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A Summary Report Of Yorkshire Feather-Moss
Thamnobryum cataractarum Survey Work
In The Yorkshire Dales National Park 2005.

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A Summary Report Of Yorkshire Feather-Moss *Thamnobryum cataractarum* Survey Work In The Yorkshire Dales National Park 2005.

This is a summary of three reports commissioned by the Yorkshire Dales National Park Authority and undertaken by N.G. Hodgetts.

Yorkshire feather-moss (*Thamnobryum cataractarum*) - a baseline survey in Thornton and Twisleton Glens.

Yorkshire feather-moss (*Thamnobryum cataractarum*) - a survey of potential sites in the Yorkshire Dales

Yorkshire feather-moss (*Thamnobryum cataractarum*) - a monitoring methodology

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Introduction

Yorkshire Feather Moss *Thamnobryum cataractarum* is a very rare endemic moss discovered as recently as 1991 (Hodgetts & Blockeel 1992) and is known from a single site, which is in the Yorkshire Dales National Park. It has an Action Plan (UK Biodiversity Group 1999) as part of the UK Biodiversity Action Plan (UKBAP) and local Biodiversity Action Plan for the Yorkshire Dales National Park. It is considered *Vulnerable* in both the British bryophyte Red List (Church *et al.* 2001) and the European Red List (European Committee for the Conservation of Bryophytes 1995). Hodgetts (2005) outlined the existing information about *T. cataractarum*, including its status, ecology and known distribution.

Yorkshire feather-moss (*Thamnobryum cataractarum*) - a baseline survey in Thornton and Twisleton Glens.

The aim of this report is to provide a baseline survey for the single known population in Thornton and Twisleton Glens SSSI. Confusingly, the River Twiss runs through the western glen, which is variously called Thornton Glen or Swilla Glen, while the River Doe runs through the eastern glen, which is Twisleton Glen. Both rivers run in deep ravines through limestone and Ingletonian strata, with a series of spectacular waterfalls. The damp, shaded rock walls of the ravines are rich in bryophytes, including Atlantic species at their eastern limits of distribution. The site goes from acidic oak wood at the northern ends to more basic oak-ash wood at the southern end. There is a diverse structure with much regeneration, some open spaces and a black bog-rush (*Schoenus nigricans*) flush. The canopy is mainly of native trees, but sycamores are also frequent. There is a good diversity of ground flora.

Methods

Preparatory work consisted of collating existing data, which is described in Hodgetts (2005a). Thornton and Twisleton Glens SSSI was visited on 16-18 September 2005. The existing data, along with site maps, were used to relocate *T. cataractarum*. The water levels in the rivers were high, and many of the waterfalls were in spate, making fieldwork difficult. However, the bryophytes were sampled at a number of points along the length of the site, wherever the water's edge was safely accessible. Sampling consisted of recording the species present above and below the water level. The latter were sampled by reaching down and gathering small samples by hand. This sometimes necessitated wading. A GPS was used to pinpoint locations to a maximum accuracy of 5 m along with digital photography used to make a record of sites where appropriate.

All records were entered in the Recorder 2002 database. Bryophyte nomenclature follows Blockeel and Long (1998). Information on bryophyte status is taken from the latest revision of the Red List, which updates Church *et al.* (2001) and is published on the JNCC web site (www.jncc.gov.uk).

Results and Conclusions

T. cataractarum is frequent to locally abundant along an approximately 1 km stretch of the River Doe in Twisleton Glen. It was found at most points where the river was sufficiently accessible to be sampled, although fieldwork was severely hampered by high water levels and the river being in spate. This stretch of the river is essentially a ravine, which is often deep and dark, and much of it is inaccessible. The habitat of *T. cataractarum* is characterised by vertical or near-vertical rock faces at and close to water level, which are more or less densely covered with bryophytes. *T. cataractarum* is essentially an aquatic plant, growing mainly on vertical or very steeply sloping rock in a zone about 7-25 cm below the water level when the stream is at its summer flow. Most plants grow in a swiftly-flowing current. It appears to require a stable substrate and is probably a poor competitor in water that is not flowing rapidly.

It also occurs just below the water level, in waterfalls and to a lesser extent a little above the waterline. When well below the water level, *T. cataractarum* tends to occur in pure swards, forming a distinct zone, but can be difficult to detect because the leaves are often eroded away, leaving bare black stems. Above this zone is a zone composed mainly of *Cinclidotus fontinaloides* and *Rhynchostegium riparioides* with occasional *T. alopecurum*, then above this *T. alopecurum* becomes dominant just above the water's surface. *T. cataractarum* can occur in both these zones at a lower frequency. Other associates of *T. cataractarum* at and below the water level include *Amblystegium fluviatile*, *A. tenax*, *Brachythecium plumosum*, *Fissidens rufulus*, *F. crassipes*, *Palustriella commutata* var. *virescens* and *Rhynchostegiella teneriffae*.

It is very difficult to determine the population of *T. cataractarum* with any accuracy, since most of it is underwater, and large areas of the glen are to all intents and purposes inaccessible. In any case, it is clearly highly undesirable to work along the ravine pulling out chunks of vegetation to determine whether *T. cataractarum* is present or not, since this could potentially endanger a very rare plant. However, it appears to be frequent or locally abundant in this restricted length of river, since it was found at all but one of the points sampled between Beezleys and Quarry Wood, and there must be of the order of tens of

thousands of shoots. It is probably meaningless to talk about 'individuals', since shoots are linked by creeping primary stems, and many sub-populations are probably genetically identical. There does seem to be some variation in morphology between sub-populations (see comments under Site 5, above), but whether this has any genetic basis is unknown. It is not known to reproduce sexually. *T. cataractarum* was not found immediately above or below this rather restricted stretch of river, or in Thornton Glen.

The site itself is reasonably secure, as an SSSI and nature reserve/beauty spot in the Yorkshire Dales National Park, and also protected by the Ingleton Scenery Company. The main threat to the continued existence of *T. cataractarum* is probably water pollution. At the time of the survey the water quality appeared to be good, with only moderate growths of green algae, and a varied bryophyte cover, with several species tending to be dominant in patches or co-dominant at and near the waterline. Any increase in green algae or *Rhynchostegium riparioides* at the expense of the other bryophytes would probably indicate eutrophication (a deterioration in water quality). Ingleton Quarry is an active works, and the boundary between the quarry and Twisleton Glen is in places very thin. Any breach of this boundary could potentially threaten *T. cataractarum*, and indeed the site as a whole, through water pollution or physical disturbance. Water pollution could also enter the site from upstream, and a vigilant watch should be kept on any developments which might cause this. Visitor pressure at this site is very intense, particularly in summer, and this could pose a potential threat. Fortunately, *T. cataractarum* occurs well away from the areas where most people walk, so disturbance is probably minimal.

It is desirable that *T. cataractarum* should be taken into cultivation as part of the *ex situ* bryophyte conservation project currently underway at Kew Gardens in co-operation with English Nature, as a contingency against it disappearing from Twisleton Glen, and as a reservoir for possible future re-introduction. It would also be highly desirable to know more about the genetic variation (if any) of *T. cataractarum*.

Yorkshire feather-moss (*Thamnobryum cataractarum*) - a survey of potential sites in the Yorkshire Dales

Introduction

It was thought possible that *T. cataractarum* might occur at other nearby sites in the Yorkshire Dales, and this report gives details of a targeted survey of selected sites specifically to look for *T. cataractarum*.

Methods

T. cataractarum appears to be rather habitat-specific, being restricted in Twisleton Glen to fast-flowing water over Ingletonian strata. Further sites for survey were chosen according to a number of criteria, including geographical proximity to Twisleton Glen, presence of waterfalls and fast-flowing water, and presence of Ingletonian (or similar) geological strata as well as the Carboniferous limestone that dominates the Craven dales. Not every site surveyed had all these attributes, but at least two of the three attributes apply to every site. Sites were visited during September and October 2005. The water levels in the rivers were generally high, and many of the waterfalls were in spate, often making fieldwork difficult. Some parts of some sites were inaccessible, especially in deep ravines. Sketch maps and notes were made in the field. No attempt was made at a full survey for all species at any of the sites, as the survey was focused on trying to find *T. cataractarum*.

All records were entered in the Recorder 2002 database. Bryophyte nomenclature follows Blockeel and Long (1998). Information on bryophyte status is taken from the latest revision of the Red List, which updates Church *et al.* (2001) and is published on the JNCC web site (www.jncc.gov.uk).

Results and Conclusions

Thamnobryum cataractarum was not found at any site examined apart from Twisleton Glen (Hodgetts 2005b). In some ways this is not very surprising, as the genus *Thamnobryum* seems to be characterised by many rare species with extremely narrow distributions. For example, *T. angustifolium* is still known only from the site in Derbyshire where it was discovered in 1883 (Holt 1886), the related *T. fernandesii* is restricted to a very few sites on Madeira (Sérgio 1981), and other species show similar patterns in islands off the coast of South America. These species are not known in a fertile state, and must be regarded as relict populations of unknown origin. They simply stay in one place, unable to reproduce or disperse to any great extent.

However, the fact that *T. cataractarum* was not found elsewhere during this survey work cannot be taken as definitive evidence that it does not occur outside Twisleton Glen. It is a difficult plant to find (as evidenced by the fact that it remained undiscovered in a well-known bryological locality until 1991!), and could conceivably occur elsewhere, although that looks increasingly unlikely as more survey work is done. Meanwhile, this serves to re-emphasise the importance of Twisleton Glen as perhaps, or even probably, the only site in the world for this species.

Future work could include further survey at more sites in the Dales, but without any real expectation of finding *T. cataractarum*. It is just as likely that a bryologist working

elsewhere might turn it up by chance. However, it is considered most likely that *T. cataractarum* is a very narrow endemic that is genuinely confined to Twisleton Glen.

Yorkshire feather-moss (*Thamnobryum cataractarum*) - a monitoring methodology

Introduction

As *Thamnobryum cataractarum* N.G.Hodgetts & Blockeel (Yorkshire feather-moss) is a very rare endemic moss, known world-wide from a single locality at Twisleton Glen in the Yorkshire Dales, its conservation is a high priority. An important part of any conservation programme is monitoring. The purpose of this is to assess, on a regular basis, the performance of the population and thus to provide an early warning of any possible problems that may need to be addressed. The statutory conservation agencies have an obligation to report regularly on the state of their protected sites, and to facilitate this, the Joint Nature Conservation Committee has produced *Common Standards Monitoring Guidance* across the full breadth of habitats and species. Part of this is *Common Standards Monitoring Guidance for Bryophytes and Lichens* (www.jncc.gov.uk).

Methods

Thought was given throughout the fieldwork to how *T. cataractarum* might be monitored and, when fieldwork had been completed, the JNCC Common Standards Guidelines were used to produce a protocol tailored to this species at its one site.

Bryophyte nomenclature follows Blockeel and Long (1998).

A monitoring methodology for *T. cataractarum*

T. cataractarum was found at six sites in Twisleton Glen in 2005 (Hodgetts 2005b). These are more or less the same points where *T. cataractarum* was found during initial fieldwork in 1991 (Hodgetts 2005a). As well as *T. cataractarum* being present, they have the virtue of being relatively accessible. They are the places where monitoring should be concentrated, using the additional photographs and diagrams in the survey report (Hodgetts 2005b), since they can be regarded as a 'stratified sample', and representative of the population overall. No doubt *T. cataractarum* also occurs at numerous inaccessible places between these sites.

T. cataractarum is undoubtedly an exceptionally difficult species to monitor, for several reasons:

- it is essentially aquatic, so difficult to see, especially in conditions of high-water;
- shoots are usually denuded and difficult to identify;
- it grows in inaccessible and dangerous places;
- it is a very rare plant, and it is undesirable to pull shoots out to determine its presence.

Thus, regular and frequent *direct* monitoring of *T. cataractarum* is probably not a realistic option. However, monitoring guidelines produced by JNCC allow *indirect* monitoring, and this appears to be something that could be used with good effect for this plant. The concept of indirect monitoring has been pioneered by English Nature, and is incorporated into the JNCC Common Standards Guidelines. It is therefore now being used in

conjunction with more direct forms of monitoring to determine the quality of SSSIs countrywide. Indirect monitoring has the great advantage that it can potentially be done by non-specialists. This is especially useful for bryophyte monitoring, which would otherwise normally require a high level of specialist input.

It is sometimes questioned whether it is actually possible to monitor bryophytes effectively without some specialist input, and this must be addressed. Certainly, anything involving survey and identification of bryophytes can only be done effectively by a specialist. It normally takes at least several years to achieve any sort of expertise in bryology, and a large investment of time and effort, so good bryologists are thin on the ground. (The same applies to lichenology, and numerous other specialisms in natural history generally.) Thus, if every rare species and assemblage were to be monitored frequently and directly, there would be far too much work for the available expertise to cope with. Pragmatically, therefore, indirect methods must be used for frequent monitoring, but combined with expert input at longer time intervals. This is the model suggested for *T. cataractarum*.

Indirect monitoring

Indirect monitoring can take place at regular intervals (e.g. annually), and would consist of an appropriate person (e.g. site manager, local YDNPA or EN staff member) visiting the site with a copy of the baseline monitoring report (Hodgetts 2005b) and checking a number of 'tick boxes' for the status of certain attributes relevant to the 'feature of interest' (i.e. *T. cataractarum*). This could be done very quickly by someone familiar with the site and local issues.

Assessment of attributes can feasibly be undertaken at any time, but is much better if done at times of low flow. If any attribute fails, the feature (i.e. *T. cataractarum*) is not in a favourable condition.

It is important that the Environment Agency has some water quality monitoring in place upstream from Beezley Falls.

Direct monitoring

It is recommended that a specialist is employed at longer intervals to check that *T. cataractarum* is still present and healthy. This could take place once every ten years, for example, and would be a useful check on the efficacy of the more frequent indirect monitoring. It would (of necessity) entail a simple assessment of the presence/absence of *T. cataractarum* at known, accessible locations described previously (Hodgetts 2005b), and a record of the presence and abundance of associated species.

If possible, a specialist should also be brought in opportunistically during drought conditions, when a more thorough survey of the *T. cataractarum* population might be possible. This would be used to modify and improve the existing baseline survey (Hodgetts 2005b).

The British Bryological Society might be a useful resource for more frequent specialist direct monitoring, through the provision of voluntary 'moss wardens', with the proviso that specimens should be removed as little as possible, if at all.

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