SD1
Rumex crispus-Glaucium flavum shingle community

Synonymy
Shingle beach community Oliver 1911, Oliver & Salisbury 1913, Tansley 1939, all *p.p*; *Glaucium flavum* sites Scott 1963 *p.p.*; *Crithmo-Crambetum maritimae* (Géhu 1960) Géhu & Géhu 1969 *p.p.*; *Lathryo-Crambetum maritimae* Géhu & Géhu 1969; *Crambe maritima* sites Scott & Randall 1976 *p.p.*; *Rumici-Lathyretum maritimi* Géhu & Géhu-Franck 1979.

Constant species
Glaucium flavum, *Rumex crispus*.

Rare species
Crambe maritima.

Physiognomy
The *Rumex crispus-Glaucium flavum* community comprises more or less open assemblages of rather coarse hemicryptophytes, usually few in number and with none consistently dominant, but together giving a highly distinctive character to the stretches of bare shingle or gravel that form the typical habitat, especially when the plants are fully grown in flower or fruit. The commonest species overall is *Rumex crispus*, generally with the obviously tri-tubercular perianths and dense panicles of var. *littoreus* Hardy (which now includes var. *trigranulatus* Syme: Lousley & Kent 1981, Rich & Rich 1988), the tall inflorescences remaining upstanding, brown and brittle, at the close of the season. *Glaucium flavum* is also constant and sometimes very abundant. It behaves as a short-lived perennial, each plant having one to many biennial leaf-rosettes, these persisting through their first winter, with the tall, branched flowering stems growing up in spring. Both these inflorescences and the foliage die after fruiting, but several new rosettes replace each old one before winter, such that colonies expand progressively from one season to the next (Scott 1963*b*).

The nationally rare *Crambe maritima* is also very characteristic of this vegetation at many sites throughout its range, particularly on rather more exposed and shifting shingle, though it can remain totally unseen outside the growing season. It is a rosette plant, but the foliage is deciduous, the much-branched vertical stem being generally buried among the pebbles in winter and perennating by means of terminal buds. In spring, these produce sometimes massive cabbage-leaves, deep purple-crimson at first, then dark glaucous green, with erect and bushy corymbose panicles. After flowering, which continues until August, the fruits ripen, with the whole inflorescences drying and eventually breaking off entirely, being bowled along the beaches in winter storms and often getting caught around the persistent dock and poppy stalks (Scott & Randall 1976).

Scattered among these plants are a number of occasionals, sometimes themselves locally abundant. *Silene vulgaris* ssp. *maritima* is one of the most frequent of these, its creeping stems buried in the shingle and putting up often quite extensive patches or carpets of low bushy shoots. Then, there is commonly some *Beta vulgaris* ssp. *maritima*, this becoming especially prominent on accumulations of organic detritus, like decaying wrack, cast up on the beaches. In such places, it often behaves as an annual and can be accompanied by *Atriplex prostrata*. More occasional overall, though abundant in some sites, are *Senecio jacobaea*, the probably native *S. viscosus*, *Cirsium arvense*, *C. vulgare*, *Sonchus arvensis*, *S. asper* and *Lactuca serriola*, some of these species overwintering just one season as rosettes, others being more long-lived. Some stands, often closer to the sea and with a little sand among the shingle, have *Honkenya peploides*, but *Cakile maritima* and *Salsola kali*, its companions on sandy strand-lines, are not generally found here. *Crithmum maritimum*, too, is only very occasional, in contrast to the shingle vegetation with *R. crispus* and *Glaucium* described from northern France (Géhu & Géhu 1969, Géhu & Géhu-Franck 1979). *Matricaria maritima* can be quite frequent, and there is sometimes a little *Geranium robertianum*, *Euphorbia paralias* and small patches of *Sedum acre*, *Cerastium fontanum* and *Potentilla anserina*.

Certain grasses can be found in the community, though these are usually only occasional and never of high cover, particularly among more exposed and mobile shingle. Scattered tussocks of *Festuca rubra*, *Elymus pycnanthus*, *E. farctus* ssp. *boreali-atlanticus* and *Ammophila arenaria* occur at low frequency throughout, but it is only where there is considerable shelter and stability that species such as *Arrhenatherum elatius* or *Holcus lanatus* make any obvious contribution to the vegetation and, even then, their cover is limited. It is in these situations, though, that the *Rumex-Glacium* community provides the major locus for the remaining British colonies of the attractive rarity *Lathyrus japonicus.*

Sub-communities

Typical sub-community: *Crithmo-Crambetum maritimae* (Géhu 1960) Géhu & Géhu 1969 *p.p.* This is generally the more open and diverse kind of *Rumex-Glaucium* vegetation with *R. crispus* and *G. flavum* both constant, *B. vulgaris* ssp. *maritima* and *S. vulgaris* ssp. *maritima* common, and *Crambe* and *Honkenya* preferentially frequent. Then, along occasional *Senecio viscosus* and *Cirsium arvense*, there are quite often some scattered plants of *S. jacobaea*, *C. vulgare*, *Sonchus* spp., with *Lactuca serriola* and *Picris echioides* occurring more rarely. *Atriplex prostrata*, *Solanum dulcamara* and *Matricaria maritima* are also preferential at low frequency and it is in this sub-community that very occasional *Crithmum* and *Plantago coronopus* are recorded. Apart from sparse tussocks of *Festuca rubra*, *Ammophila arenaria* and *E. pycnanthus*, grasses tend to be poorly represented.

***Lathyrus japonicus* sub-community:** *Lathyro-Crambetum* Géhu & Géhu 1969; *Rumici-Lathyretum maritimi* Géhu & Géhu-Franck 1979. *R. crispus* remains very common here, but *G. flavum* is somewhat reduced in frequency and *Crambe* is only occasional. *B. vulgaris* ssp. *maritima* and *S. vulgaris* ssp. *maritima* occur quite often, with *Senecio viscosus* and *Cirsium arvense* occasional, but the variety among these weedy hemicryptophytes, particularly the more short-lived ones, is less than in the Typical sub-community. The most striking feature, however, is the frequent occurrence of *Lathyrus japonicus* whose new shoots begin to appear above ground, among the dried remains of the previous year's stems, from April onwards, growing out procumbently to form quite extensive patches, adjacent plants sometimes touching to form a discontinuous carpet (Brightmore & White 1963). *Arrhenatherum elatius* is also preferentially common and quite abundant at some sites, with scattered tussocks of *Holcus lanatus* and *Festuca rubra* occurring occasionally, but grasses like *E. pycnanthus*, *E. farctus* ssp. *boreali-atlanticus* and *Ammophila* are very scarce, except where there is local accumulation of blown sand among the herbage. Scattered plants of *Plantago lanceolata* and *Hypochoeris radicata* can sometimes be found along with *Cerastium fontanum*, *Sedum acre* and *Leontodon taraxacoides*.

Habitat

The *Rumex-Glaucium* community is the characteristic pioneer vegetation of maritime shingle around the coast of the warmer south of Britain. Within this climatic zone, it is widely distributed but distinctly local, being more or less confined to stretches of sharply-draining pebbles and gravel accumulating just beyond the reach of all but exceptional tides, though not so stable and sheltered as to support progressive colonisation by plants. Fragmentary stands can be found just on or behind the seaward crests of many shingle beaches, and indeed some way inland, where suitable open habitats occur, but the community is best developed on the more extensive spits and apposition features that are found around the coasts of East Anglia and southern England.

Of the most striking plants of this kind of vegetation, *R. crispus* var. *littoreus* occurs widely around the coasts of northern Europe, but both *G. flavum* and *Crambe* are of more restricted distribution. *G. flavum* is the more extensive to the south, being a Continental Southern species (Matthews 1955) found right through the Mediterranean (Scott 1963*b*), while *Crambe* is an Oceanic West European plant, limited to the more humid northwest Atlantic coast (Scott & Randall 1976). To the north, however, their limits are more or less co-terminous, stopping in Britain at around the Forth–Clyde line (Perring & Walters 1962) and, on the Continent, in southern Scandinavia. The availability of suitable habitats beyond these areas might play some part in restricting the range of this community, but bare shingle is not entirely absent further north, and *R. crispus* var. *littoreus* continues to make a contribution to vegetation on it. Just as important is likely to be the vulnerability of the more temperate species to the cooler climate. With us, for example, *G. flavum* and *Crambe* do not penetrate into those latitudes where the July maxima fall below 17.5 °C (Conolly & Dahl 1970) and, for *Crambe*, Eklund (1931) has actually recorded poorer fruiting at the Baltic limit of the range. Another frequent member of the community, *Beta vulgaris* ssp. *maritima*, though it is not so strictly confined to shingle as *G. flavum* or *Crambe*, is an Oceanic Southern plant with an almost identical overall distribution to theirs in mainland Britain. This vegetation also provides an occasional locus for a number of other rather thermophilous plants with similar European ranges: *Crithmum maritimum*, *Euphorbia paralias* and *Elymus pycnanthus*.

Around these warmer coasts of southern Britain, the

Rumex-Glaucium community is probably confined to more exposed shingle habitats as much by the vulnerability of the establishing plants to competition away from open and disturbed ground, as by virtue of any obligate dependence on strong maritime influence. In fact, were the seeds of *G. flavum* and *Crambe* to be more readily dispersed inland, assemblages of this kind would probably colonise open river shingle and ballast away from the coast, where non-maritime *R. crispus* and some of the other associates of this vegetation are often prominent invaders. *G. flavum*, with its lighter wind-borne seeds, is very occasionally found in such situations (Scott 1963*b*), but *Crambe* has bigger sea-dispersed fruits and, though the plant is cultivated inland as the vegetable seakale, it does not seem to escape into the wild away from the coast in this country (Eklund 1931, Scott & Randall 1976). Apart from extremely local and fragmentary stands on inland pebbles and spoil, then, the community occurs very close to the sea and there many of its most distinctive species, like *R. crispus* var. *littoreus*, *G. flavum*, *Crambe*, *B. vulgaris* ssp. *maritima* and *Silene vulgaris* ssp. *maritima* have the advantage over inland colonists of bare shingle by virtue of their salt-tolerance (Scott 1963*b*, Cavers & Harper 1964, Malloch 1972, Scott & Randall 1976). For, though this vegetation usually develops out of reach of all but the highest spring tides and storm surges, it is very occasionally inundated by seawater and receives a lot of salt-spray from onshore winds throughout the year.

Winds and tides are also of great importance in influencing the character of the vegetation by their control of the disposition, size and stability of the beach material. Shingle is very much the preferred substrate of the *Rumex-Glaucium* community but the size of the material varies quite considerably from fine gravel less than 1 cm in diameter up to coarse pebbles 5 or 10 cm across and, though many beaches colonised by this vegetation show longshore sorting, some substrates are more mixed. In general, gravelly material supports richer and denser stands of the community, particularly where there is some sand or comminuted organic detritus mixed in: indeed, it is possible that the presence of this much finer fraction is more or less essential for many shingle plants to develop the extensive absorptive roots they need to thrive (Oliver 1912, Tansley 1939, Scott 1963*a*). Characteristically, *Rumex-Glaucium* vegetation avoids those stretches of shingle subject to flooding or waterlogging, most of the moisture for plant growth on the raised and sharply-draining parts of beaches probably coming from rain (Scott 1963*a*), so the occurrence of some more retentive material is perhaps crucial for the establishment and maintenance of the community.

Local variety in the substrate controls some of the diversity in cover and composition that can be seen here within and between stands. Where there is a little more sand blown in from nearby strands, for example, or where the community has developed on shingle exposed by the erosion of dunes developed on top, associates like *Festuca rubra*, *Ammophila arenaria*, *Elymus farctus*, *E. pycnanthus*, *Honkenya* and *Sedum acre* tend to become more prominent. By contrast, where decaying wrack or other driftline detritus is thrown up by the waves, more nitrophilous plants, such as *Atriplex prostrata*, *B. vulgaris* ssp. *maritima* and *Sonchus* spp., can increase in abundance, and such inputs of nutrients are probably of some significance for the community as a whole, much-rotted material providing a good seed-bed for germination and periodic additions perhaps prolonging the life of particular stands (Géhu 1960, Scott 1963*a*, Scott & Randall 1976). In general, however, the organic content of the substrate is slight and there is never any development of an integrated soil profile, even in more stable stands. In most cases, the shingle is calcareous, with the pH of the finer detritus being usually above 7, but this may reflect the fortuitous fact that most of the beaches that are physically suitable for the establishment of this vegetation are fed by exposures of lime-rich bedrocks or superficials.

The accumulation of such material in more or less stable beaches is a complex function of current and tidal movements and coastal form (e.g. Steers 1953) but the crucial factor for the development of the *Rumex-Glaucium* vegetation appears to be that the shingle should be out of reach of destructive waves during the growing season, and that only between autumn and spring is the zone of movement brought up into the area occupied by the community (Scott 1963*a*). Then, there may be some seaward erosion with shingle slipping down the steepened beach face, or some throwing up of material on to the vegetated zone. Well-established stands, with their predominance of deep-rooted hemicryptophytes, seem well able to tolerate some modest shifting of the substrate and *Crambe* in particular is especially resistant to burial and able to put up shoots from beneath 50 cm or more of shingle. Both root and stems have densely-packed starch reserves which appear normally not to be drawn upon at the start of the season, and these perhaps provide an emergency source of food for recovery in such circumstances (Scott & Randall 1976).

Although the *Rumex-Glaucium* vegetation never really develops on those beaches which are only periodically stable between spring and autumn, short-lived and fragmentary stands can be found coming and going on many stretches of shingle that persist largely intact for a few years at a time. The bigger and more striking stands, however, are characteristic of extensive and permanent features like the beaches and spits of the East Anglian coast, as on Scolt Head and at Kessingland, Walberswick, Sizewell, Thorpeness, Orford Ness and Shingle Street, on Chesil Beach in Dorset and around the seaward fringe of the enormous apposition beach at Dungeness (Oliver 1913, 1915, Scott 1963*a*, Ratcliffe 1977). Throughout the range, the Typical sub-community is the commoner form, indeed the only type of *Rumex-Glaucium* vegetation found on more exposed shingle and on the less substantial beaches that occur away from the south and east of England. Its more open and diverse character reflect the less stable conditions, with opportunity for colonisation by a variety of widely-distributed plants more or less tolerant of some exposure to salt-spray. Even where it grades to more persistent shingle vegetation, it can form a zone but a few metres deep.

The *Lathyrus* sub-community is much more restricted in its distribution, being almost entirely confined to the south-east coast, with a few outlying stands to the south-west. Here, it persists on more sheltered stretches of shingle, away from periodic tidal erosion and onshore winds, often set further back on wider beaches. Such conditions are very congenial for *L. japonicus*, a circumpolar seashore plant (Hultén 1950) which favours stable and well-drained pebbles or gravel, often with some sand (Brightmore & White 1963), but also allow the invasion of species of ranker inland swards such as *Arrhenatherum* and *H. lanatus. L. japonicus* may itself aid the development of such assemblages, or the local appearance of dune plants, by the accumulation of decaying organic matter and wind-blown sand among its patches (Brightmore & White 1963). Where consolidation is advanced, species such as *G. flavum* and *Crambe* can persist for some considerable time, but do not establish anew at all readily (Scott 1963*b*), and *L. japonicus* itself eventually disappears.

Apart from its susceptibility to tidal erosion of the substrate, the *Rumex-Glaucium* community is vulnerable to human disturbance of shingle beaches, where sediments are shifted for sea-defence works or for coastal development. Trampling may also damage stands which are left largely intact, with *Crambe* and *L. japonicus* in particular appearing to suffer from this effect: their decline has been especially marked where tourism has prospered (Scott & Randall 1976, Randall 1977).

Zonation and succession

The *Rumex-Glaucium* community is sometimes the only vegetation to be seen on shingle beaches, forming an open zone isolated from the hinterland of the shore, where dune or inland communities sometimes occur, but where there is often now a sharp boundary with agricultural land or settlements, frequently behind sea-defences. With a shift to less stable conditions, however, or where lines of drift are deposited on the beach, the *Rumex-Glaucium* community can pass to annual strandline assemblages, and on wider shores there can be gradations to vegetation of more consolidated beach substrates, either grasslands on shingle or dune communities. Where shingle accumulation is progressive, such zonations may represent a succession, but usually the *Rumex-Glaucium* community persists as a perpetually renewed pioneer vegetation.

Throughout the range of the community, the associated strandline vegetation is commonly of the *Atriplex-Beta* type, an assemblage typically found as strips on lines of decaying wrack and other detritus deposited at the tidal limits. *G. flavum* and *Crambe* are sometimes recorded among such vegetation on shingle, and *R. crispus* var. *littoreus* remains quite common, but it is *Beta vulgaris* ssp. *maritima* and various *Atriplex* spp., together with *Matricaria maritima*, that provide much of its distinctive character. Such assemblages may come and go along the strandlines in successive seasons, or replace the *Rumex-Glaucium* community where stretches of beach do not remain stable from one year to the next.

Sandier strandlines can see transitions from the shingle vegetation to the *Honkenya-Cakile* community. Here, again, *Atriplex* spp. are very common, and often locally abundant, and these, together with occasional *R. crispus* var. *littoreus*, *B. vulgaris* ssp. *maritima* and *Silene vulgaris* ssp. *maritima*, can provide some floristic continuity with the *Rumex-Glaucium* community, but it is patches of *Honkenya peploides*, with *Cakile maritima* and *Salsola kali*, that usually mark out the broken strips of this vegetation that develop at extreme high water mark. Local accumulations of sand around the patches are prone to invasion by *Elymus farctus*, *Leymus arenarius* and *Ammophila arenaria*, and this can initiate a temporary or progressive succession to fore-dunes. A very few sites, notably the beaches of north Norfolk, show a patchy but complete zonation from Typical *Rumex-Glaucium* vegetation, through the *Honkenya-Cakile* community and *Elymus* fore-dunes, to *Ammophila* vegetation of varying degrees of maturity (Oliver 1913, 1915, Ratcliffe 1977).

In other places around the coast of east and southern England, where there is an increase in the stability and shelter of the shingle habitat, without any marked accumulation of wind-blown sand, the Typical form of the *Rumex-Glaucium* vegetation can pass landwards to the *Lathyrus* sub-community, and this in turn gives way to some distinctive grasslands in which dominance passes to *Arrhenatherum*, *Festuca rubra* and *Silene vulgaris* ssp. *maritima*, with an almost total occlusion of shingle hemicryptophytes. Orford Ness and Dungeness show the best development of this *Arrhenatherum-Silene* community with, in the latter site, zonations to non-maritime *Arrhenatheretum* and uniquely extensive mosaics on compacted sandy shingle with *Festuca-Agrostis-Rumex* calcifugous grassland and scrub dominated by *Cytisus scoparius*.

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Another species which, very locally around the south-east coast, assumes prominence on sheltered shingle, especially on the leeward site of spits, is *Suaeda vera*. Its water-borne seed germinates very readily on accumulations of drift, the plants soon anchoring firmly with deep tap roots and then growing from shoots held horizontally under the pebbles, spreading outwards or extending in a single direction as shingle is shifted over the bushes. On Chesil Beach, for example, a patchy zone of open *Elymo-Suaedetum*, dominated by *S. vera*, replaces the *Rumex-Glaucium* community along the landward side of the bar, with its complex of fans and flats looking out over The Fleet (Oliver 1912, Tansley 1939). And, at Blakeney Point in Norfolk, this kind of vegetation runs around the drift-line of the sheltered embayments between the shingle laterals, replacing the *Rumex-Glaucium* community in the narrow strip that forms a transition on sandy pebbles from the dunes of the spit to the salt-marsh behind (Oliver 1913, Oliver & Salisbury 1913*a*, *b*).

Distribution

The *Rumex-Glaucium* community occurs from north Norfolk around the coasts of eastern and southern England and then, more fragmentarily, up the west coast as far as the Firth of Forth. The more extensive stands of the Typical form and all occurrences of the *Lathyrus* sub-community are found in south-east England from Chesil round to Scolt Head.

Affinities

In early accounts of British maritime vegetation (Oliver 1911, Tansley 1939), this assemblage was generally included with annual strandline plants in a broadly-defined shingle community. In fact, although it is usually very open in structure and varied in its composition, often grading to such more ephemeral mixtures, it is a well-characterised kind of vegetation worth separate recognition as the major community of pioneer shingle perennials in southern Britain. Géhu & Géhu-Franck (1979; see also Géhu & Géhu 1969) acknowledged this in their diagnosis from south-east England of a *Rumici-Lathyretum*, although this took in just the *Lathyrus* sub-community of our vegetation, and not the more widely-distributed Typical form. Apart from the absence of *Crithmum maritimum* from most of the British stands of this kind of shingle vegetation, the *Rumex-Glaucium* community is very similar to some forms of the *Crithmo-Crambetum* described from Breton shingle (Géhu 1960, Géhu & Géhu 1969, Géhu & Géhu-Franck 1979) and forms part of a sequence which runs on into the Baltic and northern Europe. Géhu & Géhu (1969) erected a new Class, the Elymetea pycnanthi, to hold this suite of associations, along with various strandline assemblages. Alternatively, their relevant alliance, the Honkenyo-Crambion could be located within Tüxen's (1966) proposed class, the Honkenyo-Leymeetea.

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Floristic table SD1

	a	b	1
Rumex crispus	IV (1–4)	IV (1–4)	IV (1–4)
Glaucium flavum	IV (1–4)	III (1–5)	IV (1–5)
Crambe maritima	III (1–6)	II (1–3)	III (1–6)
Honkenya peploides	II (1–7)	I (2–4)	II (1–7)
Sonchus arvensis	II (1–4)	I (1–5)	II (1–5)
Senecio jacobaea	II (1–4)	I (1–4)	I (1–4)
Sonchus asper	II (1–4)	I (1–4)	I (1–4)
Ammophila arenaria	II (1–5)	I (1–3)	I (1–5)
Atriplex prostrata	II (1–6)		I (1–6)
Solanum dulcamara	II (1–4)		I (1–4)
Matricaria maritima	II (1–4)		I (1–4)
Cirsium vulgare	I (1–4)		I (1–4)
Crithmum maritimum	I (2–4)		I (2–4)
Plantago coronopus	I (2–4)		I (2–4)
Sagina apetala erecta	I (1–2)		I (1–2)
Lactuca serriola	I (1–4)		I (1–4)
Picris echioides	I (1–2)		I (1–2)
Lathyrus japonicus	I (1–6)	IV (1–8)	III (1–8)
Arrhenatherum elatius	I (1–2)	III (2–7)	II (1–7)
Plantago lanceolata	I (3)	II (1–5)	I (1–5)
Holcus lanatus		II (1–6)	I (1–6)
Hypochoeris radicata		I (1–4)	I (1–4)
Beta vulgaris maritima	III (1–4)	III (1–5)	III (1–5)
Silene vulgaris maritima	II (1–6)	II (1–6)	II (1–6)
Festuca rubra	II (1–5)	II (1–6)	II (1–6)
Senecio viscosus	II (1–4)	II (1–4)	II (1–4)
Cirsium arvense	II (1–4)	II (1–4)	II (1–4)
Elymus pycnanthus	I (1–4)	I (1)	I (1–4)
Euphorbia paralias	I (1–2)	I (1)	I (1–2)
Geranium robertianum	I (4)	I (1–4)	I (1–4)
Sedum acre	I (1–4)	I (4)	I (1–4)
Lolium perenne	I (1)	I (1)	I (1)
Cerastium fontanum	I (1–4)	I (1–5)	I (1–5)
Potentilla anserina	I (3)	I (2)	I (2–3)
Leontodon taraxacoides	I (2)	I (2)	I (2)
Elymus farctus	I (3)	I (1)	I (1–3)
Number of samples	62	36	98
Number of species/sample	8 (2–13)	5 (1–12)	7 (1–13)

a Typical sub-community
b *Lathyrus japonicus* sub-community
1 *Rumex crispus-Glaucium flavum* shingle community (total)

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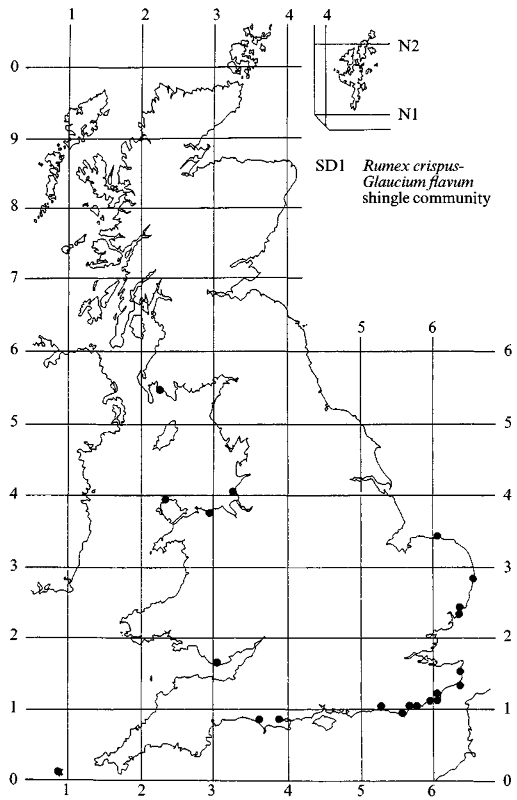

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