Sphagnum balticum (right) growing with *Sphagnum papillosum*.

Baltic Bog-moss *Sphagnum balticum* (Russow) C.E.O. Jensen

Climate Change Sensitivity:	HIGH	Ability to Manage:	MEDIUM
Non climatic threats:	MEDIUM	Vulnerability:	HIGH

Summary

Baltic bog-moss is a nationally rare and endangered bryophyte that is now restricted to four known sites in Britain, having been lost from several sites in the last century due to development, drainage and afforestation. It is considered likely that it is vulnerable to the effects of climate change as it requires very cold winters for optimum growth, and is most prolific in the Arctic tundra and northern boreal zone. Thus, more frequent mild winters in Britain are likely to be damaging to the species, giving other more common species of bog-moss a competitive advantage.

Baltic bog-moss is also vulnerable to changes in hydrology and water quality, and may be adversely affected by atmospheric nitrogen pollution. The management of existing sites to ensure optimum conditions is of prime importance for the protection of the species in Britain. In addition, the restoration of former sites, or the creation of new sites, in parts of the country that will remain climatically suitable for the species should be considered, possibly combined with species introductions or reintroductions where restored sites are distant from existing populations.

Description

Baltic Bog-moss is a small species of bog-moss, usually pale brown, yellowish-brown or orange-brown in colour, although green forms may occur in extremely wet or shaded conditions (Hodgetts, 2012). It may occur as scattered plants, or form patches or carpets. The bog-mosses can be recognised by their distinctive growth form, in particular the capitulum (head) of short, densely-arranged branches above a weak stem that carries clusters of branches with leaves that closely overlap, often in neat ranks. Baltic bog-moss has spreading stem leaves and branches in bundles of three on a pale stem. It is well known for being difficult to identify in the field due to its similarity with other species of bog-moss, and for being sensitive to trampling, thus surveys for the species should be carried out by expert bryologists. Baltic bog-moss is nationally rare (Pescott, 2016), endangered (Hodgetts, 2011), and is protected under Schedule 8 of the Wildlife & Countryside Act 1981.

Ecology and Distribution

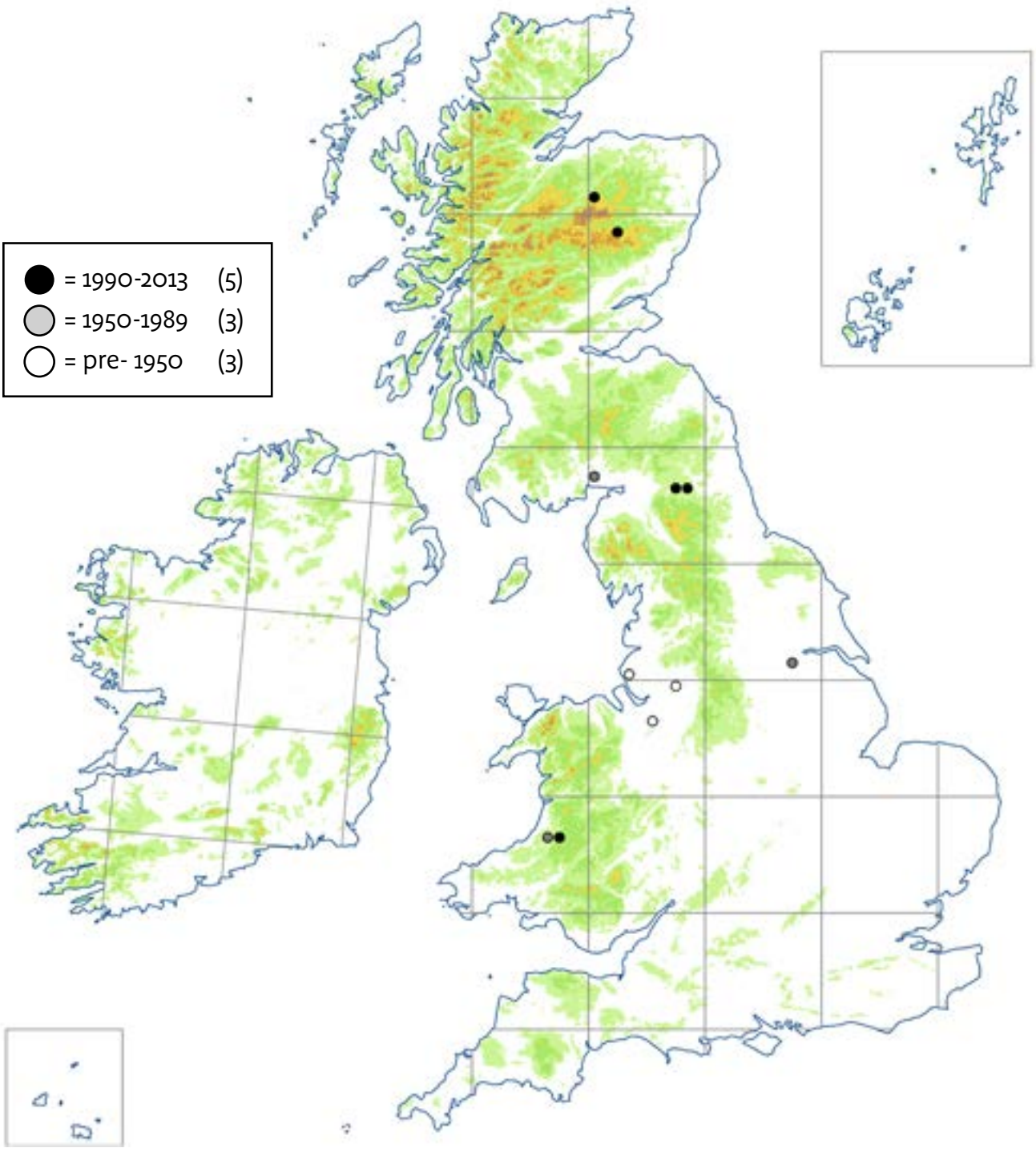
Baltic bog-moss grows primarily in nutrient-poor raised bogs that are fed by rain water (ombrotrophic), and also in marginal areas of valley bogs. More rarely it occurs in blanket bogs. It favours very wet conditions, with a water table that occurs about 5 cm below the surface, and in such conditions may form carpets. It typically occurs close to bog pools and channels, in wet peat cuttings, and in the hollows of hummock-hollow bog habitats. In less waterlogged areas it may occur as small and scattered individual plants. It is mainly a lowland species in Britain, but reaches an altitude of 660m in Scotland (Hodgetts, 2012). Other species that frequently grow with it include red bog-moss *Sphagnum capillifolium*, papillose bog-moss *S. papillosum*, Magellanic bog-moss *S. magellanicum*, flat-topped bog-moss *S. fallax*, common cottongrass *Eriophorum angustifolium*, bog rosemary *Andromeda polifolia*, cranberry *Vaccinium oxycoccos* and cross-leaved heath *Erica tetralix*.

Within Britain, Baltic bog-moss currently occurs at two known sites in Scotland, one in Wales, and one in England (the site in northern England extends over two hectads, hence the two adjacent dots on the map). The species also occurs in northern Asia, North America, Greenland, and the Baltic countries. It is typically continental in distribution and extends as far south as the Alps.

In addition to being vulnerable to the effects of climate change, Baltic bog-moss has also been badly affected in Britain by habitat loss (Blockeel *et al* 2014). Out of five sites in England, four were lost before 2000 (Porley, 2013). Causes of these losses have been site destruction for development and the loss of bog vegetation to forestry. A site in Scotland has been affected by draining and afforestation.

Presence records for Baltic bog-moss from the Atlas of British & Irish Bryophytes produced by the British Bryological Society are shown on the map below (10km grid scale).

Presence of Baltic bog-moss records, 10km², © British Bryological Society 2014 (Blockeel *et al* 2014).



Confidence in climate change impacts[17]

Distribution change: HIGH CONFIDENCE Mechanism: LOW CONFIDENCE

Baltic Bog-moss is on the edge of its range in Britain. It is a member of the circumpolar Boreo-Arctic montane element that requires very cold winters for optimum growth, and it is most prolific in the Arctic tundra and northern boreal zone. It only fruits in quantity in the Arctic regions, and is not known to fruit in Britain (Daniels & Eddy, 1990). This requirement for very cold winters makes Baltic bog-moss poorly suited to likely climate change effects in Britain, including more frequent mild winters, which may give other species of bog-moss a competitive advantage. This may make more southerly sites increasingly less suitable for the species.

In addition, Baltic bog-moss is vulnerable to changes in hydrology, in particular any lowering of the water table that is likely to result in desiccation of the bog habitat and colonisation by other species (Hodgetts, 2012). It is also vulnerable to changes in water quality, and to increased levels of atmospheric carbon dioxide and nitrogen, which may give other bryophytes and vascular plants a competitive advantage. Van der Heijden *et al* (2000) recorded that both elevated levels of atmospheric CO_2 and increased nitrogen resulted in increased growth of the papillose bog-moss *Sphagnum papillosum*, but that in contrast Baltic bog-moss did not show increased growth in these conditions.

Please read this case study alongside the relevant habitat sheets.

Adaptation options

The most effective adaptation options for Baltic bog-moss are likely to be management of existing sites to ensure optimum conditions for the species, and the restoration of areas within its existing range, possibly combined with species introductions or reintroductions where restored sites are distant from existing populations. Restoration should focus on areas likely to remain more climatically suitable for the species, namely northern areas in Britain.

- Ensure optimum management of existing sites through the appropriate management of water levels, in particular maintaining the very wet conditions favoured by the species. Such wet conditions will help limit colonisation by trees, scrub and taller vegetation that are likely to invade if sites dry out. Water quality should be managed to preserve oligotrophic, acidic conditions.
- Ensure bogs supporting Baltic bog-moss are not excessively trampled, either by livestock or surveyors. Surveys for the species should be carried out by expert bryologists who are familiar with the species, to minimise impacts on the habitat.
- Consideration should be given to restoring suitable habitat in areas of the country likely to remain climatically suitable for the species.
- Consideration should be given to reintroducing or introducing the species to areas of the country likely to remain climatically suitable for the species.
- Monitoring will help to determine population trends and the effectiveness of interventions, however this should be very carefully designed to ensure that it does not cause damage to the species, in particular by trampling by recorders.

17 An assessment of the strength of evidence that distributions are changing and the mechanisms causing change are understood. Refer to Part B, section 5 of the species section introduction for more information.

Relevant Countryside Stewardship options

WT10 Management of lowland raised bog

FM2 Major preparatory works for Priority Habitats (creation and restoration) and Priority Species

SP9 Threatened species supplement

References and further reading

Blockeel, T.L., Bosanquet, S.D.S., Hill, M.O. & Preston, C.D. (eds). 2014. Atlas of British & Irish Bryophytes. Pisces Publications, Newbury.

Daniels, R.E. & Eddy, A. 1990. Handbook of European Sphagna. Institute of Terrestrial Ecology, HMSO.

Hodgetts, N. 2007. *Sphagnum balticum* species dossier, Plantlife International.

Hodgetts, N. G. 2011. A revised Red List of bryophytes in Britain. Field Bryology, 103, 40-49.

Hodgetts, N.G. 2012. Surveillance of priority bryophytes in Scotland 2010-2013: *Sphagnum balticum* (Baltic Bog-moss). Report for Scottish Natural Heritage, unpublished.

O'Reilly, J. 2012. Muckle Moss NNR: NVC Survey & Bryophyte Survey. Report for Natural England, unpublished.

Porley, R.D. 2013. *England's Rare Mosses and Liverworts*. Princeton University Press, Woodstock Oxfordshire.

Smith, A.J.E. 2004. The Moss Flora of Britain and Ireland, 2nd edition. Cambridge University Press, Cambridge.

Van der Heijden, E., Jauhiainen, J., Silvola, J., Vasander, H. & Kuiper, P.J.C. 2000. Effects of elevated atmospheric CO2 concentration and increased nitrogen deposition on growth and chemical composition of ombrotrophic *Sphagnum balticum* and oligo-mesotrophic *Sphagnum papillosum*. Journal of Bryology, 22, 175-182.