

## Corylus avellana in Europe: distribution, habitat, usage and threats

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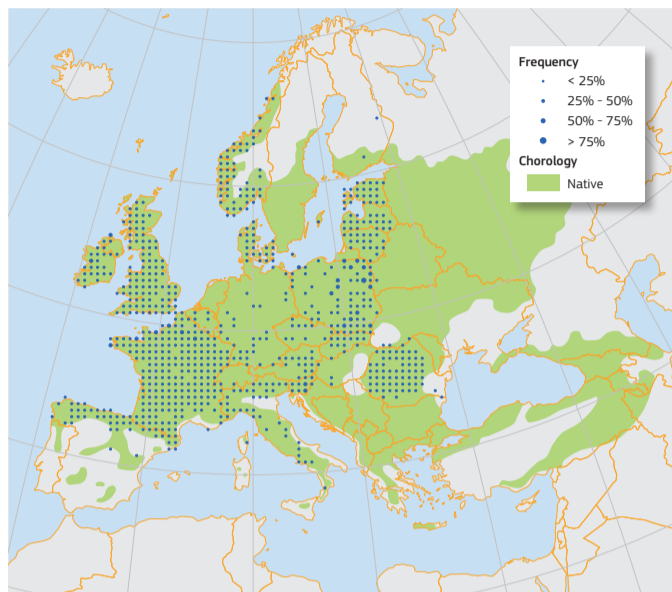
*Corylus avellana* L. (European hazel or common hazel) is a monoecious and wind-pollinated broadleaf species. It is usually an understorey shrub, very common in naturally regenerated mixed-hardwood stands. It can be found throughout Europe, from Norway to the Iberian Peninsula and east as far as the Urals. This species is very appreciated for its nuts, for which it is cultivated worldwide, especially in European countries such as Turkey, Italy and Spain, and further afield in the United States and Canada.

The common hazel (*Corylus avellana* L.) is typically a shrub reaching 4-8m tall, occasionally more than 10 m, and the stem is usually branched. The bark is grey with white and large spots. The leaves are deciduous, rounded, 6-12cm long, with a double serrate margin and hairy on both sides. The flowers appear in early spring, before the leaves, and are **monoecious** with single-sex wind-pollinated catkins. Male catkins are usually grouped together (2-4 flowers) and are yellowish-brown and up to 10cm long, while female catkins are very small. During flowering, the inflorescence becomes slender and doubles in length. The fruit is a nut, grouped in clusters of one to four together. Each nut is held in a short leafy involucre (husk) which encloses about half of the nut. The nut is roughly spherical, up to 2cm long, yellow-brown with a pale scar at the base.

The average life span of this species is about 80-90 years<sup>1</sup>. Hazelnut can be propagated both in generative (by seeds) and vegetative ways. It is commonly vegetative propagated by shoot and root suckers<sup>1</sup> and cuttings<sup>2</sup>. In particular, it is able to sprout well and spread quickly after fires<sup>3</sup>. Thanks to its larger nuts and thinner shells compared with other hazelnut species, the hazel has been used extensively in breeding programs<sup>4</sup>, and there are now more than 400 described cultivars<sup>5</sup>. Unfortunately, hazelnut has a well-known drawback: its pollen and nuts represent an important cause of allergic reactions to sensitive people<sup>6, 7</sup>.

### Distribution

Hazelnut is widely distributed in Europe, in natural stands ranging from Scandinavia to the south of the continent<sup>8</sup>. In the north it can be found in Norway up to 67°N, although its northern limit decreases further to the east<sup>9</sup>. It is absent only in Iceland, some of the Mediterranean islands (Cyprus, Malta, the Balearics) and in the northernmost and southeasternmost extremes of the continent. It is also present in North Africa and in Asia Minor<sup>10</sup>. It was introduced into North America in the mid-1850s<sup>11</sup>, where nowadays the hybrid between *Corylus avellana* and *Corylus americana* represents the main option for new crops<sup>12</sup>.



Map 1: Plot distribution and simplified chorology map for *Corylus avellana*. Frequency of *Corylus avellana* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for *C. avellana* is derived after several sources<sup>33-36</sup>.

### Habitat and Ecology

Hazel generally grows as an understorey species in mixed deciduous forests<sup>13</sup>. Due to several adaptations at leaf level, it has the capability to grow both in sun (in full light) and shade conditions<sup>14</sup>. It grows best on fertile and nutrient-rich, only slightly acid or neutral soils, or it can also thrive on dry calcareous soils<sup>1, 15</sup>. Hazelnut prefers moderate climates with enough high temperatures during the growing season, but it can resist cold temperatures or even frosts<sup>15</sup>. In Turkey an average temperature of 13-16 °C and rainfall of over 700mm is considered to provide optimal conditions for hazelnut cultivation<sup>16</sup>.



Hairy leaves with double-serrated margins. (Copyright Daniele de Rigo: CC-BY)

### Importance and Usage

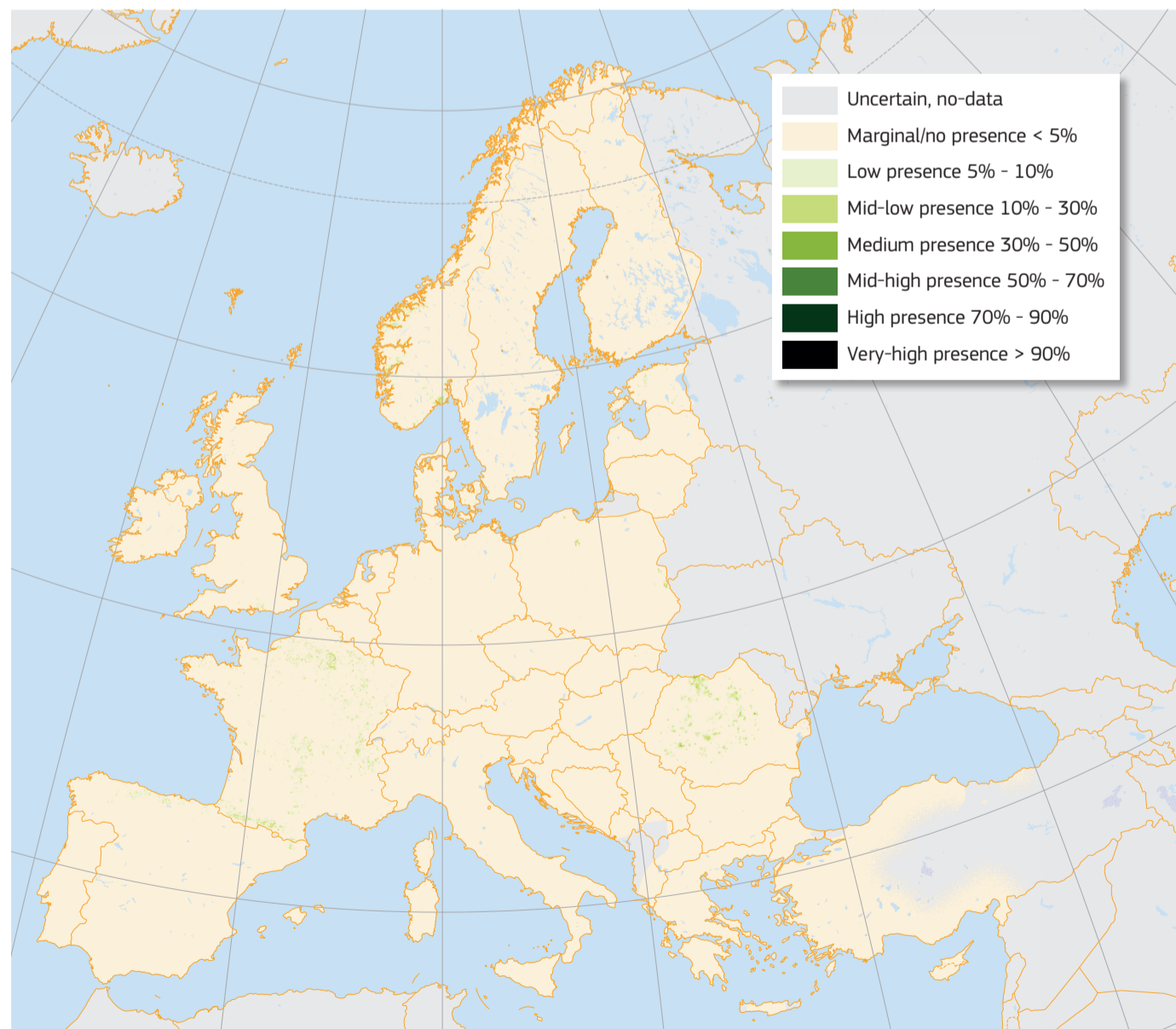
Traditionally the wood of hazel was used for fencing, barrel hoops, and the wattle in “wattle and daub” plasterwork, and the leaves were used for cattle fodder<sup>15</sup>. However, the most valued part of this species is the fruit. From ancient times, hazelnuts have been among the main food components of our ancestors<sup>17</sup>. In present times it is cultivated for its nuts, and is one of the most economically important tree nut crops worldwide<sup>18</sup>. The nuts are rich in protein and contain significant amounts of vitamin E, thiamine, and magnesium. The first five hazel producer and exporter countries in 2012 were Turkey, Italy, USA, Azerbaijan and Georgia<sup>19</sup>. Turkish hazelnut production in 2012 was 660000 tonnes which accounted for more than 75% of worldwide production<sup>19</sup>. The nuts also represent an important food supply during the cold season for several deer species, the edible dormouse, squirrels and birds<sup>20, 21</sup>. During the growing season, the leaves provide food for several animals, including invertebrates such as *Lepidoptera* spp. Recently, it was found that hazel could be a good option for producing taxol, one of the most expensive anti-cancer drugs worldwide<sup>22, 23</sup>. Last but not least, hazelnut is appreciated as an ornamental shrub, especially the form with an unusual leaf morphology, namely the cutleaf hazelnut [*C. avellana* L. f. *heterophylla* (Loud.) Rehder]<sup>24</sup>.

### Threats and Diseases

In Europe, the pathogens *Pseudomonas avellana* and *P. syringae* pv. *coryli* are responsible for the bacterial canker and decline of hazelnut<sup>25, 26</sup>. The disease is characterised by a sudden wilting of the twigs and branches, especially at the end of spring and during the summer<sup>27</sup>. Moreover, in some European countries such as Spain or Poland, hazelnut is affected by the Apple mosaic virus<sup>28, 29</sup>. In North America, it was reported that the main diseases are caused by *Anisogramma anomala*<sup>30, 31</sup>. The nuts could be affected by *Fusarium lateritium*, which is the causal agent of nut grey necrosis<sup>32</sup>.



Maturing nuts can be up to 2 cm long when ripe. (Copyright Ettore Balocchi, www.flickr.com: CC-BY)



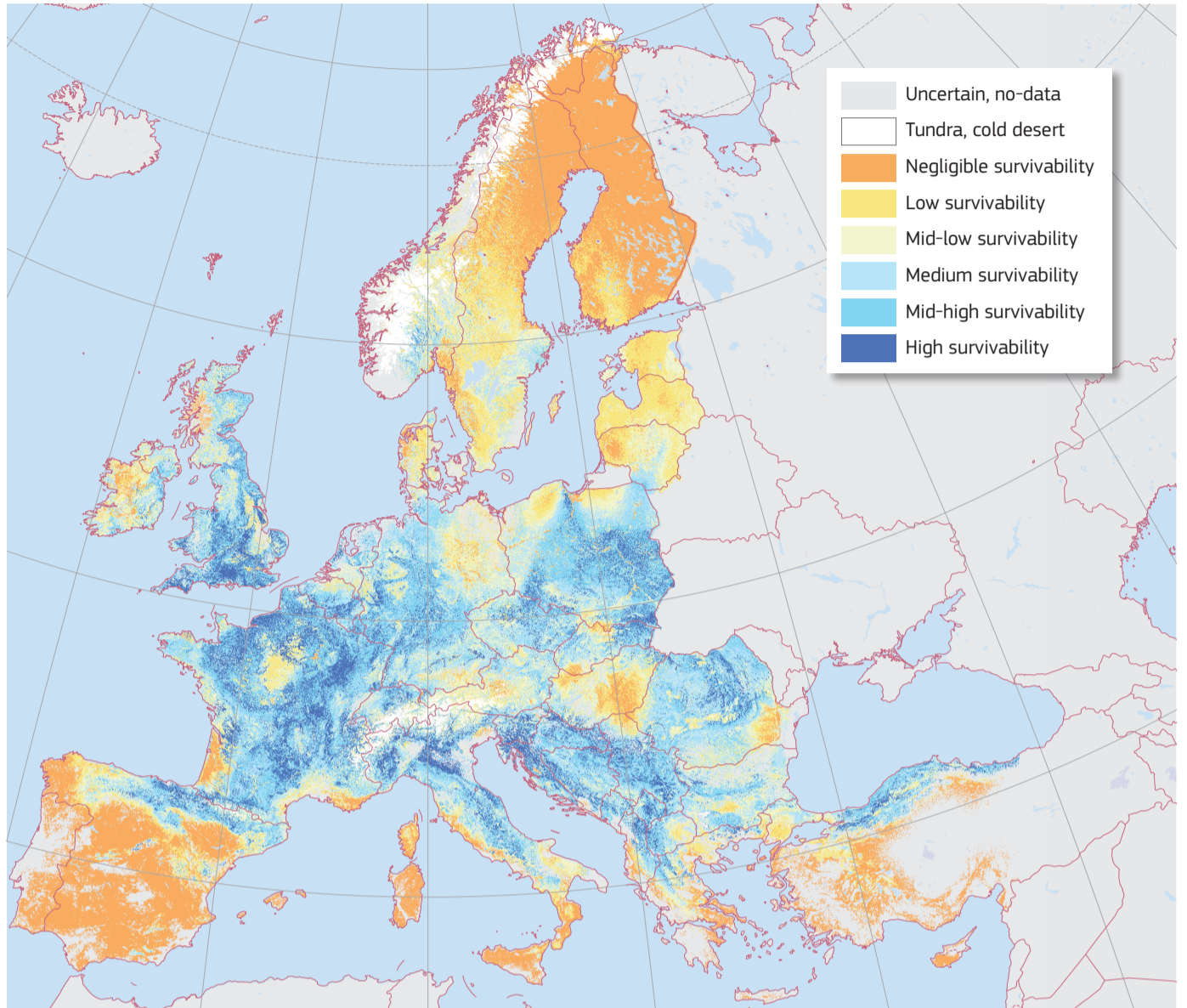
Map 2: High resolution distribution map estimating the relative probability of presence.



Yellowish male catkins pollinating before leaf growth.  
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Ancient hazelnut coppice in Galloway, UK.  
(Forestry Commission, www.forestry.gov.uk; © Crown Copyright)



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



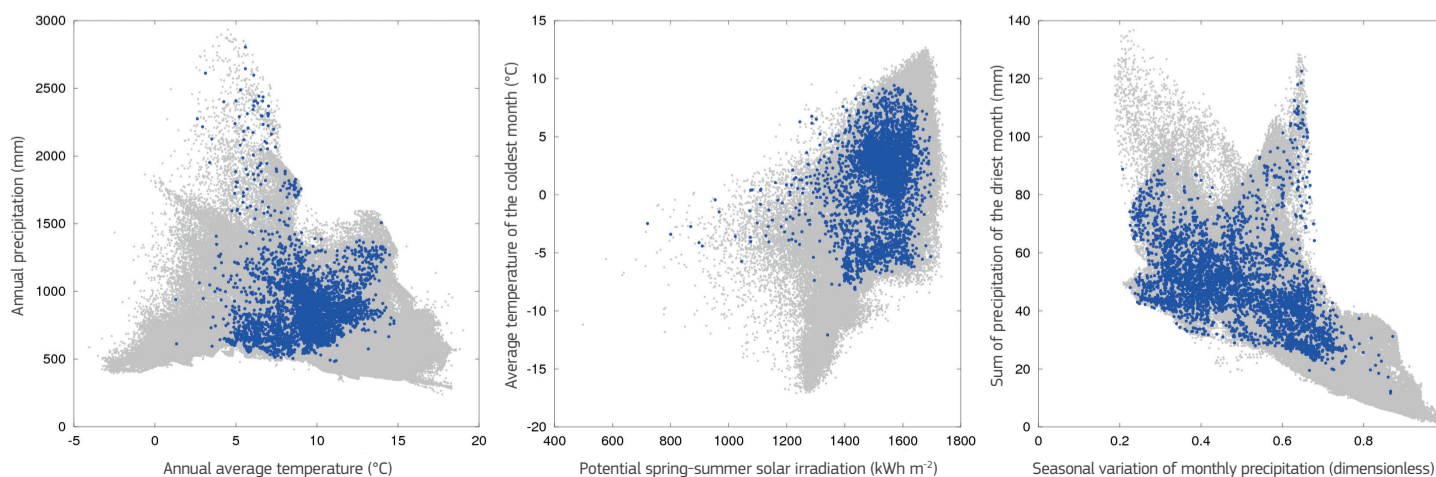
Typical shrub-form plant in a garden park (Lake Maggiore, North Italy).  
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Field data in Europe (including absences) ● Observed presences in Europe ●

Autecology diagrams based on harmonised field observations from forest plots.



This is an extended summary of the chapter. The full version of this chapter (revised and peer-reviewed) will be published online at <https://w3id.org/mtv/FISE-Comm/v01/e015486>. The purpose of this summary is to provide an accessible dissemination of the related main topics.

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