France (des Abbayes & Corillion 1949, Corillion 1950, 1959) and perhaps also in northern Spain (Proctor 1965) and it may reflect greater tolerance of winter cold by *U. minor*, but other present or past climatic conditions, or some edaphic factors, could be involved.

The other distinctive feature of the climate within the range of the community compared with that of East Anglia, indeed, with that over much of the central and eastern lowlands of Britain, is that it is decidedly wetter, with more than 120 wet days yr^{-1} (Ratcliffe 1968) and annual precipitation almost everywhere in excess of 800 mm (*Climatological Atlas* 1952). This isohyet shows a close correspondence with the British distribution of *Vaccinium myrtillus*, another sub-shrub absent from the *Calluna-Festuca* heath but sporadically represented here and in more oceanic lowland heaths provided, of course, there is little or no grazing. Such treatment may play some part in restricting its occurrence within the *Calluna-Ulex minor* heath; certainly, absence of grazing is implicated in the frequent association of bilberry with young trees in the *Vaccinium* sub-community. It should be noted, though, that this kind of vegetation, like other bilberry-rich lowland heaths, does tend to be found at somewhat higher altitudes than usual (mean almost 140 m, compared with 75–100 m for the other sub-communities), and is concentrated in those parts of The Weald where rainfall approaches or exceeds 1000 mm (*Climatological Atlas* 1952).

Over the range of acid soils occupied throughout this climatic zone by heaths in which *Calluna*, *E. cinerea* and *U. minor* play an important role, this community is characteristic of the more free-draining profiles, developed from pervious arenaceous or pebbly parent materials. In the High Weald, the higher reaches of the Cretaceous Hastings Sands and Ashdown Sands form important substrates in Ashdown Forest, and then around the western rim of The Weald, the Folkstone and Sandgate Beds, and the less lime-rich stretches of the Hythe Beds underlie stands on the Lower Greensand dip slope, as on Iping and Ambersham Commons in Sussex and Thursley and Hankley Commons in Surrey. Almost contiguous with these last sites is the extensive expanse of Eocene Bagshot and Bracklesham Beds which support many tracts of the community running north and west into the Thames basin, as on Chobham Common, for example. Eocene sands and gravels, overlain in parts by Plateau Gravels and river terrace drift, are also the characteristic substrate through the New Forest and around Poole Harbour (e.g. Wooldridge & Goldring 1953, Ratcliffe 1977).

Under the *Calluna-Ulex minor* heath, such parent materials have typically given rise to some kind of podzolic profile, either a classic humo-ferric podzol, like

those of the Shirrell Heath series, particularly important over the Lower Greensand, or, where there is more material of the finer fractions in the profile, a palaeo-argillic podzol, as of the Southampton series, a common soil type over Eocene and more recent deposits (*Soil Survey* 1983, Jarvis *et al.* 1984). Such profiles are highly acidic, superficial pH beneath the community being between 3.5 and 4.5, and generally very impoverished, features reflected in the thoroughly calcifuge character of the vegetation and the poor representation of mesophytic plants. In fact, Tubbs (1968) has suggested that, in the New Forest, the soils under this kind of heath are not quite so bereft of nutrients as in, for example, the Poole basin, something of importance to the readiness with which the vegetation can progress to different kinds of woodland (see below).

The other general characteristic of these soils is that they are relatively free-draining; indeed, in the warm dry summers typical of the region, they can be distinctly droughty (Jarvis *et al.* 1984). It is this edaphic feature which provides the major distinction between the habitat of the *Calluna-Ulex minor* heath and the *Ulex minor-Agrostis curtisii* heath. The two overlap considerably in their geographical range but, in the latter, the shift to seasonally-waterlogged gley-podzols is marked by the consistent appearance, along with *Calluna*, *E. cinerea* and *U. minor*, of *E. tetralix*, *Molinia* and *A. curtisii*. Characteristically, these species are of restricted occurrence here, though the boundary between the two vegetation types is not a hard and fast one, because the development of an argillic B horizon or a B_{Fe} pan in these podzols can impede drainage and result in local surface-water gleying in winter: the *Molinia* sub-community, with its partial replacement of *E. cinerea* and *Deschampsia flexuosa* by *E. tetralix* and *Molinia*, is characteristic of such transitional situations.

Whether the development of such generally poor soils was already in train before the extensive establishment of dry heath in central southern and south-east England is still debatable (e.g. Dimbleby 1962, Tubbs & Dimbleby 1965, Godwin 1975, Haskins 1978), but what seems certain is that the spread of vegetation of this type was encouraged by human activity, perhaps as early as in the Mesolithic Period in some areas, and certainly by the Bronze Age, and that the process of podzolisation was enhanced under the heath canopy. And treatments continue to be of prime importance in maintaining the *Calluna-Ulex minor* heath, rather than the harsh character of the edaphic environment itself: this is essentially a plagioclimax vegetation type which, when released from a regime of grazing and/or burning, progresses to woodland, a development which can already be seen in the *Vaccinium* sub-community with its crop of tree seedlings and preferentially frequent bilberry and bracken (see below).

The decline of traditional styles of heathland exploitation means that such stands of the *Calluna-Ulex minor* heath as remain often have a very leggy sub-shrub canopy in which heather is the overwhelming dominant. Burning of this vegetation can help maintain a more variegated canopy in which there is opportunity for a considerable local expansion in the cover of *E. cinerea*, *U. minor* or *D. flexuosa* on drier ground, or *Molinia* on wetter, before the regrowth or re-establishment from seed of the *Calluna*, and a coincident colonisation by a series of algae, bryophytes and lichens on the exposed soil, a process described in detail from Hindhead Common by Fritsch & Salisbury (1915). On most sites in south-eastern England, however, burning is now sporadic, accidental and uncontrolled so the kind of fire-derived mosaic which they observed in stands of the *Calluna-Ulex minor* heath is rare there. It can, though, still be seen in tracts of the community in the New Forest, where burning is the major factor perpetuating a range of dry and wet heaths: here, the Forestry Commission burns on rotations of 6–12 years to reduce the risk of accidental fires and maintain an irregular patchwork of younger sub-shrub growth and grass for grazing stock (Tubbs 1968).

In fact, the contribution of palatable grasses to the post-burn succession in this community is generally less prominent than in the *Ulex minor-Agrostis* heath, its near relative on somewhat wetter ground. But grazing has undoubtedly contributed to the maintenance of the community in the past by curtailing the invasion of trees, and Webb (1986) has suggested that, in the lowlands, this factor has been of greater long-term importance than burning in preserving the cover of heath vegetation. As with burning, however, this practice is virtually defunct, apart from in the New Forest where the various heath communities provide the bulk of the unenclosed land that is still exploited by the traditional mixture of cattle and 'heath-cropper' ponies, together with some deer (Tubbs 1968). Apart from controlling colonisation by tree seedlings, such grazing affects the proportions of the different sub-shrubs: it is perhaps a major cause of the scarcity of *U. minor* in some stands, the soft young shoots being very palatable, and it tends to favour *Calluna* as against *E. cinerea*. In more humid areas, it is probably the major factor affecting the abundance of *Vaccinium myrtillus* in this community.

Over the potential range of the *Calluna-Ulex minor* heath, the often fragmentary scatter of remaining stands also reflects losses of this kind of vegetation by a more deliberate change of land-use. Some of the Surrey commons, for example, were deregulated by the Ministry of Defence, leaving only Chobham as an extensive tract of the very characteristic landscape of the Eocene sands and gravels. Other tracts close to London persist only as part of the rough on golf courses. Then, there has

been extensive afforestation with conifers in some places: despite the inherent infertility of the soils under the community, tine-ploughing to break up the podzol pans and application of nitrogen and phosphorus has facilitated successful cropping with *Pinus sylvestris*, *P. nigra* var. *maritima* and *Tsuga heterophylla*.

Zonation and succession

Zonations between the *Calluna-Ulex minor* heath and other vegetation types are generally related to edaphic variation or to differences in treatment. Burning and grazing can modify soil-related patterns and also create effects of their own: most obviously they mediate the invasion of this vegetation by trees and very often now, with their decline, the community survives as a decreasing element in patchworks of woodland, heath and bracken. Elsewhere, stands give way abruptly to agricultural land, coniferous forest or encroaching settlements.

In the traditional kind of heath landscape of central southern and south-east England, preserved extensively now only in the New Forest, the imposition of grazing and burning over large areas enables the effect of edaphic variation to be seen in a very distinctive sequence of sub-shrub communities. Within this pattern, the *Calluna-Ulex minor* heath occupies the most free-draining of the series of acid and impoverished soils, typically podzols which show no tendency, or only a slight one, towards surface-water gleying in winter. With the shift to profiles with somewhat more severe or consistent drainage impedence, as where there is a strong pan development or a markedly argillic B horizon, the community typically gives way, through the Dorset and Hampshire area, to the *Ulex minor-Agrostis curtisii* heath. The boundary between the vegetation types can be ill-defined, but, in this moderately oceanic part of Britain, the move on to soils which show even only a slightly greater tendency to gleying is marked by the consistent appearance of *E. tetralix* along with *E. cinerea*, and the replacement of *D. flexuosa* by *Molinia* and *A. curtisii*. The sequence of vegetation types then continues with the *Ericetum tetralicis*, on seasonally surface-waterlogged ground, and the *Narthecio-Sphagnetum* on valley-mire peat accumulated in elongated hollows.

The clarity of this pattern, characteristic of the undulating sand and gravel landscapes of this part of Britain (Rose 1953) and described in detail from Cranesmoor by Newbould (1960), depends on the exact conformation of the ground and its hydrology: over generally less impeded surfaces, the drier elements in the sequence prevail; where wetter hollows predominate, the role of the *Calluna-Ulex minor* heath is much reduced and, in areas of complex topography, fine mosaics of the communities can replace ordered zonations. Geological heterogeneity, too, can introduce additional variation in soils and vegetation: patches of less sharply-draining sands or clay-sands, for example, can weather to deep acid brown earths with a cover of the *Pteridium-Galium* community, and stretches of somewhat more fertile soils often have stands of the *Ulex-Rubus* scrub, as in the New Forest 'brakes'. Although burning and grazing play a crucial role in preserving the generally open character of this landscape, they can affect the soil-related pattern. Among the heaths, for example, such treatments can favour a general dominance throughout of *Calluna*, the abundance of which may swamp variation in the subordinate preferentials of the different communities; and certain regimes of burning and grazing may allow the replacement of the heaths by Nardo-Galion or Junco-Molinion grasslands or alter the balance between heather and bracken. Disturbance of the soils, as around settlements or plantations or along tracks, can also lead to a spread of *Ulex-Rubus* scrub within the *Calluna-Ulex minor* heath.

Such sequences of heath communities, intermixed with bracken, gorse and acid grasslands, can still be seen, though not so extensively, around Poole Harbour, where the *Calluna-Ulex minor* heath is well represented in the Arne area, and on Iping Common in Sussex, Thursley, Hankley and Chobham Commons in Surrey (Ratcliffe 1977); at Ambersham Common and in Ashdown Forest in Sussex, wetter heaths and mire tend to prevail, though in this part of Britain, the *Ulex minor-Agrostis* heath is absent, the *Calluna-Ulex minor* heath passing directly to the *Ericetum tetralicis*, sometimes with the *Molinia* sub-community as a transition zone. In many of these and other smaller sites in the south-east, too, the soil-related zonation is overlain by patterns resulting from the neglect of burning and grazing, and other traditional heathland treatments like the cutting of bracken for bedding and of gorse for fuel. In the rainier parts of The Weald, the *Vaccinium* sub-community is typical of such neglected dry heaths, with its tree seedlings able to get away quickly in less densely-shaded areas. The commonest woody invaders in such situations are birch, particularly *B. pendula* on these drier soils, and oak, generally *Q. robur*, though with *Q. petraea* locally important. Pines, particularly *P. sylvestris*, can also be very abundant where seed-parents are close and other colonisers include occasional *Sorbus aucuparia* and, particularly striking in ungrazed or unburned stands in the New Forest, *Ilex aquifolium* (Peterken & Tubbs 1965, Tubbs 1968). On some Surrey commons, *Amelanchier lamarckii* has become thoroughly naturalised among birch thickets developing among the *Calluna-Ulex minor* heath, easily overlooked in summer but very obvious in April with its lovely white flowers and again with its crimson autumn foliage.

The immediate product of this kind of invasion is the characteristic 'oak-birch heath' described from south-

east England (Tansley 1911, 1939, Wooldridge & Goldring 1953) which is actually open, immature *Quercus-Betula-Deschampsia* woodland, locally dominated in its early stages by patchworks of oak, birch, pine or holly, but showing considerable floristic continuity with the heath in its field layer, *Calluna* and *U. minor* persisting in more open areas, *Pteridium*, *Deschampsia flexuosa* and *V. myrtillus* maintaining high cover even under the deepening shade of the closing canopy. Oak is typically the eventual dominant in this kind of woodland which, even within the supposed natural range of beech (in which the *Calluna-Ulex minor* heath falls), often seems to have a stability of its own, perhaps not irrevocably yielding to the *Fagus-Deschampsia* woodland, even though this is often taken to be the natural climax on base-poor soils in this region. In fact, although young beech can sometimes be found in this community, and though this species can attain dominance by such invasion (as in some of the New Forest woodlands: Peterken & Tubbs 1965, Tubbs 1968), colonisation by *Fagus* is a sporadic and localised event, depending on the occurrence of good mast years in mature trees close to stands of the *Calluna-Ulex minor* heath (Watt 1923, 1924, 1925). Such a line of succession may thus often remain a theoretical pathway.

Distribution

The community occurs from the Poole Harbour area in the west through the New Forest, where stands are particularly numerous and extensive, to Surrey and the High Weald in the east, where they occur in more local and fragmented stretches of heathland.

Affinities

In early descriptive accounts, the series of heaths of drier and intermittently gleyed soils in lowland Britain were grouped together in a compendious *Callunetum*, within which local variation among the sub-shrub associates was informally recognised (Tansley 1911, 1939), in this case on the presence in south-east and central southern England of *U. minor*. More systematically, this community can be regarded as the least extreme of the range of heaths that replaces the *Calluna-Festuca* heath in moving into the more oceanic southern and western seaboard of Britain. The presence of *E. cinerea* helps locate this kind of vegetation generally among the eu-oceanic heaths of north-west Europe; the occurrence of *U. minor* places it more precisely with the gorse heath of southern Britain and the Atlantic fringe of France and the Iberian peninsula (Böcher 1943). Phytosociologically, such communities have been grouped in one or more distinct alliances, *U. minor* and *U. gallii* sometimes being grouped together as character species, as in Bridgewater's Ulicion (in Gimingham 1972), sometimes separated, as in the split between the Ulicion nanae Duvigneaud 1944 and the Ulicion gallii des Abbayes & Corillion 1949. Whether the striking vicarism between these two gorse species is recognised at alliance level or not, the *Calluna-Ulex minor* heath is certainly best separated from the *Calluna-Ulex gallii* heath, which replaces it on similar soils beyond south Dorset, into the South-West Peninsula, Wales, the southern Pennines and round into the more oceanic parts of the Norfolk coast. In contrast to their continental equivalents, *U. europaeus* does not figure prominently in these vegetation types, perhaps because they have been longer established on very impoverished soils, though transitions to the Ulici-Cytision *Ulex-Rubus* scrub can be seen on disturbed ground.

Towards the drier parts of its range, the *Calluna-Ulex minor* heath shows quite a well-defined, edaphically-related boundary with wetter Ericetalia heath, based on the almost totally mutual exclusion of *E. cinerea* and *E. tetralix*. Increasingly to the west, this floristic junction becomes less clear, with the *Ulex minor-Agrostis curtisii* heath occupying an intermediate position.

Floristic table H2

	a	b	c	2
Calluna vulgaris	V (7–10)	V (7–10)	V (6–9)	V (6–10)
Ulex minor	V (2–7)	V (2–7)	V (2–5)	V (2–7)
Erica cinerea	IV (2–7)	V (3–8)	IV (3–6)	V (2–8)
Deschampsia flexuosa	IV (2–5)	V (1–5)	II (2–3)	IV (1–5)
Dicranum scoparium	II (1–4)	II (1–3)		II (1–4)
Hypnum jutlandicum	II (2–5)	II (1–3)		II (1–5)
Festuca rubra	II (2–3)	I (2)		I (2–3)
Cladonia fimbriata	II (2–3)			I (2–3)
Cladonia coccifera	I (1–2)			I (1–2)
Campylopus paradoxus	I (1–2)			I (1–2)

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Cladonia chlorophaea	I (1–3)			I (1–3)
Cladonia arbuscula	I (1–3)			I (1–3)
Polytrichum juniperinum	I (2–3)			I (2–3)
Pteridium aquilinum	II (1–2)	IV (2–7)	II (2–3)	III (1–7)
Vaccinium myrtillus		V (2–7)		II (2–7)
Quercus spp. seedling	I (2)	III (1–2)		II (1–2)
Betula spp. seedling	I (1–3)	III (1–2)		II (1–3)
Pinus sylvestris seedling		I (1–2)		I (1–2)
Sorbus aucuparia sapling		I (2)		I (2)
Rubus fruticosus agg.		I (2)		I (2)
Molinia caerulea	II (2–7)	III (1–5)	V (3–6)	III (1–7)
Erica tetralix	I (2)		III (3–5)	I (2–5)
Genista anglica		I (2)	I (2–3)	I (2–3)
Agrostis curtisii	I (2–3)	I (3–5)	I (3)	I (2–5)
Ulex europaeus	I (2–5)	I (5)	I (3–6)	I (2–6)
Cuscuta epithymum	I (2)	I (4)	I (4)	I (2–4)
Cladonia furcata	I (2–7)	I (2)	I (2–5)	I (2–7)
Festuca ovina	I (2)	I (1)	I (3)	I (1–3)
Potentilla erecta	I (3)	I (2)	I (2)	I (2–3)
Agrostis canina montana	I (2)	I (2)		I (2)
Cladonia impexa	I (2–6)	I (2)		I (2–6)
Polytrichum piliferum	I (2–3)	I (1)		I (1–3)
Kurzia sp.	I (1)		I (2)	I (1–2)
Ulex gallii		I (2)	I (3)	I (2–3)
Number of samples	22	9	8	38
Number of species/sample	8 (4–13)	11 (8–16)	7 (6–10)	8 (4–16)
Vegetation height (cm)	49 (20–80)	23 (15–30)	53 (15–75)	47 (15–80)
Shrub/herb cover (%)	96 (80–100)	97 (70–100)	98 (90–100)	97 (70–100)
Ground cover (%)	9 (0–60)	8 (0–30)	3 (0–20)	8 (0–60)
Altitude (m)	76 (5–220)	138 (120–215)	99 (30–168)	93 (5–220)
Slope (°)	6 (0–30)	4 (0–25)	0	4 (0–30)

a Typical sub-community
b *Vaccinium myrtillus* sub-community
c *Molinia caerulea* sub-community
2 *Calluna vulgaris-Ulex minor* heath (total)

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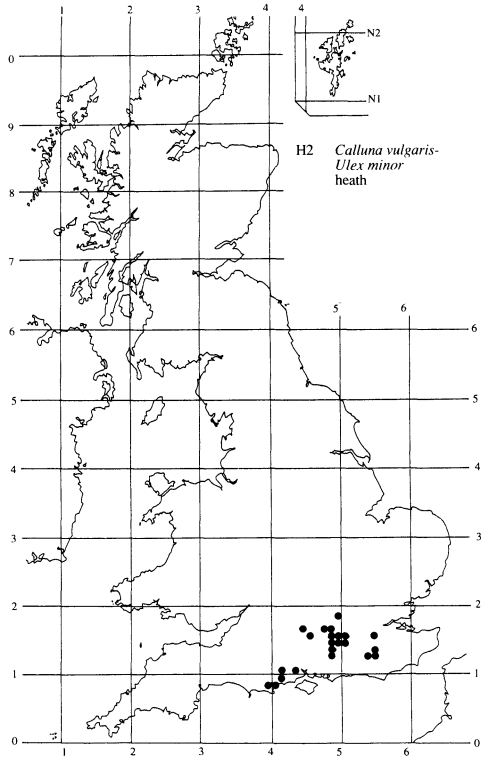

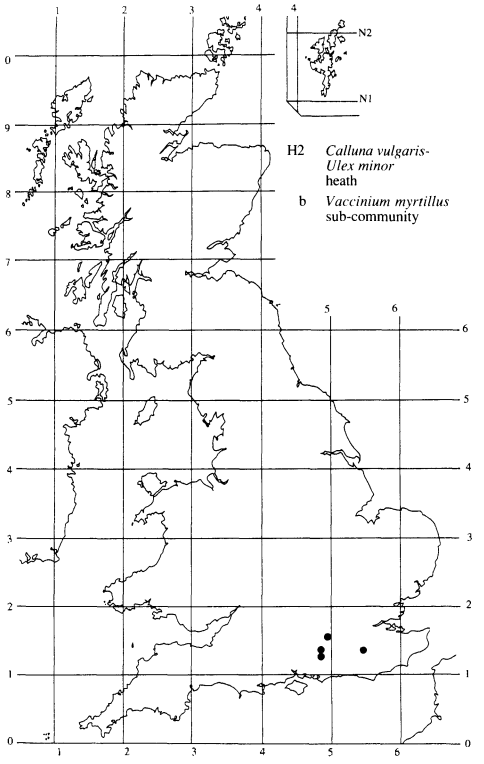

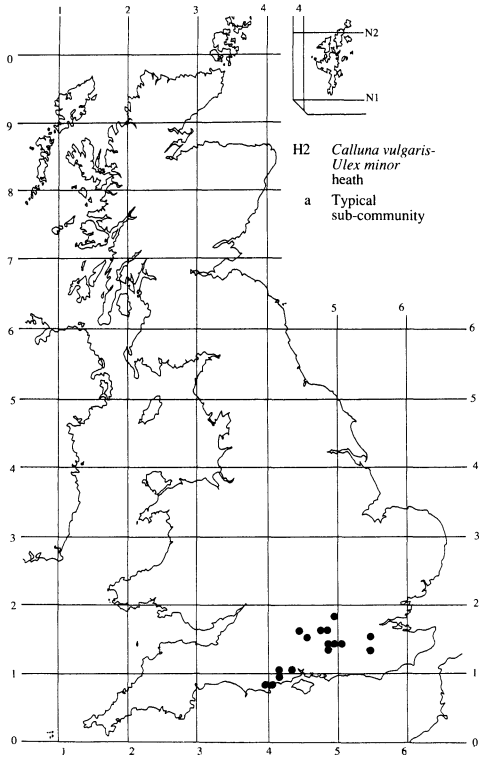

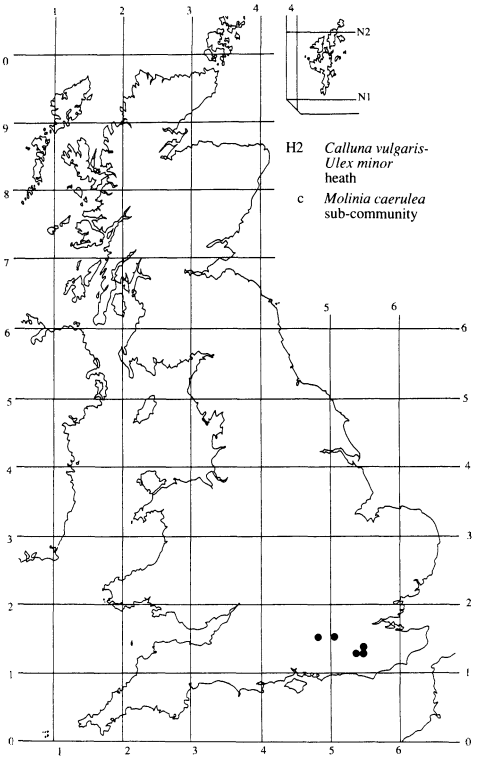

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