SM16
Festuca rubra salt-marsh community
Juncetum gerardi Warming 1906

Synonymy
Festucetum (*rubrae*) *auct. angl.*

Constant species
Festuca rubra, *Plantago maritima*, *Glaux maritima*.

Physiognomy
The closed grasslands of the *Juncetum gerardi* are normally dominated by mixtures of *Festuca rubra* and *Agrostis stolonifera* with a variety of herbaceous associates among which *Plantago maritima*, *Glaux maritima*, *Armeria maritima* and *Triglochin maritima* are generally the most frequent and abundant. *Juncus gerardii* itself is present in varying amounts: it is usually constant through all but the most anomalous of the *Juncetum* swards and in some cases is dominant or co-dominant. In certain sub-communities, there are frequent records for low-marsh species and an algal mat is often conspicuous over the substrate surface. In other sub-communities, a group of mesotrophic grassland and flush species are well-represented. The *Juncetum gerardi* is the community within which bryophytes reach their lowest limit on salt-marshes.

Sub-communities
As in the other major British salt-marsh association, the *Puccinellietum maritimae*, variation is virtually continuous, largely based on quantitative differences among relatively few species and frequently including a site-specific element reflecting local histories of marsh use. The following sub-communities should therefore be seen as foci of national variation with somewhat hazy boundaries.

***Puccinellia maritima* sub-community:** *Juncus gerardii-Puccinellia maritima* nodum Adam 1976; *Puccinellietum maritimae agrostidetosum* Beeftink 1962. This sub-community comprises generally short swards which are floristically transitional between the *Juncetum gerardi* and the *Puccinellietum maritimae*. *J. gerardi*, *Puccinellia maritima*, *Festuca rubra*, *Plantago maritima*, *Glaux maritima* and *Triglochin maritima* are constant and varying proportions of these species co-dominate. *Agrostis stolonifera*, *Armeria maritima* and rayed *Aster tripolium* are less frequent but each may be abundant in particular stands.

Sub-community with *Juncus gerardii* dominant: *Juncetum gerardi*, *J. gerardii* variant Beeftink 1962; (not *Juncetum gerardi juncetosum* Tyler 1969). *Juncus gerardii* always dominates in the tall swards of this sub-community, the stands of which are rarely extensive, 2–3 m diameter at most, and probably vegetatively expanding clones. Even on heavily-grazed marshes, *J. gerardii* remains largely untouched by stock and clumps remain tall and conspicuous though such clumps are often surrounded by a short cropped turf in which *J. gerardii* is still abundant: this perhaps indicates the existence of genotypes of *J. gerardii* of differing palatability. *Plantago maritima*, *Glaux maritima*, *Triglochin maritima* and rayed *Aster tripolium* are also constant though rarely of great abundance. *Festuca rubra* and *Agrostis stolonifera* are reduced in frequency compared with the association as a whole.

***Festuca rubra-Glaux maritima* sub-community:** *Festucetum rubrae* Yapp & Johns 1917; *Juncus gerardii-Glaux maritima-Agrostis stolonifera* Association Nordhagen 1923; *Festuca-Glaux*, *Festuca-Agrostis* and *Festuca-Armeria* noda Adam 1976; *Juncetum gerardi*, variant with *Festuca rubra* f. *littoralis* Beeftink 1962 *p.p.*; *Juncetum gerardi festucetosum* Tyler 1969 *p.p. Festuca rubra* and *Agrostis stolonifera* are usually co-dominant in the low swards of this sub-community. *Plantago maritima*, *Glaux maritima*, *Triglochin maritima* and *Armeria maritima* are also constant and may each be abundant. *Juncus gerardii* is somewhat variable in amount and even when abundant may be difficult to detect in close-cropped turf. This is the lowest vegetation in which bryophytes are typically encountered on salt-marshes: *Rhytidiadelphus squarrosus*, *Hypnum cupressiforme* and *Eurhynchium praelongum* are the most frequent species. Algae are uncommon.

Within the sub-community stands may be encountered in which either *A. stolonifera* or *F. rubra* are sparsely represented. In other cases, these two species are overwhelmingly co-dominant in short swards in which *J. gerardii* is very poorly represented (the *Agrostis stolonifera* variant). *J. gerardii* is also sparse in some stands where *F. rubra* and *Armeria maritima* are co-dominant in the absence of *A. stolonifera* (the *Armeria maritima* variant). There is good evidence to see these very distinct communities as extreme forms of *Juncetum gerardi* derived as a result of particular marsh management regimes (see below).

***Leontodon autumnalis* sub-community:** *Juncus gerardii-Trifolium repens-Leontodon autumnalis* Association Nordhagen 1923; *Juncetum gerardi leontodetosum* Raabe 1950; *Juncetum gerardi leontodetosum* and *odontitosum* Gillner 1960; *Carex distans-Plantago maritima* Association Ivimey-Cook & Proctor 1966 *p.p.*; *Juncetum gerardi festucetosum* Tyler 1969 *p.p.* This sub-community has much the same physiognomy as the last and here too *Festuca rubra*, *Agrostis stolonifera* and *Juncus gerardii* can all be well-represented in the short, smooth swards. *Plantago maritima* and *Glaux maritima* remain constant but here there are also frequent records for a variety of species characteristic of non-maritime vegetation. Among these, *Trifolium repens* is constant but *Potentilla anserina*, *Leontodon autumnalis* and *Carex flacca* can each be frequent and abundant. On cattle-grazed marshes, where the vegetation is normally not so shortly cropped as under sheep-grazing, a number of species flower and *L. autumnalis* may be particularly conspicuous. *Carex distans* may also be abundant in this sub-community but this species has different habitat preferences across its British range. It is uncommon on salt-marshes in the south-east but frequent in western England and in Wales; in Scotland, it again becomes rare on salt-marshes though it remains quite common among low coastal rocks (see Jermy & Tutin 1968).

Within the belts occupied by this sub-community there is sometimes a zonation of *T. repens*, *L. autumnalis*, *C. distans* and *P. anserina* in order of lowest occurrence but this is not universal and, indeed, all these species can occur occasionally in the lower marsh *Festuca-Glaux* sub-community. At the highest levels occupied by the *L. autumnalis* sub-community *Lolium perenne*, *Cynosurus cristatus*, *Bromus hordeaceus* ssp. *hordeaceus*, *Elymus repens* and *Poa pratensis* are sometimes found. It is possible that these species seed in from adjacent sea-banks where grassland mixtures have been sown. Another occasional species in the upper-marsh sites is *Trifolium fragiferum* which becomes restricted to coastal communities at the northern limits of its British range. It is rarely extensive, tending to occur in discrete patches often associated with freshwater seepage onto the upper marsh.

As with the *Festuca-Glaux* sub-community there are rather extreme forms of salt-marsh swards which are perhaps best seen in relation to a more central type of *Juncetum gerardi* vegetation. A *Trifolium repens* variant is very similar to the *L. autumnalis* sub-community except for its lower levels of *J. gerardii*.

Low turf very similar in floristics to this sub-community is of common occurrence on some sea cliffs. Here *F. rubra*, *Plantago maritima*, *Armeria maritima* and more rarely *Glaux maritima* are generally co-dominant but *J. gerardii*, *C. distans*, *T. repens* and *L. autumnalis* may all be conspicuous.

***Carex flacca* sub-community.** *Juncetum gerardi festuco-caricetosum nigrae* Tyler 1969; ? *Danthonia decumbens-Agrostis canina* community Tyler 1969; *Agrostis tenuis-Festuca ovina* community Tyler 1969 *p.p.* The floristics and physiognomy of this sub-community are generally similar to the last except that here *C. flacca* is much more frequent and sometimes co-dominant with the grasses and herbaceous halophytes. Bryophytes may also be more conspicuous: *Campylium polygamum*, *Amblystegium serpens*, *Grimmia maritima*, *Cratoneuron filicinum*, *Amblystegium riparium*, *Calliergon cuspidatum*, *Rhytidiadelphus squarrosus*, *Hypnum cupressiforme* and *Eurhynchium praelongum* all occur occasionally and each may be abundant in particular samples.

Sometimes the turf of this sub-community is broken by flushed gravelly patches and here *Blysmus rufus*, *Eleocharis uniglumis*, *E. palustris* and *E. quinqueflora* may be locally abundant.

Sub-community with tall *Festuca rubra* dominant: *Festucetum littoralis* Corillion 1953; Tall *Festuca rubra* nodum Adam 1976; *Juncetum gerardi*, variant with *Festuca rubra* f. *littoralis* Beeftink 1962 *p.p.*; includes *Festuca rubra-Agrostis stolonifera-Hordeum secalinum* associes Ranwell 1961; (not *Festucetum rubrae* Yapp & Johns 1917). The very distinctive springy mattresses of this sub-community are perhaps best seen as a physiognomic variant of the *Juncetum gerardi*. *F. rubra* is consistently dominant. It grows tall and dense and, after tidal inundation, presents a bedraggled appearance. Although all of the species frequent in the association as a whole occur here, most are reduced in frequency and rarely make a major contribution to the sward. *Plantago maritima* and *Agrostis stolonifera* are the most common associates. Some stands are distinctive in the presence of conspicuous amounts of *Halimione portulacoides*; others may have *Elymus pycnanthus* and, in Somerset and the upper Severn estuary, *Hordeum secalinum* occurs in this sub-community (Ranwell 1961, Owen 1972). Flowering appears to be rare in British stands

(cf. Gravesen & Vestegaard 1969 in Denmark). In winter, when the vegetation may remain flattened for long periods, seedlings of *Atriplex* spp. and *Cochlearia* spp. may appear in profusion on top of the matted grass.

Habitat

The *Juncetum gerardi* covers extensive areas of salt-marsh especially in the north and west of Britain where it is the predominant community of the mid- and upper marsh. It occurs on a range of substrates from marsh levels experiencing several hundred submergences/year to the upper tidal limit. It is usually grazed and provides swards that are valuable for commercial turf-cutting.

Regimes of salt-marsh grazing are very variable. The stock involved, the stocking rates, the pattern of use through the year may all vary from marsh to marsh and through time and all these factors might be expected to influence the appearance of the vegetation. Much of the site-specific variation within the *Juncetum gerardi* is probably related to the unique grazing history of every site.

The general effect of grazing is to maintain a fine short sward, preventing the overwhelming dominance of (a) particular species (Dahlbeck 1945, Gillner 1960, Beeftink 1977*a*). It is probably important in controlling the proportions of *Puccinellia maritima*, *Agrostis stolonifera* and *Festuca rubra* in the sward and thus influences the position and the nature of the boundary between the communities of the *Puccinellietum maritimae* and the *Juncetum gerardi* and the extent and composition of the transitional vegetation classified here as the *Puccinellia* sub-community (Ranwell 1968, Gray & Scott 1977*b*). If grazing pressure is generally low or if grazing ceases, *F. rubra* is particularly responsive, growing tall and rank, excluding most potential competitors and eventually producing the sort of tussocky, species-poor grassland that is characteristic of the tall *F. rubra* sub-community. Such vegetation is unpalatable to wildfowl (Cadwalladr *et al.* 1971, Cadwalladr & Morley 1974, Charman & Macey 1978) and to re-introduced sheep.

The preparation and cutting of 'sea-washed' turf is important at a number of salt-marsh sites (e.g. Morecambe Bay; see Gray 1972). The grass-dominated swards of the *Festuca-Glaux* sub-community (the *Agrostis stolonifera* variant) are most favoured and are prepared over a number of years by mowing during the growing season, the application of fertiliser and sometimes of selective herbicides. This produces a virtually pure turf of fine-leaved *F. rubra* and *A. stolonifera*. Cutting is now highly mechanised and involves the removal of shallow (*c.* 3.5 cm deep) turves often over considerable areas. Recolonisation of cuttings produces a diverse and irregular succession (see below) and may involve the development of the transitional *Puccinellia* sub-community.

There is a broad correlation between variation in the sub-communities of the *Juncetum gerardi* and the incidence of tidal submersion. The transitional *Puccinellia* sub-community usually extends furthest down-marsh and it may be subject to more than 250 submergences/year, though it can also occur in very slight hollows in the upper marsh. Where it extends down into the *Puccinellietum* it is found on knolls and creek levees. The *Festuca-Glaux* sub-community is also found in such situations though the lower limit of continuous swards experiences between 150 and 200 submergences/year. The *Leontodon* sub-community occurs at higher levels which are subject to up to 100–120 submergences/year. Where vegetation virtually identical to this sub-community occurs on sea cliffs, it is found in situations which receive very considerable amounts of sea-spray and its soils show some of the highest values of Na/organic matter encountered in that habitat. The *Carex flacca* sub-community is best developed at the the storm-tide level where there are usually only one or two flooding tides per annum and perhaps at extremes up to 25 submergences/year. Despite the frequent seepage of freshwater into sites occupied by this sub-community, the soil salinity during droughts may reach quite high values (Gillham 1957*b*).

Substrates on which the *Juncetum gerardi* occurs include clays, silts, sands, shingle and soils of high organic content. The *Puccinellia* sub-community spans the entire range of substrate variation. Other sub-communities are more restricted: the tall *Festuca rubra* sub-community tends to occur on clays, silts and sands while the *Festuca-Glaux* and *Leontodon* sub-communities are generally confined to sandier material with some occurrences on more organic soils. Although the *Juncus gerardii* sub-community occurs on various substrates, its occurrences in south-east England frequently indicate the presence of shingle below the top soil horizon and, in some cases, this vegetation can develop directly on shingle banks. The *Carex flacca* sub-community is most frequently found on soils with high organic content, at least in the upper part of the profile. The pH of the substrates on which the *Juncetum* occurs varies between 5.0 and 7.0, with finer material without organic enrichment being more basic.

A combined effect of tidal inundation and substrate type is mediated through soil permeability. The degree of waterlogging probably has some effect on the proportions of *F. rubra*, *A. stolonifera* and *Puccinellia maritima* in the vegetation. *F. rubra* may suffer competitively against *P. maritima* under waterlogged and more saline conditions and against *A. stolonifera* in waterlogged and less saline situations (Gray & Scott 1977*a*). On cliffs, the factor which favours the development of the *Leontodon* sub-community of the *Juncetum gerardi* rather than some form of *Festuca-Armeria* sward is probably the

retention of water in the heavy gleyed soils: both vegetation types receive similar amounts of salt-spray and both are grazed.

Among the grasses of the *Juncetum gerardi*, *A. stolonifera* seems more resistant to oil and refinery effluent spillage than either *F. rubra* or *P. maritima* and it may gain a competitive advantage in vegetation recovering from such pollution. *Armeria maritima*, *Plantago maritima* and *Triglochin maritima* are able to resist considerable amounts of spillage by virtue of their underground storage organs (Baker 1979).

Zonation and succession

In general, the *Juncetum gerardi* occupies a position above the *Puccinellietum maritimae* in the salt-marsh zonation but the extent of the *Juncetum* in the south-east differs strikingly from its contribution to salt-marshes elsewhere. In the south-east, the association is of very limited extent and occurs only at high levels in the marsh, most often forming a discontinuous zone in contact with the *Limonium-Armeria* sub-community of the *Puccinellietum*. In the north and west, the *Juncetum* is usually very extensive in both the mid- and upper-marsh. The exact reasons for this difference, and for the more seaward extension of particular species in the west, are unknown (Beeftink 1977*a*, *b*, Adam 1978) but the major factor controlling the relative positions of the two associations is the degee of submersion. In upper estuaries, where there is freshwater dilution, the positions of the *Juncetum* and *Puccinellietum* are reversed. The location and nature of the junction between the associations is also affected markedly by the extent and nature of the grazing.

Within the *Juncetum*, there is usually a zonation of the different sub-communities in relation to their tolerance of submersion. The detailed pattern varies from site to site and, though the *Festuca-Glaux* sub-community usually gives way to the *Leontodon* sub-community upmarsh, the relative depth of the zones is very variable (Figure 9). In some cases, there is a complex mosaic of the two communities over the mid-marsh. The *Leontodon* sub-community may, in turn, pass into the *Carex flacca* sub-community. Provided that the upper limit of the salt-marsh is not an artificial boundary, the topmost zone grades into non-maritime grassland or mire (e.g. Gillham 1957*b*). The tall *Festuca rubra* sub-community often forms part of zonations with the *Halimionetum*, sometimes occupying a position between this association and fragmentary stands of the *Artemisietum*.

The zonation of the sub-communities may represent a successional sequence in response to substrate accretion and the gradual raising of salt-marsh surfaces. Grazing too, can, be responsible for considerable temporal changes within the *Juncetum gerardi* (see above) and may shift the succession towards the development of other associations. Very heavy grazing, particularly by cattle and horses on clay and silt substrates, can lead to poaching and the appearance of *Puccinellietum maritimae* or to communities characteristic of disturbed saline sites such as the *Puccinellietum distantis* and the *Agrostis stolonifera-Alopecurus geniculatus* community.

Turf-cutting opens up areas for colonisation by a variety of species. In the early stages a variety of annuals and short-lived perennials predominate: *Spergularia marina*, *Juncus bufonius*, *Plantago coronopus* and *Sagina maritima*, for example, often with *Pottia heimii*. Diverse assemblages of such species have sometimes been classified within the Saginetea. *Puccinellia maritima* is frequently an early colonist and a closed *Puccinellietum maritimae* may develop. *P. maritima* may persist within a *Festuca rubra* sward to produce a patchwork of the transitional vegetation of the *Puccinellia* sub-community of the *Juncetum gerardi*. It is this pattern of recolonisation which helps make grazing and turf-cutting compatible activities on the same salt-marsh.

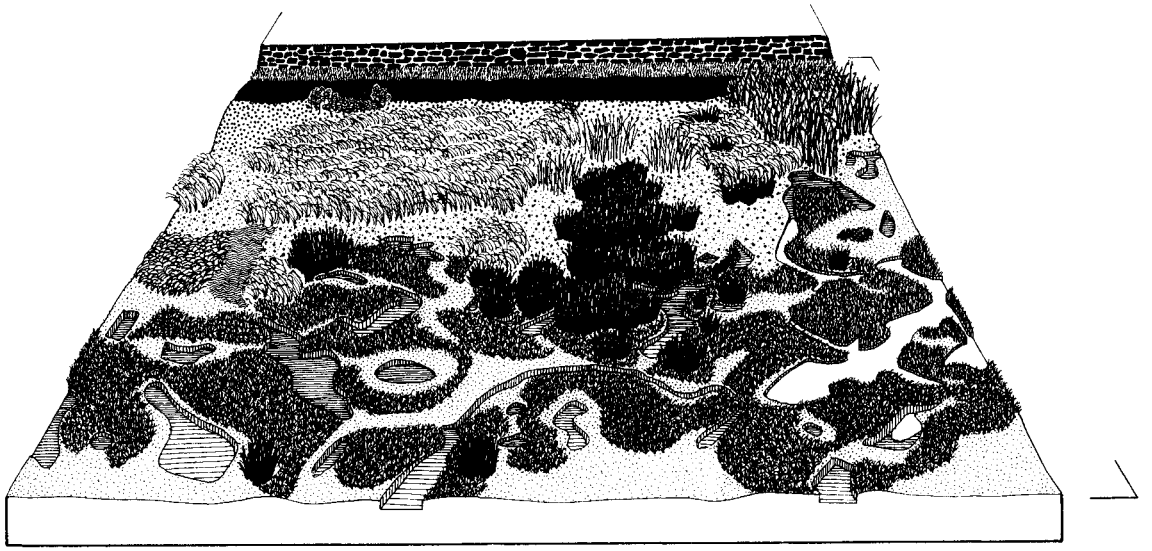
Distribution

The *Juncetum gerardi* is widespread except in the south-east where it is local and where the *J. gerardii*-dominated sub-community is the most frequent representative of the association. The *Festuca-Glaux* and *Leontodon* sub-communities are virtually ubiquitous in western Britain but very sparsely distributed in the south-east. In north Norfolk, for example, their only extensive occurrence is at Brancaster which, interestingly, is the only marsh in the area still subject to regular grazing. Both sub-communities have been reported from brackish reclaimed pastures and they may be more widespread in this habitat. Where the *Leontodon* sub-community occurs on sea cliffs it is chiefly northern with some isolated occurrences in Wales and Cornwall where its distribution may be related to localised flushing rather than a generally high precipitation. It is commonest in west Scotland, the Outer Isles, Orkney and Shetland. The grass-dominated swards of the *Festuca-Glaux* and *Leontodon* sub-communities have been encountered chiefly in those areas where sheep-grazing and turf-cutting are most intensive. The *Carex flacca* sub-community is widespread in the west but most frequent in west Scotland.

Affinities

The *Juncetum gerardi* is one of the most important communities on British salt-marshes but its internal diversity and its affinities have been little discussed. The view of the *Juncetum* adopted here is a broad one, roughly comparable to that of Tyler (1969*b*). A similar range of vegetation types to that included here occurs widely in northern Europe and numerical studies (Adam 1977) have emphasised the close relationship between the British and European communities.

Figure 9. Complex of upper marsh communities at Bolton-le-Sands, Morecambe Bay.
The bulk of the marsh vegetation comprises various kinds of SM16 *Juncetum gerardi*. In the foreground, as a mosaic around the largely dried-up pans, are the *Festuca-Glaux* and *Juncus gerardii* sub-communities, with a small patch of the tall *Festuca rubra* sub-community to the left. Above, these give way to the *Leontodon* sub-community. Scattered through the *Juncetum gerardi* are dense clumps of the SM18 *Juncus maritimus* salt-marsh. On the slope below the road, the *Juncetum* gives way to a narrow zone of the MG11 *Festuca-Agrostis-Potentilla* grassland with small stands of OV25 *Urtica-Cirsium* vegetation on rotting horse faeces. On the flushed ground below are small stands of the SM20 *Eleocharitetum uniglumis* and some larger areas of S21 *Scirpetum maritimi* and S20 *Scirpetum tabernaemontani*; from one of these, a small stand of MG13 *Agrostis-Alopecurus* grassland runs down the marsh towards a large pan. The flooded pans to the right have thick festoons of the SM2 *Ruppietum maritimae*.



Salt-marsh communities

SM16 *Juncetum gerardi*
Leontodon sub-community
Trifolium variant

SM16 *Juncetum gerardi*
Festuca-Glaux sub-community
Armeria variant

SM16 *Juncetum gerardi*
Juncus gerardii-dominated sub-community

SM16 *Juncetum gerardi*
Sub-community with tall *Festuca rubra* dominant

SM18 *Juncus maritimus* salt-marsh
Oenanthe sub-community

SM20 *Eleocharitetum uniglumis*

Swamps

S21 *Scirpetum maritimi*

S20 *Scirpetum tabernaemontani*

Mesotrophic grasslands

MG13 *Agrostis-Alopecurus* community

MG11 *Festuca-Agrostis-Potentilla* community
(with *Urtica* patches)

MG6 *Lolio-Cynosuretum*

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The *Festuca-Glaux* sub-community can be regarded as the core of the British *Juncetum gerardi*. Floristic transitions from this sub-community to the *Puccinellietum maritimae* are obvious and the major difficulty is deciding where exactly to draw the line between the two associations. In other directions, floristic affinities are more diverse and contentious. Certain authorities would see some of the samples included here within the *Leontodon* sub-community as part of the Elymo-Rumicion crispi, emphasising the transitional nature of the vegetation (see the *Agrostidetum stoloniferae* sub-association of var. *salina* and *Trifolium fragiferum* Westhoff 1947 and *Ononis spinosa-Carex distans* Association Runge 1966 in Westhoff & den Held 1969; Géhu 1973*b*). An alternative treatment of the high level stands of the *Leontodon* sub-community with pasture grasses would be to place such vegetation in a maritime sub-community of the *Lolio-Cynosuretum cristati* (e.g. Raabe 1953; see also Gillner 1960).

Carex-rich upper marsh grasslands similar to those included here within the *Carex flacca* sub-community have been described from Scandinavia (Nordhagen 1923, Du Rietz & Du Rietz 1925, Almquist 1929, Gillner 1960, Tyler 1969*b*), Germany (Tüxen 1937) and The Netherlands (Westhoff 1947). Some would place these again within the Elymo-Rumicion crispi, while others see them as variants of inland mire types occasionally encountered in maritime or paramaritime situations (cf. the *Isolepsis setacea* variant of the *Schoeno-Juncetum serratuletosum* in Wheeler 1980*b* and the Caricion davallianae dune-slack communities of Westhoff & den Held 1969).

The *J. gerardii*-dominated sub-community bears some resemblance to communities of the Eleocharion. It should, however, be distinguished from the *Juncetum gerardi juncetosum* (Tyler 1969*b*) which possesses a distinctive suite of bryophytes not represented here.

The tall *Festuca rubra* sub-community is a somewhat diverse assemblage united by the overwhelming dominance of *F. rubra*. It could be divided on a strict floristic basis between the *Juncetum gerardi*, the *Halimionetum* and the *Atriplici-Elymetum pycnanthi*. Alternatively, the entire sub-community could be separated entirely from the *Juncetum* as part of the *Festucetum littoralis* Corillion 1953 (e.g. Géhu 1975, Géhu & Delzenne 1975).

Floristic table SM16

	a	b	c	d	e	f	16
Festuca rubra	IV (2–7)	III (2–7)	V (2–10)	V (5–10)	V (2–9)	V (4–8)	V (2–10)
Juncus gerardii	V (3–7)	V (6–10)	V (2–7)	I (2–3)	V (2–7)	V (3–6)	V (2–10)
Glaux maritima	V (2–8)	IV (2–7)	V (2–8)	II (2–6)	V (2–7)	IV (2–6)	IV (2–8)
Plantago maritima	V (3–8)	IV (2–6)	V (2–8)	IV (1–5)	IV (2–7)	V (2–6)	IV (2–8)
Agrostis stolonifera	III (2–9)	II (3–7)	IV (2–8)	III (2–8)	V (2–8)	V (3–8)	IV (2–9)
Triglochin maritima	V (1–7)	IV (2–5)	IV (1–6)	II (1–5)	III (1–6)	III (1–5)	III (1–7)
Armeria maritima	III (2–6)	III (2–5)	IV (2–8)	I (2–3)	III (2–5)	III (2–6)	III (2–8)
Aster tripolium (rayed)	III (1–5)	IV (1–4)	III (1–5)	II (2–6)	I (1–4)	I (3)	II (1–6)
Puccinellia maritima	V (2–9)	I (3–6)	I (2–6)	II (2–5)			I (2–9)
Algal mat	II (3–8)	II (3–8)	I (4–8)	I (3)	I (4–5)		I (3–8)
Spergularia media	II (1–4)	I (2)	I (2–3)	II (1–4)	I (2–3)		I (1–4)
Aster tripolium	II (2–4)	I (3)	I (1–3)	I (1–4)			I (1–4)
Salicornia agg.	II (2–5)	I (2)	I (1–3)		I (2)		I (1–5)
Atriplex prostrata	I (3)	II (2–3)	I (1–3)	II (1–4)	I (2–3)	I (2)	I (1–4)
Cochlearia anglica	I (2–4)	II (2–3)	I (2–3)		I (2)		I (2–4)
Halimione portulacoides	I (2–4)	II (2–3)	I (1–2)	II (1–8)			I (1–8)
Limonium cf. *L. vulgare*	I (2–6)	II (2–4)	I (1–8)	II (1–5)	I (2)		I (1–8)
Trifolium repens		I (2–4)	I (2–5)	I (2–4)	IV (2–7)	V (1–7)	II (1–7)
Leontodon autumnalis		I (2)	I (2–5)	I (2–4)	III (1–6)	V (2–5)	II (1–6)
Carex flacca	I (3)				I (2–6)	IV (1–7)	I (1–7)
Carex distans		I (2)	I (1–3)	I (2–3)	III (1–7)	II (1–5)	I (1–7)
Potentilla anserina			I (2)	I (3–6)	II (2–8)	III (3–7)	I (2–8)
Holcus lanatus				I (3–6)	I (2–5)	I (2–6)	I (2–6)
Lotus corniculatus			I (4)	I (2–4)	I (2–5)	I (2–6)	I (2–6)
Cerastium fontanum			I (2)	I (2)	I (2–3)	II (2–3)	I (2–3)
Sagina procumbens			I (2–4)		I (2–5)	II (2–5)	I (2–5)
Eurhynchium praelongum			I (3–4)		I (2–7)	I (3–6)	I (2–7)
Rhytidiadelphus squarrosus			I (3)		I (3–5)	I (3–8)	I (3–8)
Hypnum cupressiforme			I (2)		I (2–3)	I (4–6)	I (2–6)
Anthoxanthum odoratum				I (3)	I (3)	I (2–5)	I (2–5)
Plantago lanceolata				I (2)	I (2–3)	I (1–3)	I (1–3)

Floristic table SM16 (*cont.*)

	a	b	c	d	e	f	16
Cynosurus cristatus					I (2–3)	I (5–6)	I (2–6)
Ranunculus acris					I (2)	I (1–4)	I (1–4)
Number of samples	34	49	150	85	149	46	513
Mean number of species/sample	9 (6–13)	8 (3–12)	9 (5–16)	7 (3–12)	11 (7–18)	16 (9–31)	10 (3–31)
Mean vegetation height (cm)	7 (2–25)	26 (2–40)	11 (2–75)	26 (10–60)	10 (2–50)	10 (2–60)	14 (2–75)
Mean total cover (%)	95 (70–100)	96 (50–100)	96 (50–100)	99 (80–100)	100 (90–100)	100 (90–100)	98 (50–100)

a *Puccinellia maritima* sub-community
b Sub-community with *Juncus gerardii* dominant
c *Festuca rubra-Glaux maritima* sub-community
d Sub-community with tall *Festuca rubra* dominant
e *Leontodon autumnalis* sub-community
f *Carex flacca* sub-community
16 *Juncetum gerardi* (total)

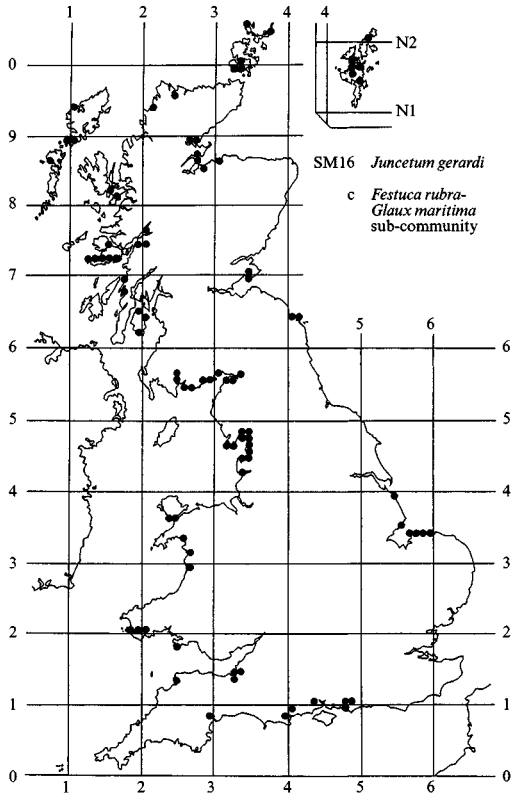
SM16 sub-communities

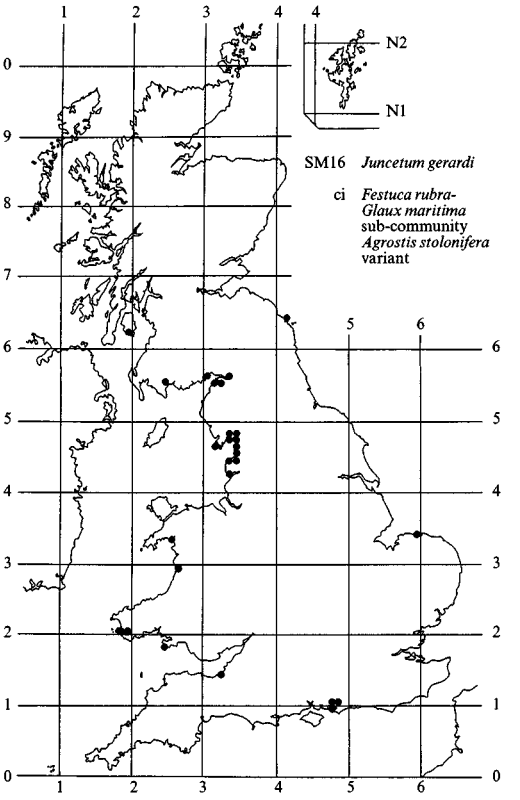
	c	ci	cii	e	ei
Festuca rubra	V (2–10)	V (5–10)	V (5–10)	V (2–9)	V (4–9)
Juncus gerardii	V (2–7)	I (2)	I (1)	V (2–7)	I (3–4)
Glaux maritima	V (2–8)	IV (2–7)	V (3–7)	V (2–7)	IV (2–7)
Plantago maritima	V (2–8)	IV (1–8)	V (2–7)	IV (2–7)	IV (2–5)
Agrostis stolonifera	IV (2–8)	V (3–8)		V (2–8)	V (4–8)
Triglochin maritima	IV (1–6)	III (2–5)	IV (1–7)	III (1–6)	II (2–4)
Armeria maritima	IV (2–8)	IV (2–8)	V (2–8)	III (2–5)	III (2–5)
Aster tripolium (rayed)	III (1–5)	II (1–4)	III (2–7)	I (1–4)	I (2)
Puccinellia maritima	I (2–6)	I (2–6)	I (2–5)		
Algal mat	I (4–8)	I (3–6)	II (3–7)	I (4–5)	
Spergularia media	I (2–3)	II (1–3)	II (2–3)	I (2–3)	I (1)
Aster tripolium	I (1–3)	I (3)	I (2–5)		
Salicornia agg.	I (1–3)	I (2–3)	II (2–3)	I (2)	
Atriplex prostrata	I (1–3)	I (1–2)	I (1–2)	I (2–3)	I (2–3)
Cochlearia anglica	I (2–3)	I (2)	I (2–3)	I (2)	I (2)
Halimione portulacoides	I (1–2)	I (4)	I (1–2)		
Limonium cf. *L. vulgare*	I (1–8)	I (1–2)	I (1–2)	I (2)	
Suaeda maritima	I (1–3)	I (2)	II (1–4)	I (2)	I (1)
Trifolium repens	I (2–5)			IV (2–7)	V (2–8)
Leontodon autumnalis	I (2–5)	I (2–5)		III (1–6)	II (2–5)
Carex flacca				I (2–6)	I (5)
Carex distans	I (1–3)			III (1–7)	I (2–4)
Potentilla anserina	I (2)	I (5)		II (2–8)	I (2–6)
Holcus lanatus				I (2–5)	I (2–3)
Lotus corniculatus	I (4)			I (2–5)	I (3–4)
Cerastium fontanum	I (2)			I (2–3)	I (2–3)
Sagina procumbens	I (2–4)	I (4)		I (2–5)	I (2)
Eurhynchium praelongum	I (3–4)	I (4)		I (2–7)	I (3)
Rhytidiadelphus squarrosus	I (3)			I (3–5)	I (3–4)
Hypnum cupressiforme	I (2)			I (2–3)	
Anthoxanthum odoratum				I (3)	

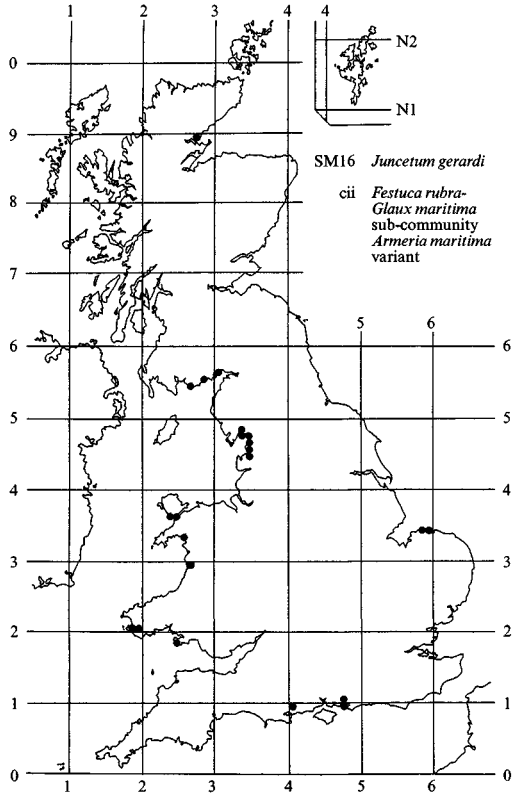
SM16 sub-communities (*cont.*)

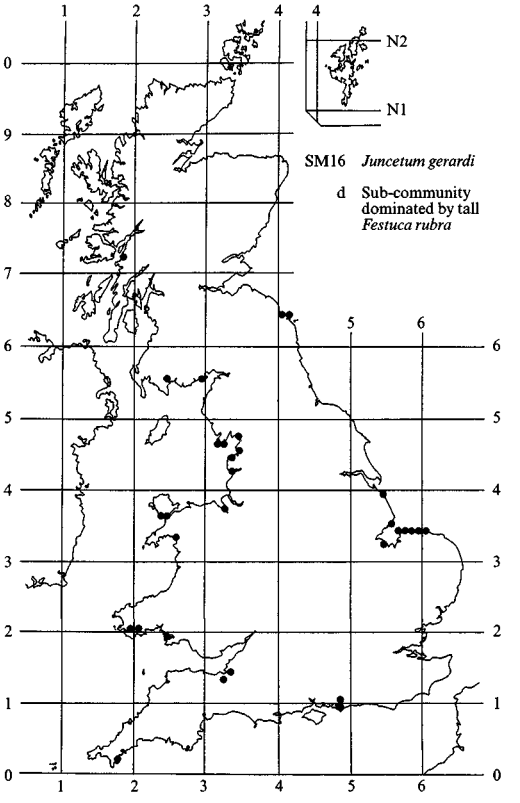
	c	ci	cii	e	ei
Plantago lanceolata				I (2–3)	
Cynosurus cristatus				I (2–3)	
Ranunculus acris				I (2)	
Number of samples	150	68	51	149	30
Mean number of species/sample	9 (5–16)	6 (2–12)	7 (4–12)	11 (7–18)	9 (5–13)
Mean vegetation height (cm)	11 (2–75)	5 (2–20)	5 (2–15)	10 (2–50)	7 (2–25)
Mean total cover (%)	96 (50–100)	98 (80–100)	96 (30–100)	100 (90–100)	99 (85–100)

c *Festuca rubra-Glaux maritima* sub-community
ci *Agrostis stolonifera* variant
cii *Armeria maritima* variant
e *Leontodon autumnalis* sub-community
ei *Trifolium repens* variant









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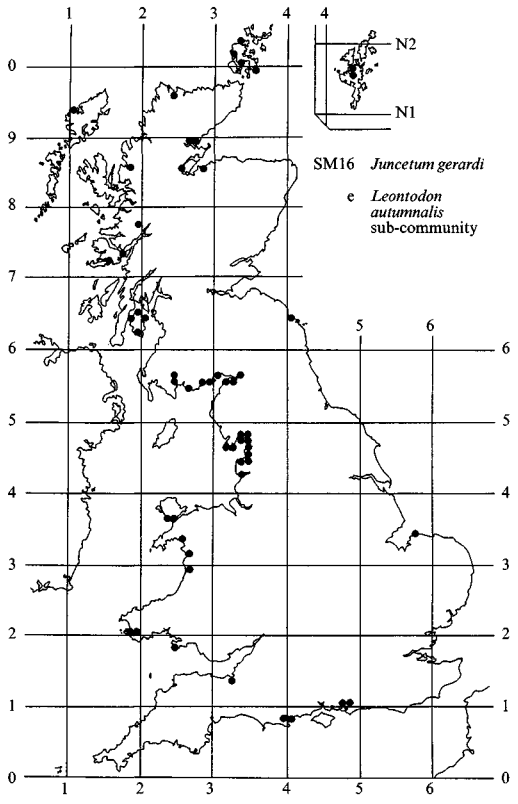

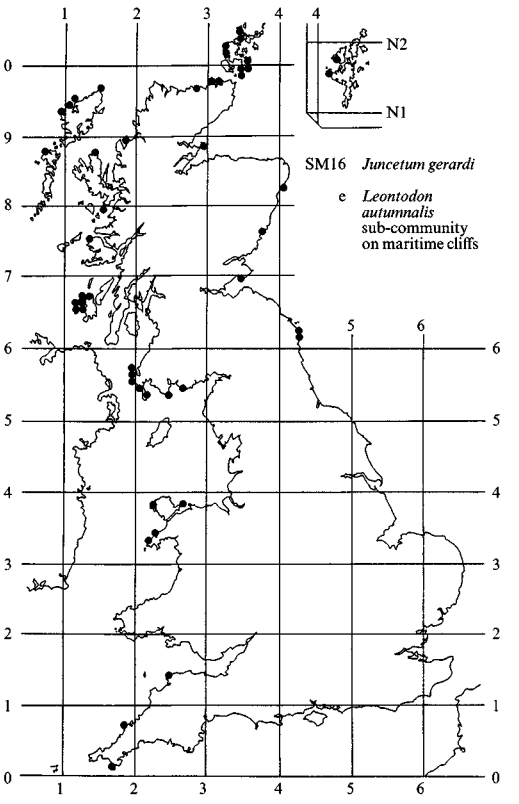

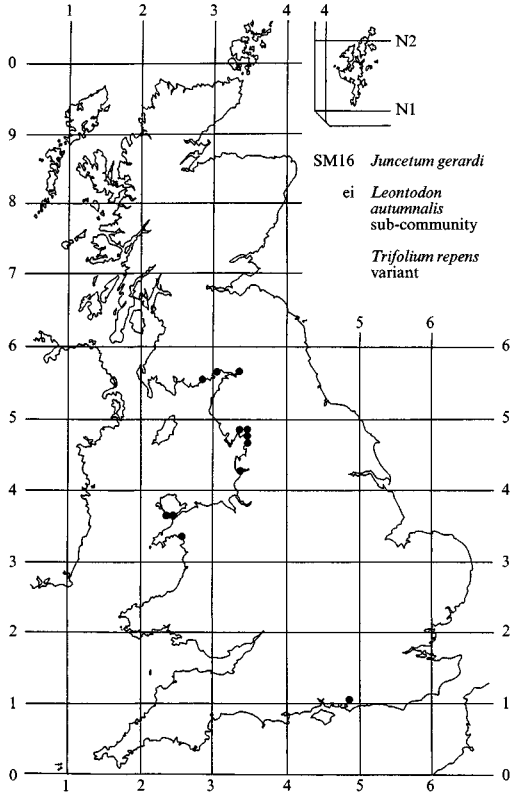

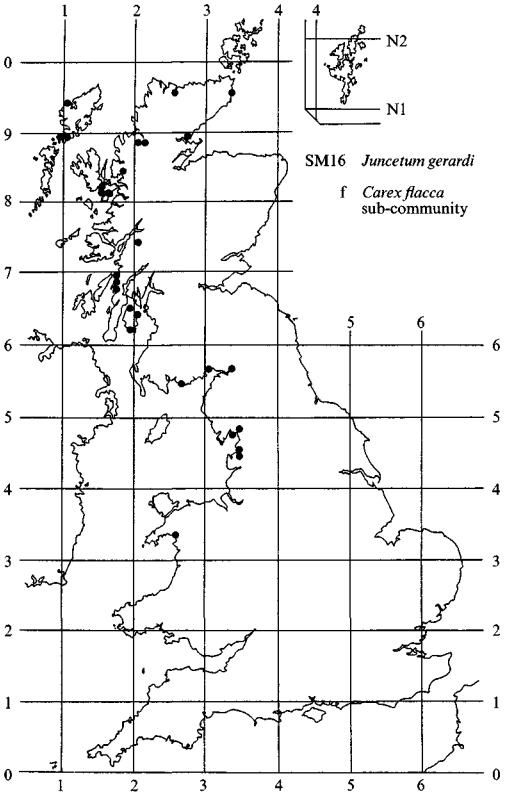

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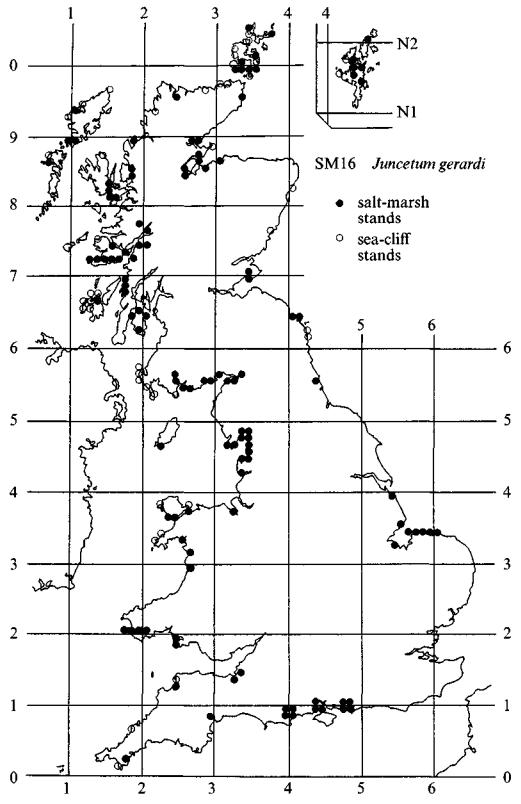

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