

The distribution of *Juncus filiformis* L. in Britain

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ABSTRACT

A field survey of *Juncus filiformis* sites in the English Lake District was carried out in 1978. The results show that this area is still a stronghold for the species. Information concerning other localities in Britain is collated and the spread of *J. filiformis* to various reservoirs discussed.

INTRODUCTION

Juncus filiformis L. is widely distributed in northern and subarctic Eurasia, extending well into southern Europe; it is also present in North America and in Patagonia. On the Continent it occurs in a variety of habitats including dune slacks, dry meadows, streamside mires and wet heaths, as well as, in the Alps, meadows, screes and lake shores (Richards 1943). In Britain, however, it is a very local species, found only on the edges of lowland lakes and reservoirs. In view of this restricted ecological range, Richards suggested that *J. filiformis* may be represented by only a single ecotype in this country.

Records of *J. filiformis* from the English Lake District date back to the seventeenth century, when it was first found at the north end of Windermere by D. Newton (Ray 1688). Since then this inconspicuous species has been recorded from a number of other lake shores in the district. As few of these records are recent, it was decided to carry out a survey of all previously known sites and also suitable sites around other lakes. The results of this survey, undertaken in 1978, are presented below. Elsewhere in Britain the species is known from a few widely scattered localities in England and Scotland including a number of recently discovered reservoir sites. An attempt has been made to draw together information concerning these sites.

BRITISH LOCALITIES

In the Lake District *J. filiformis* was found by all the lakes from which previous records exist except Tarn Hows. New localities were discovered at a number of lakes and it was recorded for the first time at Rydal Water. However, searches of several other lake shores including Ennerdale Water, Wastwater, Brothers Water, Ullswater and Haweswater Reservoir were unsuccessful. The details of the Lake District localities and all other British stations that I have been able to trace are listed below. The most recent records are given and the location of herbarium specimens is mentioned only when they are the source of such records. For the Lake District localities surveyed in 1978, estimations of population size, based on the number of discrete tufts present, are indicated by letters: A = 1 to 20, B = 21 to 100, C = 101 to 500, D = 501 to 1000, E = over 1000.

Leics., v.c. 55.

Blackbrook Reservoir: 43/460.170, scattered along margin and abundant in places, 1970 (P. A. Candlish & A. L. Primavesi, field record).

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Mid-W. Yorks., v.c. 64.

Fewston Reservoir: 44/185.539, open ground liable to inundation, 1977 (W. A. Sledge, field record); 44/19.54, 1965, **BM**, below outflow where it enters Swinsty Reservoir (F. Houseman pers. comm. 1979).

Stocks Reservoir: 34/73.56, stony shore line, 1978 (P. Jepson, field record).

Co. Durham, v.c. 66.

Tunstall Reservoir: 45/06.41, alluvial mud of inflow, 1970 (Burnip 1972), possibly present for a number of years (Graham *et al.* 1972).

Grassholme Reservoir: 35/927.216, about 50 plants, 1978 (R. Hobbs, field record).

Westmorland, v.c. 69.

Windermere: Bowness-on-Windermere (Baker 1885); 35/373.032, north end of lake in fringe marsh community (C); 35/369.029, Brathay Bay in fringe marsh community (B).

Elterwater: 35/3.0, pasture by River Brathay below lake, 1942 (Wallace 1944); 35/332.042, north shore of middle basin on stony margin and in fringe marsh community (B).

Rydal Water: 35/361.062, east end of lake in fringe marsh community (B).

Grasmere: 35/334.070, north-west corner of lake in closed marsh community, up to 15 m from shore (B).

Esthwaite Water: 34/35.97, North Fen in small area on acidic peat (W. H. Pearsall in Richards 1943); 34/356.968, bay north of Strickland Ees in closed marsh community, 3m from shore (B).

Coniston Water: 34/2.9, 1950 (Biological Records Centre), unlocalized but presumably refers to south end of this lake; 34/313.978, north end of lake on stony margin and in fringe marsh community (B).

Tarn Hows: 34/33.99, 1951 (G. Wilson, field record).

Cumberland, v.c. 70.

Thirlmere: 35/322.131, south end of reservoir over a large area periodically submerged, some plants over 100m from water's edge when visited (E).

Derwentwater: 35/26.20, Barrow Bay on gravelly lake margin, 1919, **BM**; 35/2.2, St Herbert's Island, 1846, **CGE**; 35/260.190, south end of lake on stony margin and in closed marsh community, covering a large area, up to 200 m from shore (E); 35/266.195, south-east corner of lake in open community on stony shore (A); 35/268.215, Calfclose Bay on stony margin and in fringe marsh community (C); 35/265.221, Strandshag Bay on stony lake shore and in fringe marsh community (C); 35/257.233, north end of lake on stony margin and in closed marsh community, up to 10 m from shore, with willow and alder carr developing (D).

Bassenthwaite Lake: east shore, 1933, **BM**; 35/222.273, on west shore around Blackstock Point and Hursthole Point on stony margin and in fringe marsh community (E); 35/212.292, west shore opposite Bowness Bay on stony margin and in marsh community, up to 15 m from shore, with willow and alder carr developing (D); 35/200.309, in marsh community, up to 5 m from shore, with willow carr developing (C); 35/201.320, Banks Point and north shore on stony margin and extending back through fringe marsh community into more closed vegetation, up to 5 m from shore (E).

Buttermere: 35/190.152, south-east end of lake in an open community on stony shore (A); 35/176.164, north-west end of lake on stony margin and in closed marsh community, up to 7 m from shore (C).

Crummock Water: 35/166.171, south-east of lake in closed marsh community, up to 50 m from shore (E).

Loweswater: 35/130.212, south-east end of lake in closed marsh community, up to 10 m from shore (D).

Dacre Bank: 35/4.2, 1946, **CLE**.

Renfrews., v.c. 76.

Auchendores Reservoir: 26/3.7, south and west shore on alluvial mud, 1969 (Conacher & Ribbons 1973).

Fife, v.c. 85.

Loch Leven: 37/1.0, at four stations near the loch margin, 1975 (G. H. Ballantyne, field record).

Stirlings., v.c. 86.

Loch Lomond: 26/424.905, south of Balmaha in a small area by loch shore, 1971 (E. T. Idle, field record).

Kincardines., v.c. 91.

Loch of Loirston: 38/9.0, 1968 (Biological Records Centre).

S. Aberdeen, v.c. 92.

Belhelvie Links, undated specimen in OXF which is mounted with other plants collected in 1833 and 1886, unlikely to still occur in this area due to lack of suitable habitat (C. H. Gimingham pers. comm. 1979).

Moray, v.c. 95.

Kincorth, margin of a pool (Burgess 1935).

Easternness, v.c. 96.

Loch Mhor: 28/5.2, margin of loch near Farraline, 1976 (Webster 1978).

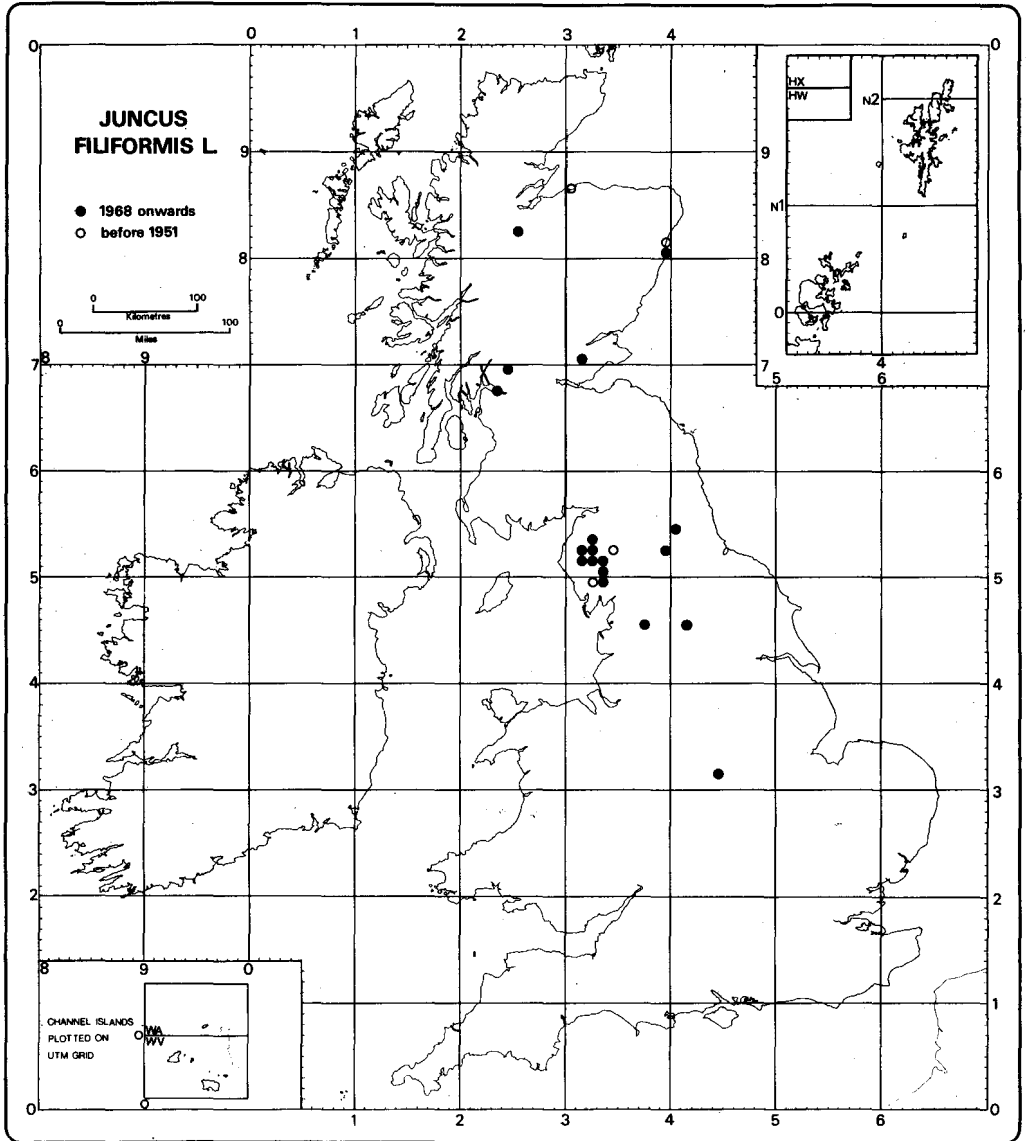


FIGURE 1. Distribution map of *Juncus filiformis* in the British Isles.

The distribution of *J. filiformis* in the British Isles is shown in Fig. 1. In addition to the localities listed above, several very doubtful or erroneous sites have been reported. Errors from Middlesex, v.c. 21, Cheshire, v.c. 58, Mid Perth, v.c. 88, and Orkney, v.c. 111, were mentioned by Watson (1883). A record quoted by Conacher & Ribbons (1973) for Llyn Helyg, Flints., v.c. 51, in fact refers to *J. tenuis*. Home (1898) reported that specimens from a hill-top near Countess Crag in S. Northumb., v.c. 67, were thought by Dr Hardy to be *J. filiformis*; this is a most unlikely locality. A record from a site near St Andrews, Fife, v.c. 85, attributed to J. H. Wilson in Young (1936), is considered to be a probable misidentification by MacLeay (1953). Finally, A. McG. Stirling (pers. comm. 1979) considers that a record for Dunbarton, v.c. 99, in P. Ewing's *Glasgow catalogue of native and established plants* (1892), must be considered doubtful as no further details can be traced.

HABITAT

In the Lake District, *J. filiformis* occurs in a variety of lake-side habitats ranging from exposed sections of lake shore to closed marsh communities sheltered behind reedswamp. Of its associated species, the following were recorded at over 40% of the sites: *Achillea ptarmica*, *Agrostis stolonifera*, *Caltha palustris*, *Carex curta*, *C. nigra*, *Deschampsia cespitosa*, *Eleocharis palustris*, *Filipendula ulmaria*, *Galium palustre*, *Juncus acutiflorus*, *J. effusus*, *Leontodon autumnalis*, *Lythrum salicaria*, *Mentha aquatica*, *Molinia caerulea*, *Phalaris arundinacea*, *Polygonum hydropiper*, *Prunella vulgaris*, *Ranunculus flammula*, *R. repens*, *Rumex acetosa* and *Senecio aquaticus*.

J. filiformis most commonly occurs in the open turf of a fringing marsh community, generally 0–2 m from the open water, where it is exposed to frequent wave action. At some localities (e.g. south-east end of Buttermere and Calfclose Bay on Derwentwater), it also grows on the gravelly beach with short-lived species such as *Juncus bufonius*, *Poa annua* and *Spergula arvensis* often present. Occasionally it is found submerged and associated with *Littorella uniflora* (e.g. south end of Thirlmere). Apart from these habitats, *J. filiformis* also occurs, sometimes in abundance, in relatively species-rich mire communities extending well back from the shore. At the south end of Derwentwater, for example, it is present over a large area on alluvial material up to 200 m from the water's edge. The vegetation at these sites is often grazed by sheep and/or cattle which prevents the development of a shrub or tree cover; where alder or willow carr has been allowed to develop, *J. filiformis* does not usually occur under dense shade. An interesting site has been described by W. H. Pearsall (in Richards 1943) where *J. filiformis* occurred on acidic peat in Esthwaite North Fen. In 1978 it was not found in the North Fen and, as there have been various changes in the vegetation over the last 50 years, notably the extension of woodland (Pigott & Wilson 1978), it is possible that this rush has been shaded out.

In other parts of Britain the species occurs in similar habitats to those outlined above. Most sites are liable to frequent submergence, particularly during the winter months, though, where it grows by reservoirs, periods of inundation will be dependent on human water demand as well as climatic conditions.

In addition to lakes and reservoirs, there are also two records of *J. filiformis* occurring by small ponds. One is in Moray where Burgess (1935) reported it from a 'margin of a pool' at Kincorth. The other refers to a specimen in CLE collected by W. F. Atkinson in 1946 from Dacre Bank in Cumberland. The only likely habitat at Dacre Bank was a small farm pond which has now been drained. Although neither of these records has been confirmed in recent years, the species should be looked for at similar sites.

DISCUSSION

Altogether there are recent (post-1967) records of *J. filiformis* from 15 lakes and 7 reservoirs in Britain, of which 11 of the lakes are in the Lake District. Although *J. filiformis* may now no longer deserve inclusion among the species of rare or threatened British plants listed by Perring & Farrell (1977), it nevertheless requires attention from conservation bodies. Many of its localities in Cumbria are popular recreation areas where heavy trampling and disturbance could threaten its survival and at Bowness-on-Windermere various building developments may well have caused its extinction.

TABLE 1. RESERVOIRS WITH RECENT RECORDS OF *JUNCUS FILIFORMIS*

Reservoir	Date of construction	Date of first record
Blackbrook, v.c. 55	1906	1965 (Candlish)
Stocks, v.c. 64	1932	1978 (Jepson)
Fewston, v.c. 64	1879	1959 (Biological Records Centre)
Grassholme, v.c. 66	1915	1978 (Hobbs)
Tunstall, v.c. 66	1879	1970 (Burnip)
Auchendores, v.c. 76	1880	1969 (Conacher & Ribbons)

The arrival of *J. filiformis* at a number of reservoirs in England and one in Scotland suggests that it can be dispersed over relatively long distances. These reservoirs (listed in Table 1) were all established in areas where no large body of standing water previously existed, so that *J. filiformis* was unlikely to have been present before construction. On the other hand, at Thirlmere, its only reservoir locality in the Lake District, it was known to occur (Baker 1885) before the water level was raised by 50ft in 1894. Perring & Farrell (1977) suggest that its seed may be carried by birds and this would seem to be the only means by which this species could have reached these new isolated sites. The seeds, like those of many other *Junci*, are mucilaginous and sticky when moistened (Ridley 1930, Richards 1943), which could allow them to become attached to the feet and other parts of water birds. Gillham (1970) has suggested that small viscid rush seeds attached directly to the bird are more likely to escape preening than seeds adhering in mud. Internal transport is also possible but, however carried, the occurrence of this rare species at these six sites indicates that seed movement by birds migrating between water bodies in Britain can be an effective method of dispersal. The maximum possible time taken for *J. filiformis* to reach these reservoirs varies from 46 years at Stocks to 91 years at Tunstall. However, these periods were probably shorter since the species was generally well-established when first recorded. It is obviously impossible to determine the distance over which seed has travelled, but Blackbrook, the most outlying site, is 150–200km from its nearest known localities.

As well as these reservoirs, *J. filiformis* has only recently been found at Loch Mhor in Easternness and Rydal Water in Westmorland. In the field it is often very inconspicuous, particularly when overshadowed by associated species. The most distinctive character is the inflorescence, which usually has less than 10 flowers and is generally placed half-way or lower down the apparent stem, although, when heavily grazed, it can have the initial appearance of being terminal. It is quite possible that this slender rush has been overlooked at other sites in Britain.

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