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# S1

## *Carex elata* sedge-swamp *Caricetum elatae* Koch 1926

### Synonymy

*Carex elata* consocias Pearsall 1918; Open carr Pearsall 1918 *p.p.*; *Carex elata* associations Holdgate 1955b *p.p.*; *Carex elata* headwater fen community Haslam 1965; Association of *Carex elata* Pigott & Wilson 1978.

### Constant species

*Carex elata*.

### Rare species

*Calamagrostis stricta*.

### Physiognomy

The *Caricetum elatae* comprises vegetation dominated by *Carex elata*, usually as prominent tussocks. These are up to 40 cm in diameter and height, occasionally taller in deeper water, are often closely up set with to 60 tussocks per 10 × 10 m (Wheeler 1975) and have a canopy of spreading leaves about 1 m long. The community is generally species-poor. Most frequently, there are taller herbaceous dicotyledons scattered around the tussocks and often rooted in the peaty stocks at or around water-level; among these, *Cirsium palustre*, *Eupatorium cannabinum*, *Lycopus europaeus* and *Ranunculus lingua* are the most frequent. *Galium palustre* and *Solanum dulcamara* sometimes form thick tangles of sprawling shoots. In areas of shallow water between the tussocks, scattered plants of *Menyanthes trifoliata*, *Mentha aquatica*, *Potentilla palustris* and *Berula erecta* may occur and, in deeper pools, there may be elements of floating-leaved or submerged aquatic vegetation. In deeper water, too, *Cladium mariscus* may be locally prominent, its clumps forming mosaics with the *C. elata* (Haslam 1965, Wheeler 1975). Occasionally, scattered shoots of *Phragmites australis* form a sparse cover.

The *C. elata* tussocks themselves, especially those which are less vigorous, form a distinctive support for epiphytic *Hydrocotyle vulgaris*, *Epilobium palustre*, *Cardamine pratensis* and (e.g. Holdgate 1955b) *Filipendula ulmaria*. Here, too, there may also be sparse wefts of

*Calliergon cuspidatum* but, in general, bryophytes are rare.

Saplings of *Salix cinerea* or, in the north, *S. atrocinerea*, are a frequent feature of the community. These seem to gain a hold mostly between the tussocks, on more open areas of bare organic matter (Haslam 1965, Pigott & Wilson 1978). *Alnus glutinosa* is a less frequent invader but it may be able to colonise the tussock tops.

### Habitat

The community usually occurs as emergent vegetation in up to 40 cm of water in shallow pools and old peat cuttings, more fragmentarily in derelict ditches (Wheeler 1975) and sometimes as part of open-water transitions around larger water bodies (Pearsall 1918, Holdgate 1955b, Pigott & Wilson 1978). Some of the best stands are found in the hollows of what seem to be collapsed pingos or ground-ice depressions on the west Norfolk commons (Sparks *et al.* 1972). In these localities, Haslam (1965) has suggested that *C. elata* dominance is particularly associated with a combination of generally waterlogged conditions and a fluctuating water-table. The north-western localities of the community are also characterised by these features.

The tussocks are commonly rooted in the somewhat unconsolidated organic material over the base of the swamp basins and, in deeper water, they may form a highly unstable semi-floating mat, held together by a tangle of interwoven lateral roots just below the water surface (Wheeler 1975). More rarely, the tussocks are rooted directly in the underlying mineral substrate. In the west Norfolk hollows, organic material lies over thin smears of glacial gravels on Chalk and the water pH ranges from 5.5 to 7.2.

Where it is accessible to stock (a rare occurrence), *C. elata* seems to be grazed (Holdgate 1955b).

### Zonation and succession

In west Norfolk, the *Caricetum elatae* may occasionally fill more shallow hollows but it usually occurs as a zone around open water or gives way in deeper water to the

*Cladietum marisci* (Haslam 1965, Wheeler 1975). Mosaics of the two dominants commonly occur at the junctions of the communities. Away from the water, the zonation varies with the basin slope: on more gradual surrounds, there is often a fairly sharp transition to some kind of rush-pasture and then to calcicolous grassland; around more steeply sided hollows, calcicolous grassland may abut directly on to the *Caricetum elatae* (Wheeler 1975).

In its Cumbrian localities, the community occurs in close association with the *Potentillo-Caricetum rostratae* to which it grades in deeper water and elements of which may occur between the *C. elata* tussocks forming mosaics (Pearsall 1918, Holdgate 1955b, Pigott & Wilson 1978).

The advance of the *Caricetum elatae* and its gradual colonisation by *Salix atrocinerea* and *Alnus glutinosa* form part of the successional changes catalogued at Esthwaite North Fen over some 50 years (Pearsall 1918, Tansley 1939, Pigott & Wilson 1978). Here, an area of what seems to have been *Phragmitetum australis* reed-swamp and *Potentillo-Caricetum rostratae* in 1914–16 was occupied by the *Caricetum elatae* by 1929 and by 1969 had an open woodland cover. *C. elata* appears to be tolerant of a certain amount of shade (Pigott & Wilson 1978), although beneath a *Salix-Alnus* canopy, its dominance weakens and the major tussock sedge in the open woodland at this site is *C. paniculata*.

### Distribution

The *Caricetum elatae* is an uncommon community, being restricted to a few localities in west Norfolk, Anglesey and Cumbria. The Scottish locality on Loch Ness described by West (1905) has not been visited but it had a predominance of *Carex rostrata* when re-surveyed by Spence (1964).

### Affinities

*C. elata* is a sedge with a predominantly eastern distribution in Britain (Jermy *et al.* 1982) and in this country it also occurs as a component, and occasionally as a dominant, in the *Peucedano-Phragmitetum australis* and *Phragmites australis-Eupatorium cannabinum* fens and, much less commonly, in the *Potentillo-Caricetum rostratae* and the *Carex rostrata-Calliergon* fens. In this scheme, the *Caricetum elatae* is retained to characterise those very distinctive situations where *C. elata* occurs as the sole dominant of species-poor vegetation in the general absence of large amounts of all other swamp and fen dominants. These are much less common in Britain than in Continental Europe.

The scope of the community is somewhat narrower than that originally proposed by Koch (1926) and developed by certain European authors (e.g. Vollmar 1947) and the vegetation described here seems to be akin to that placed in a more species-poor sub-Association,

*comaretosum palustris* (= *potentilletosum palustris*), by van Donselaar (1961) and Westhoff & den Held (1969). *C. elata* swamps with *Phragmites australis* or *Cladium mariscus* have sometimes been separated off into distinct vegetation types, e.g. the *Caricetum elatae phragmitosum* (Koch 1926, Vollmar 1947) and the *Caricetum elatae cladietosum* (Libbert 1932).

### Floristic table S1

<i>Carex elata</i>	V (7–9)
<i>Cirsium palustre</i>	III (1–3)
<i>Galium palustre</i>	III (1–3)
<i>Hydrocotyle vulgaris</i>	III (1–3)
<i>Eupatorium cannabinum</i>	III (1–3)
<i>Juncus subnodulosus</i>	III (1–3)
<i>Potentilla palustris</i>	III (1–5)
<i>Salix cinerea</i> saplings	III (1–3)
<i>Solanum dulcamara</i>	III (1–3)
<i>Calliergon cuspidatum</i>	III (1–5)
<i>Epipactis palustris</i>	III (1–3)
<i>Menyanthes trifoliata</i>	III (1–3)
<i>Lycopus europaeus</i>	III (1–3)
<i>Ranunculus lingua</i>	III (1–3)
<i>Cladium mariscus</i>	II (1–5)
<i>Phragmites australis</i>	II (1–3)
<i>Equisetum palustre</i>	II (1–3)
<i>Mentha aquatica</i>	II (1)
<i>Caltha palustris</i>	II (1–3)
<i>Berula erecta</i>	II (1–5)
<i>Lythrum salicaria</i>	I (1)
<i>Epilobium palustre</i>	I (4)
<i>Carex nigra</i>	I (4)
<i>Juncus acutiflorus</i>	I (2)
<i>Agrostis canina canina</i>	I (5)
<i>Anthoxanthum odoratum</i>	I (4)
<i>Viola palustris</i>	I (4)
<i>Brachythecium rutabulum</i>	I (4)
<i>Holcus lanatus</i>	I (1)
<i>Cardamine pratensis</i>	I (4)
<i>Rhynchospora squarrosus</i>	I (1)
<i>Rumex acetosa</i>	I (1)
<i>Eurhynchium praelongum</i>	I (1)
Number of samples	7
Number of species/sample	12 (6–17)

