THE HEATHER TRUST

Promoting Integrated Moorland Management

Heather Beetle

Heather beetles have been eating heather for thousands of years, but they were only identified as the cause of dead or damaged heather in the mid-nineteenth century. The Heather Trust believes that in many areas, heather beetle has been a driving force behind the conversion of heather moorland into white hill dominated by coarse grasses.

Despite heather beetle's potential for causing serious damage, there is still a great deal that we do not know about this threat to heather moorland. Outbreaks of heather beetle have occurred on a large scale since the advent of modern moorland management, but long-term economic damage is often confined to wetter moorland.

This Briefing explores the beetle's lifecycle, the timing and nature of the damage it causes and the available management options to restore lost or damaged heather.

The Heather Trust
Newtonrigg, Holywood, Dumfries, DG2 0RA
www.heathertrust.co.uk

Heather Beetle Lifecycle

Heather beetles *lochmaea suturalis* belong to a large and very widespread family of leaf beetles. Small, olive and unremarkable in appearance, adult heather beetles are approximately 6mm from end to end. There is one generation of beetles every year, and immature adults pass the winter hibernating either in *Sphagnum* moss, heather litter or up to 5cm deep in soil.

- Beetles emerge in spring to feed on heather when the day temperature reaches an average of 9°C
- Being weak on the wing, dispersing beetles seldom fly very far and they rely on the wind to help them travel. As a result, outbreaks will often spread downwind, and it is common to find beetle damage occurring in quite narrow swathes across the moor.
- Females become sexually mature towards the end of April and deposit up to 700 eggs in small groups on Sphagnum moss over a period of up to ten weeks.
- Eggs take 1 - 4 weeks to hatch, and the peak emergence of larvae is usually in early July.
- After hatching, the larvae climb up the heather plant and browse on the young shoots and leaves. Within six weeks – (i.e. about mid-August) - they are fully grown and drop off the heather, crawling into the soil and litter to pupate.
- Immature adults may start to emerge towards the end of August but are not abundant until late September. They hibernate when the average temperature falls below 9degC, so consequently there is not a great deal of activity in autumn.
- No stages are seriously affected by normal frost but high levels of humidity are required for eggs to hatch successfully. This explains why the first signs of an outbreak are often observed at the edges of *Sphagnum* beds and bog flushes.

Natural Control Mechanisms

Weather

A run of warm damp springs and early summers will provide suitable conditions for a large build-up of beetle numbers. The springs and summers of 1997, 1998 and 1999 provided such a run.

Cool, dry springs severely inhibit egg-laying and so put a brake on the spread of the beetle. The Heather Trust's heather beetle survey found that reported beetle damage in 2013 was considerably lower than previous years, and this may be due to a very late, harsh period of heavy snow which fell at the end of March.

Habitat

Sphagnum acutifolia (a species of moss) is alleged to be almost essential for the production of beetle larvae in large numbers. Its absence greatly reduces the production of larvae, but they can still be produced in numbers from heather litter, provided that it is damp enough.

Parasites & Predators

The main parasite and indeed the controlling factor on beetle populations is the small wasp *Asecodes* [*entodon*] *mento*, which lays its eggs in the beetle larvae. So effective is this wasp as a control mechanism that in the years when beetle breeding is inhibited by the weather (e.g. a cold, dry May), almost every larvum carries an immature wasp and the population of beetles crashes in consequence.

The ladybird *Coccinella hieroglyphica* preys on larvae, and several species of spider and ant will feed on heather beetles at various stages of their life cycle.

Recognising Signs of Heather Beetle

Before heather beetle had been studied in any detail, most damaged heather was attributed to cold conditions, and heather which was killed or affected, was described as having been “frosted”.

With the exception of some extreme examples, heather beetles are not always as obvious as you might expect. It is perfectly possible to suffer from extensive heather beetle damage and never see a heather beetle.

Extreme or unseasonal cold weather can have an effect on heather, turning it grey and brittle (these symptoms are similar because both frosting and beetles cause heather plants to lose water and become dehydrated) but frosting can be distinguished from beetle damage in the following ways:

• Heather plants which have been damaged by heather beetle have often been stripped of their leaves, leaving little more than naked red or grey stalks with tufts of surviving greenery here and there.

• Heather beetle outbreaks are spread with equal severity across areas of shelter and shade, making it impossible for cold weather to have had such a unilateral effect.

• Heather damaged by beetle turns a very distinctive fox red colour in the early autumn.

The Heather Trust
Newtonrigg, Holywood, Dumfries, DG2 0RA

www.heathertrust.co.uk

Vegetation Change & Management

There is a considerable amount of evidence to support the idea that the continuing spread of purple moor-grass *Molinia caerulea* is related not only to over-browsing of associated heather by sheep in winter but by episodic beetle outbreaks. Where soil conditions support vigorous growth of purple moor-grass, heather of any age loses its competitive edge if it is damaged or destroyed by beetle.

It is tempting to feel like fast action will assist in dealing with the sudden appearance of heather beetles, and traditional wisdom dictates suggests that the best way to deal with an outbreak is to burn it as soon as possible. Modern legislation means that this is not straightforward, and there are many factors to consider.

Even if burning could happen quickly, beetle larvae are sensitive to smoke and heat and often drop off the plants to avoid the flames. Many are killed and the effect can be very positive, but it must be balanced with the many disadvantages of burning out of season.

There is also a grave danger of fires damaging summer-dry soils as well as plant communities - as decades of bitter experience in the Peak District and North York Moors National Parks have shown.

If an outbreak occurs, the manager has no option but to grin and bear it. There is nothing he can do to stop it in its tracks, although there is much that can be done to restore the damage and prevent a recurrence.

Managing "Beetled" Heather

There are no definite rules for dealing with beetle damage within the legal burning season, and the situation can be extremely variable.

As a guideline:

• Damaged heather will usually recover rapidly if it is young, and moors which are well-burned never suffer as badly as those which carry a lot of old heather. Summer fires designed to control beetle directly are likely to do more harm than good and should never be used.

• It is a mistake to burn affected young heather in big fires merely to get rid of the dead grey twiggy top-growth. Following this course of action merely creates a big-fire pattern on the moor. In many cases, the correct thing to do is to strip this heather with fires as if no outbreak had occurred. It will soon recover. It may be necessary to spray off dead heather, burn it and reseed so that invasive grasses do not get a foothold. This will depend on the precise nature of the outbreak.

• If the heather is degenerate, then regeneration has to come from seed and burning becomes an essential strategy. However, although it may be tempting to try to get rid of all the litter and dead material, managers should still burn in a coarse strip pattern and so avoid denuding large areas.

• It is to be noted that heather which has been damaged by heather beetle can be very difficult to burn properly. Beetles have stripped the leaves, meaning that the fire can struggle to build up heat and move through the canopy of naked stems. This may slow the burning process, leave a large amount of litter unburnt at ground level and restrict the amount of burning days available. This should be considered when planning a burning regime after an outbreak of heather beetle.

• In several cases, cutting has been shown to be an effective means of managing heather after an outbreak of heather beetle, either used on its own or in tandem with burning to allow large areas of damaged heather to be broken up. Cutting can help to remove the dead canopy of heather litter, allowing regeneration to take place from stick or rootstock.

Heather Trust Research

The Heather Trust is leading way on research into heather beetle in Britain, running three projects which aim to help land managers gain access to the best and most up to date information relating to outbreaks and subsequent management techniques

The Peak District Heather Beetle Project

The Heather Trust identified two moors in the Derbyshire Peak District as sites for a scientific study into heather recovery after a beetle outbreak in 2012.

Monitoring is now underway to assess the impact of various management techniques on heather beetle damage, including cutting and burning. Some findings were published in 2015, and more information will come after further monitoring.

The results from this study will feed in to our understanding of beetle damage and its restoration, and we are frequently in contact with both estates and their neighbours in order to better understand this serious problem.

The Heather Trust received funding to carry out this project in 2012 and hopes to find other funding partners through its duration.

The Langholm Moor Heather Beetle Project

Langholm Moor suffered devastating damage from heather beetles during 2009 and 2010, just as the project was beginning to make progress. Over 1,000 Ha of heather was lost from the Southern end of the moor, spanning a huge area either side of the road between Langholm and Newcastleton. Fortunately, ease of access allowed for much of the damage to be reached with machinery, and a combination of burning, cutting and subsequent spraying to control invasive grasses has set much of this south end on the road to recovery.

The Demonstration Project is funded by a partnership of SNH, GWCT, Buccleugh Estates and the RSPB, but separate work was commissioned by the Heather Trust to monitor the heather's recovery on three different sites at the south end of the moor where the beetle damage was most devastating.

The Heather Trust's Beetle Survey

The Heather Trust runs an annual survey to gather information about heather beetle outbreaks and raise awareness about the problem.

The first survey forms were returned in 2006, meaning that we now have detailed and accurate information on beetle attacks which have taken place over nine years, from Cornwall to Caithness. The results not only allow us to keep an eye on the beetle situation across the country, but they also allow us to plot individual outbreaks on a map and thereby start to pull together patterns and trends behind beetle movements.

Our survey findings reinforce the anecdotal notion that damaged heather is often lost altogether if there is no treatment to remedy it, and while this valuable store of information has not yet been formally analysed, several patterns have become obvious.

The Heather Trust
Newtonrigg, Holywood, Dumfries, DG2 0RA

www.heathertrust.co.uk

The Heather Trust has been exploring the changing face of heather management for many years and we have uncovered a huge amount of information.

We are continuing to explore several themes discussed in this document in more detail, particularly relating to issues where cutting and burning complement one another to optimise habitat management. We will publish further Members' Briefings in due course.

We would be very pleased to hear from moorland managers who wish to share information relating to their management of heather.

For more information on heather beetle, visit the Trust's website, and remember to fill in the survey form to let us know about beetle damage.

Also, for the latest Natural England review into heather beetle research, see http://publications.naturalengland.org.uk/category/4993022171283456

THE HEATHER TRUST

Promoting Integrated Moorland Management

This is one of a series of guides put together by the Heather Trust to provide an overview on a range of topics that are relevant to people with an interest in the management of moorland.

Free for download from the Heather Trust website

The Heather Trust
Newtonrigg, Holywood, Dumfries, DG2 0RA

www.heathertrust.co.uk