

## MG6

# *Lolium perenne*-*Cynosurus cristatus* grassland *Lolio-Cynosuretum cristati* (Br.-Bl. & De Leeuw 1936) R.Tx. 1937

### Synonymy

Fatting Pastures and Dairy Pastures Stapledon 1925; First-Grade Ryegrass Pasture and Second-Grade Ryegrass Pasture Davies 1941 & 1952, Beddows 1967; Reverted Pasture Duffey *et al.* 1974; Ordinary dry meadows Ratcliffe 1977; *Trifolio-Agrosto-Festucetum* Evans *et al.* 1977 *p.p.*

### Constant species

*Cerastium fontanum*, *Cynosurus cristatus*, *Festuca rubra*, *Holcus lanatus*, *Lolium perenne*, *Trifolium repens*.

### Physiognomy

The *Lolio-Cynosuretum* generally has a short, tight sward which is grass-dominated. *Lolium perenne* is usually the most abundant grass with varying amounts of *Cynosurus cristatus*. In younger, re-sown grasslands, *C. cristatus* may be rare and, with good management, it generally remains a subsidiary species. With less intensive grazing, however, it may attain dominance and it is then especially conspicuous in winter by the abundance of its dead wiry flowering stems. *Festuca rubra* and *Agrostis capillaris* are frequent throughout and, in long-established pasture, they may be abundant. *Holcus lanatus* and *Dactylis glomerata* are also frequent but of somewhat patchy distribution. They may become more prominent as coarse tussocks if pasture is under-grazed and *H. lanatus* is often abundant and vigorous around cattle dung which the animals avoid. *Poa pratensis* and *P. trivialis* are the only other grasses frequent throughout.

The dicotyledonous component of the sward is rather unvaried in its composition but individual species may be prominent in particular stands. The most frequent and abundant species overall is *Trifolium repens* which often attains co-dominance with *L. perenne* in well-managed swards. *Cerastium fontanum*, *Plantago lanceolata*, *Ranunculus acris*, *Achillea millefolium* and *Bellis perennis* are also frequent but generally at low cover. Diversity may be increased by the persistence of meadow species where the community has been derived from

such grasslands as the *Centaureo-Cynosuretum* or by the occurrence of a variety of ephemerals alongside footpaths, around gateways or on patches of bare soil exposed by poaching. *Bromus hordeaceus* ssp. *hordeaceus*, *Medicago lupulina*, *Trifolium dubium*, *Poa annua* and *Hordeum murinum* may be locally abundant in such situations. Tall herbs are generally rare but *Urtica dioica*, *Heracleum sphondylium* and *Anthriscus sylvestris* may be prominent where there is soil eutrophication and disturbance around gateways or along field margins.

Of greater importance for the management of the *Lolio-Cynosuretum* is the frequent occurrence of *Senecio jacobaea* and *Cirsium arvense* as abundant and tenacious weeds. *S. jacobaea* is a biennial which seeds prolifically and which can rapidly colonise over-grazed pastures and areas of bare soil, especially in times of drought or where there is infestation by rabbits. It is not unpalatable to all stock (sheep can eat it) but in quantity it is lethal. Regeneration can occur from root-buds so that defoliation with herbicides may be unsuccessful as a means of eradication. *Cirsium arvense* is a perennial which spreads readily by the production of nodal shoots from extensive adventitious roots. This more than compensates for its usually dioecious sexuality and its frequent occurrence in single-sex populations. Again, herbicide treatment or, in this case, cutting or even ploughing, may be inadequate for control (Salisbury 1964).

Bryophytes are generally present in the sward at low cover with scattered plants of *Brachythecium rutabulum*, *Eurhynchium praelongum* and *Rhytidiadelphus squarrosus*. *B. rutabulum* occasionally shows great abundance on moist patches of bare soil.

### Sub-communities

**Typical sub-community:** *Lolio-Cynosuretum typicum* (Br.-Bl. & De Leeuw 1936) R.Tx. 1937. Here, the general floristics are the same as described above, except that *Agrostis stolonifera*, *Ranunculus repens* and *Cirsium vulgare* are slightly preferential. However, this is a

somewhat variable sub-community including, as well as a range of older re-seeded grasslands, a variety of types which could be considered as variants.

***Alopecurus pratensis* variant.** Regularly-mown *Lolio-Cynosuretum* often shows an abundance of *A. pratensis* which may attain co-dominance with taller forms of *L. perenne*. *Ranunculus acris* is slightly preferential.

***Alopecurus geniculatus* variant.** Over the frequently puddled topography of seasonally-inundated areas of pasture alongside ponds and streams, *A. geniculatus* is a constant and sometimes abundant component of an uneven sward.

***Deschampsia cespitosa* variant.** *D. cespitosa* often occurs patchily in undulating ill-drained pastures. It may be grazed, which prevents its coarse tussocks overwhelming the sward. *Potentilla reptans* and *Ranunculus repens* show a slight preference for this variant and there is usually a prominent bryophyte component with sometimes abundant *B. rutabulum*, *Calliergon cuspidatum* and *Plagiomnium cuspidatum*.

***Iris pseudacorus* variant:** *Lolio-Cynosuretum iridetosum* O'Sullivan 1965; *Lolio-Cynosuretum juncetosum*, *Iris pseudacorus* variant O'Sullivan 1968b p.p.; *Lolio-Cynosuretum*, Sub-Association of *Lotus uliginosus* (Br.-Bl. & De Leeuw 1936) R.Tx. 1937 p.p. In certain parts of the country, *I. pseudacorus* is a prominent member of river-valley stands of *Lolio-Cynosuretum* which are flooded in winter, sometimes for considerable periods. The shoots may attain a height of 150 cm though they are readily grazed back to the rhizome stumps by cattle and sheep.

***Anthoxanthum odoratum* sub-community:** *Lolio-Cynosuretum*, Sub-Association of *Luzula campestris* (Br.-Bl. & De Leeuw 1936) R.Tx 1937; *Trifolium-Agrostio-Festucetum* Evans *et al.* 1977 p.p. In the rather richer vegetation of this sub-community, *L. perenne* and *C. cristatus* generally share dominance with *F. rubra* and *A. capillaris*. *H. lanatus*, *D. glomerata* and *P. pratensis* remain frequent but the distinctive preferential grass is *A. odoratum* which is present in small amounts. Most of the dicotyledons of the community are frequent here, although *T. repens* is not as generally abundant as in the Typical sub-community, and *Rumex acetosa*, *Hypochaeris radicata* and *Luzula campestris* are preferential. There are occasional records for hay-meadow species such as *Centaurea nigra*, *Leucanthemum vulgare* and *Leontodon hispidus* but *Lotus corniculatus* and *Lathyrus pratensis* are usually absent. Bryophytes are frequent with *Rhytidiadelphus squarrosus* preferential and sometimes abundant.

***Trisetum flavescens* sub-community:** *Lolio-Cynosuretum plantaginetosum mediae* Heinemann p.p. in LeBrun *et al.* 1949. The grass dominants here are the same as in the

*Anthoxanthum* sub-community but *T. flavescens* and *Phleum pratense* ssp. *bertolonii* are constant preferentials. There are also occasional records for a variety of more calcicolous species such as *Sanguisorba minor*, *Pimpinella saxifraga*, *Galium verum* and *Saxifraga granulata* as well as the Mesobromion grasses *Festuca ovina* and *Avenula pubescens*.

### Habitat

The *Lolio-Cynosuretum* is the major permanent pasture type on moist but freely-draining circumneutral brown soils in lowland Britain. Enclosed stands in farm fields are virtually ubiquitous and form the bulk of dairying and fattening pasture in many parts of the country, as well as providing occasional crops of hay or silage. The community is also widespread as a recreational sward and on village greens, road verges and lawns.

All the major grasses of the community are palatable but *L. perenne*, the usual dominant, has long been considered our most valuable herbage grass (e.g. Marshall 1789, Hubbard 1984). The proportion of *L. perenne* in pasture swards was first used by Davies (1941) to distinguish between first- (30% or more *L. perenne*), second- (15–30%), third- (about 12%) and fourth-grade (trace or absent) types. The more detailed floristic profiles of first- and second-grade pastures given by Beddows (1967, after Jenkin 1923 and Davies 1952) clearly correspond to the *Lolio-Cynosuretum*. Even in its wild forms, *L. perenne* is nutritious and often very productive and rapidly-growing but the selection of first, nineteenth-century varieties and, later, Aberystwyth S cultivars has made available a wide range of forms, some early, others late, some stemmy and relatively short-lived, others compact, very leafy and more persistent (Beddows 1953, 1967, Hubbard 1984). These, and a variety of cultivars of the most important herbage dicotyledon, *T. repens*, have been seeded in to permanent pasture, and into long-leys which have become permanent, to produce a range of grasslands which now approximate to the *Lolio-Cynosuretum*.

Good pastoral treatment is essential for the maintenance of productive pasture stands. Many of the grasses in the community are winter-green and fields can be grazed, in rotation, throughout the year. The usual stock are cattle with some use also for sheep. In the growing season, the number of stock is ideally maintained just to control the growth of the herbage, then reduced if there is any drop in availability of bite and increased once again when there has been a recovery of the sward (Davies 1952, Moore 1966, Beddows 1967). Good pasture stands of the *Lolio-Cynosuretum* have a dense herbage in which there is a balance of the different components and little bare ground. Heavy grazing can encourage the spread of rosette hemicryptophytes at the expense of the more nutritious grasses. Further,

although some consolidation of the sward is conducive to the growth of many species (including *L. perenne*: see Beddows 1967), heavy trampling breaks up the surface and may cause severe poaching, especially on wetter ground in winter. This may allow the spread of ephemeral weeds on to the exposed patches of bare soil in the following spring. Where grazing is too light, the low-yielding *C. cristatus* may spread, together with the coarser grasses *H. lanatus* and *D. glomerata*. Tussocky patches of grass with lank rosette species are a common feature of the avoidance-mosaics which develop around dung-pats in cattle-grazed *Lolio-Cynosuretum*. Once there is a taller sward, certain species (e.g. *T. repens*: see Donald 1961) may be shaded out, *L. perenne* may show a reduced ability to tiller (Beddows 1967) and the vegetation may be more susceptible to lose chlorophyll with 'burn' in harsh winter winds (Davies & Fagan 1938, Beddows & Jones 1958).

The *Lolio-Cynosuretum* is not normally treated as permanent hay-meadow but it is a widespread practice for fields to be shut up in spring at irregular intervals for summer-mowing. In such circumstances, there are no floristic differences between mown and unmown stands. However, where there is more regular mowing, *Alopecurus pratensis* tends to be prominent and this species is often sown in, together with taller cultivars of *L. perenne*, where the *Lolio-Cynosuretum* is to be used in this way (see *Alopecurus pratensis* variant above). The occasional presence of species characteristic of traditional hay-meadows is often indicative of the development of the *Lolio-Cynosuretum* from such swards by re-seeding, fertiliser application and an increase in grazing.

Regular grazing, with or without occasional mowing, can maintain sown or derived stands of the community in artificial habitats such as road verges. On coarse recreational swards, village greens and lawns, where the *Lolio-Cynosuretum* occurs widely, regular mowing may approximate to close grazing in its effect on the physiology and floristics of the vegetation, though here there is not the input of natural manures that stock provide to counteract the continual removal of clippings. In such situations as these, trampling is often an additional problem and heavy use may cause an increase in such resistant species as *Bellis perennis* and *Plantago major* as well as permitting the spread of ephemerals on scuffed patches of bare soil.

The *Lolio-Cynosuretum* occurs on a variety of brown soils over a wide range of bedrock types and superficial deposits but it thrives best on deep loams which are moist but free-draining, mesotrophic and of circumneutral pH. These features correspond to the edaphic optimum for *L. perenne* (Beddows 1967). The maintenance of fertility is essential in pasture stands and the dung and urine from stock are generally supplemented with natural or, more usually, artificial ferti-

lisers. Where the community occurs on brown earth soils, as is usual in the Typical and *Anthoxanthum* sub-communities, liming may be essential to counteract surface leaching, especially on lighter-textured soils or in areas of higher rainfall. *L. perenne* will not persist in upgraded upland pastures unless adequate supplies of lime and phosphate are provided (Thomas 1936). The brown calcareous soils characteristic of the *Trisetum* sub-community do not normally show such a lime-deficiency but they may be quite oligotrophic without the application of fertilisers. Along roads, soils may be eutrophicated and limed by the application of rock-salt in winter and the throwing up of limestone ballast and dust by traffic. Upland roads sometimes have a strip of *Lolio-Cynosuretum* related to such enrichment along the verge edge and this vegetation is avidly eaten by roaming sheep and ponies. Moderate applications of salt or inundation by sea-water do not appear to affect the growth of *L. perenne* adversely (Chippendale 1954, Beddows 1967).

Although the community will persist on heavy soils or under occasional inundation by fresh-water, effective drainage is essential for maintaining pasture stands of the *Lolio-Cynosuretum* in good heart. Where soils are ill-draining and gleyed, the *Deschampsia* variant of the Typical sub-community is characteristic and this vegetation often occurs in hollows in undulating pastures on till, between the ridges of ridge-and-furrow and in patchy lines between inadequately spaced drains. The *Iris* variant is typical of soils which are inundated, sometimes for long periods, in winter and which remain saturated for much of the summer. More sporadic inundation, often coupled with the effects of trampling by stock around drinking places, leads to the development of the *Alopecurus geniculatus* variant.

### Zonation and succession

The application of careful uniform treatment within enclosed pasture stands of the *Lolio-Cynosuretum* tends to minimise the occurrence of zonations. However, where past improvement has been uneven, transitions may remain. Steeper banks inaccessible to ploughing may still carry patches of *Centaureo-Cynosuretum* as remnants of previous meadow vegetation. Hollows resistant to drainage may have the *Holcus-Deschampsia* community or *Holco-Juncetum*; the *Deschampsia* and *Iris* variants of the Typical sub-community can be seen as truncated zonations to such vegetation which occur where drainage is less successful. Where rivers and pools are not embanked, the *Alopecurus geniculatus* variant represents part of a transition to the vegetation of regularly-inundated water margins. Where pastures have been won from rocky upland topography, there may be zonations to calcifugous grasslands (with the *Anthoxanthum* sub-community) or calcicolous grass-

lands (with the *Trisetum* sub-community) as the soil thins to some type of lithomorph profile around outcrops.

The *Lolio-Cynosuretum* can be derived from a very wide range of vegetation types (Figure 9) including, in extreme cases, communities of stabilised sand-dunes and blanket mire. Certain kinds of agricultural treatment or neglect may allow some of the more closely related types of original unimproved vegetation to replace the *Lolio-Cynosuretum*. In older pastures, a return to more traditional organic manuring and the withdrawal of summer grazing may permit the re-establishment of the meadow vegetation of the *Centaureo-Cynosuretum*. This is perhaps more likely in the *Anthoxanthum* and *Trisetum* sub-communities where certain meadow species persist or where there are fragments of meadow-sward on banks or adjacent verges. Similarly, the choking of drains may permit the development of extensive *Holcus-Juncetum*.

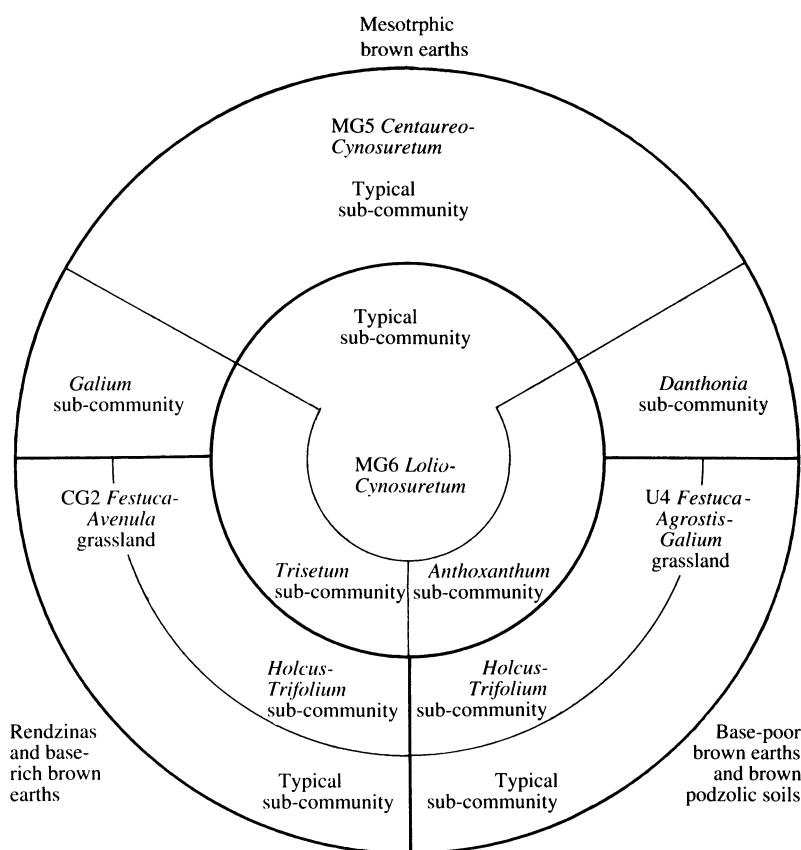
Generally, however, successions involving the *Lolio-Cynosuretum* appear to be mediated by grazing. Under-

grazing allows coarser species to increase their cover and this is sometimes a prelude to the invasion and spread of *Arrhenatherum elatius* and the development of an *Arrhenatheretum*. Abandoned pasture often shows a patchy mosaic of the two communities with scattered saplings of *Crataegus monogyna*. Where grazing is too severe, the sward may be opened up for invasion by weeds and rabbit infestation may speed the run-down to some weed-dominated vegetation. Trampling may be an attendant problem with over-grazing by cattle but is especially important in recreational and amenity stands of the *Lolio-Cynosuretum* where heavy use along foot-paths, around gateways and in goal-mouths may produce a succession to *Lolio-Plantagin* vegetation.

### Distribution

The *Lolio-Cynosuretum* is a virtually ubiquitous community of the British lowlands, occurring wherever there has been intensive improvement for pasturing. It is particularly abundant and important in the major dairy-ing areas of the wetter west (the South-West Peninsula, south Wales, the Welsh Borders, parts of the Midlands and the Scottish lowlands) and in the traditional fattening regions (Dorset, Romney Marsh, Leicestershire and Northamptonshire, the Lindsey District of Lincoln-

Figure 9. Convergence and loss of diversity among grasslands with continuing agricultural improvement.



shire, Deeside and north Wales and along the Northumberland coastal plain: see Beddows 1967).

#### Affinities

The *Lolio-Cynosuretum* has been almost totally neglected in British descriptive literature despite its familiarity and agricultural importance. It is not as simple a community as the common designation 'pasture' implies but it can generally be distinguished from the other grasslands of the Cynosurion by the constancy of *L. perenne* and *C. cristatus* and the absence of the characteristic suite of meadow species that are typical of the *Centaureo-Cynosuretum*. Indeed, well-defined management tends to sharpen its boundaries with other vegetation types, although there are sometimes clear affinities with the mires of the *Holco-Juncion* and *Filipendulion* and with the open trampled vegetation of

the *Lolio-Plantaginion*. The lack of dominance by *Juncus* spp. or tall herbs or the maintenance of a diverse closed sward are usually sufficient to distinguish the community in such cases. There may be greater difficulty in separating certain stands of the *Lolio-Cynosuretum* from some types of long-ley but the poor representation of *C. cristatus* in such vegetation types is a valuable criterion.

The community was first described in its present form by Tüxen (1937) from north-west Germany and it is widespread in western Europe (e.g. LeBrun *et al.* 1949, Sissingh & Tideman 1960, Westhoff & den Held 1969). It has also been described from Eire (O'Sullivan 1965, 1968*b*) and from Scotland (Birse & Robertson 1976, Birse 1980) and there is a broad similarity between the subdivisions in these various accounts and the types described here.

#### Floristic table MG6

	a	b	c	6
<i>Lolium perenne</i>	V (1–8)	V (2–7)	V (4–7)	V (1–8)
<i>Cynosurus cristatus</i>	V (2–8)	V (2–7)	IV (2–8)	V (2–8)
<i>Trifolium repens</i>	V (2–9)	V (1–8)	V (2–4)	V (1–9)
<i>Holcus lanatus</i>	IV (1–8)	V (2–6)	III (2–5)	IV (1–8)
<i>Cerastium fontanum</i>	III (1–5)	V (1–5)	IV (1–3)	IV (1–5)
<i>Festuca rubra</i>	III (1–9)	IV (2–8)	IV (4–6)	IV (1–9)
<i>Agrostis stolonifera</i>	II (1–7)	I (2–9)	I (6)	I (1–9)
<i>Alopecurus pratensis</i>	II (1–7)	I (3)	I (2–4)	I (1–7)
<i>Ranunculus repens</i>	II (1–7)	I (1–4)		I (1–7)
<i>Cirsium vulgare</i>	II (1–3)	I (1)		I (1–3)
<i>Alopecurus geniculatus</i>	I (1–6)	I (1)		I (1–6)
<i>Deschampsia cespitosa</i>	I (1–5)			I (1–5)
<i>Iris pseudacorus</i>	I (1–6)			I (1–6)
<i>Anthoxanthum odoratum</i>	I (1–5)	V (1–7)		II (1–7)
<i>Ranunculus acris</i>	III (1–4)	IV (1–5)	I (1–2)	III (1–5)
<i>Rumex acetosa</i>	II (1–4)	III (1–4)	I (2–3)	II (1–4)
<i>Hypochoeris radicata</i>	I (2–5)	II (2–4)	I (2)	I (2–5)
<i>Luzula campestris</i>	I (1–3)	II (1–5)		I (1–5)
<i>Rhynchospora squarrosa</i>	I (3–4)	II (1–6)		I (1–6)
<i>Trisetum flavescens</i>	I (1–6)	I (2–4)	V (2–4)	II (1–6)
<i>Phleum pratense bertolonii</i>	I (1–5)	I (1–4)	V (2–5)	I (1–5)
<i>Pimpinella saxifraga</i>		I (1–5)	II (2–5)	I (1–5)
<i>Agrostis capillaris</i>	III (1–8)	V (2–8)	IV (4–8)	III (1–8)
<i>Plantago lanceolata</i>	II (1–6)	III (1–5)	IV (3–4)	III (1–6)
<i>Dactylis glomerata</i>	III (1–8)	III (1–4)	IV (2–7)	III (1–8)
<i>Poa pratensis</i>	II (1–5)	III (1–5)	III (1–5)	III (1–5)
<i>Cirsium arvense</i>	II (1–5)	II (1–5)	III (3–4)	III (1–5)
<i>Taraxacum officinale</i> agg.	III (1–3)	II (1–3)	II (1–3)	II (1–3)

**Floristic table MG6 (cont.)**

	a	b	c	6
<i>Bellis perennis</i>	II (1–6)	II (1–4)	II (2–4)	II (1–6)
<i>Achillea millefolium</i>	II (1–5)	II (2–5)	II (4)	II (1–5)
<i>Brachythecium rutabulum</i>	II (1–7)	II (1–5)	III (2–4)	II (1–7)
<i>Poa trivialis</i>	II (1–7)	II (2–5)	II (2–5)	II (1–7)
<i>Leontodon autumnalis</i>	I (1–4)	II (1–4)	II (1–3)	II (1–4)
<i>Trifolium pratense</i>	II (1–5)	II (1–7)	I (2–4)	II (1–7)
<i>Bromus hordeaceus hordeaceus</i>	I (1–6)	II (1–6)	I (2)	I (1–6)
<i>Festuca pratensis</i>	I (1–3)	I (1–4)	I (4)	I (1–4)
<i>Lathyrus pratensis</i>	I (2–5)	I (1–3)	I (2)	I (1–5)
<i>Trifolium dubium</i>	I (2–8)	I (2–7)	I (2)	I (2–8)
<i>Veronica chamaedrys</i>	I (1–2)	I (1–2)	I (1)	I (1–2)
<i>Phleum pratense pratense</i>	I (1–4)	I (2–4)	I (4)	I (1–4)
<i>Medicago lupulina</i>	I (1–5)	I (2–3)	I (3)	I (1–5)
<i>Potentilla reptans</i>	I (2–5)	I (3–7)	I (3)	I (2–7)
<i>Festuca ovina</i>	I (2)	I (3)	I (7)	I (2–7)
<i>Poa annua</i>	I (1–5)	I (2–4)	I (2)	I (1–5)
<i>Prunella vulgaris</i>	I (1–4)	I (2–5)	I (3)	I (1–5)
<i>Eurhynchium praelongum</i>	I (1–7)	I (1–3)	I (1–4)	I (1–7)
<i>Cardamine pratensis</i>	I (1–2)	I (1–2)		I (1–2)
<i>Arrhenatherum elatius</i>	I (1–3)	I (1–2)		I (1–3)
<i>Centaurea nigra</i>	I (1–4)	I (2–4)		I (1–4)
<i>Juncus effusus</i>	I (4)	I (4)		I (4)
<i>Plantago major</i>	I (1–4)	I (1)		I (1–4)
<i>Potentilla anserina</i>	I (1–3)	I (1–3)		I (1–3)
<i>Rhinanthus minor</i>	I (3–4)	I (3–5)		I (3–5)
<i>Rumex obtusifolius</i>	I (1–2)	I (4)		I (1–4)
Number of samples	102	43	10	155
Number of species/sample	13 (9–20)	14 (4–26)	14 (11–20)	13 (4–26)

a Typical sub-community

b *Anthoxanthum odoratum* sub-communityc *Trisetum flavescens* sub-community6 *Lolio-Cynosuretum cristati* (total)



