

## Sorbus aria in Europe: distribution, habitat, usage and threats

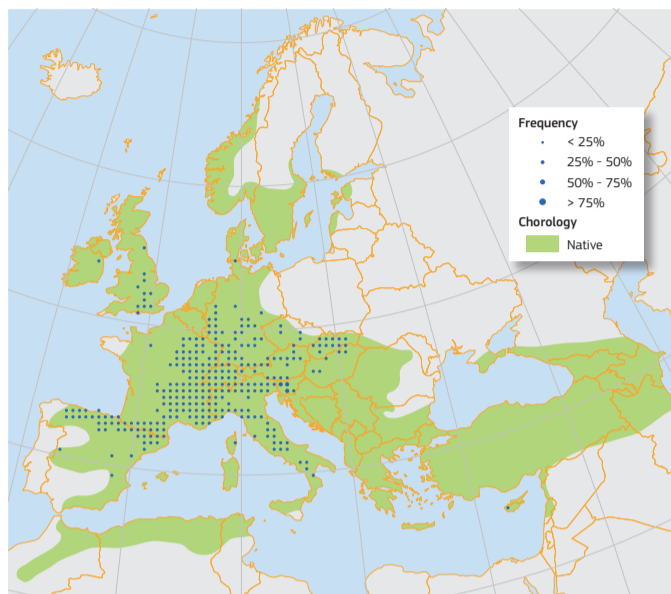
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*Sorbus aria* (L.) Crantz or common whitebeam (syn. *Aria nivea*) is a medium sized deciduous tree or shrub, characterised by white small flowers arranged in inflorescences, which develop lenticel-speckled reddish pomes. It is a mountain species of southern, western and central Europe, occurring mainly in openings and at the edges of European limestone beech forests. It is part of a larger and relatively recent evolving species complex arising from crossing-events between taxa and populations of the *Sorbus* species, which covers a wider distribution reaching Central Asia. It is quite a popular ornamental tree, although its practical use is comparatively low.

*Sorbus aria* (L.) Crantz (syn. *Aria nivea*) or common whitebeam is a slow-growing, small to medium sized deciduous tree or shrub that grows up to 5-15 m tall, rarely up to 20 m and 40 cm in diameter<sup>1</sup>. The species often develops multiple, slender trunks with a smooth to shallowly fissured, yellowish-grey bark that becomes grey-black with vertical cracks when old. Younger shoots are shiny olive or yellowish- to reddish-brown, usually densely **tomentose** and have large, conspicuously hairy terminal buds<sup>1,2</sup>. The leaves change colour from light green in spring to dark green in summer, and then to yellow in autumn. They are alternate, simple and variable in shape, from ovate, elliptical to circular, with double-serrate toothed margins, sometimes indented into shallow lobes. Their size is approximately 6-12 cm long and 4-8 cm wide. They are usually densely white haired beneath with around 10-15 pairs of veins<sup>2</sup>. Whitebeam is a **monoecious hermaphrodite** species with flowers of about 1.5 cm in diameter and white in colour that are arranged in **corymbs** of 5-10 cm in diameter. Flowers are insect pollinated and self-incompatible in the **diploid** sexual species<sup>3</sup>. The trees have a typical lifespan of around 100-200 years, and start fruiting when 10-20 years old. Flowering lasts from May to June and single flowers are open for about a week<sup>1</sup>. Fruits are orange to scarlet globose **pomes** 8-15 mm in diameter with many **lenticels** on the skin. They are eaten and dispersed mostly by birds<sup>2</sup>. They ripen from September to October and often stay on the twigs during winter<sup>1</sup>.

### Distribution

The taxonomy of the genus *Sorbus* is very complex, as like most species of this genus, they can not only hybridise, but also duplicate their genome from **diploid**, i.e. the species **sensu stricto** (*s.str.*), to **polyploid** forms, which display different morpho-ecological characters and are described as different species. *Sorbus* is classified into five subgenera, grouping morphologically similar forms and hybrids arising from crossing-events between taxa and populations. Within the subgenus *Aria*, the section *Aria*, i.e. the *Sorbus aria sensu lato* (*s.l.*), includes primary **diploid** species, its subspecies, their **apomictic triploid** and **tetraploid** forms and their hybrids<sup>3,4</sup>. This species complex occurs in a wide range across western, central and southern Europe, in North-western Africa in mountains of Morocco, Algeria and Tunisia, eastwards to Turkey, Lebanon, Caucasus and the



Map 1: Plot distribution and simplified chorology map for *Sorbus aria*. Frequency of *Sorbus aria* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for *S. aria* is derived after Meusel and Jäger<sup>15</sup>.

Middle East, while the **diploid** *Sorbus aria s.str.* has a restricted range, which covers almost all mountainous and hilly regions of southern Europe from the Iberian Peninsula and Southern Italy eastwards to the Balkans and Carpathian Mountains<sup>1,2</sup>. In the Alps it is found mainly up to 1600 m, but reaches 2155 m in the Wallis region of Switzerland<sup>1</sup>. Occurrences in West Ireland and South England are isolated, since the species is virtually absent from the coastal provinces of West France<sup>3</sup>, from where it reaches to South Germany, South Poland and East Hungary. Beside the typical subspecies, an accepted local subspecies is described as *Sorbus aria* subsp. *lanifera* (A.Kern.) Jáv.<sup>5</sup>, which is reported to occur as a local **endemic** in lower montane fir-beech forests in Croatia<sup>6</sup>.

### Habitat and Ecology

Whitebeam is a **mesophile** species that can grow in different soil types. However, it occurs relatively rarely in very acid and very alkaline soils or in habitats with light and sandy soils, as well as in heavy clay soils. Usually it prefers moist but well-drained, neutral

to basic (alkaline) fertile, lime-rich soils. Its deep root system makes it also resistant to drought<sup>1</sup>. It is a light-demanding tree, which normally occurs in semi-shade habitats, open deciduous woodlands or scrublands, where this species is often recorded on the edges and only rarely occurs in deep shade<sup>1</sup>. The diploid species is generally distributed as a sub-Mediterranean floral element in the mountain zones throughout almost all of Southern Europe. It is a stable element of **xero-thermophile** beech forest types (alliance *Cephalanthero-Fagion*), often on shallow calcareous soils on steep slopes and relatively dry and warm sites, dominated by beech (*Fagus sylvatica*) commonly with limes (*Tilia* spp.), hornbeam (*Carpinus betulus*) and sessile oak (*Quercus petraea*), in the shrub layer with common privet (*Ligustrum vulgare*), barberry (*Berberis vulgaris*) and cornelian cherry (*Cornus mas*)<sup>7-9</sup>.



Pale underside of young whitebeam leaves. (Copyright Graham Calow, www.naturespot.ork.uk: AP)

### Importance and Usage

Whitebeam is quite a popular ornamental tree but its practical use is comparatively low. There are many garden forms and the wood was used for furniture and various items of household equipment in history. The frozen or cooked fruits are edible but not tasty. In former times the fruits, leaves and twigs were used as livestock-fodder and the mealy fruit substance was processed into a type of meal or flour, which was used to extend regular bread flour (German name "Mehlbeere = Flour Berry")<sup>1</sup>. Planting material can be propagated by seed and inoculation.



Whitebeam is a slow-growing species that may have a shrub form. (Copyright Stefano Zerauscheck, www.flickr.com: AP)



Bark is smooth in young plants. (Copyright Silvano Radivo, www.actaplantarum.org: AP)



Fruits are orange to scarlet and are eaten and dispersed mostly by birds. (Copyright Stefano Zerauscheck, www.flickr.com: AP)



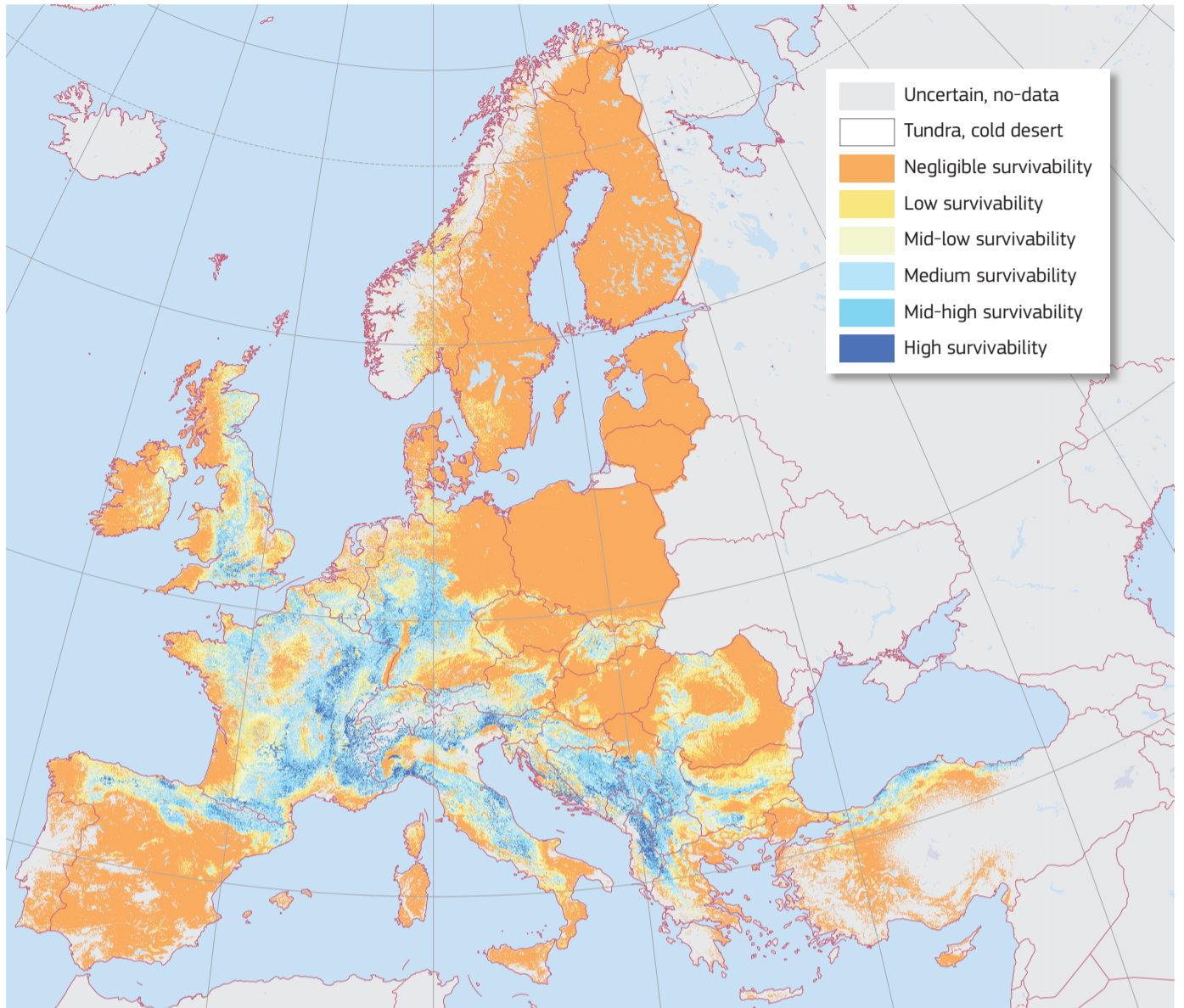
Leaves are elliptical-ovate with toothed margins. (Copyright Silvano Radivo, www.actaplantarum.org: AP)

## Threats and Diseases

Older whitebeam trees can reach root-depth of 1–2m, rendering them quite resistant to wind-throw, but sensitive to industrial smoke emissions<sup>1</sup>. Roots may be attacked by aphids (*Aphis sorbi*) and leaves by caterpillars of e.g. *Argyresthia conjugella*, while the larvae of the wasp *Megastigmus brevicaudus* feed on seeds<sup>1, 10</sup>. Infectious diseases may be apple canker (*Neonectria ditissima*), and fireblight (*Erwinia amylovora*). In common with several other woody plants, the whitebeam is vulnerable to attack by *Heterobasidion annosum*, which is potentially subject to expansion in the European boreal and temperate continental ecological zones<sup>11, 12</sup>. A common fungal pathogen is the rust *Ochropsora ariae*<sup>13, 14</sup>. Young whitebeam trees are especially susceptible to browsing and many generalist herbivore arthropods are known to feed on the species<sup>1</sup>.



Fruits can persist on the plant during the winter becoming important food for many birds. (Copyright Stefano Zerauscheck, www.flickr.com: AP)



Map 3: High resolution map estimating the maximum habitat suitability.



White flowers are arranged in large 5–10 cm clusters. (Copyright Silvano Radivo, www.actaplantarum.org: AP)

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Buds are hairy on the tips of younger shoots. (Copyright Silvano Radivo, www.actaplantarum.org: AP)

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