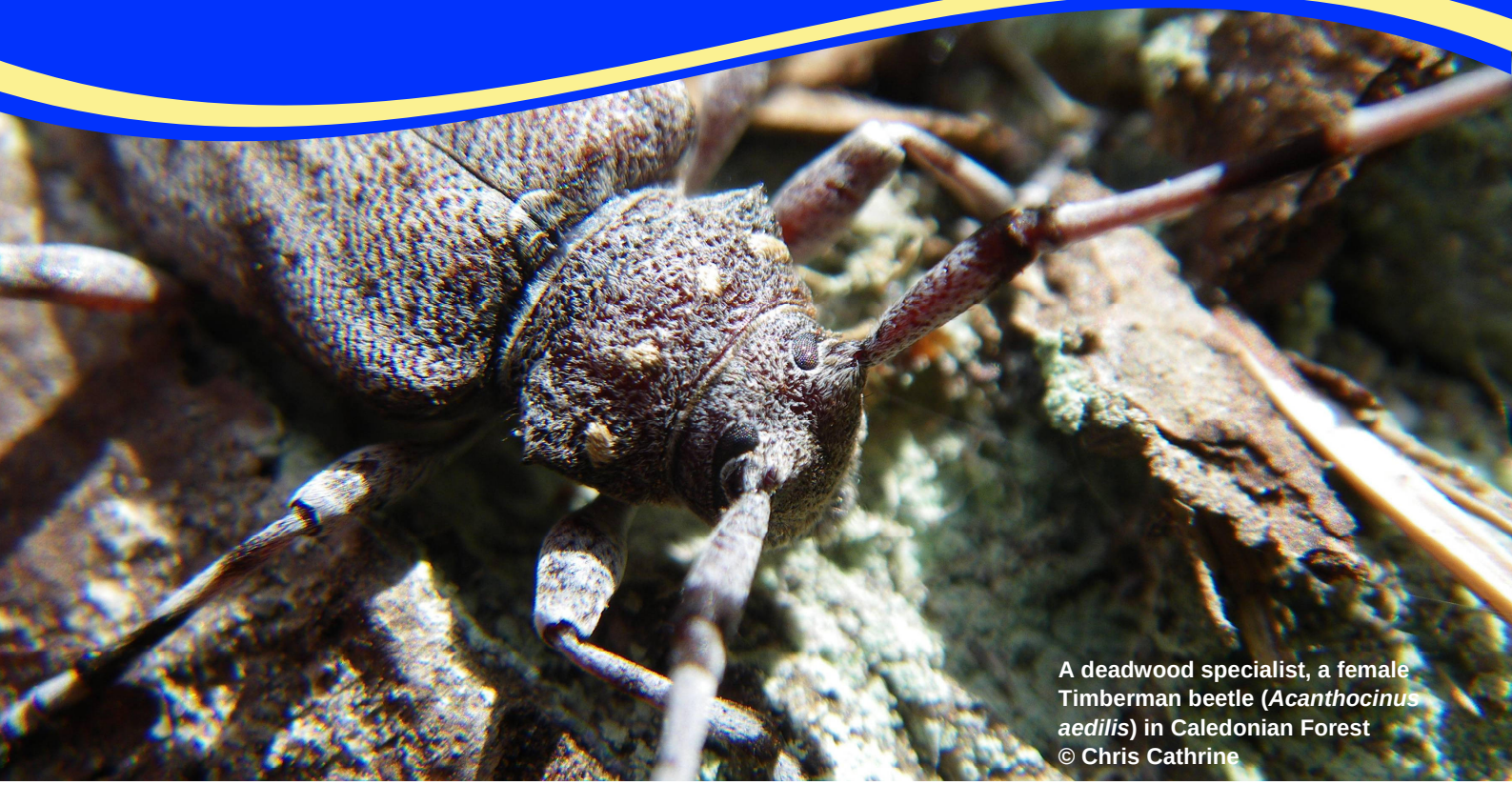
SCOTTISH INVERTEBRATE HABITAT MANAGEMENT

Deadwood



A deadwood specialist, a female Timberman beetle (*Acanthocinus aedilis*) in Caledonian Forest
© Chris Cathrine

Introduction

Deadwood plays a key role in ecosystem functioning and productivity in terrestrial and riparian habitats. It provides habitat for many species of bryophytes, lichens, fungi, invertebrates, fish, amphibians, reptiles, birds and mammals. Despite this essential role, deadwood has been removed from woodland ecosystems by humans for thousands of years.

Deadwood is often viewed simplistically as standing snags or fallen dead tree material and logs. In fact, there is a huge range of deadwood micro-habitats that may be found within these categories, as well as on living trees – in particular, veteran trees provide many important deadwood habitats. Dry rot holes, wet rot holes, rotting heart wood and decaying sap under bark are all examples of deadwood micro-habitats. In addition to these terrestrial habitats, deadwood that is fully or partially submerged in water provide essential micro-habitats for a variety of fish and freshwater invertebrates.

Deadwood habitats directly support a great many specialist species – known as 'saproxylic' organisms. The majority of saproxylic invertebrates are micro-habitat specific, and not tree species specific, although many of these are threatened through loss of habitat. Those species specialising both in micro-habitat and tree species are at particular risk, however, such as the aspen hoverfly (*Hammerschmidtia ferruginea*) and the pine hoverfly (*Blera fallax*), both of which are included in the Scottish Natural Heritage Species Action Framework.

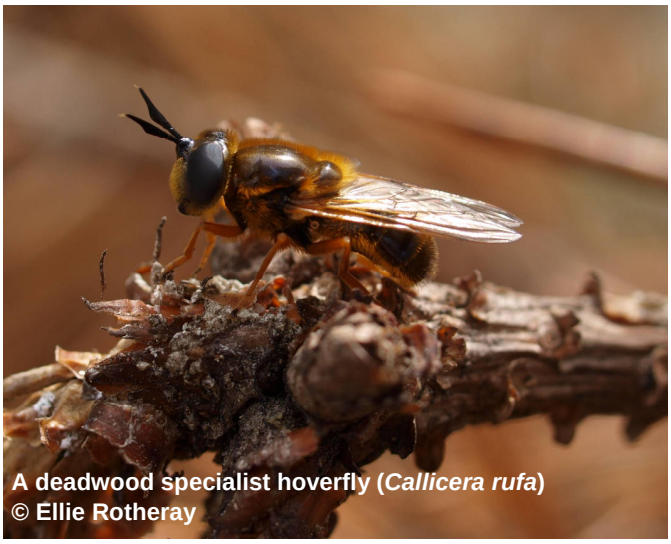
As well as providing direct ecosystem services through nutrient cycling, soil creation and food for other animals, saproxylic invertebrates create new habitats within deadwood, and their bodies themselves also provide habitats for other animals, such as parasitoid wasps, including the Sabre wasp (*Rhyssa persuasoria*) which lays its eggs within the larvae of wood wasps and longhorn beetles that live within fallen deadwood.

Overall, it has been estimated that 13% of all species of plants and animals known in the UK are directly dependent on deadwood habitats, while many more are dependent upon the saproxylic organisms themselves, making deadwood an important focus for conservation management (Antrobus *et al.* 2005).

Threats

Removal

Deadwood may be removed for a variety of reasons. In the past, it was used as fuel and for raw material for constructing shelter and tools. It is now sometimes removed in the largely mistaken belief that it will prevent the spread of fungal or insect-borne disease in commercial woodland, in response to a perceived threat to public safety, or to meet public expectations of 'tidiness' in woodlands.



A deadwood specialist hoverfly (*Callicera rufa*) © Ellie Rotheray

Uniform age structure

Modern forest practices tend to involve stands of species of uniform age. There are also many aforestation projects aiming to restore areas of semi-natural woodland. However, by these projects also often involve planting trees of the same age at a site, and may not supplement these with new planting rounds in the future. This means that these woodlands do not have a natural varied age structure, and lack the progressive input of new deadwood material or veteran trees found in a more natural woodland environment.

Uniform species structure

Modern forest practices tend to involve single species stands—often consisting of exotic conifers, which support relatively few saproxylic species. This means that deadwood in these areas is not provided by a variety of tree species. This limits the diversity of saproxylic species, and means that those specialising in deadwood from one species of tree are unlikely to occur.

Harvesting

Commercial forestry practices involve harvesting trees before they reach full maturity, prevent natural input of deadwood or the establishment of veteran trees. While forest management good practice involves the creation of deadwood, available guidance does not normally address the need for continued regular input of new material, and so does not create habitat that can support sustainable saproxylic populations.

Loss of traditional woodland management

Traditional woodland management practices such as coppicing and pollarding can increase the life expectancy of a tree, improve stability, and create deadwood habitats. These trees are also more likely to become veterans. Unfortunately, these traditional woodland management techniques are now rarely practiced in the UK, and the skills are being lost.

Car parking

Car parking around the base of veteran trees in fields and parkland can compact soil and cause erosion. These trees may then become unstable and fall. It is furthermore likely that they will then be removed for health and safety or to provide more space in the car park.

Livestock

Livestock can cause compaction and erosion through poaching of ground at the base of veteran trees, destabilising these. They may then fall.

Erosion

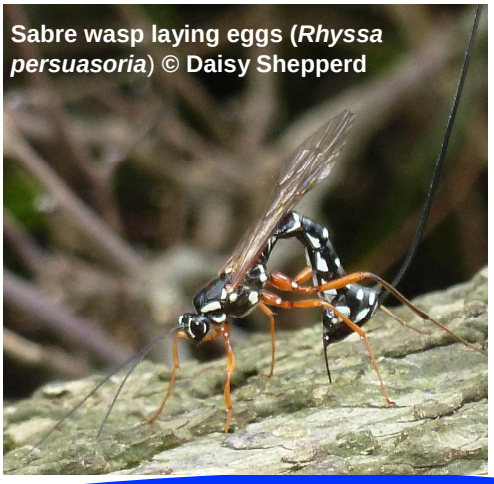
Erosion around the base of veteran trees can result in the tree becoming unstable and falling.

Fertilisers

The application of fertilisers and lime to increase stock grazing productivity can modify the ecology to the detriment of veteran trees and saproxylic species.

Pesticides

Pesticides can damage trees, be absorbed by deadwood and kill the saproxylic species present.



Sabre wasp laying eggs (*Rhyssa persuasoria*) © Daisy Shepperd

Habitat management

Leave naturally occurring deadwood in situ

When deadwood occurs naturally, this should be left in situ where it is found (including within freshwater habitats). If this conflicts with other landuse (e.g. restricts access or presents health and safety risk in amenity woodland), fallen dead should be moved only as far as is absolutely necessary. If necessary, log piles may be created. See 'Create new logpiles' section.

Standing dead should be left if at all possible—if it presents a health and safety hazard it may be possible to secure it safely in a standing position.

Aim for natural average deadwood density

When developing a woodland management plan, it should aim for as close to a semi-natural volume of deadwood for that type of woodland (e.g. 60 – 100m^3 ha^{-1} would be ideal for boreal forests, while levels in excess of 200 m^3 ha^{-1} should be aimed for in broadleaf forest). However, any deadwood is better than none. Methods for estimating deadwood densities can be found in Kirby *et al.* (1998) and *Forestry Commission Operations Note 15: Deadwood*.

Aim for natural rate of input of new deadwood

When developing a woodland management plan, it should aim for a regular input of new deadwood material each year, at as close to a natural rate of input as possible. For example, one study of near natural boreal forests, dominated by Scots pine, estimated the annual input rate of new dead wood as 1.4m^3 ha^{-1} yr^{-1}.

A longhorn beetle larvae in deadwood
© Chris Cathrine

Create new standing dead

Standing dead can be created in a number of ways, including cutting branches and topping trees (e.g. using pole saw or harvester) and ring barking of branches or trees. Explosives may also be used to top trees, but it is important to use specialist trained contractors and to fully consider public affairs, and the serious health and safety implications of this method.

A variety of tree species should be used.

Create new fallen dead

Fallen dead can be created in a number of ways, including cutting trees (near ground level or leaving higher stumps to provide standing dead) or pulling them over (e.g. using tirfor winch or vehicle mounted winch).

A variety of tree species should be used.

Create new rot holes & crevices

Intentionally damage living trees to encourage formation of rot holes and crevices. Pollarding and coppicing may encourage the creation of rot holes and crevices within living trees.

Create new logpiles

Logpiles can be created where deadwood must be moved for various reasons. These logpiles should be created in shaded, open, wet and dry areas to provide a habitat suitable for a variety of different species.

Encourage veteran trees

Veteran trees provide a variety of important deadwood micro-habitats while still alive. It is therefore important to safeguard existing veteran trees and encourage new ones. Existing veteran trees should be identified and new trees selected. Soil surrounding selected trees should be protected from compaction and erosion (e.g. through livestock trampling or car parking) and ground water level changes. Fertilisers, pesticides and ploughing must be avoided. A range of veteran tree species is important. Birch can provide veteran trees faster than other species, and can therefore provide a 'quick fix' for the interim, while other species slowly mature. Pollarding may increase the life of a tree, and also encourage the creation of deadwood habitats within the living tree. Tree Protection Orders can be a useful tool for protecting veteran trees.

Aim for natural age structure

Ultimately, the ideal aim for deadwood management would be to manage a woodland so that a natural age structure is achieved. The woodland would then provide a regular input of new deadwood material naturally, and sustainably. In reality, it is likely that other uses (e.g. amenity, commercial timber production etc.) will mean this is not appropriate for all sites.

Aim for natural species diversity

Ultimately, the ideal aim for deadwood management would be to manage a woodland so that a natural diversity of species is achieved. The woodland would then provide deadwood material from different tree species naturally, and sustainably. In reality, it is likely that other uses will mean this is not appropriate for all sites.

Further information

Scotland Rural Development Programme: http://www.scotland.gov.uk/Topics/farmingrural/SRDP

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ISI Initiative for Scottish Invertebrates

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Scottish Natural Heritage
All of nature for all of Scotland

This document should be referenced as:

Buglife. 2011. *Scottish Invertebrate Habitat Management: Deadwood*. Buglife – The Invertebrate Conservation Trust.

This habitat management factsheet was produced as part of the 'Action for Scottish Invertebrates' project. This project is grant-aided by Scottish Natural Heritage and delivered on behalf of the Initiative for Scottish Invertebrates (ISI) by Buglife – The Invertebrate Conservation Trust.