MC9
Festuca rubra-Holcus lanatus maritime grassland

Synonymy
Holcetum lanati Gillham 1953 *p.p.*, Goodman & Gillham 1954 *p.p.*; *Sileno maritimae-Festucetum pruinosae* R.Tx. 1963 *p.p.*, *Armerieto maritimae-Daucetum gummiferi* Géhu 1964 *p.p.*, includes *Festuco-Dactyletum maritimae* Malloch 1971.

Constant species
Festuca rubra, *Holcus lanatus*, *Plantago lanceolata*, *Armeria maritima*.

Rare species
Allium schoenoprasum, *Astragalus danicus*, *Oxytropis halleri*, *Primula scotica*, *Scilla verna*, *Senecio integrifolius* ssp. *maritimus*, *Trifolium occidentale*.

Physiognomy
The *Festuca-Holcus* maritime grassland generally has a closed fairly low-growing but rather rank and often tussocky sward. It is almost always dominated by grasses of which *F. rubra* is usually the most prominent, though *H. lanatus* and, to a lesser extent, *Dactylis glomerata*, are often abundant. Herbaceous dicotyledons are generally an important component of the vegetation and many of these are non-maritime species. *Armeria maritima* and *Plantago lanceolata* are both constant and *Plantago maritima*, *Rumex acetosa* and *Trifolium repens* are frequent throughout. Bryophytes and lichens are rare.

Sub-communities

***Plantago maritima* sub-community.** *F. rubra* is the usual dominant in the thick sward of this sub-community, though *H. lanatus* and, less frequently, *Agrostis stolonifera* and, in the north, *Poa subcaerulea*, may be abundant in particular stands. *Plantago maritima*, *Trifolium repens* and *Lotus corniculatus* are additional constants here and *P. maritima* is sometimes so abundant as to be a co-dominant, especially where there is a shorter grazed turf. *Scilla verna* is frequent, though never abundant, and *Astragalus danicus*, *Primula scotica* and *Senecio integrifolius* ssp. *maritimus* occur occasionally within their ranges of distribution. *Parnassia palustris* is a low frequency differential.

***Dactylis glomerata* sub-community:** *Festuco-Dactyletum maritimae* Malloch 1971. *F. rubra* is again generally dominant though both *H. lanatus* and *Dactylis glomerata* which is constant here, are occasionally very abundant producing a thick, rather luxuriant, sward. *Rumex acetosa*, *Scilla verna* and *Daucus carota* ssp. *gummifer* are also constant in this sub-community. *Lotus corniculatus* and *Hypochoeris radicata* are frequent. *Silene vulgaris* ssp. *maritima* and *Anthyllis vulneraria* are preferential occasional species.

***Achillea millefolium* sub-community.** *F. rubra* is generally dominant, though *Agrostis capillaris*, which is frequent in this sub-community, is sometimes abundant. *Trifolium repens*, *Achillea millefolium*, *Galium verum* and *Lotus corniculatus* are additional constants here and *Plantago maritima*, *Dactylis glomerata*, *Rumex acetosa*, *Potentilla erecta* and *Hypochoeris radicata* are frequent. This is the most species-rich of the sub-communities and there are many occasional species characteristic of the richer neutral and calcareous grasslands, notably *Centaurea nigra*, *Campanula rotundifolia*, *Helianthemum nummularium*, *Festuca ovina*, *Carex caryophyllea*, *Hieracium pilosella* and *Conopodium majus*. The maritime *Genista tinctoria* ssp. *littoralis* occurs occasionally.

***Primula vulgaris* sub-community.** *F. rubra* generally dominates but *H. lanatus* may be abundant. *Lotus corniculatus*, *Rumex acetosa* and *Primula vulgaris* are additional constants with *Dactylis glomerata*, *Agrostis stolonifera* and, particularly in the west, *Geranium sanguineum* frequent. *Brachypodium sylvaticum*, *Ranunculus ficaria* and *Viola riviniana* are low frequency preferential species in the often luxuriant sward.

***Anthoxanthum odoratum* sub-community.** This is the most distictive of the sub-communities. *F. rubra* is much less abundant here and dominance is usually shared by *A. odoratum*, *H. lanatus* and *Agrostis capillaris* all of which are constant. The frequency of *Armeria maritima* is much reduced but additional constants are *Rumex acetosa*, *Poa subcaerulea* and *Potentilla erecta* with *Plantago maritima*, *Trifolium repens*, *Scilla verna*, *Lotus corniculatus* and *Ranunculus acris* frequent, the last being a good preferential species. *Empetrum nigrum* is occasionally present and it may dominate. There are also various low frequency species characteristic of heaths and acid grasslands: *Deschampsia flexuosa*, *Luzula campestris*, *Hypnum cupressiforme*, *Cladonia chlorophaea* and *Peltigera canina*.

Habitat

The *Festuca-Holcus* community is one of a number of grasslands occupying a less maritime position on sea-cliffs, being characteristic of somewhat sheltered situations, either towards the top of cliffs or on lee slopes (Figure 22). A sub-set of soil samples showed a mean sodium/loss-on-ignition ratio almost half that of the *Festuca-Armeria* grassland and approximately the same as the values for the *Festuca-Daucus* and *Festuca-Hyacinthoides* communities. The generally gentle slopes on which the *Festuca-Holcus* grassland occurs usually have deep ranker soils, often moist though always free-draining.

Some of the floristic variation between the sub-communities seems to be related to maritime influence but soil moisture and nutrient status are also important. The *Plantago maritima* and *Dactylis* sub-communities are the more maritime, the former on rather moister soils, the latter on better drained sites, though rarely on chalk or limestones. Of the other three sub-communities, the *Achillea* sub-community is characteristic of drier shallower soils and the *Primula* sub-community of moister soils, often in sheltered gullies where the slopes may be steeper; in both cases the soils are rich in calcium. The *Anthoxanthum* sub-community is found predominantly on north-facing slopes, often on sandstones, where the soils have a low superficial pH and are generally nutrient-poor.

The *Festuca-Holcus* grassland is usually ungrazed. Light grazing has relatively little effect other than a reduction in sward height and an encouragement of the growth of *Plantago maritima* at the expense of the grasses.

Zonation and succession

The *Festuca-Holcus* grassland usually occupies a zone between the *Festuca-Armeria* grassland, into which it passes through the *Holcus* sub-community of the latter, and maritime types of heath. In especially sheltered situations, it may be the most maritime community on cliffs.

Grazing probably mediates a successional relationship with the *Festuca-Plantago* maritime grassland.

Distribution

The community occurs widely on British sea-cliffs except along the south coast. The *Dactylis* sub-community is most common in the south-west with isolated occurrences in Scotland. The *Plantago maritima* sub-community is most common in the north and the *Anthoxanthum* sub-community has been recorded only in Scotland where it is especially common in Caithness and on Orkney, though reaching south to the Mull of Galloway. The *Achillea* and *Primula* sub-communities are less common; the former is particularly abundant around the Solway Firth and the latter is scattered in its distribution.

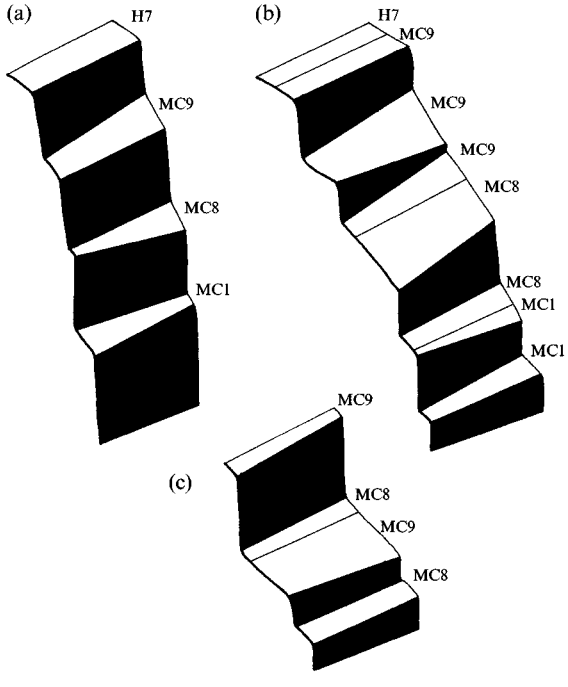


Figure 22. Sea-cliff zonations with *Festuca-Holcus* grassland.
The figures show stylised zonations of vegetation types from (a) the MC1 *Crithmo-Spergularietum*, through the MC8 *Festuca-Armeria* and MC9 *Festuca-Holcus* grasslands to H7 *Calluna-Scilla* heath, with (b) fragmentation of the pattern on a stepped cliff and (c) reversal of the zonation where there is interception and downwash of spray.

https://doi.org/10.1017/CBO9780511541834.064 Published online by Cambridge University Press

Affinities

The *Festuca-Holcus* grassland is somewhat intermediate between the more maritime grasslands and the neutral swards of the Arrhenatheretalia but it is sufficiently maritime to include within the Glauceto-Puccinellietalia of the Asteretea and Malloch (1970, 1971) placed Cornish stands of this vegetation in his new alliance, the Silenion maritimae. There is no exact phytosociological counterpart to the community, though the *Dactylis* sub-community falls within the range of Tüxen's *Sileno-Festucetum pruinosae* and perhaps the typical sub-association of Géhu's *Armerieto Daucetum gummiferi*.

The sub-communities show floristic affinities with a variety of other maritime vegetation types: the *Dactylis* sub-community with the *Festuca-Daucus* maritime grassland, the *Primula* sub-community with the *Festuca-Hyacinthoides* maritime grassland and the *Anthoxanthum* sub-community with maritime heath.

https://doi.org/10.1017/CBO9780511541834.064 Published online by Cambridge University Press

Floristic table MC9

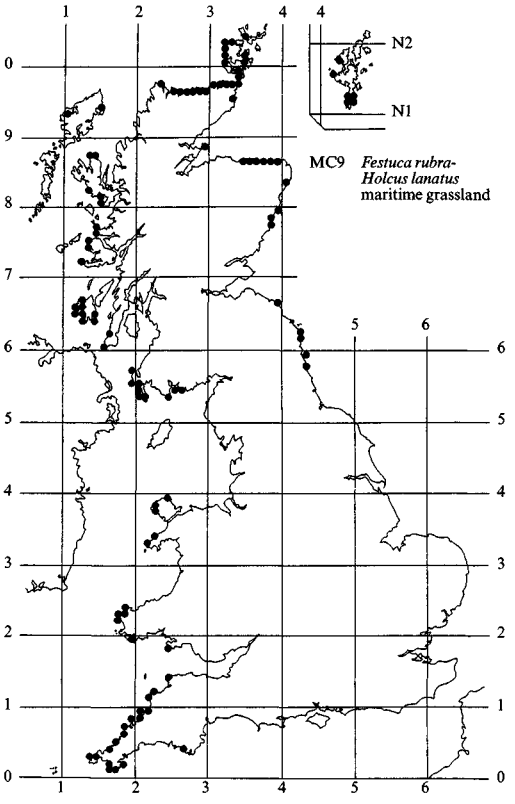
	a	b	c	d	e	9
Festuca rubra	V (4–10)	V (4–10)	V (4–10)	V (3–10)	V (3–9)	V (3–10)
Holcus lanatus	V (1–8)	V (2–10)	V (2–5)	IV (2–7)	V (3–8)	V (1–10)
Plantago lanceolata	V (1–7)	V (1–4)	V (1–5)	V (1–5)	IV (2–5)	V (1–7)
Armeria maritima	IV (1–6)	IV (1–5)	III (1–4)	III (2–6)	II (2–4)	IV (1–6)
Lotus corniculatus	IV (1–5)	III (1–4)	V (1–5)	IV (2–5)	III (2–4)	III (1–5)
Plantago maritima	V (2–10)	I (2–5)	III (1–6)	II (3–5)	III (2–4)	III (1–10)
Trifolium repens	V (1–5)	I (2–4)	IV (2–4)	II (3–4)	III (2–4)	III (1–5)
Rumex acetosa	II (1–4)	V (1–5)	III (1–5)	V (1–5)	IV (2–5)	III (1–5)
Dactylis glomerata	I (2–7)	V (1–8)	III (1–6)	III (2–7)		II (1–8)
Scilla verna	III (1–4)	V (1–4)	II (1–3)	I (2–4)	III (2–4)	III (1–4)
Daucus carota gummifer	I (1–4)	IV (1–4)	II (1–3)	II (1–2)		II (1–4)
Silene vulgaris maritima	I (2–4)	II (1–5)	I (2–4)	I (2–3)	I (4)	I (1–5)
Anthyllis vulneraria	I (1–4)	II (1–6)	I (1–4)			I (1–6)
Achillea millefolium	I (1–3)	I (2–4)	V (1–4)	II (1–3)	I (3)	II (1–4)
Galium verum	I (2–5)	II (2–5)	V (2–4)	II (2–4)		II (1–4)
Centaurea nigra	I (1–3)	I (2)	II (1–4)			I (1–4)
Campanula rotundifolia			II (1–3)	I (2)		I (1–3)
Genista tinctoria littoralis			I (3–6)			I (3–6)
Carex caryophyllea			I (1–4)			I (1–4)
Cerastium diffusum diffusum			I (1–3)			I (1–3)
Festuca ovina	I (4)	I (5)	I (3–8)	I (5)		I (3–8)
Helianthemum nummularium			I (1–3)			I (1–3)
Conopodium majus	I (1)		I (1–3)			I (1–3)
Hieracium pilosella			I (1–2)			I (1–2)
Trichostomum brachydontium			I (2)			I (2)
Primula vulgaris	I (1–4)	I (2–4)		V (2–6)	I (4)	I (1–6)
Geranium sanguineum			I (1–6)	III (2–5)		I (1–6)
Ranunculus ficaria	I (2–3)	I (3)	I (2)	II (2–5)		I (2–5)
Viola riviniana	I (2–3)	I (1–3)	I (2–5)	II (1–4)	I (2–3)	I (1–5)
Brachypodium sylvaticum		I (4–8)	I (1–7)	II (2–5)		I (1–7)

Anthoxanthum odoratum	I (4)		I (3)	I (5–6)	V (3–8)	I (3–8)
Agrostis capillaris	II (2–6)	I (3–4)	III (1–9)	I (4)	V (2–8)	II (1–9)
Poa subcaerulea	II (3–8)			I (4)	IV (2–5)	II (2–8)
Potentilla erecta	II (2–4)	I (2–4)	III (2–4)	II (2–4)	IV (2–4)	II (2–4)
Ranunculus acris		I (2)	I (1–2)	I (2–3)	III (2–4)	I (1–4)
Empetrum nigrum	I (3–6)				II (2–8)	I (2–8)
Deschampsia flexuosa					I (3–4)	I (3–4)
Luzula campestris	I (1–2)		I (1–3)	I (1–3)	I (2–4)	I (1–4)
Hypnum cupressiforme	I (3–4)		I (2–3)		I (3–4)	I (2–4)
Cladonia chlorophaea					I (2)	I (2)
Peltigera canina					I (2–3)	I (2–3)
Agrostis stolonifera	III (2–8)	II (2–4)	II (2–5)	III (2–6)		III (2–8)
Hypochoeris radicata	II (1–4)	III (1–4)	III (1–4)	I (1–2)	I (2–3)	II (1–4)
Cerastium fontanum	II (1–3)	II (1–3)	II (1–2)	I (1–2)	II (1–2)	II (1–3)
Cochlearia officinalis	II (1–3)	II (1–6)	I (2)	II (2–4)	I (1)	II (1–6)
Carex flacca	I (1–4)	I (2)	II (1–4)	II (1–3)	I (4)	I (1–4)
Leontodon autumnalis	II (1–4)	I (3)	I (1–2)	I (1)	II (1–3)	II (1–4)
Thymus praecox	I (2–4)	I (1–4)	II (2–4)	I (4)	II (1–3)	I (1–4)
Koeleria macrantha	I (2–4)	I (1–3)	II (2–4)	I (3)		I (1–4)
Angelica sylvestris	I (1–5)	I (1–4)		I (1–5)	II (2–4)	I (1–5)
Carex nigra	I (1–5)	I (1–4)		I (3)	II (2–4)	I (1–5)
Danthonia decumbens	I (3–4)	I (3)	I (1–5)	I (3)	I (4–6)	I (1–5)
Bellis perennis	I (2–3)		I (1–4)	I (1–2)	I (2–3)	I (1–4)
Rumex crispus	I (2–4)	I (1)	I (2)	I (3)		I (1–4)
Heracleum sphondylium	I (1–3)	I (1–4)	I (1–5)	I (1–3)		I (1–4)
Senecio jacobaea	I (1–2)	I (1)	I (2)	I (1–2)		I (1–2)
Sagina apetala	I (2–3)		I (2–3)		I (3)	I (2–3)
Eurhynchium praelongum	I (2)		I (2–3)		I (5)	I (2–5)
Rhytidiadelphus squarrosus	I (2–4)		I (2–4)		I (3)	I (2–4)
Carex panicea	I (2–4)		I (3–4)		I (2–3)	I (2–4)
Euphorbia portlandica	I (2)		I (2)	I (2)		I (2)
Serratula tinctoria	I (5)	I (2–3)		I (6)		I (2–6)
Sedum anglicum	I (1–2)	I (2–3)	I (2–4)			I (1–4)
Aira praecox	I (2)				I (3)	I (2–3)
Leontodon taraxacoides	I (2–3)	I (1–3)				I (1–3)

Floristic table MC9 (*cont.*)

	a	b	c	d	e	9
Leucanthemum vulgare		I (1–2)		I (1)		I (1–2)
Euphrasia tetraquetra		I (1–3)	I (2–4)			I (1–4)
Solidago virgaurea			I (4)	I (1)		I (1–4)
Pseudoscleropodium purum			I (3–4)	I (3)		I (3–4)
Number of samples	123	54	39	20	21	257
Number of species/sample	13 (8–21)	12 (6–18)	18 (9–27)	15 (11–22)	14 (9–20)	14 (6–27)
Vegetation height (cm)	10 (2–30)	15 (3–30)	13 (2–50)	14 (5–35)	13 (4–25)	12 (2–50)
Total vegetation cover (%)	100 (90–100)	100	99 (90–100)	100	100 (95–100)	100 (90–100)
Altitude (m)	27 (3–215)	31 (3–80)	20 (3–80)	20 (2–55)	43 (9–100)	28 (3–215)
Slope (°)	11 (0–45)	18 (0–55)	13 (0–60)	21 (0–50)	12 (0–45)	14 (0–60)
Soil depth (cm)	35 (5–82)	27 (4–81)	22 (3–75)	24 (4–52)	44 (8–70)	31 (3–82)
Number of soil samples	32	10	11	7	6	66
Superficial pH	5.6 ±0.1	5.5 ±0.2	5.7 ±0.3	6.1 ±0.3	5.3 ±0.3	5.6 ±0.1
Water content (% soil dry weight)	96 ±16	77 ±13	71 ±17	130 ±21	136 ±33	96 ±9
Loss on ignition (% soil dry weight)	25 ±3	24 ±2	34 ±6	38 ±5	33 ±6	28 ±2
Sodium (mole g^{-1})	66 ±13	47 ±7	44 ±11	57 ±9	42 ±10	56 ±7
Potassium (mole g^{-1})	11 ±1	13 ±1	10 ±2	11 ±2	11 ±4	11 ±1
Magnesium (mole g^{-1})	42 ±5	49 ±11	51 ±18	65 ±15	35 ±8	46 ±5
Calcium (mole g^{-1})	26 ±5	17 ±4	53 ±16	69 ±20	31 ±11	34 ±5
Phosphorus (mole g^{-1})	1.3 ±0.4	0.6 ±0.2	2.5 ±0.8	1.3 ±0.4	0.9 ±0.4	1.4 ±0.2
Sodium/loss on ignition (mole g^{-1})	255 ±23	205 ±27	123 ±17	146 ±9	131 ±15	203 ±14

a *Plantago maritima* sub-community
b *Dactylis glomerata* sub-community
c *Achillea millefolium* sub-community
d *Primula vulgaris* sub-community
e *Anthoxanthum odoratum* sub-community
9 *Festuca rubra-Holcus lanatus* maritime grassland (total)



https://doi.org/10.1017/CBO9780511541834.064 Published online by Cambridge University Press