

***Puccinellia distans* (Jacq.) Parl. subsp. *borealis* (O. Holmb.)
W. E. Hughes (Poaceae) in mainland Scotland and the
Outer Isles**

P. J. O. TRIST

Glovers, High St, Balsham, Cambridge, CB1 6DJ

and

J. K. BUTLER

Seaside Cottage, Thurso East, Caithness, KW14 8NH

ABSTRACT

Puccinellia distans subsp. *borealis* (Northern Saltmarsh Grass) is distinguished from subsp. *distans* by its shorter culms and narrower leaves and in its native habitat the culms of the former are frequently procumbent. It has mostly contracted, dense and narrow panicles as opposed to the open character of the panicles of subsp. *distans*. Reflexed branches are frequent in subsp. *distans* but infrequent in subsp. *borealis*. The lemmas of subsp. *distans* are marginally smaller. The predominant natural habitat is identified as cracked seashore pavement of Old Red Sandstone rock and the importance of the man-made habitat on harbour and slipway stone structures is emphasised. The latter habitat probably controls the distribution of the plant. It is only rarely found in the saltmarsh habitat.

KEYWORDS: taxonomy, habitat, phenology, distribution.

INTRODUCTION

It is considered that the first British collection of *Puccinellia distans* subsp. *borealis* was made by Ralph Tate under the name of *Sclerochloa distans* from Balta Voe, Unst, Shetland in 1865 (BM). E. S. Marshall collected it as *Glyceria distans* Wahl. on "cliffs c. half a mile south of Wick, Caithness" and also at Melvich, West Sutherland, both sheets of 1886 in BM and CGE. In 1888 W. H. Beeby collected it as *Glyceria distans* Wahl. "on the stoney shores of Hildasay Is., Shetland" (BM) and in E. S. Marshall's collection in CGE a sheet is labelled "comm. W. H. Beeby leg. 1888, E. S. Marshall". Further collections were made by F. J. Hanbury at Uyeasound, Unst, Shetland, 1894, who also gave a sheet to Marshall (CGE). One of us (P.J.O.T.) has considered these specimens and is satisfied that they are all the same taxon, namely *Puccinellia distans* subsp. *borealis*. In Hubbard & Milne-Redhead (1968) the title "A *Puccinellia* new to Britain" is misleading. Credit can be given to Beeby for publishing a short account under *Glyceria distans* var. *prostrata* in 1895 but he was not the first to collect the taxon. He had noted the prostrate growth in his first collection and later obtained plants from F. J. Hanbury from which he took seed. From his plants in cultivation Beeby (1895) recorded "the prostrate habit is not so pronounced as in the wild specimens". Nevertheless he mistakenly published *Glyceria distans* var. *prostrata* Beeby.

Subsp. *borealis* was not included in Hubbard (1954) and first appeared under *Puccinellia capillaris* (Liljebl.) Jansen in Hubbard (1968). He was first alerted to this taxon in 1955 when he received specimens from the Isle of May off the coast of Fife (v.c. 85). In 1962 Elaine Bullard sent a specimen from Sule Skerry, Orkney to Hubbard who identified it as *Puccinellia capillaris*. Subsequently Bullard (1968) found the same taxon on the coast of all Orkney Islands. Hubbard & Milne-Redhead (1968) reported it from the coasts of Caithness, West Sutherland, Banff and Moray.

DESCRIPTION OF *PUCCINELLIA DISTANS* SUBSP. *BOREALIS*, NORTHERN SALTMARSH GRASS

A loose to compact perennial. Culms spreading, procumbent or erect, 2–40 cm long, 2–4 noded, smooth. In natural habitats the culms seldom exceed 28 cm long. Leaves grey-green, glabrous, sheaths smooth, slightly inflated, striate; ligules 0.4–2.2 mm long, membranous; blades blunt-tipped, 3–12 cm long, seldom flat and mostly plicate, 1–2 mm wide but width in small plants is <1.0 mm. Panicles mostly contracted, erect and dense throughout, 2–12 cm long; when panicles exert, the branches at the lower nodes are patent; pedicels 0.8–4.8 mm long, scabrid.

Spikelets oblong, 2.5–9 mm × 1.5–2 mm, 2–8 flowered. Glumes slightly unequal, ovate to elliptic; lower 0.5–2 mm long, 1-nerved; upper 1.3–2.8 mm long, 3-nerved. Lower lemmas oblong to elliptic, blunt, (1.8–)2.2–2.8 mm long, minutely hairy at the base. Paleas about as long as lemma, hairy on the keels. Anthers 0.4–1 mm long.

The following summarises the nomenclature:

Puccinellia distans (Jacq.) Parl. subsp. *borealis* (O. Holmb.) W. E. Hughes in *Botanical journal of the Linnean Society* **76**: 363 (1978).

Glyceria distans var. *prostrata* Beeby in *Journal of botany (London)* **33**: 315–316 (1895).

Poa retroflexa Curtis subsp. *borealis* O. Holmb. in *Botaniska notiser* **26**: 182 (1926).

Puccinellia distans var. *prostrata* (Beeby) Jansen & Wachter in *Nederlandsch kruidkundig archief* **40**: 248 (1930).

Puccinellia capillaris (Liljebl.) Jansen in *Flora Neerlandica* **1**: 2, 69 (1951).

Puccinellia borealis (O. Holmb.) Å. Löve & D. Löve in *Botaniska notiser* **128**: 498 (1976).

HABITAT

THE NATURAL HABITAT

The most convincing natural habitat of *Puccinellia distans* subsp. *borealis* is at a low level on a rocky seashore platform. On the British mainland it occurs around the coast of Caithness (v.c. 109), having a specific preference for the flagstone pavement of the Old Red Sandstone. This fine-grained sedimentary rock forms gently sloping flat surfaces fractured at intervals by long fissures typically a few mm wide.

This grass occupies these fissures (as shown in Fig. 1) at the lowest level on the shore capable of accommodating higher plants, i.e. 4 m above Ordnance Datum. Here there is a sparse community in which the constant species are *Armeria maritima* (Miller) Willd., *Plantago maritima* L., *Puccinellia distans* subsp. *borealis* and *Sagina maritima* G. Don. Occasional associates are *Aster tripolium* L. and *Plantago coronopus* L. This community occupies about 1 m of vertical height and gives way at higher levels to a similar but richer community in which the dominant grass is *Festuca rubra* subsp. *junccea* (Hackel) K. Richter which is responsible for some displacement of the *P. distans*. In this higher zone *Agrostis stolonifera* L. and *Tripleurospermum maritimum* (L.) Koch occur in addition to *Carex distans* L. and *Euphrasia foulaensis* F. Towns. ex Wettst. at the top of the zone some 7 m above Ordnance Datum level.

On the Scottish mainland good examples of this community in platform cracks were found at Proudfoot ND/383.510 (see Fig. 2) and at Thurso East ND/143.701 (both v.c. 109, Caithness); such communities occur all round the coast from Reay in north-west Caithness to Helmsdale on the east coast of Sutherland wherever the exacting conditions of sloping pavement at the correct intertidal height occur. It is also the dominant natural habitat on seashores in Orkney.

Subsp. *borealis* is also to be found in saltmarshes but its occurrence in this habitat is uncommon. Saltmarsh itself is rare due to the combination of a rocky wave-exposed shore and the prevalence of coarse sand on the sea bottom. On this account subsp. *borealis* is seldom found in association with *Puccinellia maritima* (Hudson) Parl.; where it does occur on Orkney the former has a hazardous chance of withstanding the competition of a close sward created by the stolons of *P. maritima*. This association in saltmarsh is known in Orkney and Shetland. It is reported by Bullard (pers. comm., 1987) "in saltmarsh with open areas of bare mud" at Westayre Loch, Sanday, 1966; "in muddy saltmarsh at the edge of a small loch", Sandsend, Shapinsay, 1966 with *Juncus bufonius* L. and *Spergularia marina* (L.) Griseb.; and on saltmarsh at Sebay Mill, Tankerness, 1966. In 1982 Bullard sent specimens (now in **herb. P.J.O.T.**) of subsp. *borealis* from "open areas of saltmarsh on

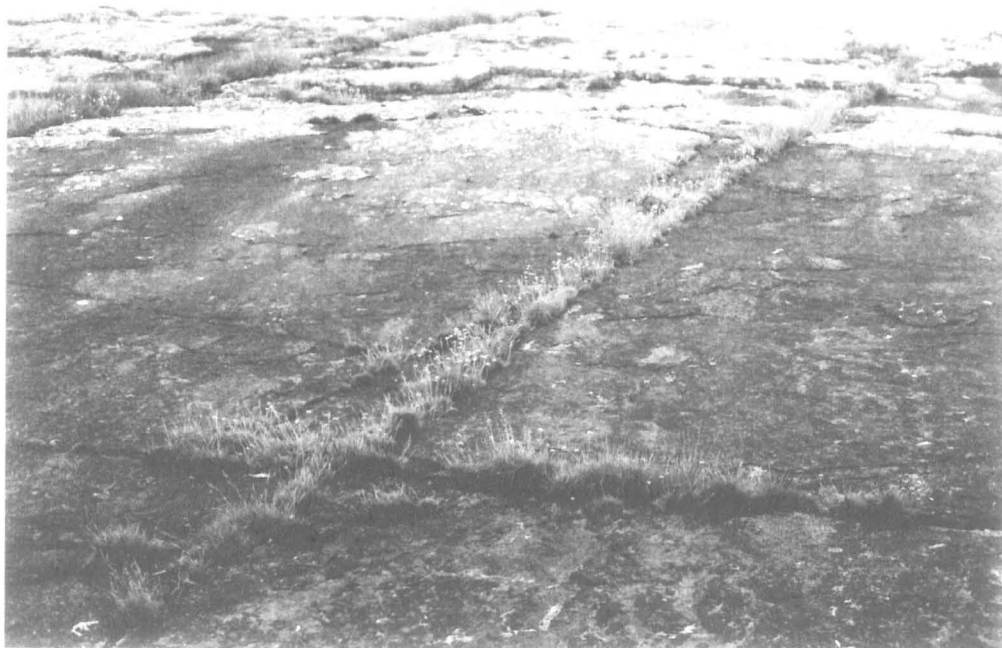


FIGURE 1. *Puccinellia distans* subsp. *borealis* in association with *Armeria maritima* in the cracks of Old Red Sandstone natural paving at Proudfoot, Wick.



FIGURE 2. Individual plants of *Puccinellia distans* subsp. *borealis* in crevices. The rock is partly coated with tar.

the east side of Cata Sound, Orkney" which were associated with *Agrostis capillaris* L., *Armeria maritima*, *Juncus gerardii* Loisel., *Plantago maritima* and *Puccinellia maritima*.

This uncommon association between the two species of *Puccinellia* is also recorded by Scott & Palmer (1987) "about the tiny brackish pool behind the jetty at Grutness", Shetland and by Gilbert & Holligan (1979) on Rona, North Ebrudes, v.c. 104.

Subsp. *borealis* is less common on sand and fine stones, but does occur on such substrates, for example on the sloping banks of the tidal River Halladale at Bighouse, West Sutherland NC/890.649. E. S. Marshall also records finding occasional plants "on muddy decomposed boulder clay" south of Wick in 1886 (CGE) and also "in mud among stones at the rivermouth at Dunbeath" ND/165.295, both in Caithness. It also occurs on the stony shore on the western side of Loch Eriboll, v.c. 108, W. Sutherland. There are two examples, at Janetstown and Lybster on the east coast of Caithness of the plant being found among larger (c. 150 mm) waveworn boulders which did not have a matrix of silt or other fine material; this situation is, however, uncommon.

MAN-MADE HABITAT

The natural habitat occurs around 1 m above mid tide level, which is also the level at which the top of a harbour quay is constructed. This proves to be a very good habitat for *Puccinellia distans* subsp. *borealis*. There are many records from small quays, slipways and stonework on larger harbour walls. The quay top is often a stone pavement and the pattern of local distribution suggests that the seed is carried by waves flooding over the quay. Plants are to be found mainly in the crevices of the pavement and also on tracks and rough ground within reach of the swell. Bullard (pers. comm., 1987) found the plant in two locations amongst *Leymus arenarius* (L.) Hochst. in coastal dunes some distance from the swell region. The plant may occasionally act as a short-lived ruderal when carried by vehicle tyres from a harbour area.

In the quay top community which is on the horizontal, the plant association is richer than in the natural sloping pavement habitat. *Armeria maritima*, *Plantago maritima* and *Sagina maritima* are the constant associates but *Aster tripolium*, *Cochlearia anglica* L., *Matricaria discoidea* DC., *Plantago coronopus*, *Potentilla anserina* L., *Spergularia marina* and *Tripleurospermum maritimum* typically occur. In this habitat the *Puccinellia distans* subsp. *borealis* is able to survive alongside *Festuca rubra* subsp. *junceae*, whereas in the natural habitat of the sloping rock platform they tend to occupy different levels. A good example of a rich community is the harbour quay at Keiss in Caithness ND/351.609 where thousands of plants of subsp. *borealis* were seen in July 1993.

A comparison of the vertical distribution of the plants in the natural and man-made habitats shows that the horizontal surface of a quay allows the species a better foothold at higher elevation above mid-tide.

The success of the man-made habitat is clear. It can be said that almost every quay and slipway on the far north and east coast of the mainland and on Orkney and Shetland are candidate sites for at least a few plants of subsp. *borealis*. This habitat is the main source of new seed and probably the basis of the present distribution. Numerically the distribution seems to be centred on north-east Caithness, Orkney and Shetland where the population is sufficiently dense to provide seaborne seed for wider distribution.

PHENOLOGY

Davis (1983) records that in species of *Puccinellia* "growth and flowering are continuous throughout the summer and simultaneous among varied microhabitats within populations". The various maritime habitats in which subsp. *borealis* is found shows its ability to adapt to environmental variability.

The sea shore by the harbour at Lybster, Caithness, v.c. 109 has a man-made earth-stone boat slipway. A single plant of subsp. *borealis* collected on 16 July 1982 was 20 cm high overall with 17 fresh green panicles. All culms were erect and panicles were in varying stages of development from first break of sheath to open panicles. Within a few metres five plants of 4–8 cm high had 1–3 panicles per plant, all of which had one or more dead panicles and others in stages of dying or development. In another collection taken the same day at Janetstown on the east coast of Caithness, where the large-shingle beach was similar, subsp. *borealis* was found between stones on a bank above and on

the harbour wall. Four plants of 6–10 cm in height were taken and three had single dead panicles and leaves; on the other plant there were two dead panicles and three panicles in stages of dying. These records illustrate the continuous growth of individual plants of subsp. *borealis* which may be seen from mid-June to mid-August in all the types of maritime habitats.

Davis (1983) also discusses the periods of moisture stress which arise from varying frequencies of tidal wash. In addition there are variations in salt stress on plants where salt is retained in crevices as opposed to direct drainage through shingle and sand beaches at river mouths. There may also be a difference in salt retention in natural platform crevices compared to quay top crevices because the latter lie on a rubble base.

Procumbent growth is noticeable on beach habitats subject to tidal flow and this appears as a reaction to the tidal thrust over the rocks. Plants out of reach of seawater flush, but within the spray and swell of high tides, frequently have erect growth.

Davis (1983) also records that species of *Puccinellia* “are patchily distributed due to the discontinuous and restricted occurrence of suitable habitats”. This is demonstrated on the north coast of the Scottish mainland. Between Loch Eriboll in West Sutherland and Reay in Caithness the rocks are from the Moine Succession or igneous intrusions related to it. Here, *Puccinellia* spp. are very sparse. Between Reay and Scrabster the shore is mostly vertical cliff. But between Scrabster and John o’Groats there is an almost continuous occurrence of flat rocky platforms of Old Red Sandstone where subsp. *borealis* can be found whenever these platforms have the preferred intertidal height. On the east coast of Caithness from John o’Groats to Dunbeath there are many stretches of vertical cliff but any occurrence of suitable rocky platforms is likely to have some specimens of the plant. South of Dunbeath there are few suitable natural habitats since cliff, boulder beach or fine sand prevail.

DISTRIBUTION

Puccinellia distans subsp. *borealis* is reported from the north of the Outer Hebrides, v.c. 110 on the Butt of Lewis, Uig and at Stornoway, but there are no records for the North Ebrides, v.c. 104 or the west coast of Scotland. It occurs frequently on the coasts of the Orkney Isles (v.c. 111), on North Rona (v.c. 110) to their west, on Fair Isle, Foula and Shetland (v.c. 112). On the north coast of Scotland it is found on the shores of Loch Eriboll and then eastward at intervals to Bighouse (v.c. 108) almost at the western boundary of Caithness. It is seen at Brimsness and Scrabster. Eastward from Scrabster it is locally plentiful along to John o’Groats. South from John o’Groats it occurs at intervals, being plentiful around Wick and occurring at Lybster, Dunbeath, Helmsdale and as far as Golspie. Then again it can be found at Hopeman and Peterhead on the coast of Banff (v.c. 93, N. Aberdeen) and at intervals down to Fife (v.c. 85), where it occurs frequently between Crail and Pittenweem and on the Isle of May to the east. It is recorded from Rosyth, Fife and at Leith Docks, (v.c. 83, Midlothian), also on the Bass Rock in the Firth of Forth and at Tynninghame, East Lothian (v.c. 82).

The plant is known from the Faeroes, Iceland, Greenland, Norway and on the coast of the Netherlands.

The hybrid between *Puccinellia distans* (Jacq.) Parl. subsp. *borealis* (O. Holmb.) W. E. Hughes and *P. maritima* (Huds.) Parl., named *Puccinellia* × *mixta* O. Holmb., has been found on the Fianuis peninsula on North Rona, Outer Hebrides, v.c. 110 by Gilbert & Holligan (1979). It is also recorded from Denmark, Holland, Iceland, Norway and Sweden (Jones & Stace 1975).

ACKNOWLEDGMENTS

We are grateful to the curators of **BM** and **CGE** for access to specimens and information. We thank D. H. Kent for assistance with nomenclature and Elaine Bullard for field notes and discussions and also Elizabeth Norman for help with field work over several years. Charles Turner kindly commented on the manuscript.

REFERENCES

- BEEBY, W. H. (1895). *Glyceria distans* var. *prostrata* Beeby. *Journal of botany (London)* **33**: 315–316.
- BULLARD, E. R. (1968). Notes on the occurrence of *Puccinellia capillaris* (Liljebl.) Jansen. *Bulletin of Orkney Field Club* **4**: 5.
- DAVIS, J. J. (1983). Phenotypic plasticity and the selection of taxonomic characters in *Puccinellia* (Poaceae). *Systematic botany* **8**: 341–353.
- GILBERT, O. L. & HOLLIGAN, P. M. (1979). *Puccinellia capillaris* (Liljebl.) Jansen \times *P. maritima* (Huds.) Parl. on North Rona, Outer Hebrides. *Watsonia* **12**: 338–339.
- HUBBARD, C. E. (1954). *Grasses*, 1st ed. Penguin, Harmondsworth.
- HUBBARD, C. E. (1968). *Grasses*, 2nd ed., p. 199. Penguin, Harmondsworth.
- HUBBARD, C. E. & MILNE-REDHEAD, E. (1968). A *Puccinellia* new to Britain. *Proceedings of the Botanical Society of the British Isles* **7**: 507.
- JONES, B. M. G. & STACE, C. A. (1975). *Puccinellia capillaris* (Liljebl.) Jans. \times *P. maritima* (Huds.) Parl. = *P. \times mixta* Holmberg in STACE, C. A. ed. *Hybridisation and the flora of the British Isles*, p. 559. Academic Press, London.
- SCOTT, W. & PALMER, R. C. (1987). *Puccinellia distans* (Jacq.) Parl. subsp. *borealis* (O. Holmb.) W. E. Hughes in SCOTT, W. & PALMER, R. C. *The flowering plants and ferns of the Shetland Islands*, p. 357. The Shetland Times, Lerwick.

(Accepted September 1994)