

WITNESS: Loss of biodiversity linked to dead or decaying wood (the fading of the saproxylic rainbow)

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About the WITNESS section

So much environmental thought stays inside the abstract space of philosophy, policy recommendations or debates. In this corner of *The Ecological Citizen*, we stay close to the ground: To bear witness to the losses of lifeforms, lifeways, and places that humanity's no-limitations growth is driving. To remember the Earth realities we love and are fighting to preserve.

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“Dead wood is the life of the forest”

– The slogan for forestry at Windhorse Farm in Nova Scotia, Canada (Drescher, 2009: 36)

Thanking the bus driver, and stepping down onto the verge of a narrow road that we had been following for several miles, I quickly find the undulating gravel track – identified earlier on my map – and the cover of Scots pines. I am heading to meet a group of conservationists, with our task on this cold still morning being to examine some tree-felling that has been carried out in a nature reserve. (The work was done, I have been told, with a chainsaw, and the person responsible has even cut away some of the wood from within the stumps.) To arrive punctually at the meeting point, I will have to cover three-quarters of a mile in a quarter of an hour: comfortable enough, except that nature will do everything she can to check my progress.

The bowing of branches in the canopy betrays the passage of a red squirrel. To the side of the path, I pick out the inky splash of yet-uneaten blaeberrries. Above them, the understory smoulders with rowan fruits. And on the ground lies a piece of turquoise-stained fallen wood, with the artist, I speculate, being

a fungus called green elfcup (Figure 1A). Further along the trail, on a slender decaying branch of an understory hardwood, I notice the small orange globules of coral spot, another agent of wood-rot (Figure 1B).

I can describe those last two species as being *saproxyllic*. And if I could honour the essayist's tradition here by citing a definition for that term from the *Oxford English Dictionary*, I would.¹ As it is, I can scarcely think of a more important word awaiting entry (meanwhile, *zombocalypse* has just found a route in). Instead, I will paraphrase Siitonen and Ranius (2015) and state that saproxyllic species are those with a dependence, during at least some part of their life cycle, on the dead or decaying wood of fallen or standing shrubs or trees, either directly or through the presence of other saproxyllic species. Beyond variation related to the species of shrub or tree, this wood can differ in the level of exposure to sunlight, in the dampness of the immediate environment, and in size (from fine twigs to massive trunks). Moreover, as Kirby (1992) notes, different combinations of ecological circumstances will support different assemblages of saproxyllic organisms.

The diverse panoply of saproxyllic species, in addition to fungi, encompasses representatives from numerous taxonomic groups, including mammals, birds, beetles, wasps, bees, ants, moths, snakeflies, true flies, true bugs, thrips, spiders, mites, pseudoscorpions and nematodes (Stokland *et al.*, 2012). And, as Speight (1989: 19) commented, “a surprisingly large number of the species are the only known living examples of often quite major groups.”

Many saproxyllic life forms, such as the aforementioned green elfcup and coral spot, are common and widespread. (Indeed, some overly controlling gardeners, perhaps recalling an unhappy memory of childhood chickenpox, cannot get beyond the notion of the latter of those species being a ‘pervasive disease’.) On the other hand, many are not. Focusing on invertebrates in Europe, Kirby (1992) observed that a large proportion of the species associated with dead wood are local or rare and that many are declining. In the case of the



Figure 1. Green elfcup [A] and coral spot [B] (photos by Holger Krisp [CC BY 3.0] and Stephen James McWilliam [CC BY 4.0], respectively).

region's beetle fauna, around one in every five saproxylic species is considered to be threatened with extinction, according to the International Union for Conservation of Nature (Cálix *et al.*, 2018).

Two endangered insects from the UK fauna will exemplify the diverse benefits that dead wood yields (and also enable the continuation of a chromatic journey that began with the green- and orange-hued fungi). The first species is a crane fly called the scarce yellow splinter, whose larvae inhabit galleries within rotten logs lying in streams. The species' entire known range comprises a handful of sites in a small corner of England (Godfrey, 2001). The second insect is the globally threatened blue ground beetle, named on account of the dark exoskeleton's indigo sheen (Figure 2A). Both the grubs and adults of the species draw their sustenance from slugs and other soft-bodied invertebrates, and as such they might not satisfy a strict definition of saproxylic. Nevertheless, senescent features of trees such as dead bark are important for this beetle in offering protective sites for overwintering, and it has been stated that an abundance of rotting wood is a key factor in ensuring the ongoing suitability of the few known locations for the species in the UK (Buglife, 2020).

Drivers of decline in saproxylic invertebrates

Staying with invertebrates, I turn now to the drivers of the decline, taking Europe as an example. Studies of partially fossilized insect remains suggest that many rare or extinct saproxylic species in the region were common in the pre-Neolithic landscape (Siitonen and Ranius, 2015). Various anthropogenic factors have since combined to thwart the cascade of life that springs from wood's decay. As the human population grew, tree-covered land was cleared for agriculture, while, in the surviving forest, increasing pressure was placed on woody debris as a combustible fuel. Next came modern forestry with its distaste for native broadleaved trees – the species of greatest benefit for saproxylic invertebrates – and its malignant obsession with homogeneity and tidiness (gone, therefore, was the added within-habitat heterogeneity that comes from the presence of dead and decaying trees). Then, in a more recent twist, old trees in urban locations and other humanized places began to suffer “indiscriminate felling for spurious health and safety reasons” (Cálix *et al.*, 2018: 6).

Arguably the most deleterious impact of all, from the perspective of saproxylic biodiversity, can be seen in the contemporary scarcity of large old trees exhibiting features of senescence (hereafter, post-mature trees). To quote Speight, from his seminal report on dead-wood invertebrates (1989: 19), “to the saproxylic fauna, a moribund, over-mature tree represents not a habitat but a multiplicity of habitats. It is not so much an individual abode as a megalopolis.” Microhabitats of special importance in such trees include water-filled rot holes and mould-containing cavities, and they can persist for at least as long as the tree remains alive and standing, which may be several centuries. With dead trees, in contrast, microhabitats will generally remain suitable for at most a few decades (Siitonen and Ranius, 2015).

The loss of post-mature trees is a problem seen in many parts of the world and one that is compounded by the low ‘recruitment rate’ into the next

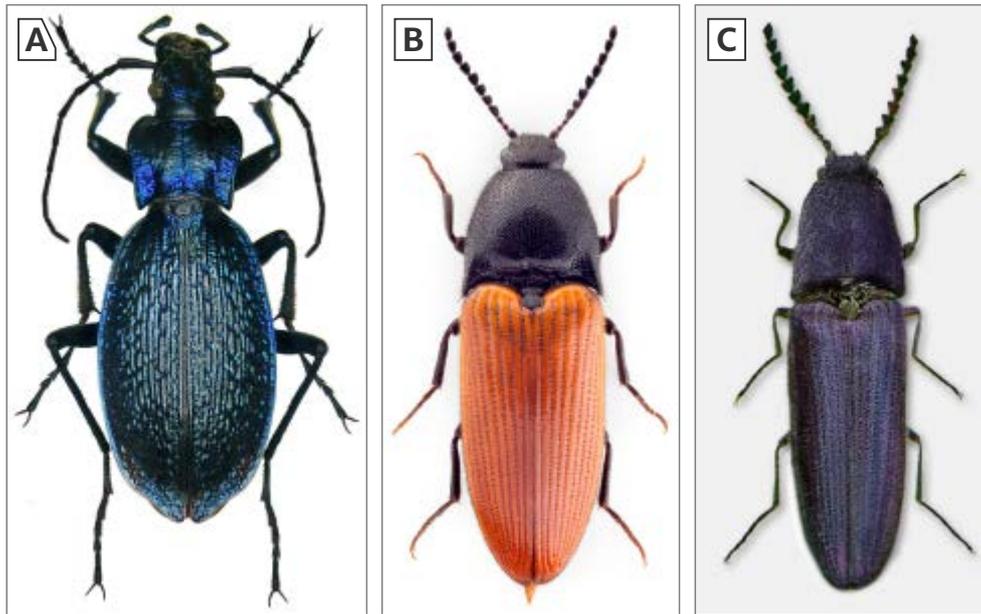


Figure 2. Blue ground beetle [A], red-horned cardinal click beetle [B] and violet click beetle [C] (photos by URSchmidt [CC BY 3.0], John Hallmén [CC BY 3.0] and Lamiot [CC BY-SA 3.0], respectively).

generation (Siitonen and Ranius, 2015; Lindenmayer and Laurance, 2016). The impending temporal nadir for these trees has been described as a ‘generation gap’ (e.g. Read, 2000), and a pulse of extinctions is almost certainly going to be the upshot.

Invertebrates with a dependence on decaying woody material within large old trees include two species whose coloration will give me bookends to the spectral survey. In the UK, both are known from only a small number of sites. The first is the red-horned cardinal click beetle (Figure 2B), and trees used by members of this species include old ash pollards (Alexander, 2010).² The second is the violet click beetle (Figure 2C), an insect whose larvae develop within the wood mould that accumulates at the base of hollowed-out trunks (Cuff *et al.*, 2021).

Conservation measures

An awareness of the issues described above is, at last, seeping into land-management practices. Forestry codes in Canada, the US, and elsewhere, including many European countries, are becoming more mindful of saproxylic biodiversity (Stokland *et al.*, 2012). And there is an increasing interest in prolonging the lives of post-mature trees. The largest such trees are generally found within habitats like wood-pasture where historic human-guided influences on the land have allowed the trees to grow in open conditions with limited competition from neighbours (Buglife, 2013). Maintaining the historic regimen will often be the best policy to follow in safeguarding the trees and the dependent saproxylic fauna (Siitonen and Ranius, 2015). Further advice for supporting the conservation of saproxylic species is presented in Box 1, which can be summarized as the policy of ‘letting things be’.

Box 1. Some advice for land-management practices in regard to dead wood (Kirby, 1992: 29 and 31).

- “The simplest rule about dead wood is that it should be left where it is to undergo natural decay processes,” with dead wood of large diameter being “particularly important.”
- “Cutting up and removing, or burning, dead and fallen trunks and major branches of large and particularly ancient trees, is a reprehensible act which can never be justified in conservation terms.”
- “The danger of old and decayed trees is frequently greatly exaggerated [...] Old hollow trees with reduced crowns are often safer than mature ones with a full crown. Trees with full crowns have much greater wind resistance, and are far more likely to fall in gales.”
- “The possession of unsafe limbs is not, under any circumstances, a reason for the felling of an entire tree.”

In parallel to improvements in forestry practices and efforts aimed at extending the lifespan of post-mature trees are conservation initiatives of a more experimental nature. In the case of the violet click beetle, for instance, trials are being carried out to see if breeding can be encouraged within compost bins, using a special concoction of organic material. For some other saproxylic species, the potential benefits of artificially creating microhabitats *in situ* is being explored; and, thus, I return to my meeting with the conservationists.

I join the group in time to follow them to the site of the felled Scots pines. The chainsaw work, I should note, was no act of vandalism. In fact, it had been carried out with skill and care in order to create artificial rot holes. These will fill up naturally with rainwater and can be loaded with sawdust and other organic matter, with the purpose of supporting larval development in the pine hoverfly – yet another saproxylic species whose survival, in the UK at least, is balanced on a precipice on account of past forest management practices. Something similar was tried in the woodland back in 2010, but it failed (Summers, 2018). A large amount of thought and effort has gone into this latest attempt, including the labour-intensive rearing of hundreds of larvae off-site, but the evidence base to guide the project is thin and there has necessarily been much guesswork. The same can be said for many other projects in the conservation of saproxylic organisms. The future of these species hangs in the balance not just on account of the loss and degradation of habitats and microhabitats but also because the creation of nature-mimicking alternatives can be a profound challenge.

Notes

- 1 *Saprophyte* and *saprotroph* are both listed in the dictionary, but they indicate a mode of living that draws on decaying organic matter of any kind.
- 2 A pollard is a tree whose woody matter has been periodically cut in a way which encourages growth above the height that browsing animals can reach.

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