THE HEATHER TRUST
Promoting Integrated Moorland Management

Heather Beetle Outbreaks

Figure 1 Adult Heather Beetle

Although beetle outbreaks have occurred at regular intervals since the pest was first recognised in 1853, moor owners, keepers and farmers are often at something of a loss to know what to do about this plague when it strikes.

The Life Cycle

There is one generation of beetles per annum. Winter is passed by the immature adults in hibernation in *Sphagnum* moss, heather litter or up to 5cm [2"] deep in soil.

Beetles emerge in spring to feed on heather when the day temperature reaches 9^{o}C. They are very poor fliers and they cannot make serious headway against wind, which disperses them. The spread of the adults is largely a matter of chance, and consequently it is common to find outbreaks occurring in sometimes 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, they climb up the heather plant and browse on the young shoots and leaves. After about six weeks - *i.e.* about mid-August - the larvae are full grown and drop off the heather and crawl 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 maximum temperature falls below 9^{o}C so 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, which

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explains why the first signs of an outbreak are nearly always observed at the edges of *Sphagnum* beds and bog flushes.

Factors that control heather beetle numbers

a. Weather

A run of warm damp springs and early summers provide suitable conditions for a build-up. 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.

b. Habitat

Sphagnum acutifolia 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 it is damp enough.

c. Parasites

The ladybird *Coccinella hieroglyphica* preys on larvae. An adult will eat a beetle larvum per day and its larvae as many as 2. However, the main parasite and indeed the controlling factor on beetle populations is a small parasitic wasp *Asecodes [Entodon] mento,* which lays its eggs in the beetle larvae. So effective is it 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.

Factors that predispose heather to damage by beetle

All age classes of heather can be affected, and in serious outbreaks whole swards covering sometimes hundreds - even thousands of acres, show the tell-tale foxy red colouration in late summer, together with the bitten and ragged appearance of the shoots which grew that year.

Although the moor can appear devastated after such an outbreak, recovery can often be rapid and complete - provided the heather is not degenerate**.** Pioneer, building and mature heather will usually shrug off the effects of an outbreak within two or three years, but degenerate heather may be killed completely.

Managers have to balance up the desirability of wet flushes and *sphagnum*-filled sheep drains [grips] which may provide abundant insects for grouse and other moorland birds against the risks that such sites provide the initial focus for an outbreak.

Vegetation changes following beetle outbreaks

There is a considerable amount of evidence to support the idea that the continuing spread of *Molinia* grass is related not only to over-browsing of associated heather by sheep in winter but by episodic beetle outbreaks. Where soil conditions support vigorous *Molinia*, heather of whatever age loses its competitive edge if it is damaged or destroyed by beetle. Because *Molinia* supports large numbers of voles, vegetation changes of this kind may be significant in terms of hen harrier ecology.

Where does this leave the manager?

Direct control of the beetle is not a practical option. There is no selective insecticide spray, which would be effective, permitted or desirable to use on heather moorland.

The legal position on out-of-season burning in Scotland differs from England. In Scotland, there is no mechanism that can be used to obtain permission to burn outwith the statutory period laid down in primary legislation.

In England, people have sought permission to burn beetled heather out-of-season and on the face of it, this is an attractive option. However, permission has to be granted by DEFRA and the consequential time-delay from the discovery of the outbreak to the granting of a licence [assuming DEFRA decided that it was appropriate to do so] would mean that the vulnerable larvae would have pupated by the time the consent was granted, and so would be out of reach of the fire. In addition, even if the operation could be done quickly, beetle larvae are sensitive to smoke and heat and would immediately drop off the plants and burrow into the litter. Although some would be killed, the majority would survive.

There is another aspect of out-of-season burning which is important. There is 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. Summer fires designed to control beetle are therefore likely to do more harm than good and should never be used.

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 prevent a recurrence.

The Treatment of "Beetled" Heather

Affected heather will 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. It is a mistake to burn affected young heather in big fires merely to get rid of the dead grey sticky top-growth. Following this course of action merely creates a big-fire pattern on the moor. The correct thing to do is to strip this heather with fires in the same way as would be done if no outbreak had occurred. It will soon recover.

If the heather is degenerate, then regeneration has to come from seed and burning becomes an essential strategy. However, although it may be desired 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.

The manager should take an objective look at the wetness of the moor and consider doing some judicious draining if environmental criteria can be satisfied.

Figure 2 Heather Beetle Grubs

Summary

- Outbreaks of heather beetle have occurred at regular intervals for at least 150 years;
- Long-term economic damage is normally confined to boggy moorland;
- Beetle eggs require a humid environment for successful development;
- Biological control is highly effective;
- Chemical control is environmentally unacceptable;
- Good heather management makes the plant less susceptible to permanent beetle damage;
- Drainage to reduce excessive *Sphagnum* moss is desirable as long as it does not also destroy the bog flushes on which other wildlife depends;
- Over decades, repeated beetle outbreaks on poorly drained mineral soils coupled with undergrazing in summer and over-browsing in winter [by sheep and deer] are probably responsible for the steady replacement of heather by *Molinia*;
- In years when beetle outbreaks occur, the carrying capacity of the moor for grouse, deer and sheep is reduced. Managers should take steps to shoot the game species hard and reduce the sheep/days per hectare on the hill in winter to reduce the browsing impact on the remaining heather.

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