

Rafflesia arnoldii

Family: Rafflesiaceae

42 known species in the genus *Rafflesia*

Rafflesia arnoldii is one of the world's largest individual flowers, with its flowers being able to reach a diameter of 150 cm. When in bloom, flowers smell like rotting flesh to attract pollinators such as carrion flies. The appearance of the flower (five reddish petal-like perigone lobes, with white blotches) serves as a visual indicator for survival and reproduction.

Rafflesia only consists of the flower. Plants in this family lack vegetative parts and chlorophyll, and are thus unable to photosynthesise. *Rafflesia* are thus holoparasitic plants (cannot photosynthesise). Plants in this family only grow in the stem and root tissue of plants from the genus *Tetrastigma* (Miq.) Planch. *Rafflesia arnoldii* is an obligate endo-holoparasite, and host specific. Three species of *Tetrastigma* have been identified as host plants of this species *T. leucostaphylum* (Dennst.) Alston ex Mabb., *T. curtisii* (Ridl.) Suess and *T. pedunculare* (Wallich ex. Lawson) Planch. It is completely dependent on its host for growth, nutrients and water.

Rafflesia goes through multiple phases in its development (including invisible and visible stages), taking around 3 to 5 years for one life cycle for *Rafflesia arnoldii*. Another study observed exponential growth of the buds of *Rafflesia arnoldii* and “estimated that the female flowers of *R. arnoldii* respectively took from 3 years and 5 months to 5 years and one month to complete its life history. The male flower took a shorter time, and needed 2 years and 11 months to 4 years and 5 months to reach its complete life history.” Initially, the seed would grow inside the host plant (around 2 to 3 years) (invisible stages). This is followed by the visible stage, where the bud develops. They experience low recruitment and high mortality of buds. Various survivability rates found at different phases of their life history during bud growth. Relatively high mortality rates at most stages, but buds at the later stages of their life history had high survivorships and would likely flower.

“Morphological characters of *R. arnoldii*: *Rafflesia arnoldii* R. Br has unisexual and sessile flowers, developing outside the host. Flower buds are protruding as a corky swelling with hexagonal patches, up to 34.7 cm in diam., dark brown or sometimes white or pale brown at the top when immature and pale to strong sorrel when mature. The bracts are brown to dark brown and are usually released prior to blooming. When the flowers bloom, they emit a strong odor, similar to that of a rotting carcass, attracting pollinators. The flower is up to 81 cm in diameter, with a tube up to 15.5 cm high, perigone consisting of 5 lobes, 22 – 29 cm long and 23.3 – 33 cm wide.”

Distribution: Plants from the family rafflesiaceae are restricted to tropical rainforests of Southeast Asia, and are found only on the west of the Wallace line. *Rafflesia* can be found in tropical rainforests of Borneo, Sumatra, Java, Peninsula Malaysia, Thailand and the Philippines. *Rafflesia arnoldii* can be found in areas including Sumatra and Borneo. Due to it being host specific, its range limited to that of its host plant *Tetrastigma*.

Variables contributing to its presence include mean annual temperature, slope, elevation, and occurrence of the host plant (which is affected by soil type, mean annual temperature, slope, elevation, soil organic carbon, prefer dense canopy cover). Other factors like biotic interactions may also affect its survival and recruitment in different areas.

Threats: Currently has not been evaluated by the International Union for Conservation of Nature (IUCN) red list.

Faces threats including habitat lost from deforestation (Sumatra faces an average annual forest loss rate of 0.46 million hectares per year). Studies have suggested that *Rafflesia arnoldii* would be more susceptible to extinction than other non-parasitic plants in the same habitat. Both host and parasite species would be affected by disturbances, and disappearance of the host plants would lead to the extinction of *Rafflesia*.

Lack of understanding of *Rafflesia* spp.

Insufficient public knowledge also threatens its existence, as inability to recognise the host plants can result in locals cutting down the host, affecting nutrient supply to *Rafflesia arnoldii* if found within the host.

Human uses: Species of *Rafflesia* are used ethnomedicinally, and have antioxidant properties. However, their medical properties are not scientifically proven. *Rafflesia arnoldii* used during and after childbirth, to promote delivery and recovery. It is also used as an aphrodisiac. *Rafflesia* is one of Indonesia's national flowers. source of ecotourism in Borneo.

Discovery/history: Discovered by Sir Stamford Raffles (who was also a naturalist) and Dr Joseph Arnold on 19 May 1818 in Sumatra. Arnold was the first person to see the flower from the exploration party (consisting of Sir Stamford Raffles, his wife (Lady Sophia Raffles), his doctor, and Dr Joseph Arnold) after being led there by a local servant. He described seeing "a swarm of flies hovering over" the flower and laying their eggs in it, and that it produced "precisely the smell of tainted beef". The flower measured a full yard across (~ 90 cm). The flower was removed by Arnold and sent back to Manna; he also drew a coloured drawing of the flower. However, the specimen turned brown and was infested with maggots. These specimens were brought by naturalist Dr Thomas Horsfield to England, and ended up with Robert Brown, a highly respected naturalist in England. He named the plant *Rafflesia arnoldii* in his paper "An Account of a New Genus of Plants, Named *Rafflesia*". He proposed to name the genus *Rafflesia* in honour of Raffles, who sponsored the exploration trip, and was reputed in the English scientific community. He proposed to name the species *arnoldii* after Joseph Arnold. 20 years earlier, another species of *Rafflesia* was reportedly spotted in Java by French surgeon-naturalist Louis Auguste Deschamp. He was recognised as the first from the West to find and describe *Rafflesia*. His notes and specimens were confiscated when the ship he was sailing in was taken by the British Navy on the way back to France in 1803, and his work only reappeared many years later.