

CG3

Bromus erectus grassland

Synonymy

Chalk grassland *auct. angl. p.p.*; *Brometum auct. angl.*; *Zernetum auct. angl.*; *Cirsio-Brometum* Shimwell 1968a *p.p.*; *Cirsio-Brometum* Shimwell 1968a *emend.* Willems 1978 *p.p.*

Constant species

Bromus erectus, *Carex flacca*, *Festuca ovina*, *Lotus corniculatus*, *Plantago lanceolata*, *Sanguisorba minor*.

Rare species

Aceras anthropophorum, *Astragalus danicus*, *Carex humilis*, *Hypochoeris maculata*, *Linum perenne* ssp. *anglicum*, *Phyteuma tenerum*, *Polygala calcarea*, *Pulsatilla vulgaris*, *Senecio integrifolius* ssp. *integrifolius*, *Thesium humifusum*, *Thymus pulegioides*.

Physiognomy

This community comprises all those swards in which *B. erectus* makes up more than 10% of the cover and where other grasses of similar physiognomy, notably *Brachypodium pinnatum* and *Avenula pubescens*, make a usually negligible contribution. It includes vegetation which is similar in floristics and structure to the *Festuca-Avenula* grassland as well as some where the dense tussocks of *B. erectus* have a much more dominating effect. Taking the community as a whole, however, the most obvious general feature is the markedly reduced frequency here of most chamaephytes (*Thymus praecox*, *Hieracium pilosella*, *Helianthemum nummularium*), those hemicryptophytes which cannot produce extensive bushy sprawls of shoots, large rosettes or tall leafy stems (*Asperula cynanchica*, *Koeleria macrantha*, *Briza media*, *Scabiosa columbaria*, *Campanula rotundifolia*, *Plantago media*), certain therophytes (*Linum catharticum*, *Gentianella amarella*) and bryophytes (*Pseudoscleropodium purum*, *Homalothecium lutescens* and acrocarps of patches of bare soil). The most frequent associates overall are all hemicryptophytes which can persist by depressing or growing through the coarse, bulky foliage of the dominant and its accumulating litter: *Sanguisorba minor*,

Carex flacca, *Plantago lanceolata*, *Cirsium acaule* and *Lotus corniculatus*. *Festuca ovina* seems to survive the presence of substantial amounts of *B. erectus*, though it often persists patchily and, in the rankest swards, it is commonly replaced by *F. rubra* in a tussocky form.

The rare species which are such a distinctive feature of certain kinds of *Festuca-Avenula* grassland are also, for the most part, reduced here. Some of those which are more frequent and widespread in that community are chamaephytes (*Polygala calcarea*, *Thesium humifusum*) or diminutive geophytes (*Orchis ustulata*, *Herminium monorchis*, *Spiranthes spiralis*) which are readily overwhelmed. Others fare better. *Phyteuma tenerum*, for example, can persist in numbers and with a splendid stature in these coarser swards (e.g. Wells 1975). *Senecio integrifolius* ssp. *integrifolius* can also grow tall and perhaps survive here as a short-lived perennial (Smith 1979) and *Linum perenne* ssp. *anglicum* may benefit by the long life of its individuals (Ockendon 1968). *Hypochoeris maculata* has basal leaves which, growing larger, can depress the surrounding herbage (Wells 1976). *Pulsatilla vulgaris* now survives mainly in this community (Wells & Barling 1971) and has been observed actually to increase in numbers by vegetative growth from lateral buds on the rootstock when *B. erectus* invades, though with a very marked reduction in the proportion of plants flowering. Much-etiolated survivors seem to be able to resume flowering when grazing is re-instated (Wells 1968). Among the orchids, taller species such as *Aceras anthropophorum* and *Himantoglossum hircinum* seem able to persist well and these are sometimes joined by more widespread robust species such as *Anacamptis pyramidalis* and *Gymnadenia conopsea* which are generally less common in the short turf of the *Festuca-Avenula* grassland.

Sub-communities

Typical sub-community: *Zerna erecta* grassland Wells 1975 *p.p.* This sub-community includes those swards which are closest to the *Festuca-Avenula* grassland. *B.*

erectus and *F. ovina* (with occasional *F. rubra*) are present in roughly equal proportions and there are frequently smaller amounts of *Koeleria macrantha*, *Briza media* and *Avenula pratensis*, together with some of the characteristic dicotyledons and bryophytes of that vegetation type. Hemicryptophytes, such as *Leontodon hispidus*, *Scabiosa columbaria* and *Plantago media* continue to occur quite commonly, though there is an obvious reduction in *Asperula cynanchica* and most of the chamaephytes. Moreover, the sward often has a generally coarser or markedly patchy appearance, being organised around clonal tussocks of *B. erectus*, between which there are stretches of shorter and more fine-grained turf.

***Centaurea nigra* sub-community:** Chalk grassland Tansley & Adamson 1926 *p.p.* The general floristics here are quite similar to those above but there are some slight shifts in composition and physiognomy. *B. erectus* is more abundant (generally with more than 50% cover) and the sward is taller and ranker with a further reduction in the frequency and cover of some *Festuca-Avenula* species. Most obviously, *Centaurea nigra* becomes constant and there are occasional records for a variety of coarse dicotyledons such as *Senecio jacobaea*, *Rhinanthus minor*, *Galium mollugo*, *Achillea millefolium*, *Daucus carota* and *Hypochoeris radicata*.

***Knautia arvensis-Bellis perennis* sub-community:** *Brometum* Cornish 1954 *p.p.*; *Zerna erecta* grassland Wells 1975 *p.p.*; *Cirsio-Brometum anthoxanthetosum* Willems 1978. Again, in this sub-community, *B. erectus* tends to be much the most abundant species in swards which are rather poor in many *Festuca-Avenula* plants, but the most noticeable feature is the rise to prominence of species characteristic of ranker mesotrophic grasslands. These include grasses such as *Dactylis glomerata*, *Cynosurus cristatus*, *Phleum pratense* ssp. *bertolonii* and, less frequently, *Holcus lanatus*, *Lolium perenne*, *Trisetum flavescens* and *Agrostis stolonifera* and perennial dicotyledons like *Prunella vulgaris*, *Taraxacum officinale* agg., *Bellis perennis*, *Trifolium pratense*, *T. repens* and, especially distinctive here, *Knautia arvensis*. The sprawling legumes *Vicia cracca* and *Lathyrus pratensis* are quite common and there are occasional to frequent records for the pauciennials *Medicago lupulina*, *Blackstonia perfoliata* and *Centaureum erythraea*.

***Festuca rubra-Festuca arundinacea* sub-community.** In the tall, rank and much more species-poor swards of this sub-community, *B. erectus* is generally very much the dominant species, frequently with somewhat smaller amounts of tussocky *F. rubra* and *F. arundinacea*. *F. ovina* and the other fine-leaved grasses of the *Festuca-Avenula* grassland, together with many of its characteristic dicotyledons are here no more than occasional.

Leontodon hispidus and *Centaurea nigra* remain common and are here joined by another hemicryptophyte, *Centaurea scabiosa*.

Habitat

Like many species with a Continental distribution through Europe, *Bromus erectus* reaches a general north-western limit in Britain around the Humber-Severn line, extending northwards more locally and, then, often on warmer, south-facing slopes. Within these climatically-related limits, it is typically a dominant in lightly-grazed or ungrazed grasslands on calcareous, base-rich soils mostly, in the south-eastern part of the country, over Chalk and Oolite. Floristic variation within the community seems to be related partly to the degree of expansion of *B. erectus* in the sward and partly to the edaphic conditions prevailing when it invades or extends its cover.

B. erectus is palatable to sheep, cattle and rabbits and, though areas of shorter, mixed and more nutritious turf may be preferred to its coarse and fibrous herbage (Hope-Simpson 1940*b*), there is little doubt that it is held at low levels by heavy grazing and that, when this is relaxed, it can show a vigorous and rapid vegetative expansion (e.g. Tansley & Adamson 1926, Hope-Simpson 1941*b*, Watt 1957, 1962, Thomas 1960, 1963, Wells 1967*a*, 1968, 1971). Established tussocks grow by tillering around their margins and expanding radially and they may eventually coalesce and totally dominate a sward (e.g. Austin 1968*a*). Many of the stands included here have almost certainly originated in this way with the reduction of grazing of *Festuca-Avenula* grassland in which *B. erectus* occurs occasionally at low cover values (and perhaps also from some types of *Festuca-Hieracium-Thymus* grassland where it is present at very low frequencies). The drop in frequency of many of the characteristic *Festuca-Avenula* species can be readily understood as a response to the shading effect of the tall and bulky foliage of *B. erectus* and the accumulation of its coarse and resistant litter (Wells 1968, 1971, Austin 1968*a*). The differential loss of such species between the different sub-communities (and between different stands of the same sub-community) may also reflect to some degree the extent to which *B. erectus* expansion has proceeded since the relaxation of grazing. Thus, the swards of the Typical sub-community may have been more recently or heavily grazed than the ranker vegetation of the *Centaurea nigra* sub-community, though we have no information which might test this view. Also, there may be some local and temporary waning of the dominance of the *B. erectus* which could complicate matters: concentric rings of the grass are a common sight and Austin (1968*a*) has shown how tussocks can degenerate centrally, leaving the way open for a resurgence of a more varied calcicolous flora within.

However, some of the floristic differences between the

sub-communities are probably related to edaphic variation. The Typical sub-community, for example, is characteristically a vegetation type of shallower and more calcicolous grey and humic rendzinas (especially over Chalk) while the *Knautia-Bellis* sub-community is more frequent on the Oolite, where this softer rock often weathers to produce deeper and more mesotrophic brown rendzinas (e.g. Findlay 1976). The *Centaurea* sub-community may be intermediate in this respect: it is especially typical of deeper colluvial soils towards the eastern end of the South Downs (e.g. Tansley & Adamson 1926). Some of this floristic variation may be inherited from the swards in which *B. erectus* has expanded because exactly the same edaphically-related contrast is seen within the *Festuca-Avenula* grassland where it marks the difference between the *Cirsium-Asperula* and *Holcus-Trifolium* sub-communities.

How far *B. erectus* can invade such vegetation types rather than expand within them from established plants is a difficult question. When ungrazed, it can certainly fruit prolifically and, though its seeds are heavy (Lloyd 1964, Lloyd & Pigott 1967), they are awned and readily caught in animal hair or on clothing. Where there are still some grazing animals about and where the sward is not yet too rank, it is possible that some spread may occur by dispersal from fruiting tussocks nearby. The invasion of abandoned arable land, a common feature of the Chalk in certain periods with changes in the agricultural economy, is a more complicated matter. Though *B. erectus* has an ample food store in its large seeds, it seems strikingly unable to gain a hold where such exposed soils are markedly oligotrophic as, for example, where very shallow rendzinas have been ploughed and left and have lost any nitrogen through leaching (Cornish 1954, Lloyd 1964, Lloyd & Pigott 1967). The addition of nitrogen in field trials has also been shown to produce no response, which suggests that a poor water supply may also be involved (Lloyd & Pigott 1967). Disturbed areas of deeper and more mesotrophic soils, however, can be invaded: at Porton Down, on the Hampshire/Wiltshire border, for example, Wells *et al.* (1976) reported patchy *B. erectus* grassland on land ploughed 50–100 years before. These swards seem mostly to be of the kind included here in the *Festuca rubra-F. arundinacea* sub-community and it is possible that this distinctively rank and species-poor vegetation has developed primarily by such direct invasion of open ground with no resumption of pasturing.

Zonation and succession

Zonations involving the *Bromus* grassland are most often reflections of seral changes related to the intensity of grazing and sometimes complicated histories of ploughing and abandonment. Occasionally, the community may show an abrupt transition to disturbed, oligotrophic soils that cannot, apparently, be invaded

by *B. erectus* (Lloyd 1964, Lloyd & Pigott 1967). More usually, it occurs in irregular patchworks with surviving areas of *Festuca-Avenula* grassland, other rank swards that have developed with a demise of grazing (e.g. the *Brachypodium pinnatum* and *Avenula pubescens* grasslands) and scrub. Such patterns have been described in detail from Lullington Heath in Sussex (Grubb *et al.* 1969), Barton Hills in Bedfordshire (Wells & Morris 1970) and Porton Down (Wells *et al.* 1976) and they are a common feature of many areas of the southern Chalk and Oolite (e.g. Ratcliffe 1977).

In principle, the fact that *B. erectus* will be eaten by stock and rabbits means that its expansion in swards is reversible with a resumption of grazing (Hope-Simpson 1940b). In practice, this may be more complicated. For example, Wells (1971) showed how *B. erectus* maintained its cover in this kind of vegetation over shallow, rendziniform soils with quite heavy grazing, even increasing in extent on deeper loamy soils. It is therefore possible that swards may stabilise with a higher *B. erectus* cover and that really hard grazing, with no alternative, more palatable herbage, is necessary to effect any marked reduction.

The high cost of this kind of pastoral control has focused attention on mowing as an alternative means of retaining or recovering the species-richness and diversity of those calcicolous swards where *B. erectus* can gain a hold. Wells (1971) demonstrated that cutting in spring, shortly after growth commenced in March, was effective in holding steady or reducing the cover of *B. erectus*, perhaps by depleting the newly-mobilised food reserves. Regrowth was then poor and other species were able to capitalise on the provision of space. Summer cutting sometimes encouraged the expansion of *B. erectus*, perhaps because of stimulating the production of tillers when growth was in full swing. Though mowing is unselective (and not always practical on very steep slopes), it can be precisely timed and this may have advantages in allowing selected species to flower and set seed (e.g. Wells 1969, 1971, 1973).

Burning, though it has been more traditionally practised on grasslands with *Brachypodium pinnatum*, has sometimes been used as a means of controlling *B. erectus* which, in dry weather, is readily ignited with its accumulations of litter. It may not always be successful. Indeed, it may stimulate fresh growth in the cleaned sward and, though new shoots may be more eagerly eaten by stock, without grazing the *B. erectus* may simply resume its dominance.

The subsequent successional development of *Bromus* grassland with the continued absence of grazing has never been followed in detail. Though stands of the community often occur in close association with scrub, we do not know how readily shrubs and trees can invade the ranker swards. Certainly, some stands, after rapid establishment following myxomatosis, seem to have

remained substantially unchanged for 30 years. Large populations of field voles (*Microtus agrestis*) often become established in such litter-choked tussocky grasslands and these may play an important role in eating and barking seedlings of woody species (Smith 1980). Deliberate or accidental burning may also repeatedly set back any invasion and help maintain the vegetation as a plagioclimax. Where colonisation by *B. erectus* is more gradual or patchy, it is possible that shrubs and trees may become established in the more open turf or on ant-hills which are often abandoned as they become increasingly shaded by the tall grasses (Wells *et al.* 1976, King 1977c).

Distribution

Bromus grasslands occur throughout the range of the species but they are especially frequent over the Chalk in the North and South Downs, through Hampshire and Wiltshire and into the Chilterns, on the Oolite of the Cotswolds and Northamptonshire and over the Magnesian Limestone of West Yorkshire. The Typical and *Centaurea* sub-communities occur throughout the range while the *Knautia-Bellis* and *Festuca rubra*-*F. arundinacea* sub-communities have been more frequently encountered in Wiltshire. *B. erectus* also occurs with *Brachypodium pinnatum* in mixed swards, especially on the Cotswold and Northamptonshire Oolite.

Affinities

Traditionally, the more calcicolous kinds of *Bromus*-dominated grasslands in Britain have been treated as part of a broadly-defined 'Chalk grassland' or its phytosociological equivalent, the *Cirsio-Brometum* Shimwell 1968a *emend.* Willems 1978. Where ranker swards have been described, they have usually been separated off into various kinds of *Bromus* grassland (e.g. Cornish 1954, Wells 1975, Wells *et al.* 1976, Smith 1980). Here, all such swards have been united within a single community which, though it has a reduction overall in the representation of calcicoles, still has clear affinities with the Mesobromion. The community can be regarded as the major natural ungrazed counterpart of the mainstream *Festuca-Avenula* grassland over most of the southern part of its range.

Similar Mesobromion grasslands in which *B. erectus* plays an important role have been described from France (e.g. Allorge 1921–2), Belgium (LeBrun *et al.* 1949), The Netherlands (Westhoff & den Held 1969) and Germany (e.g. Ellenberg 1978, Oberdorfer 1978). On the Continent, however, this grass is also a prominent species within the xeric swards of the Xerobromion and certain of the steppe-grasslands of the Festucetalia valesiacae.

Floristic table CG3

	a	b	c	d	3
<i>Bromus erectus</i>	V (5–9)	V (5–9)	V (5–9)	V (5–9)	V (5–9)
<i>Sanguisorba minor</i>	IV (1–6)	V (2–6)	IV (1–5)	V (2–6)	V (1–6)
<i>Carex flacca</i>	IV (1–6)	IV (1–5)	IV (1–5)	IV (1–4)	IV (1–6)
<i>Plantago lanceolata</i>	IV (1–7)	III (1–5)	IV (1–5)	IV (1–5)	IV (1–7)
<i>Lotus corniculatus</i>	IV (1–5)	IV (2–6)	V (2–5)	II (1–4)	IV (1–5)
<i>Festuca ovina</i>	IV (2–8)	V (2–8)	III (2–7)	I (2–6)	IV (2–8)
<i>Leontodon hispidus</i>	IV (1–8)	III (2–5)	III (1–4)	III (1–6)	III (1–8)
<i>Campanula rotundifolia</i>	III (1–2)	II (1–3)	I (1–2)	II (1–3)	II (1–3)
<i>Pseudoscleropodium purum</i>	III (1–8)	II (2–9)	II (1–4)	I (2–7)	II (1–9)
<i>Homalothecium lutescens</i>	II (1–4)	I (1–3)	I (1)	I (2)	I (1–4)
<i>Asperula cynanchica</i>	II (1–2)	I (2–4)	I (1)		I (1–4)
<i>Fissidens cristatus</i>	II (1–3)	I (2)	I (1–2)		I (1–3)
<i>Centaurea nigra</i>	I (1–4)	IV (1–4)	I (2–4)	II (1–4)	II (1–4)
<i>Thymus praecox</i>	II (1–6)	III (2–5)	II (1–5)	I (2)	II (1–6)
<i>Polygala vulgaris</i>	I (1–3)	II (1–5)	I (1)	I (1)	I (1–5)
<i>Senecio jacobaea</i>	I (1–2)	II (1–3)	I (2–3)	I (2)	I (1–3)
<i>Rhinanthus minor</i>	I (1–4)	II (2–3)	I (5)		I (1–5)
<i>Galium mollugo</i>	I (1–3)	II (2–5)	I (1–3)	I (1–2)	I (1–5)
<i>Achillea millefolium</i>	I (2–4)	II (1–4)	I (2–3)	I (2–3)	I (1–4)
<i>Daucus carota</i>	I (1–3)	II (1–4)		I (1–2)	I (1–4)
<i>Hypochoeris radicata</i>		II (1–4)			I (1–4)
<i>Prunella vulgaris</i>	III (1–4)	II (1–4)	IV (1–4)	I (1–3)	III (1–4)
<i>Taraxacum officinale</i> agg.	I (2–3)	I (2)	IV (1–3)	II (1–3)	II (1–3)
<i>Bellis perennis</i>	I (1–3)	I (2–4)	IV (1–3)	I (1)	II (1–4)
<i>Trifolium pratense</i>	II (1–8)	II (1–5)	V (1–6)	I (1)	II (1–8)
<i>Medicago lupulina</i>	II (1–4)	I (2–4)	V (1–5)		II (1–5)
<i>Knautia arvensis</i>	I (1–3)	I (2–3)	IV (1–3)		II (1–3)
<i>Dactylis glomerata</i>	II (1–5)	II (1–5)	III (1–4)	II (1–8)	II (1–8)
<i>Viola hirta</i>	II (1–5)	I (2–4)	III (1–5)	I (5)	II (1–5)
<i>Vicia cracca</i>	I (1–3)	I (3)	III (1–4)	I (1)	I (1–4)
<i>Blackstonia perfoliata</i>	I (1–4)	I (2–3)	III (1–3)	I (1)	I (1–4)

<i>Trifolium repens</i>	I (1–3)	I (1–3)	III (1–5)	I (1–4)	I (1–5)
<i>Cynosurus cristatus</i>	I (1–5)	I (1–6)	III (2–5)		I (1–6)
<i>Centaureum erythraea</i>	I (1–3)	I (3)	III (1–3)		I (1–3)
<i>Phleum pratense bertolonii</i>	I (1–2)	I (2–4)	III (1–4)		I (1–4)
<i>Holcus lanatus</i>	I (1–5)	I (2–5)	II (1–4)	I (2–6)	I (1–6)
<i>Lolium perenne</i>	I (1)	I (2–6)	II (1–4)	I (1–3)	I (1–6)
<i>Ranunculus bulbosus</i>	I (1–4)	I (2)	II (1–3)	I (1)	I (1–4)
<i>Cerastium fontanum</i>	I (1–3)	I (2–3)	II (1–3)	I (1)	I (1–3)
<i>Trisetum flavescens</i>	I (1–6)	I (2–5)	II (1–4)	I (1)	I (1–6)
<i>Lathyrus pratensis</i>	I (1)	I (3)	II (1–3)	I (1)	I (1–3)
<i>Primula veris</i>	I (1–2)	I (1–6)	II (1–3)	I (2–3)	I (1–6)
<i>Anthyllis vulneraria</i>	I (1–3)	I (1–4)	II (1–3)	I (1)	I (1–4)
<i>Leucanthemum vulgare</i>	I (1–4)	I (1–6)	II (1–3)		I (1–6)
<i>Agrostis stolonifera</i>	I (1–3)	I (2–5)	II (1–6)		I (1–6)
<i>Ononis spinosa</i>	I (1–3)		II (1–3)	I (1)	I (1–3)
<i>Cirsium eriophorum</i>			II (1–3)		I (1–3)
<i>Festuca rubra</i>	II (2–9)	I (2–8)	II (4–6)	IV (1–6)	II (1–9)
<i>Festuca arundinacea</i>	I (1–6)		I (1)	III (2–6)	I (1–6)
<i>Centaurea scabiosa</i>	I (1–4)	II (2–4)	I (1–4)	III (1–6)	II (1–6)
<i>Cirsium acaule</i>	IV (1–8)	III (1–7)	IV (1–6)	II (1–3)	III (1–8)
<i>Briza media</i>	III (1–7)	IV (1–6)	IV (1–6)	I (1)	III (1–7)
<i>Koeleria macrantha</i>	III (1–5)	III (1–5)	II (1–4)	II (1–4)	III (1–5)
<i>Pimpinella saxifraga</i>	III (1–4)	III (1–4)	II (1–3)	II (1–4)	III (1–4)
<i>Avenula pratensis</i>	III (1–6)	II (1–4)	II (2–3)	III (1–5)	II (1–6)
<i>Linum catharticum</i>	III (1–4)	II (1–3)	III (1–4)	I (2)	II (1–4)
<i>Helianthemum nummularium</i>	II (1–6)	II (1–6)	II (1–6)	III (1–4)	II (1–6)
<i>Plantago media</i>	III (1–5)	I (1–4)	III (1–4)	I (1–2)	II (1–5)
<i>Scabiosa columbaria</i>	III (1–4)	III (1–4)	I (1–2)	I (1–4)	II (1–4)
<i>Galium verum</i>	II (1–4)	II (1–4)	II (1–4)	I (1–3)	II (1–4)
<i>Hieracium pilosella</i>	II (1–4)	I (2–4)	II (1–6)	I (1)	II (1–6)
<i>Carex caryophylla</i>	II (1–4)	I (1–2)	II (1–5)	I (1–3)	II (1–5)
<i>Hippocrepis comosa</i>	II (1–5)	II (1–4)	I (3)	I (1–3)	II (1–5)
<i>Euphrasia officinalis</i> agg.	II (1–4)	I (2–3)	II (1–4)		II (1–4)
<i>Avenula pubescens</i>	II (1–7)	I (1–5)		II (1–4)	II (1–7)
<i>Succisa pratensis</i>	II (1–5)	I (1–4)	I (3)	I (1–3)	I (1–5)

Floristic table CG3 (cont.)

	a	b
<i>Brachypodium pinnatum</i>	I (4)	I (2–4)
<i>Picris hieracioides</i>	I (1–3)	I (1)
<i>Weissia</i> cf. <i>microstoma</i>	I (1–3)	I (1)
<i>Campylium chrysophyllum</i>	I (1–5)	I (1)
<i>Crataegus monogyna</i> sapling	I (1–2)	I (1–3)
<i>Filipendula vulgaris</i>	I (1–7)	I (1–3)
<i>Tragopogon pratensis</i>	I (1–3)	I (3)
<i>Campanula glomerata</i>	I (1–4)	I (2–3)
<i>Calliergon cuspidatum</i>	I (2–6)	I (4)
<i>Anthoxanthum odoratum</i>	I (1)	I (2–5)
<i>Agrimonia eupatoria</i>	I (1)	I (3)
<i>Phleum pratense</i> pratense	I (3)	I (2–3)
<i>Brachypodium sylvaticum</i>	I (2–4)	I (2–5)
<i>Potentilla reptans</i>	I (1–3)	I (3)
<i>Ctenidium molluscum</i>	I (2–8)	I (2–4)
<i>Gentianella amarella</i>	I (1–3)	I (3)
<i>Thymus pulegioides</i>	I (1–4)	I (3–5)
<i>Hypnum cupressiforme</i>	I (1–5)	I (3)
<i>Cruciata laevipes</i>	I (1)	I (3)
<i>Anacamptis pyramidalis</i>	I (1–3)	I (1–4)
<i>Leontodon taraxacoides</i>	I (4)	I (2–3)
<i>Ophrys apifera</i>	I (2)	I (1–2)
<i>Gymnadenia conopsea</i>	I (1)	I (1–3)
<i>Ononis repens</i>	I (2–5)	I (3–5)
<i>Veronica chamaedrys</i>	I (1)	I (1–3)
<i>Thesium humifusum</i>	I (3)	I (2)
<i>Origanum vulgare</i>	I (4–5)	I (2–5)
<i>Pastinaca sativa</i>	I (1–2)	I (2–4)
<i>Clematis vitalba</i>	I (1–3)	I (3–4)
<i>Cirsium arvense</i>	I (1–3)	I (2–3)
<i>Ulex europaeus</i>	I (1)	I (1)
<i>Hypochoeris maculata</i>	I (1–2)	I (1–2)

c	d	3
I (2–4)	I (4)	I (2–4)
I (2)	I (1–2)	I (1–3)
I (1)	I (1–3)	I (1–3)
I (1–2)	I (2–3)	I (1–5)
I (1)	I (1–2)	I (1–3)
I (1–3)	I (3)	I (1–7)
I (1)	I (1)	I (1–3)
I (2)	I (3)	I (1–4)
I (1–4)	I (2)	I (1–6)
I (1–3)	I (1)	I (1–5)
I (1–2)	I (1)	I (1–3)
I (1)	I (1)	I (1–3)
I (3)	I (4)	I (2–5)
I (1)		I (1–3)
I (2–5)		I (2–8)
I (3)		I (1–3)
I (2–3)		I (1–5)
I (1)		I (1–5)
I (1)		I (1–3)
I (1–3)		I (1–4)
I (1–6)		I (1–6)
I (1–3)		I (1–3)
I (1–2)		I (1–3)
I (2)		I (2–5)
I (1)		I (1–3)
I (1)		I (1–3)
I (1)		I (1–5)
I (1)		I (1–4)
I (1)		I (1–4)
I (4)		I (1–4)
I (1)		I (1)
I (1–2)		I (1–2)

<i>Danthonia decumbens</i>	I (1–3)	
<i>Phyteuma tenerum</i>	I (2–3)	I (1–4)
<i>Orobanche elatior</i>		I (2)
<i>Arrhenatherum elatius</i>		I (3–8)
<i>Poa pratensis</i>		I (3)
<i>Carduus nutans</i>		I (1)
<i>Reseda lutea</i>		I (2)
<i>Carlina vulgaris</i>	I (1–3)	I (2–5)
<i>Agrostis capillaris</i>	I (5)	I (3–4)
<i>Rhytidiadelphus loreus</i>	I (4)	I (3–5)
<i>Rosa canina</i> agg.	I (1)	I (1–3)
<i>Crepis capillaris</i>	I (1–2)	
<i>Rhytidiadelphus triquetrus</i>	I (1–4)	
<i>Coeloglossum viride</i>	I (1–3)	
<i>Arctium minus</i> agg.	I (1–3)	
<i>Dicranum scoparium</i>	I (1)	
<i>Pulsatilla vulgaris</i>	I (2–5)	
<i>Convolvulus arvensis</i>		I (3)
<i>Fraxinus excelsior</i> sapling		I (1)
<i>Clinopodium vulgare</i>		I (2–4)
<i>Dactylorhiza fuchsii</i>		I (1–3)
<i>Rumex acetosa</i>		I (3)
<i>Onobrychis viciifolia</i>		I (3–6)
<i>Ranunculus repens</i>		I (2–4)

Number of samples	105	76
Number of species/sample	21 (4–35)	22 (9–36)

- a Typical sub-community
- b *Centaurea nigra* sub-community
- c *Knautia arvensis*-*Bellis perennis* sub-community
- d *Festuca rubra*-*Festuca arundinacea* sub-community
- 3 *Bromus erectus* grassland (total)

I (1)	I (1)	I (1–3)
	I (3–4)	I (1–4)
I (1)	I (1)	I (1–2)
I (2)	I (1–7)	I (1–8)
I (1–3)	I (1)	I (1–3)
I (1)	I (1)	I (1)
I (1)	I (1)	I (1–2)
		I (1–5)
		I (3–5)
		I (3–5)
		I (1–3)
I (1)		I (1–2)
I (1)		I (1–4)
I (1–2)		I (1–3)
I (1)		I (1–3)
I (1–2)		I (1–2)
	I (1–5)	I (1–5)
I (1)		I (1–3)
I (1)		I (1)
I (2–3)		I (2–4)
I (1)		I (1–3)
I (1)		I (1–3)
I (2)		I (2–6)
I (1)		I (1–4)

34

28 (6–39)

48

13 (6–22)

263

20 (4–39)



