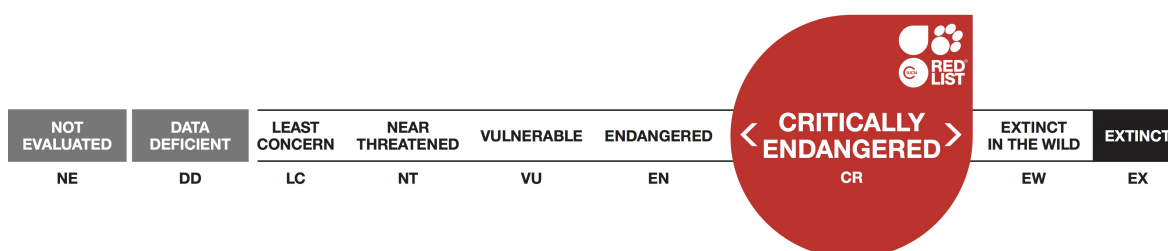


## *Aquilaria crassna*, Agarwood

Assessment by: Harvey-Brown, Y.



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## Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Malvales	Thymelaeaceae

**Taxon Name:** *Aquilaria crassna* Pierre ex Lecomte

**Common Name(s):**

- English: Agarwood, Eagle Wood

## Assessment Information

**Red List Category & Criteria:** Critically Endangered A2cd [ver 3.1](#)

**Year Published:** 2018

**Date Assessed:** December 13, 2017

**Justification:**

*Aquilaria crassna* is a large evergreen tree which occurs in Viet Nam, Cambodia, Lao PDR and Thailand. The species is targeted extensively for the valuable resin known as agarwood. As a result of agarwood exploitation it is estimated its population for the last three generations has declined by over 80%. It is therefore assessed here as Critically Endangered. It is recommended that its population is monitored and species identifications procedures are implemented to enable its trade and use to be regulated with greater accuracy.

**Previously Published Red List Assessments**

1998 – Critically Endangered (CR)

<http://dx.doi.org/10.2305/IUCN.UK.1998.RLTS.T32814A9731504.en>

## Geographic Range

**Range Description:**

*Aquilaria crassna* occurs in Viet Nam, Cambodia, Lao PDR and Thailand at altitudes 300–900 m asl. In Viet Nam it is widespread, found from central Viet Nam southwards to Phu Quoc Island in Kien Giang province (Schmidt and Nguyen 2004).

**Country Occurrence:**

**Native:** Cambodia; Lao People's Democratic Republic; Thailand; Viet Nam

# Distribution Map

*Aquilaria crassna*



Range  
● Extant (resident)

Compiled by:  
BGCI



## Population

In Viet Nam, *Aquilaria crassna* is described as being found only in scattered stands with low numbers of trees (Loc and Luu 2002). Furthermore Tran *et al.* (2003) state that the population of *A. crassna* in Vietnamese forests is decreasing. In Viet Nam it is difficult to find trees with a dbh of over 15 cm (N.H. Nghia pers. comm. 2017).

In Thailand, *A. crassna* only remains in protected areas, with its densest population being in Khao Yai National Park (Zhang *et al.* 2008, Rose 2013). In a monitoring plot in Khao Yai National Park the number of *A. crassna* trees decreased from 238 (2000-2001) to 147 (2008) (Zhang *et al.* 2008). The species has a scattered and clumped distribution in Lao PDR, with most wild stands have either been logged or are under severe threat (Thomas *et al.* 2006, Jensen and Meilby 2012).

In Cambodia, *A. crassna* is described as being very rare and only remaining in small quantities in natural forest, particularly in protected areas (Rose 2013).

*Aquilaria crassna* has been heavily exploited in Viet Nam (Loc and Luu 2002), which resulted in population declines of over 80% in the 1990s (Nghia 1998). It is believed that similar losses have occurred across the rest of its range (Nghia 1998). Based on the status on this species across its range and the decline estimate given in Nghia (1998) it is estimated here that over the last three generations *A. crassna* population decline has been over 80%.

**Current Population Trend:** Decreasing

## Habitat and Ecology (see Appendix for additional information)

*Aquilaria crassna* is a light demanding large evergreen tree which is found scattered in natural forest on rocky, shallow ferrallitic soil. It commonly occurs along streams (Schmidt and Nguyen 2004). *Aquilaria* spp. have been observed to have a low natural regeneration and to be slow growing (CITES 2015).

**Systems:** Terrestrial

## Use and Trade

*Aquilaria crassna* is the major source plant for agarwood, the valuable resin produced by some *Aquilaria* species, in Viet Nam (Tran *et al.* 2003). In Viet Nam the wood of *A. crassna* is used in traditional medicine to assist digestion and as a tranquilliser. It is also prescribed in Vietnamese medicine as a powder, aqueous preparation or tincture to treat gastralgia, nausea, vomiting and anxiety (Lemmens and Bunyapraphatsara 2003). *Aquilaria crassna* is the preferred species for agarwood used for meditation purposes in Japan, due its particular sweetness when burnt (Lee *et al.* 2016). Lao PDR is the only country in which *A. crassna* resides where harvesting of wild trees is still legal (Jensen and Meilby 2012).

This species is frequently grown within home gardens and it is cultivated in large scale industrial plantations in Viet Nam, particularly in Phu Quoc Island and Khanh Hoa Province (Tran *et al.* 2003, Schmidt and Nguyen 2004). More than 10,000 hectares of *A. crassna* plantations have been established in Viet Nam (N.H. Nghia pers. comm. 2017). This species has also been cultivated widely across Sumatra in Indonesia (Turjaman *et al.* 2016). It is estimated that over 5,000 hectares of *A. crassna* plantations

have been established in Lao PDR with 2,000 hectares being planted in 2003 alone (Jenson 2004). In a national review of *Aquilaria* plantations in China between 2006 and 2010, 40 hectares was found to be *A. crassna* (Yin *et al.* 2016).

Commercialisation of agarwood in Lao PDR began between 1975 to 1976 and by the 1980's this has spread across the entire country (Jenson and Meilby 2008). Studies conducted in Lao PDR reveal differences between the quality and quantity of *A. crassna* in local and national markets, products sold in local markets tend to be sold in larger quantities but are of lower quality whereas at national and regional scales the quality of *A. crassna* improves and the quantity provided is reduced (Jenson and Meilby 2008). Local people in the Ha Tinh province of Viet Nam have been collecting seedlings of *A. crassna* from natural forests since 1986 and planting them in their home gardens (Loc and Luu 2002). Loc and Luu (2002) also state that a good income can be made in Viet Nam from selling *A. crassna* trees for agarwood production.

Analysis of CITES Trade Data between 1996 and 2015, investigating direct trade using importer-reported figures (see Figures 1, 2 and 3 in the Supplementary Material), report Powder as the most commonly exported commodity type (141,149 kg), followed by chips (93,079 kg) (see Figure 1). Between 1996 and 2015 a total of 6,660 live specimens were exported, the key exporters were: Malaysia (2,500) all from wild sources, Lao PDR (2,000) all from artificially propagated sources and Thailand (2,010) all from artificially propagated sources (see Figure 2). Only two countries exported powder during this period: Thailand (137,421.8 kg) and Viet Nam (3,727 kg), of these exports 97,420 kg were from artificially propagated sources and 10,002 kg were from wild sources (TRAFFIC pers. comm. 2017). Analysis of exporter-reported figures for this species shows significantly larger volumes of trade with 4,033,480 live specimens exported. Thailand (2,904,412 specimens) was the largest exporter of live specimens followed by Viet Nam (1,128,968 specimens) (see Figure 3). All exports are reported to be from artificially propagated sources. Although all *Aquilaria* spp. are listed on appendix II of CITES there are no species identification procedures in place. This makes effective regulation and monitoring of the genus in trade extremely difficult (Soeharto *et al.* 2016).

## **Threats (see Appendix for additional information)**

The species is threatened by heavily exploitation for agarwood. In Thailand *A. crassna* is heavily poached in its remaining range (Zhang *et al.* 2008).

## **Conservation Actions (see Appendix for additional information)**

*Aquilaria crassna* is cultivated at the Forest Research Institute of Malaysia (FRIM) as apart of an *ex situ* conservation program (Lee and Mohamed 2016). It is recorded in six *ex situ* collections on Botanic Gardens Conservation International PlantSearch database (BGCI PlantSearch 2017). All species of the genus *Aquilaria* have been listed on Appendix II of CITES since 2005. The Viet Nam Red Data Book identified *A. crassna* as an Endangered species in need of protection and conservation (Loc and Luu 2002). *Aquilaria crassna* has been assessed as Critically Endangered in Lao PDR (Thomas *et al.* 2006). It is estimated that only 11-15% of *A. crassna* habitat is protected in Lao PDR (Rose 2013). The Viet Nam Seed Tree Project established a conservation seed orchard (Loc and Luu 2002).

*Aquilaria crassna* population needs to be monitored if the impact of agarwood trade is to be accurately determined. Furthermore in order to regulate the trade of *A. crassna* more effectively species

identification procedures need to be implemented at the point of harvest and when it is being exported/imported.

## Credits

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## Bibliography

BGCI. 2017. PlantSearch. Botanic Gardens Conservation International, London. Available at: [https://www.bgci.org/plant\\_search.php](https://www.bgci.org/plant_search.php).

CITES. 2015. Report on NDF of Agarwood for Sustainability Harvest in Indonesia.

CITES. 2017. CITES Trade Database . Available at: <http://trade.cites.org/>.

IUCN. 2018. The IUCN Red List of Threatened Species. Version 2018-1. Available at: [www.iucnredlist.org](http://www.iucnredlist.org). (Accessed: 28 June 2018).

Jensen, A. 2004. DOMESTICATION OF AQUILARIA SPP. AND RURAL POVERTY – SOCIO-ECONOMIC AND GENETIC ASPECTS OF THE PLANTING BOOM IN THE “WOOD OF THE GODS”. NAFRI. Luang Prabang .

Jensen, A. and Meilby, H. 2012. Assessing the Population Status of a Tree Species Using Distance Sampling: *Aquilaria crassna* (Thymelaeaceae) in Northern Laos. *International Journal of Forestry Research* : 11.

Jenson, A. & Meilby, H. 2008. Does commercialization of a non-timber forest product reduce ecological impact? A case study of the Critically Endangered *Aquilaria crassna* in Lao PDR. *Oryx* 42(2): 214-221.

Lee, S.Y. and Mohamed, R. 2016. Rediscovery of *Aquilaria rostrata* (Thymelaeaceae), a species thought to be extinct, and notes on *Aquilaria* conservation in Peninsular Malaysia. *Bulmea* 61(1): 13-19.

Lee, S.Y. and Mohamed, R. 2016. The Origin and Domestication of Aquilaria, an Important Agarwood-Producing Genus. In: Mohamed, R. (ed.), *Agarwood: Science Behind the Fragrance*, Springer.

Lee, S.Y., Wei Lun, N.G., Mahat, M.N., Nazre, M. and Mohamed, R. 2016. DNA Barcoding of the Endangered Aquilaria (Thymelaeaceae) and Its Application in Species Authentication of Agarwood Products Traded in the Market. *PloS ONE* 11(4).

Lemmens, R.H.M.J. and Bunyaphrathatsara, N. (eds). 2003. *Plant Resources of South-East Asia 12(3) Medicinal and poisonous plants 3*. Backhuys Publishers, Leiden.

Loc, H.T. and Luu, N.D.T. 2002. CONSERVATION AND USE OF *Aquilaria crassna* IN VIETNAM: A CASE STUDY. Proceedings of the Southeast Asian Moving Workshop of Conservation, Management and Utilization of Forest Genetic Resources. Thailand.

Nghia, N.H. 1998. *Aquilaria crassna*. The IUCN Red List of Threatened Species 1998. . Available at: <http://www.iucnredlist.org/details/32814/0>.

Rose, M. 2013. Non-detriment-findings in CITES – Thymelaeaceae. Universität wien.

Schmidt, L. H. and Nguyen, X. L. 2004. *Aquilaria crassna* Pierre. Available at: [http://ign.ku.dk/english/employees/forest-nature-biomass/?pure=files%2F20547044%2Faguilariacrassna\\_100\\_int.pdf](http://ign.ku.dk/english/employees/forest-nature-biomass/?pure=files%2F20547044%2Faguilariacrassna_100_int.pdf).

Soeharto, B., Budidarsono, S. and van Noordwijk, M. 2016. Gaharu (eaglewood) domestication: Biotechnology, markets and agroforestry options. Working paper no.247. World Agroforestry Centre (ICRAF) Southeast Asia Regional Program., Bogor, Indonesia.

Thomas, P., Newman, M., Svengsuksa, B. and Ketphanh, S. 2006. A Review of CITES Appendices I and II Plant Species From Lao PDR. Available at:  
<http://www.darwininitiative.org.uk/documents/13007/3139/13-007%20FR%20Ann13%20Review%20of%20CITES%20plant%20species.pdf>.

Tran, Q.L., Tran, Q.K., Kouda, K., Nguyen, N.T., Maruyama, Y., Saiki, I. and Kadota, S. 2003. A survey on agarwood in Vietnam. *J. Trad. Med.* 20: 124-131.

Turjaman, M., Hidayat, A. and Santoso, E. 2016. Development of Agarwood Induction Technology Using Endophytic Fungi. In: Mohamed, R. (ed.), *Agarwood: Science Behind the Fragrance*, Springer.

Yin, Y., Jiao, L., Dong, M., Jiang, X. and Zhang, S. 2016. Wood Resources, Identification, and Utilization of Agarwood in China. In: Mohamed, R. (ed.), *Agarwood: Science Behind the Fragrance*, Springer.

Zhang, L., Brockelman, W.Y. and Allen, M.A. 2008. Matrix analysis to evaluate sustainability: The tropical tree *Aquilaria crassna*, a heavily poached source of agarwood. *Biological Conservation* 141: 1676-1686.

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## External Resources

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# Appendix

## Habitats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.6. Forest - Subtropical/Tropical Moist Lowland	Resident	Suitable	Yes

## Threats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Threat	Timing	Scope	Severity	Impact Score
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.2. Intentional use: (large scale) [harvest]	Ongoing	Unknown	Very rapid declines	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		

## Conservation Actions in Place

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Conservation Actions in Place
In-Place Species Management
Subject to ex-situ conservation: Yes
In-Place Education
Included in international legislation: Yes
Subject to any international management/trade controls: Yes

## Additional Data Fields

Distribution
Lower elevation limit (m): 300
Upper elevation limit (m): 900
Habitats and Ecology
Generation Length (years): 50-100

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