

## Ostrya carpinifolia in Europe: distribution, habitat, usage and threats

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*Ostrya carpinifolia* Scop., known as European hop-hornbeam, is a small to medium-sized broadleaved deciduous tree. The flowers are catkins which are produced in spring along with bud-burst; the fruit forms in pendulous clusters and the seed is a small nut. The native range of this species includes Middle Europe, Southern Europe and the Balkan area, Western Asia and Caucasian countries. In the northernmost part of its range it behaves as a light-demanding pioneer which prefers sunny and warm places, while in the southernmost countries it grows better in semi-shaded and more humid sites. The European hop hornbeam often grows in rocky areas and on shallow and poorly developed soils, forming the understorey of *Pinus nigra* forests and deciduous sub-Mediterranean forests, where it may represent one of the dominating species together with *Carpinus orientalis*, *Fraxinus ornus*, and *Quercus pubescens*. Its wood is very heavy and hard and it is mainly used for providing fuel wood and charcoal. The fungi *Botryosphaeria dothidea* and *Cryphonectria parasytica* cause the most serious damage to the European hop hornbeam.

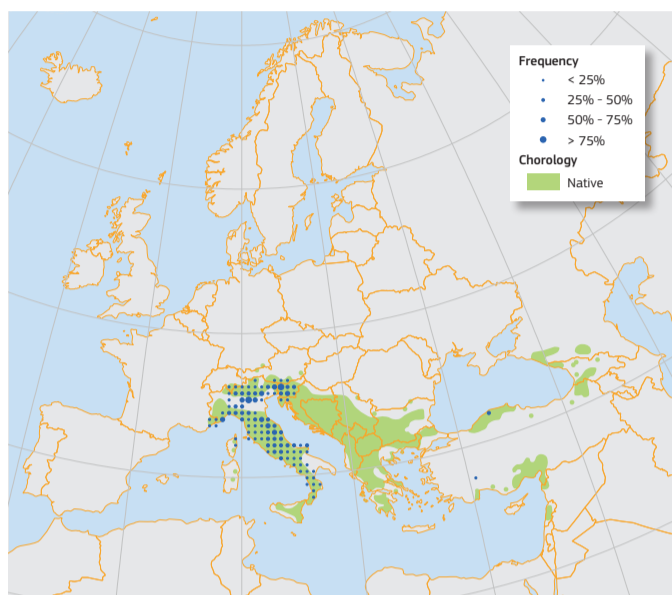
European hop-hornbeam (*Ostrya carpinifolia* Scop.) is a small to medium-sized broadleaved deciduous tree that can reach up to 25m. After coppicing it often loses its arboreal habit appearing in form of a tall shrub of just 3-6m tall<sup>1</sup>. Its conical or irregular crown bears alternate **obovate-lanceolate**, **acuminate** and **dentate** leaves 3-10cm long, rounded and symmetric at the base, with 10-15 secondary veins per side<sup>1</sup>. The flowers are produced in spring along with leaf-bud opening, with male catkins 5-10cm long and female catkins 2-5 cm long. The fruit forms pendulous clusters 3-8 cm long with 6-20 seeds, which become golden-brown in autumn; each seed is a small nut 2-4 mm long, fully enclosed in a bladder-like **involucre**<sup>1</sup>. The bark of young stems is dark grey and smooth, while it is scaly, rough, longitudinally fissured and dark-brown in mature trees<sup>2</sup>.

### Distribution

The European hop-hornbeam is **endemic** to temperate West Eurasia: more in detail, its native range includes Middle Europe (South-East Switzerland and South Austria), Southern Europe (South-East France and Corsica, Italy, Sardinia, Sicily), the Balkan area (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Montenegro, Serbia, Slovenia, Greece, probably extinct in Hungary) European Turkey, Western Asia (Anatolia, Syria, Lebanon) and Caucasian countries (Georgia, Armenia, Cis- and Transcaucasian districts of the Russian Federation)<sup>3-6</sup>. **Palynological** evidence suggests that it was able to spread northwards and colonise Europe only after the last glaciation; i.e. 7 000 years ago<sup>7</sup>.

### Habitat and Ecology

This hop-hornbeam is a **stenohydric** plant<sup>8</sup>, which means that it shows rather constant transpiration and osmotic pressure values also under moderate drought stress conditions<sup>9</sup>. Thus, it is able to colonise windy and sunny slopes, but it is mostly found in rainy areas or under wet microclimatic conditions (e.g. deep and humid ravines and canyons) where air humidity is constantly available<sup>1</sup>. This explains why in the northernmost part of its range this species behaves as a light-demanding pioneer that prefers sunny and warm places, while in the southernmost countries it grows better in semi-shaded and more humid sites<sup>2, 10</sup>. The European hop hornbeam often grows in rocky areas and on shallow and poorly developed soils, mainly on limestone<sup>3</sup>, but also on volcanic<sup>11</sup> and gypsum rock outcrops<sup>12</sup>. It plays an



Map 1: Plot distribution and simplified chorology map for *Ostrya carpinifolia*. Frequency of *Ostrya carpinifolia* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for *O. carpinifolia* is derived after Meusel and Jäger<sup>4</sup>.

important role in all the Balkan-Ilyrian area up to 900m in elevation, occasionally reaching 1 300-1 400m. Here it takes part in species-rich shrubberies (the so-called 'shibljak'): together with *Cornus mas*, *C. sanguinea*, *Corylus avellana*, *Cotinus coggygria*, *Cotoneaster nebrodensis*, *Juniperus oxycedrus*, *Paliurus spinachristi*, *Syringa vulgaris* and, in the warmest sites, also *Coronilla emerus* and *Pistacia terebinthus*, it usually colonises open places where it forms the understorey of *Pinus nigra* forests and deciduous sub-Mediterranean forests, where it may represent one of the dominating species together with *Carpinus orientalis*, *Fraxinus ornus*, and *Quercus pubescens*<sup>13</sup>. These plant communities may be ascribed to the alliance of *Ostrya-Carpinus orientalis*, and similar species-assemblages are rather widespread on the hillsides and mountains of central and northern Italy<sup>14-16</sup>, former Yugoslavia<sup>17</sup> and of the continental part of Greece<sup>18-20</sup>, while those of Calabria, Corsica, Sardinia and Sicily<sup>21-24</sup> may better be referred to the alliance *Pino laricionis-Quercion congestae* and those of South-East France to *Quercetalia pubescentis*<sup>25</sup>. European hop-hornbeam seems to have played an important role within the mature forest communities of the Near East<sup>26</sup>.

More often, the communities which it dominates represent an early and unsteady step of progressive succession processes: under low-disturbance conditions they rapidly evolve towards mixed broadleaved forests dominated by deciduous oaks (mainly *Quercus pubescens*, but also *Quercus cerris*, *Quercus congesta*, *Quercus petraea* and *Quercus frainetto*), by conifers like *Pinus nigra* subsp. *dalmatica* and subsp. *nigra* in the Balkan peninsula, *Cedrus libani* between 1500 and 1800m in South Anatolia, Syria and Lebanon, *Pinus brutia* and *Pinus nigra* up to 1700m in Anatolia, more rarely by *Quercus coccifera/calliprinos* in Eastern Mediterranean countries or by *Fagus sylvatica* along the northern border of its range, for example in central and northern Italy and in Bulgaria<sup>1, 2, 6, 11</sup>.



Male catkins are produced in spring and are 5-10 cm long. (Copyright Gianluca Nicoletta, www.actaplantarum.org; AP)

### Importance and Usage

The wood of the hop-hornbeam is very hard and heavy, difficult to work<sup>2, 27</sup>. It has been used in the past for different purposes, especially in rural areas, for making small items and charcoal<sup>28-30</sup>. It tends to crack when dried, so it is not appreciated for industrial purposes, although it still represents an excellent firewood<sup>27, 31</sup>. For this very purpose, in central Italy most hop-hornbeam woodlands are still intensely exploited as coppices<sup>16</sup>. The ability to colonise dry areas and shallow lime- and magnesium-rich soils makes this tree species suitable for the reforestation of many degraded sites<sup>32</sup>. It is also used to form hedges and as an ornamental tree along roadsides<sup>27</sup>. Hop hornbeam is one of the hosting trees of the white truffle (*Tuber magnatum*)<sup>33</sup>.



Leaves in a seedling: leaves are ovate with toothed margin and symmetric at the base. (Copyright Stefano Zerauscheck, www.flickr.com; AP)



Sub-Mediterranean forest in North East Italy where hop-hornbeam dominates. (Copyright Stefano Zerauscheck, www.flickr.com; AP)





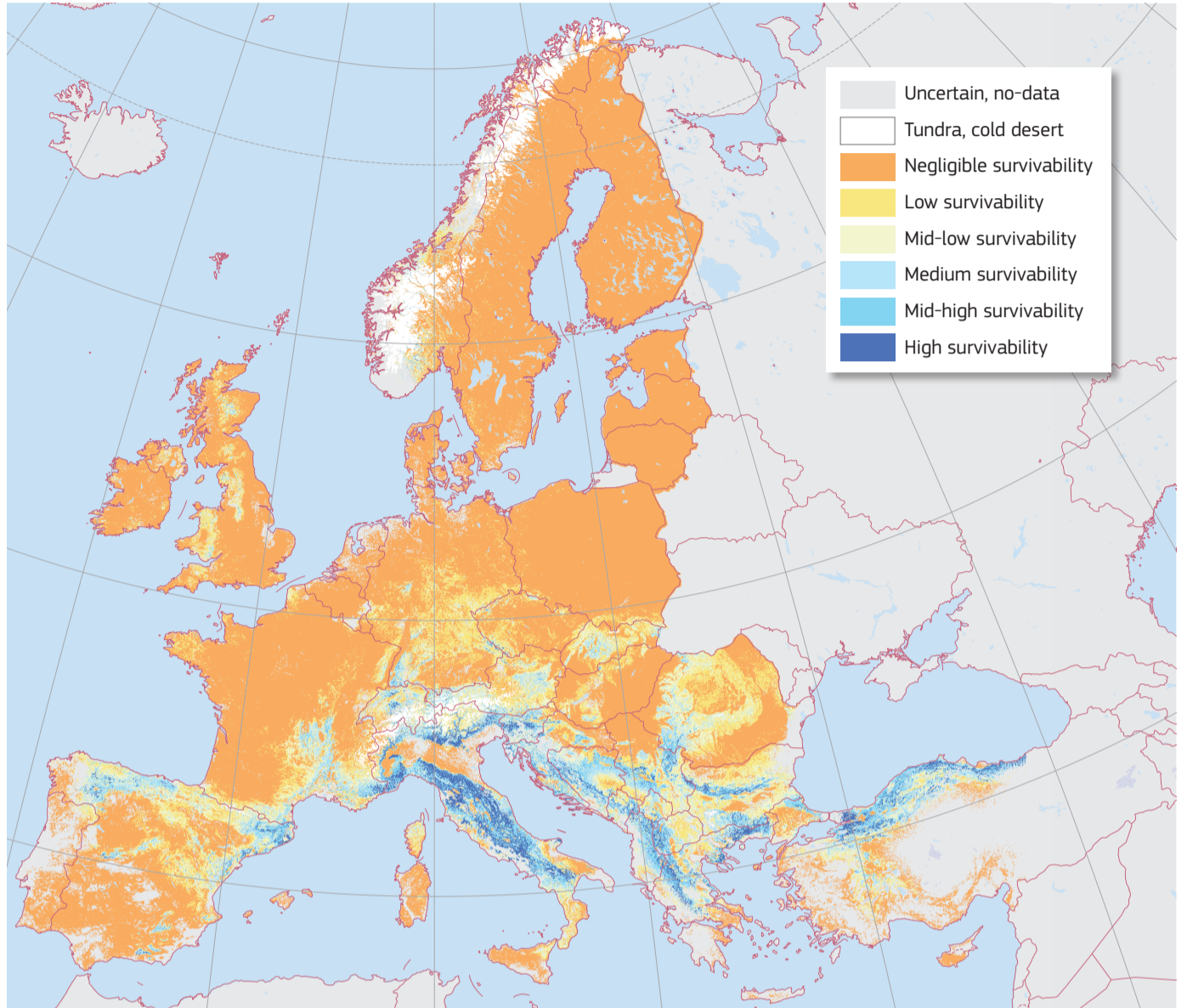
⋯ Mature fruits covered by the dry and brown bladder-like involucre. (Copyright Franco Rossi, www.actaplantarum.org; AP)

## Threats and Diseases

The European hop-hornbeam is known to be resistant to various diseases, but unusual and extensive dieback caused by the ascomycete fungus *Botryosphaeria dothidea*<sup>34</sup> has been observed in western Slovenia and northern Italy in recent years along with extreme drought and high temperature events. It is affected by several fungal diseases like twig blight and canker, caused by *Cryphonectria parasytica* (Murr.) Barr.<sup>35-37</sup>. The tree is also vulnerable to the European oak bark beetle (*Scolytus intricatus*) which is found on oaks (*Quercus* spp.), beeches (*Fagus* spp.) and chestnuts (*Castanea* spp.) whose distribution may partially overlap with that of the European hop-hornbeam<sup>38-40</sup>.



⋯ Isolated tree in winter. This species is a small tree rarely exceeding 25 m. (Copyright Stefano Zeraushek, www.flickr.com; AP)



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

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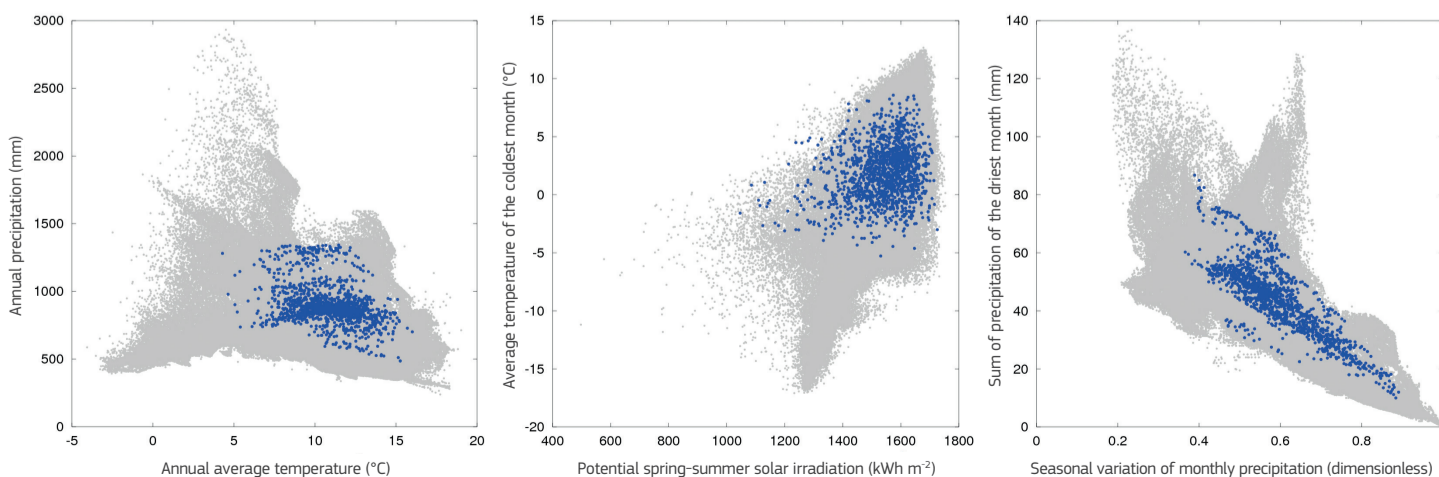
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⋯ Smooth bark in a young plant. (Copyright Silvano Radivo, www.actaplantarum.org; AP)

## Field data in Europe (including absences) ● Observed presences in Europe ●

## Autecology diagrams based on harmonised field observations from forest plots.



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