# The status and habitat of *Homomallium incurvatum* in the north of England

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## Introduction

*Homomallium incurvatum* is one of a small group of bryophytes that are widespread and frequent in parts of continental Europe but disproportionately rare in Britain. *Jungermannia leiantha* and *Anomodon attenuatus* are two other members of this group. The status of *Homomallium* in Britain has been a cause for concern for some time. Prior to the field work reported in this account, it had been seen at only two sites in England since 1950, at Ingleton in NW Yorkshire (apparently last seen in 1969), and at Gainford by the River Tees in Durham (in 1977). There is one recent record from Scotland (Den of Airlie, Angus, in 2002). The species is classified as critically endangered in the British Red Data Book (Church *et al.*, 2001).

There seemed to be no obvious explanation for the apparent disappearance of *Homomallium incurvatum* from its English localities. The habitat, on shaded stones, rocks and walls, is not under particular threat, and its occurrence on base-rich strata might have been expected to provide buffering against atmospheric pollutants when these occurred at high levels during much of the twentieth century. Climatic causes have been suggested as one possible explanation.

During 2005 and 2006, on behalf of English Nature (now Natural England), I investigated the past and present occurrence of *Homomallium* at its sites in the north of England. After some initial failures, field surveys in and near its former localities eventually resulted in its rediscovery at four of these sites. My experience in the field suggested that the paucity of recent records may be due as much to ignorance of the habitat niche occupied by *H. incurvatum* as to catastrophic decline.

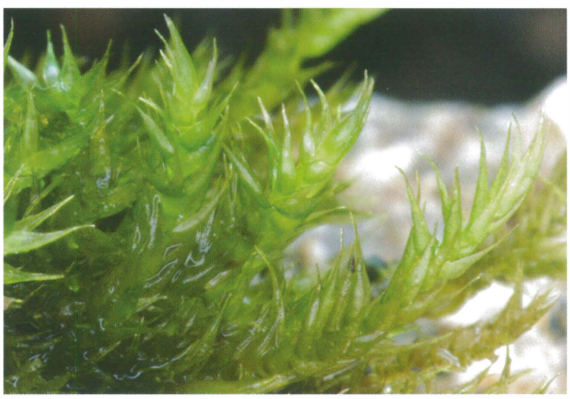

**Figure 1.** Leafy shoots of *Homomallium incurvatum* from Whitcliffe Scar, Yorkshire. Photo: Des A. Callaghan.

## Recognition

*Homomallium* is a small genus in the Hypnaceae. It is closely related to the genus *Hypnum* and the very familiar *H. cupressiforme*, one of our most common and morphologically variable bryophytes. *Homomallium incurvatum*, the sole European member of the genus, is a slender moss with creeping shoots that are closely appressed to the substrate. The leaves are curved upwards, *i.e.* away

from the substrate (Figure 1). This is a distinctive feature but is not unique, being shared with *Hypnum resupinatum*. *H. incurvatum* is autoicous and regularly produces sporophytes. The spore capsules are curved, the extent of the curvature depending on the length of the capsules. When the capsules are short, the mouth of the capsule is directed horizontally (Figure 2). When they are longer they may describe a semi-circle, such that the mouth of the capsule is directed downwards, towards the substrate. The curved capsules are the second distinctive feature of *H. incurvatum*. In the various forms and segregates of *H. cupressiforme* the capsules are either erect or only slightly curved. In combination, the orientation of the leaves and the curvature of the capsules generally allow *H. incurvatum* to be identified in the field. It is also a more slender plant than normal forms of *H. cupressiforme*.

However, caution is needed in identifying sterile material of *Homomallium*. Because of the general resemblance to *Hypnum resupinatum* and to atypical forms of *H. cupressiforme* careful microscopic examination is called for. There are two important characters for confirmation of *Homomallium incurvatum*:

- the leaves have a characteristic shape, being rather abruptly contracted at or near mid-leaf to a relatively broad acumen (Figure 3). The leaves of *H. cupressiforme* are more evenly tapered, or are contracted above mid-leaf, so that the overall shape is rather different.

**Figure 2.** Capsule of *Homomallium incurvatum* from Whitcliffe Scar, Yorkshire. Photo: Des A. Callaghan.

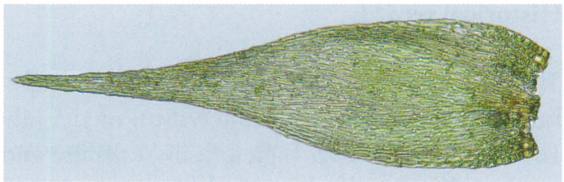

**Figure 3.** Single leaf of *Homomallium incurvatum* from Whitcliffe Scar, Yorkshire. Photo: Des A. Callaghan.

- the alar cells are arranged in regular longitudinal rows and form a triangular group ascending the basal margin of the leaf. They are moderately thick-walled, compact and not inflated (or rarely a few cells at the extreme base may be enlarged).

Although these characters are usually sufficient to confirm sterile material, *Hypnum cupressiforme s.l.* is exceptionally variable and occasional plants may be encountered that approach *Homomallium* in leaf shape and/or arrangement of the alar cells. Sterile collections should not be referred to *Homomallium* if there is any ambiguity in the differentiating characters, or if the plants are from base-poor rocks or trees.

*Homomallium incurvatum* could be passed over in the field for *Rhynchostegiella tenella* and *Amblystegium serpens*. *R. tenella* has extremely narrow leaves and the plants therefore have a more silky appearance. Sporophytes are often present, as in *Homomallium*, but they differ in having a shorter, papillose seta and the urn hardly longer than wide. *A. serpens* has capsules that may appear very similar to those of *Homomallium*, but the leaves are shorter and less attenuate and they are scarcely curved. Microscopically both of these species are immediately separated from *H. incurvatum* by the distinct single nerve of the leaf. In *H. incurvatum* the nerve is short and double.

## Historical records

The first British records of *Homomallium incurvatum* were made by William Wilson on 13 July 1838 at Helk's Wood, Ingleton, in Yorkshire and on the following day by a roadside north-west of Kendal in Westmorland (Wilson, 1855). A few years later, in 1843, Richard Spruce discovered the species at High Force in Upper Teesdale in Durham, noting: 'I had nearly passed this over for *H. serpens* [*Amblystegium serpens*], which it certainly much resembles, especially in the form of its capsules' (Spruce, 1844).

Subsequently, the known distribution of *Homomallium* in England became established during a productive period of some 50 years from the 1860s to 1915. Most of these records were due to four bryologists, who clearly came to know the species well: J.M. Barnes, C.H. Binstead and G. Stabler in Westmorland and Cumberland, and R. Barnes in North Yorkshire and Teesdale. Knowledge of *Homomallium* seems to have been largely lost with the deaths of these individuals, J.M. Barnes prior to 1896, G. Stabler in 1910, R. Barnes in 1918, and C.H. Binstead in 1941. H. incurvatum has also been reported from Derbyshire, but these records are incorrect. Nineteenth century records cited in Linton (1903) belong to *Ctenidium molluscum* (vouchers in MANCH). A more recent record from Matlock in Derbyshire (1961, leg. C.D. Pigott, NMW) probably belongs to *Hypnum resupinatum.*

*Homomallium incurvatum* continued to be recorded at Ingleton in Yorkshire throughout the first half of the 20th century. However the best-known station for the species at this time, a wall in the lower part of Swilla Glen, was destroyed in the 1960s by the extension of the car park there (J.G. Duckett, pers. comm.). The last known record from Ingleton was apparently made by A.R. Perry and other members of the British Bryological Society on a limestone boulder in woodland in the glen on 29 August 1969. There is a single recent record from Teesdale by M.J. Wigginton, from soil in deciduous woodland by the River Tees at Gainford in March 1977. The habitat is anomalous, but the specimen is fertile and the record undoubtedly correct. The Ingleton and Gainford records are the only confirmed post-1950 records from the north of England. The solid dot for square NY21 in Hill *et al.* (1994) originates from a record by Binstead, and is therefore pre-1941.

The present and historical distribution of *Homomallium incurvatum* is shown in Figure 4. There are records from 27 individual localities in 19 10-km squares of the national grid. The early records have either been confirmed from herbarium specimens, or are considered reliable because they were independently verified at the time, or were made by bryologists known to have been familiar with the species. However it remains possible that a few of the literature records accepted here may prove to be incorrect if herbarium vouchers can be traced.

## Extant sites and ecology

During 2005 and 2006 I conducted several field

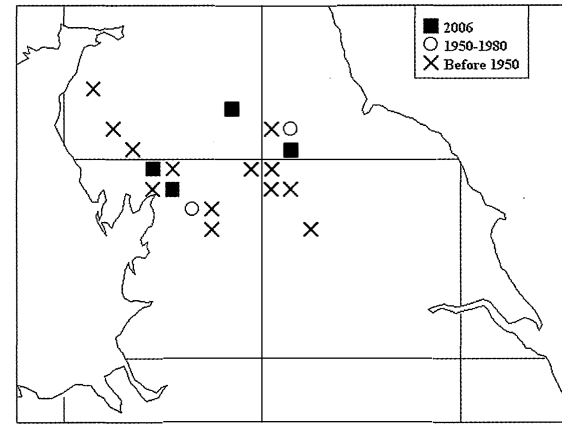


**Figure 4.** Distribution map of *Homomallium incurvatum* in the north of England (map produced using Dr Alan Morton's DMAP for Windows version 7.2a)

| Locality | Stone(s) in wall | Stone(s) on ground | Rock ledge |
|---|---|---|---|
| Barrowfield | 1 | 1 | |
| River Kent | 1 | 2 | |
| Whitcliffe | 1 | 3 | |
| High Force | | 1 | 1 |
| **Total** | **3** | **7** | **1** |

**Table 1.** Habitat niche occupied by *Homomallium incurvatum* at extant sites

surveys to search for *Homomallium* in and around its historical sites. Though initially frustrated by lack of knowledge of the precise ecological niche occupied by the species, these surveys eventually confirmed its continued presence at four of its historical sites. These are:

- Cumbria (Westmorland, v.-c. 69): on the banks of the River Kent near Sedgwick and Natland.
- Cumbria (Westmorland, v.-c. 69): near Barrowfield, below Scout Scar.
- N. Yorkshire (v.-c. 65): Whitcliffe Scar and Wood, Lower Swaledale. This site is in the Lower Swaledale Woods and Grasslands Site of Special Scientific Interest (SSSI).
- Durham (v.-c. 66): High Force, Teesdale. This site is in the Upper Teesdale SSSI.

Eleven discrete populations of *Homomallium incurvatum* were found at these sites. Table 1 summarises the substrate occupied by each of these populations. In the early stages of my field work, I concentrated my searches on large crags and boulders. In retrospect, however, this approach was somewhat misguided. As the table shows, the niche most commonly occupied by *H. incurvatum* is small stones at ground level, typically where ground vegetation is sparse. The stones colonised are commonly no more than c.30 cm in maximum width, often less. Both by the River Kent and at Barrowfield, the species occurs on piles of stones, probably of man-made origin. It also occurs on stones in walls, a habitat familiar to the early bryologists.

Figure 5 shows the general habitat of *Homomallium incurvatum* at the Whitcliffe site, and Figure 6 provides a closer view of one of the stones. Its presence on a rock ledge on a low crag at High

**Figure 5.** General habitat of *Homomallium incurvatum* at Whitcliffe Scar, Yorkshire (*Crataegus monogyna* at rear, *Fraxinus excelsior* right of centre). Photo: Tom L. Blockeel.

**Figure 6.** Closer view of stone covered by *Homomallium incurvatum* (with *Schistidium elegantulum*) at Whitcliffe Scar, Yorkshire. Scale: the penknife is 8cm long.. Photo: Tom L. Blockeel.

**Figure 7.** *Homomallium incurvatum* on a rock ledge at High Force (to left of penknife). Photo: Tom L. Blockeel.

Force (Figure 7) appears to be exceptional. At all of the sites the substrate is in shade, but field observations suggest that the species is intolerant of very low light levels. I often looked for *H. incurvatum* under the dark permanent shade of yew trees (*Taxus baccata*) but never found it there, although small stones are often plentiful on bare ground under these trees in limestone woodland.

*Homomallium incurvatum* occurs on basic substrates, though the rock is not always highly calcareous. None of the observed sites is wet or irrigated, and two of them are on south-facing slopes. However the ground is often sufficiently moist and sheltered to support *Allium ursinum*. The preference for small stones may be explained by the slender stature and prostrate growth form of the moss. Large boulders in limestone woodlands are usually covered in deep mats of robust, often bushy, pleurocarpous mosses. *H. incurvatum* appears to be intolerant of exposed sites. I did not observe it in niches subject to prolonged desiccation or insolation.

*Homomallium incurvatum* is commonly fertile, and sporophytes were present at all four localities. Although capsules regularly dehisce in summer, there was considerable and unexpected variation in the relative maturity of sporophytes observed both within and between the different sites.

The associates of *Homomallium incurvatum* include many common and widespread species of basic stones and rocks, including *Neckera complanata*, *Eurhynchium crassinervium*, *Rhynchostegium murale*, and ubiquitous species such as *Brachythecium rutabulum* and *Hypnum cupressiforme*. No particular pattern of association could be identified, nor was it accompanied by any nationally rare or scarce bryophyte. The most unusual associate was *Schistidium elegantulum* at Whitcliffe. Though this appears to be one of the less common segregates of the *S. apocarpum* complex in Britain, its distribution is still poorly known.

## Conclusions

The presence of *Homomallium incurvatum* at or near four of its former localities suggests that it has not undergone a catastrophic decline as previously feared. Local knowledge of its exact distribution and ecology was largely lost with the generation of bryologists who knew the species well, and its preferred habitat niche was not understood until the present survey was well advanced. It is very likely that it persists undetected at other former sites, including possibly some of those visited during the early stages of my field work. It is an easily overlooked species because, although it may occur in the vicinity of 'glamorous' botanical sites, it tends to occur in unexceptional places and is not associated with other rare bryophytes. It is also difficult to judge the former abundance of the species. A few of the older herbarium specimens are copious, but equally copious collections could have been made at the Whitcliffe site in 2006. The large number of specimens from Ingleton does not provide proof that the species was once abundant there, having been amassed over a period of some 150 years.

However, it is probable that some of the former habitats of *Homomallium* have undergone change. A few may be more overgrown than previously. The crags at Winston Bridge in Teesdale were found to be wooded, overgrown and rather heavily shaded, with extensive growth of *Hedera helix* in places. Loss of elm trees may have been a contributory factor. Several former records were from walls, a habitat unlikely to remain stable over prolonged periods. On the other hand, the presence of the species on walls at three of the newly discovered sites and its occurrence on piles of stones that are likely to be of man-made origin indicates that it has successful dispersal mechanisms, presumably by spores, and occasional disturbance or movement of stones may offer new habit for colonisation.

There is no hard evidence that *Homomallium incurvatum* has been affected by climate change at its English localities. In continental Europe the species occurs in places subject to harsher winters than Britain, but also hotter summers. The occurrence of relatively plentiful and healthy plants of the species at Whitcliffe and by the River Kent suggests that recent mild winters have not adversely affected its growth.

## Conservation

The extant populations of *Homomallium incurvatum* occur in or at the edge of mature woodland and are not actively threatened. However there are some potential risks:

- Disturbance to walls. The extant populations on walls appear to be small and isolated and are vulnerable to one-off events, *e.g.* dislodgement of stones or restoration work

- Excessive shading. Observations to date suggest that *H. incurvatum* does not survive in deep shade, and that some former sites may have become overgrown in recent years.

- Gross interference. While small-scale disturbance of stones has the potential to provide new habitat for colonisation, especially in the vicinity of extant sites, gross disturbance or even the loss of single stones from the wrong place could be catastrophic when populations are small.

## Acknowledgements

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