Saproxylic Invertebrates:

Ecology and management of wood-decay habitats

BACK FROM THE BRINK

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What are saproxylic invertebrates?

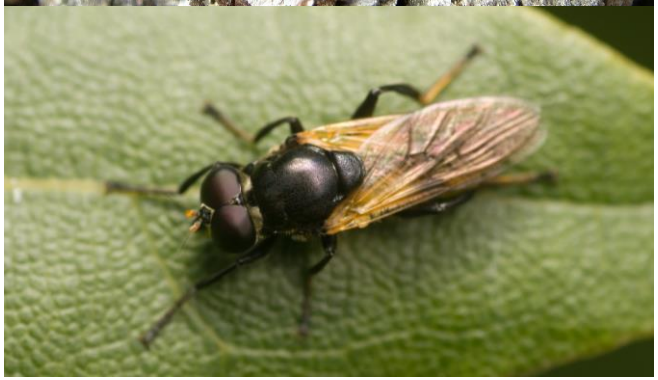
- *sapros* = decayed; *xylon* = wood (in Greek).
- "species dependent upon **dead or decaying wood** at some stage of their lifecycle, or upon **wood-inhabiting fungi** or **other saproxylics**"
- Also includes bark-associated species.
- **Around 2,000 invertebrate species in the UK** are dependent upon dead or decaying wood in one form or another.
- This includes some of our **rarest and most threatened invertebrates**.

Tanner Beetle (*Prionus coriarius*) in New Forest © Steven Falk

What are saproxylic invertebrates?

- This means **over 2000 different life styles**, with each species having precise requirements.
- This includes: detritivores, fungivores, predators, scavengers, parasitoids, and various types of symbiosis.
- **Beetles** (~700 species) and **flies** (~750 species) support the greatest no. of saproxylic species in the UK.
- But also an **assortment of other insects** (such as moths, bugs, thrips, bees, wasps and ants) **and non-insects** (such as spiders, mites, pseudoscorpions and nematodes) inhabit dead and decaying wood.

Stag Beetle's © Steven Falk



Myolepta © Will George

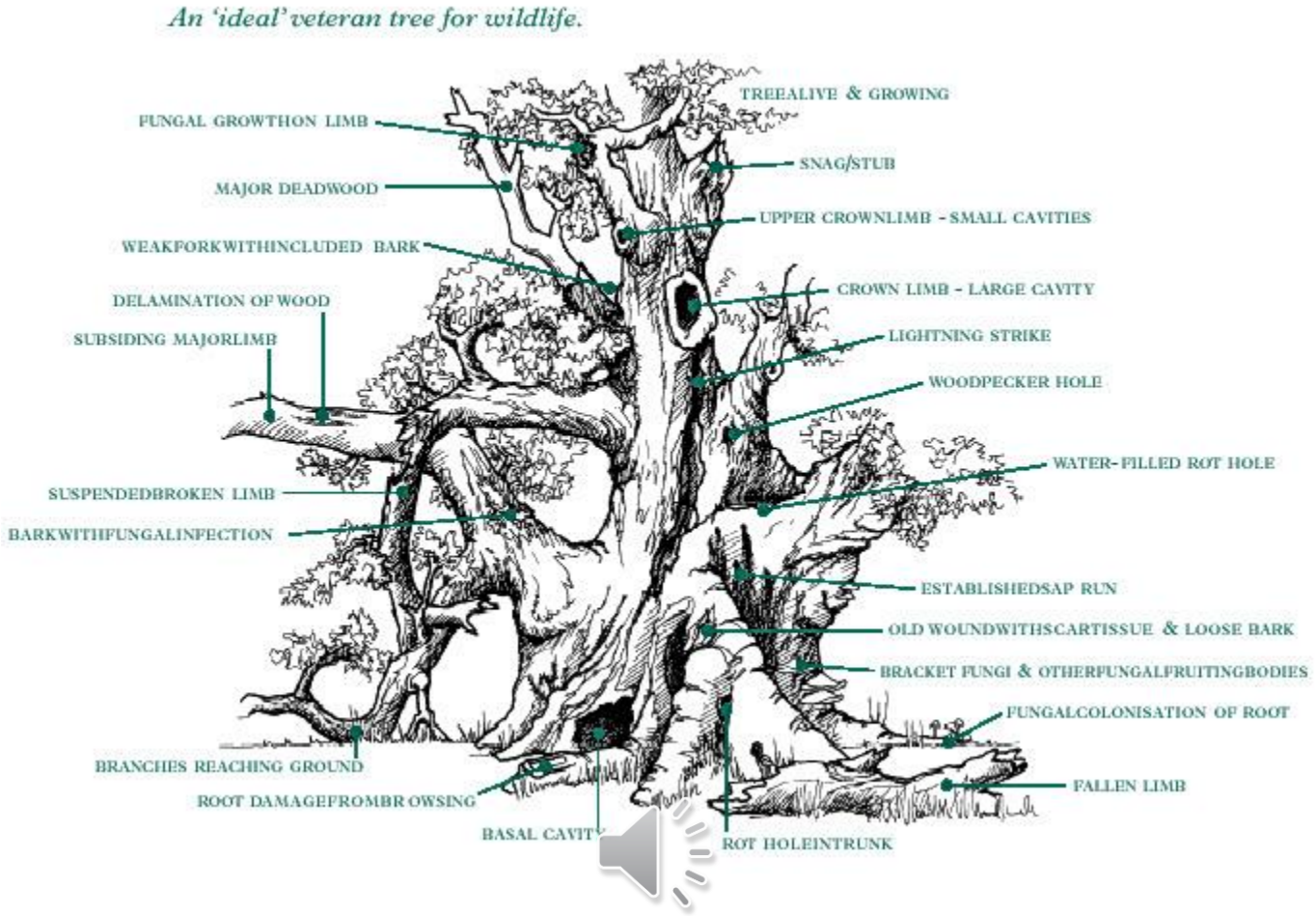
A large number of invertebrates (and vertebrates) live in dead and decaying trees but do not use them for their nourishment.

- **The living tree is most important**, for it is the living tissues that generate the wood which will ultimately decay.

- Important features of a living tree include:

→ **Heart rot** (brown- and white-rot decay).
→ **Wood mould** (i.e. mixture of decaying wood, litter and fungal hyphae) at base of hollow trunks/stumps.
→ **Dead attached limbs** (e.g. stag-horned trees).
→ **Cavities** of assorted sizes.
→ **Rot-holes** (water-filled or dry).
→ **Sap runs** and slime fluxes.
→ **Aging** (thickened/old), **flaking or loose bark**.
→ **Associated fungi** (e.g. bracket fungi). → **Decaying underground roots**.
→ **Woodpecker holes**.

An ‘ideal’ veteran tree for wildlife – In: Read, H. 2000. *Veteran Trees: A Guide to Good Management*. English Nature, Peterborough.



Heartwood decay

- The single most important wood-decay resource for invertebrates is a large standing living tree with **columns of decay in the heartwood** (or ripewood).

- **Most saproxylic invertebrates rely on fungi and/or micro-organisms** to break-down the components of wood into more digestible materials, or feed on these directly/indirectly.

- Heartwood-rotting fungi are **keystone species** – a large number of other species are completely dependent on the conditions which they create.

- White-rotted heartwood and brown-rotted heartwood (also known as red rot) support quite different faunas.

© Andrew Skinner

Cosnard's Net-winged Beetle
(*Erotides cosnardi*)

- Endangered (RDB1) and globally rare species.
- Only two known populations in Britain – Wye Valley and West Sussex Downs.
- Larvae develop in cavities within white-rotten heartwood of ancient beech *Fagus* trees.

Oak Click Beetle
(*Lacon querceus*)

- Endangered (RDB1) species.
- Known only from Windsor Forest in Britain.
- Develops exclusively in red-rotten Oak *Quercus* trunks and main boughs.
- Its larvae prey on the larvae of the Hairy Fungus Beetle (*Mycetophagus piceus*), which feeds directly on the mycelium of the Chicken-of-the-woods Fungus (*Laetiporus sulphurous*) deep inside the decaying trunk.

Wood mould

- Both white rot and brown rot ultimately decay and compost into soil-like wood mould. This is the **end product of trunk and bough hollowing by fungi**.
- This accumulates in the bottom of the cavities hollowed out within the tree and is **the rarest of the wood decay habitats**.
- Trees must be sufficiently old to develop enough dead wood, and sufficient time passed for the fungi to decay this wood and the products to be composted.
- **Wood mould supports some of Britain's rarest insects** that develop in this medium of relatively constant temperature and humidity.

Royal Splinter Cranefly
(*Gnophomyia elsneri*)

Only known globally from Windsor Forest and a site in Slovakia. Develops in porridge-like wet wood mould in hollow beech or beech stumps.

Violet Click Beetle
(*Limoniscus violaceus*)

- Endangered (RDB1) species.
- It is only known from Windsor Forest and two areas of the north Cotswold wood-pastures.
- Believed to be one of the final specialist wood-decay invertebrate species to colonise a tree.
- It's larvae develop in wood and leaf mould in base of hollow Beech *Fagus* and Ash *Fraxinus* trees where they are predatory on other invertebrates.

Rot holes

- Smaller cavities in the trunk and in the branches in which debris and rainwater accumulates and composts. As they are often open to the elements, they **offer different conditions** to those found in the centre of the main trunk.

- Often **develop as a consequence of branch damage** providing access for heart-rot fungi and become enlarged through the combined action of heart-rot fungi, invertebrates and physical break-down of the decaying wood.

- Particularly favoured for their moister conditions by flies such as hoverflies (Syrphidae), moth flies (Psychodidae), wood gnats (Mycetobiidae), long-legged flies (Dolichopodidae), and others. These will have varied life styles.

Pocota personata & Rot holes in an old Sycamore © Steven Falk

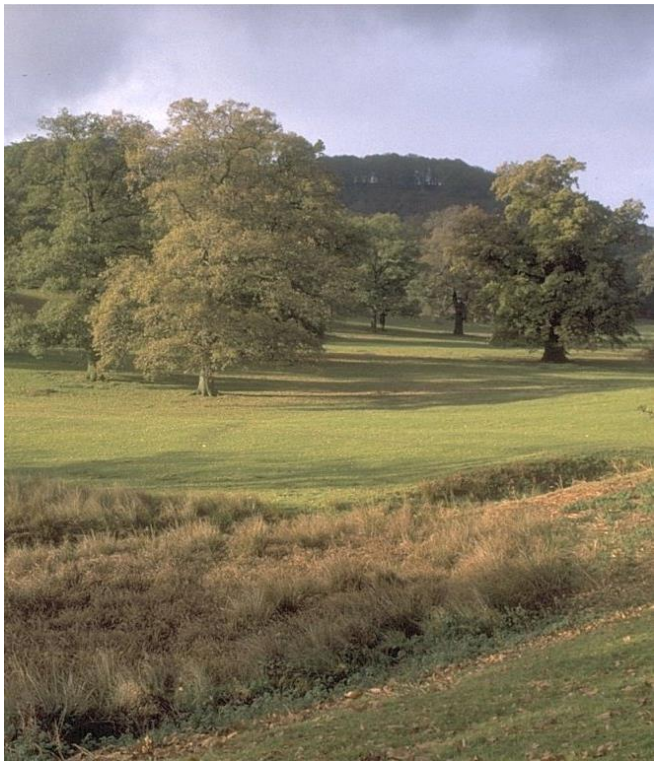
Why conserve saproxylic invertebrates?

- They are among **the most threatened invertebrates in Europe**!
- Some species are so specific in their habitat requirements and so dependent on centuries of continuity of such trees in the same locality, that they can be used as **good indicators of habitat quality and continuity**.
- By breaking down dead wood, they help to **free-up nutrients and minerals** locked up in the wood, once-again making them available to the tree.

© Udo Schmidt

What do saproxylic invertebrates need?

- Require a **diverse age structure** of living woody plants in order to ensure continuity of wood-decay habitats (most critical factor for long-term persistence of saproxylic invertebrates).
- Need **sufficient no. of trees** to maintain viable invertebrate populations.
- Many require **open-grown trees**, however some favour the more humid conditions found in dense areas of trees.
- **Connectivity is important** – saproxylic invertebrates are often poor dispersers (have evolved with a stable habitat that doesn't move).

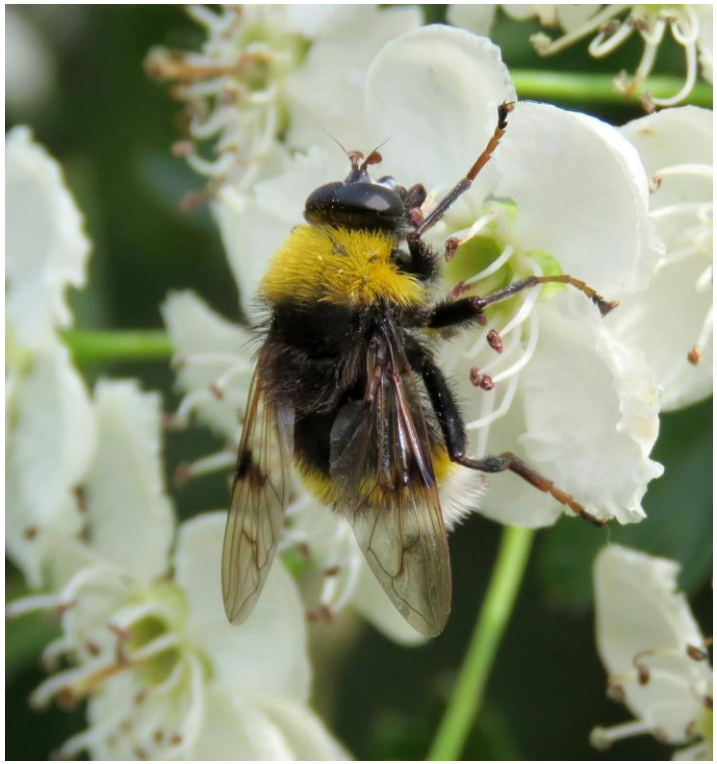


What do saproxylic invertebrates need?

- Many saproxylic insects need nectar and pollen as adults so **access to blossom is important** – nectar provides an energy-rich food, while pollen provides protein-rich food which aids egg production.

- Flowering trees and shrubs are by far the most important sources, although other plants can also be very popular.

- e.g. Hawthorn, Sallow, Holly, Privet, Rowan, Crab apple, Wild pear, Guelder rose, Bramble, Hogweed and Angelica.



© Steven Falk

Tree management for saproxylic invertebrates

- Require a **diverse age structure** of living woody plants in order to ensure continuity of wood-decay habitats (most critical factor for long-term persistence of saproxylic invertebrates). → Ensure a supply of both young and mature trees to provide future veterans. Retain trees showing decay features and do nothing to damage those features.

- Need **sufficient no. of trees** to maintain viable invertebrate populations. → Maintain as many veteran trees as possible, allowing these to age and die naturally, but continue any long-established pollarding.

- Many require **open-grown trees**, however some favour the more humid conditions found in dense areas of trees. → Encourage open grown trees, which develop larger butts and trunks and have more heart wood decay at an earlier age than woodland trees.

- **Connectivity is important** – saproxylic invertebrates are often poor dispersers (have evolved with a stable habitat that doesn't move). → Reduce site fragmentation by promoting future veterans on land in between existing site. This can be via tree planting or encouraging natural regeneration.

Tree management for saproxylic invertebrates

- **Keep as much dead wood on site as possible** (preferably all of it). Ensure that dead wood is allowed to lie / stand in a variety of conditions, ranging from very humid and shaded, to partially shaded or fully exposed to sunshine.

- Do not carry out management work on all the trees at the same time.

- **Retain the same tree species composition** on the site when planting younger trees and encouraging the regeneration.

- NB. Avoid removing veteran, exotic trees as they can sometimes support the same valuable microhabitats and associated invertebrates as native, veteran trees.

Veteranisation

- **Where an age gap exists** between ancient trees and those that will be future ancient trees, veteranisation may be needed.

- A technique whereby **younger trees are intentionally 'damaged', subsequently exposing them to bacteria and fungi that speed-up the decay process.**

- It should **NEVER** be carried out on ancient or other veteran trees, and should be seen as a last resort.

- Pollarding trees of intermediate age can also be used to close up the generation gap.

© Ancient Tree Forum

Surrounding land management

- **Trees do not exist in isolation**; the environment around them can be crucial to their welfare.
- The ‘improvement’ of grassland through reseeding or the application of fertilisers, herbicides etc. can be detrimental.
- Inorganic fertilisers disrupt mycorrhizal fungi, making trees more susceptible to stress.
- Ploughing damages the roots of the trees and mycorrhizal fungi.
- **No inorganic fertilisers should be applied, and no ploughing or reseeding carried out.**

Surrounding land management

- **Maintain any traditional grazing regimes**, but avoid excessive stocking.
- **Ensure that there are adequate nectar sources in open sunny conditions** (e.g. by relaxing grazing or not cutting between April and Sept, retaining/planting blocks of flowering trees/scrub).
- **Don't provide supplementary feeding** for livestock, except where vital for livestock health (dung enriches the soil) and **avoid using avermectins in livestock** (other types of wormers may be just as detrimental).
- **Use rotational management** to generate a diversity of structures / sward heights.

Summary

- Saproxylic invertebrates are among our rarest and most threatened species.
- Saproxylic invertebrates require good populations of ancient or veteran trees.
- Management should ideally aim for a large number of trees, in close proximity, with a good range of different ages (including future veterans).
- The continuity of **dead wood resource** (both standing and fallen) and **dead wood features** (e.g. decay cavities, rot pools, sap runs) is important.

© Neil Aldridge