The lowlife of a green hill

The diversity and dynamics of bryophytes on Shotover

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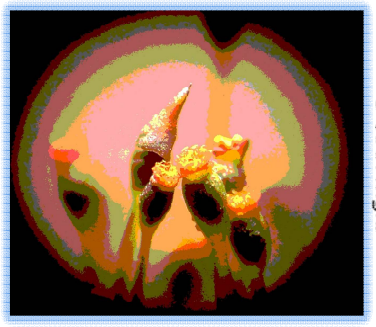


Good Morning. I'm glad to be giving today's presentation because although many of you will know that I 'do mossing' it may not be quite so obvious what that means in practice, or indeed, what bryophytes can tell you about a habitat; and it's a shame there are only a few managers who think about incorporating bryophytes into the management of their reserves. So I hope I can give you a brief insight into why I think mosses are a really important part of the ecology.

I think one of the biggest things about mosses is their small-ness !
And you'll probably agree when I say that, to most of us, moss is usually something we take for granted. But once you start looking at them close-up you begin to realise just how beautiful, and perfectly formed, these tiny plants really are!

So the first part of my presentation will be about the diversity of bryophytes on Shotover and in the second part we'll look at bryophyte dynamics - the cause and affect between our conservation work and bryophyte responses.

But first, in case anyone's not sure, mosses and liverworts (including hornworts) make up the bryophytes. Liverworts are simpler in structure than mosses and are generally found in the wetter habitats.



Bryophytes don't have flowers or seeds, but instead they have capsules containing spores which are dispersed on the wind. They also don't have roots or veins like vascular/herbaceous plants do, so they absorb their nutrients directly through their leaves from water, whether that's ground water, rainfall or any other kind of precipitation.

<u>Part 1: Bryophyte diversity on Shotover</u>

Just to set the scene with a bit of wider context: there are an estimated 22,000 species of bryophyte globally (compared to approximately 400,000 vascular plants), and just over 1000 species in the UK. In Oxfordshire there are some 400 species on record.

When I arrived with Shotover Wildlife in 1999 there were (to our knowledge)166 species already recorded. We've recorded 116 of these since 1999, leaving 50 species not refound. But we've found 14 new species. The recent total number of bryophyte species recorded is 130 and the all-time total to date is 180 (2013). This is a good level of diversity for a predominately acidic site like Shotover.

As I say, we've found 14 new species, and it's interesting to consider why this might be. So apart from the fact that someone is looking for them, we do have cleaner air now, especially with regards to sulphur dioxide, and I believe James Rainey will be touching on this after lunch (Dendrochronology); but bryophytes have definitely responded to this cleaner air. Old trees with alkaline bark are providing ideal conditions for calcicole species. Lastly, there are the ephemeral pioneers: these are the apparently-random, transient colonizers that come in when the opportunity arises but often don't hang around for very long.

Why have 50 bryophytes not been refound? There are 4 fairly clear-cut reasons for this:

1) The bogs we once had were drained in the 1800s, so we've lost all our bog species such as the Sphagnums.
2) We've lost all our open, wet-heath habitat and some the bryophytes that thrive on the bare soil: species in the families Grimmiales, Bryales and Pottiales.
3) Shotover has suffered a relentless degradation of its dead wood habitat which is continuing to the present day, and bryophytes we once had have gone, along with the removal of the timber.
4) Cattle grazing has been greatly reduced over the decades, along with the resulting piles of wet, rotting, dung which some specialist dung-loving bryophytes thrive on; so no longer do we have the wonderfully-named *Splachnum ampulaceum*!

It is interesting to note that a number of species that were thought to be extinct (Steel, D, Shotover The Natural History of a Royal Forest 1984. Publ. Pisces) have been re-discovered; so why did they return? Cleaner air is not only a reason for new arrivals, but also for the return of some species we previously once had. Then there's the provision of bare soil through our Acidic Grassland initiative which has provided for the return of some soil mosses - of which more in a moment. And not forgetting recorder effort. Many bryophytes are exceedingly small and can be easily overlooked (and need identification under a microscope), so who knows what might have been lurking there all the time but just wasn't found.



Orthotrichum stramineum

Shotover Wildlife has been running a Bryophyte Monitoring Programme for several years now, to keep tabs on how our scarcest and most vulnerable bryophytes are fairing and we've seen both gains and losses through this monitoring.

Shotover is a really good place for bryophyte diversity and it is the range of different habitats in close proximity that makes it so good. There are all our fine woodland trees for the species that like living bark – the epiphytes; also the many kilometres of ancient boundary banks for the species that don't like disturbance; there's not only the shady woodland but the open expanses of stable bare ground for the soil colonists; plenty of rotting tree stumps for the species that like an acidic substrate, the acidophiles; lots of streamlines and marshy areas for the wet-loving liverworts; various boulders and doggers around the hill for the saxicoles, the rock-loving mosses; and not forgetting daft people like me who are prepared to get wet and dirty identifying the plants! So a mixture of all sorts.



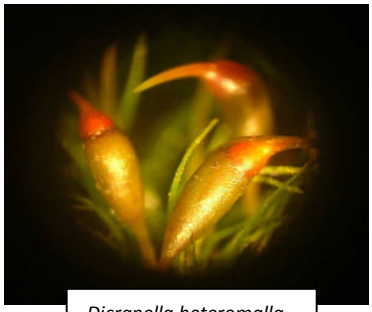
<u>Part 2: Bryophyte dynamics on Shotover</u>
This is about the relationship between conservation work and the responses of the mosses to that work.

I'd like to talk about bryophyte dynamics using the Acidic Grassland initiative that we carried out over 3 years from 2008 where we were restoring a total of 1 hectare (2 ½ acres) of monoculture bracken to acidic grassland, to enhance biological, structural and habitat diversity. We did this by scraping off the top soil to a depth of about 25cm in 6 separate areas on Horspath Common, Shotover.
This was to remove the fertile top layer and get down to nutrient-poor mineral layer beneath so that colonisation by higher plants would be as slow as possible. This in turn provides a long period of bare soil for other colonists to become established like lichens and fungi, and all the different invertebrate taxa.

And just look at this! After 6 years you can see just how slow the succession has been in all that time – abundant moss cover, still; and the herbaceous flora barely having got started. And it's the slowness of the successional process which is so vital in pump-priming the bottom of food chain. The developing micro-fauna really is strutting it's stuff amongst the mosses! If you go and have a look on a sunny day, you'll see it's fizzing with life.

And so we come to the all-important monitoring after the work is done, an essential part of any intervention. The Acidic Grassland initiative has demonstrated how important it is to monitor the biological results of your work, and I've just got time to show you 4 moss responses:

Dicranella heteromalla
Although this moss is among the most common and abundant colonizers of the soil scrapes, I just wanted to show it to you for its sheer beauty. The capsules are a quarter the size of a grain of rice! Stunning isn't it.



Dicranella heteromalla

Pleuridium acuminatum
This one is quite a different matter – it's over 30 years since this moss was last recorded on Shotover. It's a bare soil pioneer so will be lost once the soil becomes dominated by the stronger flora but it has had plenty of time to lay down its spores for future years. It is almost gone now but it has done its job and this is all part of the successional process at work.

Polytrichum piliferum
A scarce moss in Oxfordshire and noted by David Steel (Steel '84) as extinct on Shotover, it is an early colonizer of bare acidic soil and arrived with gusto soon after providing the conditions it needed. Although it is abundant at the moment, it will gradually disappear as its gap-filling nature is threatened by the encroachment of other mosses. All part of life!

Pogonatum nanum
This was one of the most exciting results for us. *Pogonatum nanum* reappeared after an absence of 200 years! It was last recorded from Shotover in the1800s, is rare in Oxfordshire, and in decline nationally. It was discovered during Shotover Wildlife's monitoring of the first soil scrape. It has already become difficult to find again because the successional process is gradually moving on and it is being crowded out by larger, stronger-growing mosses. Tiny, exquisite, and rare, its leaves are just 3mm long.

And so to conclude. I hope I've been able to show you that, not only can well-monitored conservation work turn up the most delightful surprises, but let us not forget the really important role that bryophytes play in the early stages of succession in pump priming the bottom of the food chain from which so much other fantastic wildlife can flourish! And *understanding* these processes is a really important part of conservation ecology.

Thank you.