

‘Host of the month’ is a series of information sheets and blogs that highlight a tree host and their associated priority pests and diseases that are best seen and recorded in that month. For January we’re looking at spruce (*Picea* species), and great spruce bark beetle.

By the mid-15th century the Norway spruce trees in the mountains of Italy, Germany and Switzerland had endured several decades of particularly cold weather during the ‘little ice age’. The wood from these slow grown trees went on to be incorporated into some of the most famous musical instruments in the world. Spruce was widely used for violin manufacture at the time, including those made by the luthier Antonio Stradivari in northern Italy. The density of the cold grown spruce wood gives it acoustic properties that have been suggested as the reason for the unique sound of Stradivarius violins - and their breathtaking price tags.

Expensive instruments aside, we’re probably more familiar with Norway spruce (*P. abies*) as Christmas trees, and Sitka spruce (*P. sitchensis*) as a forestry species in the north and west of the British Isles. Norway spruce has been grown here since at least 1500 while Sitka was introduced to the UK from the Pacific north-west of the USA in 1831. Sitka is now the dominant species in production forestry accounting for 59% in Wales, 58% in Scotland and 26% in England (National Forest Inventory, 2018).



Figure 1: ‘Antonius’, a violin made by Stradivari in 1711 (Metropolitan Museum of Art)

The 35 or so species of spruce (*Picea*) are all members of the pine family (*Pineaceae*) which includes pines (*Pinus*), firs (*Abies*), larches (*Larix*), cedar (*Cedrus*), Douglas firs (*Pseudotsuga*), and hemlocks (*Tsuga*). Spruce are found across the northern hemisphere, generally being restricted to higher altitudes the closer they are to the equator. Although Norway and Sitka are by far the most common spruces in the UK you might also encounter Serbian spruce (*P. omorika*), white spruce (*P. glauca*) and Colorado blue spruce (*P. pungens* ‘*glauca*’), particularly in gardens, parks, and other amenity spaces.

Spruce are distinguished from other members of the pine family principally by their foliage which is needle-like and attached singly to the shoots via a short woody ‘peg’ (fig. 2). The individual needles can be the same colour all over like Norway or Colorado spruce, or have distinctly differently coloured surfaces like Sitka and Serbian. (fig. 2). Needle tips can be sharply pointed, as in Colorado and Sitka, or less so as in Norway or Serbian. Like

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other *Pinaceae* the male and female cones are separate but occur on the same tree. In all spruce species the female spruce cones are initially upright but after pollination they turn and hang down below the shoots. In common with all other *Pinaceae* each cone scale houses a pair of winged seeds, in spruce the wings are readily detached from the seeds.



Figure 2: Left to right - evenly coloured Norway spruce needles, distinctly different coloured upper and lower surfaces of Sitka spruce needles, and Norway (left) and Sitka (right) cones.

Priority pest – great spruce bark beetle (*Dendroctonus micans*)

Great spruce bark beetle (GSBB) is native to mainland northern Eurasia and has been expanding its range for the last 100 years or so. It was first found causing damage to spruce trees in the UK in 1982 in Shropshire, subsequent investigations revealed it had probably been breeding there since at least 1972. From there it spread first to Wales and western England and has now reached southern Scotland. It will feed on spruce, pines, and some other conifers but in the UK it appears to prefer spruce.

The adult beetles are 6-8 mm long and 2.5-3.0 mm wide, and initially after hatching and emerging, a pale yellow-brown colour. As they mature they become dark brown and black with characteristic orange hairs that cover the body (fig. 3). Female beetles tunnel into the bark of live trees to lay their eggs beneath the bark, often in clusters of 50-80. When they emerge the larvae feed communally on the outer layers of live wood, maintaining a clear feeding front by piling frass and dead/diseased larvae behind them and creating a brood chamber. The accumulated frass forms 'islands' within the chamber resulting in a distinctive quilt-like appearance (fig. 4). Once mature the larvae retreat to these frass islands to pupate, often *en masse*. Once the

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adults hatch they frequently mate with their siblings before exiting the tree via circular holes in the bark. In the UK the complete lifecycle can take 18-25 months which leads to extensive overlap of generations and consequently any life-cycle stage can be found at any time of year.



Figure 3: left to right - adult female GSB, larvae, and the 'quilted' appearance of galleries (Crown copyright, Forestry Commission)

Symptoms

From a distance one of the signs of GSB infestation is dying and dead foliage on single branches or the very top of the tree (fig. 4) as the tunnelling actions of larvae cut off water and nutrient flow. As numbers of GSB increase the dieback spreads, eventually killing the whole tree (fig. 4).

As the female beetles bore into the bark resin canals are ruptured, releasing resin which oozes out of the bore site. The resin is initially clear and colourless but as it dries out it becomes opaque, ranging from white to pale brown in colour. Much of the resin spatters down the tree, forming long white streaks on the trunk and branches (fig. 5). Directly around the bore site the action of the beetle causes the resin to form a mounded mass with a hole through the centre called a resin tube and this is characteristic of GSB. Tubes higher up the trunk tend to be smooth textured, those nearer the root collar are more granular.

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Figure 4: left to right - crown dieback associated with early infestation of GSBB, extensive branch needle loss and branch death, profuse resin bleeds from entry holes made by female GSBB (*Crown copyright, Forest Research*)



Figure 5: Assorted resin tubes caused by female GSBB boring into the bark of spruce to lay eggs (*Crown Copyright, Forest Research*)

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Lookalikes

Larger eight-toothed spruce bark beetle (*Ips typographus*) is present in Norway spruce across mainland Europe and was found in Kent in 2018. Since then several further outbreaks have been found in Kent and Sussex and are subject to eradication measures. Numbers build up in windblown, damaged, and recently felled spruce trees before nearby live trees are attacked. As with GSBB, attacks on live trees can give rise to crown thinning, dying/dead foliage and branches and eventually tree death. The holes made by adult beetles (fig. 6) are smaller (2-2.5mm in diameter) and are not accompanied by resin tubes and associated resin streaking. Galleries below the bark have a distinctive appearance with multiple galleries radiating out from a single central one (fig. 6).

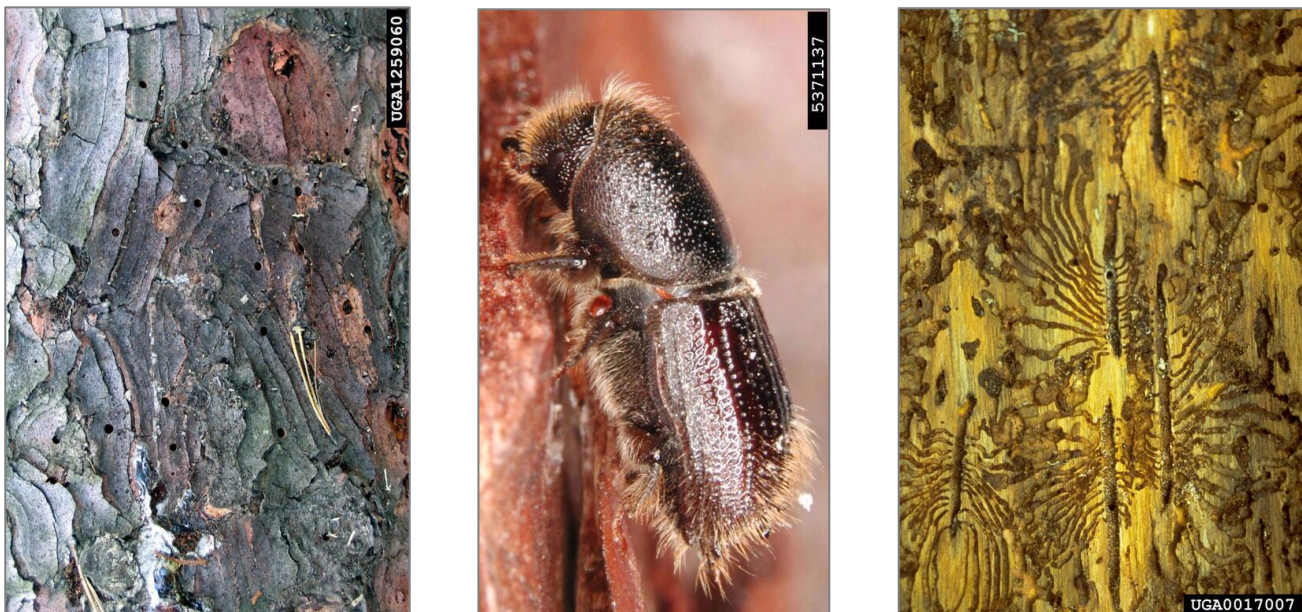


Figure 6: left to right – Larger eight-toothed bark beetle holes (*Landesforstpräsidium Sachsen, Bugwood.org*), adult larger eight-toothed bark beetle (*Gyorgy Csoka, Hungary Forest Research Institute, Bugood.org*), and right, larger eight-toothed bark beetle feeding galleries (*William M. Ciesla, Forest Health Management International, Bugwood.org*)

Abiotic factors such as drought, waterlogging, and root compaction can all also cause browning, dieback, thinning crowns foliage discoloration. **Green spruce aphid (*Elatobium abietinum*)** can cause widespread damage/needle loss on spruce and other insects such as adelgids, mites and weevils can all cause foliar and shoot damage. In all these cases resin tubes will not be present.

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Reporting

January is an ideal time to seek out spruce trees and see if you can identify any signs and symptoms of great spruce bark beetle.

Please report possible sightings via [TreeAlert](#). Healthy tree data is equally important, so please do report those too.

For more information and resources on [great spruce bark beetle](#) please check the Observatree website.

Matt Parratt, Forest Research, December 2023

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