

## Aesculus hippocastanum in Europe: distribution, habitat, usage and threats

C. Ravazzi, G. Caudullo

*Aesculus hippocastanum* L., the European horse-chestnut, is a **mesophytic** broad-leaved tree native to a few mountain ranges in the Balkan Peninsula, but widespread in the urban landscape of moist, warm-temperate Europe. The morphology and ecology of its large seeds are very distinctive, and they are also known for their medicinal properties. Natural populations are reduced and declining after strong insect infections, pollution, wood extraction and forest fires. For this reason it recently received the status of near-threatened species.

### Description

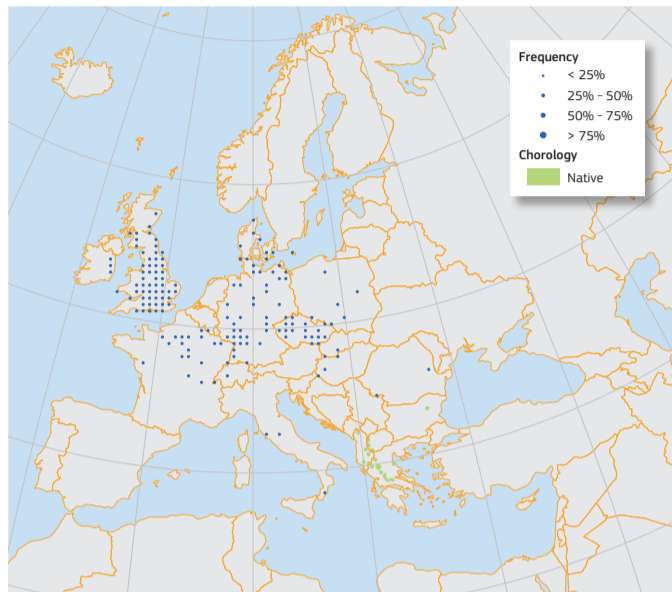
European horse-chestnut (*Aesculus hippocastanum* L.) is the only European native species belonging to the *Aesculus* genus, which counts 13 tree and shrub species living in temperate deciduous forests<sup>1</sup>. It is a large and tall tree growing up to 39m and potentially very long-living<sup>2</sup>. It develops an oval crown, bearing large shade-giving leaves composed by 5-7 **palmate** leaflets. Numerous white **hermaphrodite** flowers are born in a pyramidal inflorescence. The petals are yellow at the base, as are their major veins at pollination maturity, while later turning deep orange and thus afterwards rejected by bumblebees and honeybees<sup>3</sup>. Pollen is very distinctive, with coarse spines<sup>4</sup>. Only 2-5 (8) flowers from the base of each inflorescence develop the subglobose fruit, provided with sharp spines and containing one to three seeds. The ripe seed recalls the chestnut fruit in its dark brown colour and is used for horse feeding, justifying the origin of the common name<sup>5</sup>. The surface of the seed also bears a large whitish scar-like mark, which is the **hilum**, attaching them to the ovary<sup>6</sup>.

### Distribution

The European horse-chestnut is **endemic** for two relict main ranges, each containing small isolated populations respectively in mountains of Greece, Albania and the former Yugoslav Republic of Macedonia<sup>7, 8</sup> and in the Preslavski Balkan, Bulgaria<sup>9, 10</sup>. It is a relic species from the Early Pleistocene, about 1 million years ago. At that time it was still widespread in Europe<sup>11, 12</sup>. Its subsequent decline may be related to the extinction of large mammals acting as dispersers of its large seeds<sup>13</sup> and to low tolerant seed physiology to desiccation<sup>14</sup>. In 1557 AD seeds of uncertain provenance were imported from Turkey to Prague, beginning the tree cultivation in Europe<sup>5</sup>. Claims of occurrence in the Bronze Age pile dwellings from North Italy<sup>15</sup> turned to be modern contaminants.

### Habitat and Ecology

The European horse-chestnut is a **mesophytic** tree, growing in moist deciduous broad-leaved forests under a warm-temperate climate. It thrives especially at the bottom of shady ravines on limestone bedrock and on alluvial soils in association with hornbeam (*Carpinus betulus*), but also in mountain mixed forests up to 1600m altitude<sup>16</sup>. It is very sensitive to forest fire; moreover seed are both dormant and recalcitrant; i.e. they do not tolerate water desiccation even at maturity<sup>14</sup>. This is why horse-chestnut seedlings do not establish on open and dry substrates, limiting species ability to pioneering moist rocky and karstic sites only and preventing migration after forest withdrawals and climate worsening<sup>16</sup>.



Map 1: Plot distribution and simplified chorology map for *Aesculus hippocastanum*. Frequency of *Aesculus hippocastanum* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for *A. hippocastanum* is derived after several sources<sup>8, 10, 26-28</sup>.

### Importance and Usage

Horse-chestnuts are favourite trees of gardens, parks and roadways under moist climates. Numerous horticultural varieties have been described. The seeds have traditionally been used as a therapy for chronic venous inefficiency<sup>17</sup> and are processed by the pharmaceutical industry. It has been shown that they contain escin, preventing accumulation of white blood cells responsible for poor blood flow in the legs, common with ageing<sup>18</sup>. Unprocessed seeds are poisonous, but a decoction of the bark and leaves is also used in folk medicine of Albania, Kosovo and Central Italy to treat circulatory and rheumatic problems<sup>19, 20</sup>.

### Threats and Diseases

Total population in the native habitat is reduced to less than 2500 mature individuals<sup>21</sup>, with declining subpopulations due to strong infections by *Cameraria ochridella* (nocturnal moth, Lepidoptera), which feeds on the leaves, causing mid-summer defoliation and exhaustion of the trees and may reduce reproduction in natural populations<sup>22-24</sup>. Horse-chestnuts are highly vulnerable<sup>25</sup> to the Asian longhorn beetle (*Anoplophora glabripennis*) which is a large wood-boring beetle native of Asian countries, such as Japan, Korea and China. Other threats are road construction, local tourism, wood extraction, pollution, and forest fires in the residual native areas. European horse-chestnut is assessed as vulnerable in Greece and Bulgaria and near-threatened at European scale<sup>21</sup>.



The large leaves are composed of 5-7 palmate leaflets. (Copyright Free Photos, www.flickr.com: CC-BY)



The large brown seeds are also known as conkers. (Copyright Free Photos, www.flickr.com: CC-BY)



Isolated large European horse chestnut in a garden park. (Copyright Nacho, www.flickr.com: CC-BY)



The distinctive flowers appear in spring and are pollinated by bees. (Copyright Free Photos, www.flickr.com: CC-BY)

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