

Agarwood (Gaharu) Harvest and Trade in Papua New Guinea: A Preliminary Assessment

An information document prepared by TRAFFIC Oceania for the Eleventh Meeting of the CITES Plants Committee, with reference to CITES Decisions 11.112 and 11.113 regarding *Aquilaria* spp.

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Background

Agarwood, aloeswood, eaglewood and gaharu¹ are all names for the resinous, fragrant and highly valuable heartwood produced primarily by *Aquilaria* species, in the family Thymelaeaceae. Over 1000 tonnes of agarwood were reported in international trade in 1998 under the name *Aquilaria malaccensis* although there are 15 species in the genus and eight are known to produce agarwood. *Aquilaria malaccensis* is the only species listed on CITES Appendix II.

The demand for agarwood far exceeds supply. Populations of eight *Aquilaria* species have declined to the point where they are categorised as threatened according to IUCN Red List Categories. Of these, six are considered at risk from over-exploitation for agarwood.

CITES Decision 11.112 tasks the Plants Committee to continue its review of the genus *Aquilaria*, in order to:

- determine how species within the genus may be distinguished from each other when in trade, particularly when traded as agarwood;
- determine measures, other than improved identification, that might improve accurate reporting of trade in specimens of *Aquilaria malaccensis*; and
- determine whether additional species in the genus should be included in Appendix II of the Convention, either because of similarity of appearance or because their biological and trade status qualify them for inclusion in Appendix II.

In addition, CITES Decision 11.113 states that:

- If it is determined, as a result of this review, that additional species should be included in Appendix II, the Plants Committee shall specify which species should be included in Appendix II under the provisions of Article II, paragraph 2(a), and which species should be included in Appendix II under the provisions of Article II, paragraph 2(b).

The TRAFFIC Network report *Heart of the Matter* (Barden *et al*, 2000) reviewed the state of knowledge of agarwood use and trade and CITES implementation for *Aquilaria malaccensis*. The report also provided individual country reports for the 10 countries known at that time to be range states for *A. malaccensis* and hence likely to be engaged in harvest and trade in agarwood (Bhutan, India, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam). Papua New Guinea (PNG) was not covered in the report apart from anecdotal reports of cross-border trade with Indonesia.

The island of New Guinea, which represents the known eastern extreme of the range of *Aquilaria* spp., is divided into two political entities: the Indonesian province of Irian Jaya (now known as West Papua²) and the independent state of Papua New Guinea (PNG).

Irian Jaya is a known source area for gaharu exported from Indonesia. Since the Indonesian monetary crisis of 1997, harvesting activities in Irian Jaya have risen. A single seizure of 7 tonnes of gaharu (originating from Irian Jaya) in Jakarta in 1997 was only a fraction of the hundreds of tonnes reportedly smuggled out from Irian Jaya the previous year, according to the provincial governor (Barden *et al*, 2000).

¹ Gaharu is the Bahasa Indonesia/Malay term for agarwood, and is also used by many Papua New Guineans involved in the trade. This report will refer to the product derived from agarwood trees as gaharu.

² For ease of historical reference and to save confusion, this report will use Irian Jaya to refer to the western half of the island of New Guinea.

On the PNG side of the border, harvesting is believed to have started around 1997 (O. Gideon, *pers. comm.* to TRAFFIC Oceania, 1999). At that time, PNG government authorities presumed the species being harvested for gaharu to be *Aquilaria filaria*, which has been recorded from several locations on the Indonesian side of the border. In PNG the discovery of gaharu as a resource is relatively recent and interest in the harvest and trade is still rising.

At this stage, unexploited stands of gaharu still exist in PNG. In areas where harvesting has begun, villagers are still learning how to extract gaharu and manage the trees. PNG therefore provides a unique opportunity to promote the establishment of a sustainable gaharu industry. Further understanding of trade dynamics and the development of an appropriate regulatory framework at local community and national levels may enable the sustainable management and conservation of viable *in-situ* populations and the establishment of *ex-situ* plantations.

TRAFFIC Oceania initiated work on gaharu harvest and trade in PNG in April 2001, in collaboration with the WWF South Pacific Programme, with the objectives of identifying species being harvested for gaharu, clarifying the existing national regulatory framework, and mapping the current harvest and trade dynamics.

Field research centred on two provinces of PNG, Sandaun and East Sepik. The western border of Sandaun province also represents the territorial border between PNG and Indonesia. The actual survey of forest habitats was conducted in East Sepik Province from 14 April until 7 May 2001, during which time eight villages and adjoining landholdings were visited.

In addition, TRAFFIC Oceania and WWF South Pacific Programme attended two meetings of an Inter-Agency Committee (IAC) set up by the PNG National Forest Service to specifically discuss the trade in gaharu. This IAC includes representatives from the PNG Office of Environment and Conservation (PNG's CITES Management Authority), PNG Internal Revenue Commission and the PNG Forest Research Institute. TRAFFIC's research with WWF on gaharu in PNG has been conducted in a transparent manner, and has allowed for creation of valuable links with the IAC members noted above, as well as the CITES Plants Committee representative based at the University of PNG.

Initial findings

Identification: Herbarium specimens collected in East Sepik and Sandaun Provinces, from trees that produce gaharu, have been identified as *Gyrinops ledermannii* Domke on the basis of flowering and fruiting material. Only one reference is known to indicate that a species of *Gyrinops* produces gaharu: *Gyrinops versteegii* (Gilg.) Domke in West Papua, Indonesia (H. Wiriadinata, Herbarium Bogoriense, Indonesia, *in litt.* to TRAFFIC Oceania, 2001)³.

The genus *Gyrinops* is found in Sri Lanka, in some eastern Indonesian islands (Lombok, Sumbawa, Flores, Sumba, Sulawesi and the Moluccas) and in New Guinea. It consists of seven species, four of which are found on the island of New Guinea: *Gyrinops ledermannii*, *G. versteegii*, *G. caudata* and *G. podocarpus* (Ding Hou, 1960).

The flora of the island of New Guinea is relatively poorly known. At present, there are three gaharu-producing species known from New Guinea: *Aquilaria filaria*, *Gyrinops versteegii* and *G. ledermannii*. The former two are only recorded from Irian Jaya, however it is conceivable that these two species also occur in PNG and also that there are more gaharu-producing species than presently known. Further surveys and herbarium specimens of gaharu-producing

³ *Gyrinops versteegii* is listed as an "included" species (along with *Aquilaria beccariana*, *A. microcarpa*, and *A. hirta*) under the Indonesian export quota for *Aquilaria malaccensis* in a list of CITES Appendix II species in trade from Indonesia (Indonesian Ministry of Forestry, 2000). In this document, the total Indonesian quota set for gaharu in 2001 is 75 tonnes.

plants are needed from New Guinea and nearby islands to confirm the identity and distribution of gaharu-producing species.

As of August 2001, no specimens of *Aquilaria* spp. have been recorded from PNG. Until June 2001, no confirmed specimens of *Gyrinops ledermannii* were held at herbaria in Lae (PNG National Herbarium), Port Moresby (University of Papua New Guinea) nor Canberra (Australian National Herbarium). The *G. ledermannii* type specimen collected by Ledermann from the Sepik region in 1912 is no longer stored at the Berlin Herbarium (Prof. Dr Brigitte Zimmer, Berlin Herbarium, *in litt.* to TRAFFIC Europe-Germany, 2001), believed to have been destroyed in the World War II bombing of Berlin.

Taxonomy: There is a need for further taxonomic research into the relationship between *Aquilaria* and *Gyrinops*. Ding Hou (1960) and Hallier *f.* (1922) have acknowledged the similarity between the two genera *Aquilaria* and *Gyrinops*, which are only able to be consistently distinguished on the basis of a single character. In *Aquilaria* the number of stamens is twice the number of petals (*i.e.* 10) while in *Gyrinops* there are equal numbers of stamens as petals (*i.e.* 5).

Hallier *f.* considered that the difference in the number of stamens alone was not sufficient to retain the two genera and reduced *Gyrinops* into synonymy with *Aquilaria*.

Ding Hou retained the two genera in his *Flora Malesiana* analysis. However, he acknowledged that further research was required as the "merging of *Aquilaria* and *Gyrinops* ... might give a better reflection of the natural affinities, as the single character separating [these two genera] is, in my opinion, not a natural segregation" (Ding Hou, 1960: 4).

Geographical and Ecological Distribution: The occurrence of *Gyrinops ledermannii* has been confirmed only from Sandaun and East Sepik Provinces (R.Kiapranis, PNG National Herbarium, *pers. comm.* to TRAFFIC Oceania, 2001). Only one other recorded specimen has been collected from PNG, an indeterminate *Gyrinops* or *Aquilaria* species recorded near Ihu in Gulf Province on the southern coast of the country (Australian National Herbarium, *in litt.* to TRAFFIC Oceania, 2001). Anecdotal information from villagers and middlemen buyers indicates the possible occurrence of gaharu-producing species in other provinces of Papua New Guinea, including Manus, Madang, Gulf, Western and New Britain.

Gyrinops ledermannii has been observed as a mid-canopy tree species in lowland forests on mountains, hills and slopes probably below an altitude of 1000 m and in flat areas with a seasonally high water table but not inundated for long periods. Soils are usually sticky yellow to red clays, with a thin humus layer and often with a dense surface root mat. Distribution of plants in the forest appears to be strongly clumped with often a very high but localised density of trees.

Harvest and Trade Dynamics: Staff at the Papua New Guinea Herbarium in Lae began receiving inquiries from potential gaharu buyers in the mid-1990s, with interest focusing on the possible occurrence of *Aquilaria* in PNG. Around the same time, plant specimens also began to be sent to Lae for identification from buyers and landowners at Green River, Sandaun (West Sepik) Province (R. Kiapranis, PNG National Herbarium, *pers. comm.* to TRAFFIC Oceania, 2001). Prior to the activities of Asian buyers and traders initiating local interest in PNG's gaharu resources, there was no known traditional use for gaharu-producing trees by Papua New Guineans.

Interview-based research by TRAFFIC Oceania indicates that organised gaharu trade from PNG began in 1997 in Sandaun Province. Trade from East Sepik Province began in 1998. Asian buyers (or their local partners) visited the villages and taught individuals to identify trees and instructed them in basic techniques of finding, harvesting and cleaning gaharu. These individuals were taught that gaharu forms where the tree has sustained damage either in the roots, branches or trunk. They were told to cut out small amounts of gaharu using their knives, but leave the tree standing. Only if there were large amounts of gaharu in the heartwood were

they told to cut the tree down. In practice, villagers find these techniques time consuming and physically demanding and trees are often chopped down to check for gaharu in the trunk, branches and roots.

Harvest rates in sample plots in the Hunstein Range (East Sepik province) are relatively high, ranging from 12-39% of *Gyrinops ledermannii* trees over 5cm diameter at breast height cut down in the search for gaharu since harvesting began⁴.

As noted in Barden *et al*, grading gaharu is a complicated process. This includes evaluating the size, colour, odour, weight (on scales and in water) and flammability of the wood – but application of grade codes (Super A, A, B, C, D, E) varies between buyers in PNG. Asian buyers are mostly based in Vanimo, though several have been reported to buy in Wewak when there is demand. Most Asian buyers have PNG nationals working for them who are sent as ‘agents’ out to the village communities to assay and purchase gaharu. Prices paid to collectors in East Sepik and Sandaun Provinces are made in PNG Kina (PGK) per gram or kilogram. According to information collected from individuals involved in the trade, prices in May 2001 averaged as follows:

A grade = PGK1139.5 (USD341); B grade = PGK791.2 (USD237); C grade = PGK172 (USD172); D grade = PGK371.66 (USD111).⁵

PNG National Forest Service export figures show that nearly 4 tonnes of gaharu were exported in the period October 1999-March 2001, with a stated value of USD 827,382 (average price = USD207/kg) (PNG National Forest Service, *in litt.* to TRAFFIC Oceania, 2001). However, one middleman buyer reported much higher volumes (*e.g.* a single shipment of 10 tonnes in November 2000) being exported from Vanimo through Port Moresby.

While there are numerous anecdotal reports of illegal trade across the border to Jayapura (Indonesia) from Vanimo by land and sea, little evidence for large-scale movement of gaharu was recorded during the survey period. However, gaharu was noted by border post officials as one of four main commodities in trade (both legal and unregulated) between Vanimo and Jayapura⁶. When it does occur, transport of gaharu from PNG to Indonesia is most likely to occur by foot or by small boat. Singapore is believed to be the most common international destination for large shipments of PNG-sourced gaharu, mostly transported by ship and commercial air flights.

Regulatory Environment and Government Institutions: As of August 2001, no specific provision existed in PNG for the national protection of gaharu-producing species, neither had quotas been set for export or harvest. However, the PNG National Forest Service has specified that the following documents need to be obtained in order to export “Eaglewood” (gaharu) legally from PNG:

- Certificate of Company Registration;
- Forest Industry Participant certificate;
- Timber License (plus PGK50,000 bond);
- Export license (must be obtained for each incidence of export).

⁴ If January 1998 is used as an approximate starting point for harvesting in the survey area, these statistical indicators relate to a 42-month period.

⁵ Exchange rate in May 2001: PGK1 = USD0.299

⁶ The only recorded incident during the survey period was on 11 April 2001, when 120 kg of gaharu was reported by a PNG customs official to have been exported to Irian Jaya via the Wutung border crossing.

The OEC, as the PNG CITES Management Authority, has never issued a CITES permit for exports *Aquilaria malaccensis* or any other gaharu producing species (Barnabus Wilmott, OEC Wildlife Enforcement Branch, *pers. comm.* to TRAFFIC Oceania, 2001).

An Inter-Agency Committee (IAC) set up by the PNG National Forest Authority to specifically discuss the trade in Gaharu has met on two occasions (April 26 and July 20, 2001). Although general IAC consensus has been reached on the need for individual agencies to co-operate further (*e.g.* surveys on identification, distribution and trade of gaharu-producing species, the development of clear national policy guidelines, and best-practice harvest management) no co-ordinated action has yet been taken. This is partly due to a lack of available funds.

Conservation impact: *Gyrinops ledermannii* appears to be under significant threat at the population level from indiscriminate felling by villagers in their efforts to harvest gaharu, with suspected gaharu-bearing trees being cut regardless of infection. The real volume of trade is likely to exceed that being recorded at present.

Recommended actions

- *CITES Assessment:* With specific reference to CITES Decisions 11.112 and 11.113, it is recommended that the analysis of whether additional species in the genus *Aquilaria* should be included in CITES Appendix II be widened to include at least the two species of *Gyrinops* (*G. versteegii* and *G. ledermannii*) known to be harvested for gaharu. For an assessment of gaharu-producing species of both *Aquilaria* spp. and *Gyrinops* spp. to be conducted in time for the 12th Conference of the Parties to CITES, funds need to be identified immediately to enable the TRAFFIC Network to implement activities specified in its proposal to the CITES Secretariat (see Annex of PC11 Doc. 8.3).
- *Develop conservation and management strategy in PNG:* Research into the species biology and ecology, gaharu formation, fungal pathology and propagation techniques will inform the development of an integrated strategy, incorporating both *in-situ* and *ex-situ* goals. National and provincial management plans should provide best-practice harvesting guidelines and grading guidelines. The development of a business enterprise model would enhance the access to appropriate benefits by local communities and resource owners. Research into techniques for villagers to undertake propagation of seedlings, enrichment planting and the establishment of plantations is also needed to ensure future access to a gaharu resource. PNG would benefit from co-operation with organisations or individuals from other gaharu source/trading nations with expertise in these areas.
- *Conduct further field research on gaharu trade in New Guinea:* To understand the magnitude of gaharu resources in New Guinea, further research needs to be undertaken relating to harvest and trade dynamics on both sides of the border (PNG and ID).
- *Develop legislative mechanisms and enforcement/management capacity in PNG:* As part of a National Management Strategy, more comprehensive regulatory mechanisms to control and monitor harvesting and trade of gaharu are required. This should include provision of adequate legislative provisions, appropriate personnel, resources and prioritisation by relevant PNG authorities. Further enhancement of co-operative efforts between PNG and Indonesia would also benefit the management of gaharu harvest and trade.
- *Taxonomic research:* The systematic relationship between *Aquilaria* and *Gyrinops* requires further study. Additionally, the botanical identification/description of gaharu-producing species recorded (and anecdotally reported) in other parts of Papua New Guinea and eastern Indonesia should be undertaken. Once the results of more comprehensive studies are available, it is likely that a new species- and genus-level taxonomy for *Aquilaria* and *Gyrinops* will need to be developed.

- *Further co-operation between stakeholders in PNG:* Management programs for harvesting and trade in gaharu will only succeed if there is a multi-party integrated approach. This has already begun with the establishment of the Inter-Agency Committee in PNG, the work of the WWF Sepik Community Landcare project, and the research at the Forestry Research Institute in Lae. Community groups and other stakeholders (including buyers, middlemen and traders) must be further engaged in the decision-making and management process.
- *Raise awareness:* Training materials need to be developed and should be targeted at different stakeholder groups including landowners, traders, government officials and other commercial operations to ensure people are fully informed about the conservation impact and legality of their actions with respect to harvests and trade.

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References

- Barden, A., Awang Anak, N., Mulliken, T., and Song, M. (2000). *Heart of the Matter: Agarwood Use and Trade, and CITES implementation for Aquilaria malaccensis*. TRAFFIC International.
- Ding Hou, 1960. *Thymelaeaceae*. In: Van Steenis, C.G.G.J. (ed.), Flora Malesiana Series I, Volume 6. Wolter-Noordhoff Publishing, Groningen, The Netherlands, pp.1-15.
- Domke, W. 1932. *Zur Kenntnis einiger Thymelaeaceen*. Notizblatt des Botanischen Gartens und Museums zu Berlin - Dahlem 11: 348-363.
- Hallier, H., 1922. *Beitrage zur Kenntnis der Thymelaeaceen und ihrer naturlichen Umgrenzung*. Mededeelingen van's Rijks Herbarium Leiden No. 44. Firma P.W.M. Trap. Leiden. pp. 1-31
- Kadir, A.A., Ng, L.K. & Ali, A.R.M. 1997. *Economic aspects of Aquilaria malaccensis and its conservation in Malaysia*. In: Productive functions of forests. Proceedings of the XI World Forestry Congress 13-22 October 1997. Antalya, Turkey.
- Kerenga, K. 2000. *A Management Strategy for PNG's Eaglewood Resource*. Unpublished report to WWF South Pacific Programme, PNG office.
- La Frankie, J.V. 1994. *Population dynamics of some tropical timbers that yield non-timber forest products*. Economic Botany 48(3): 301-309.
- Newton, A.C., and T. Soehartono, 2000. *CITES and the conservation of tree species: The case of Aquilaria in Indonesia*. CITES Plants Committee information document, prepared for the Tenth Meeting of the CITES Plants Committee.
- Ng, L.T., Chang Y.S. & Kadir, A.A., 1997. *A review on agar (gaharu) producing Aquilaria species*. Journal of Tropical Forest Products 2 (2), 272-285.
- Soehartono, T. & Mardiasuti, A., 1997. *The current trade in gaharu in West Kalimantan*. Biodiversitas Indonesia 1: 1-10.
- Soehartono, T., and Newton, A.C., 2000. *Conservation and sustainable use of tropical trees in the genus Aquilaria: I. Status and distribution in Indonesia*. Biological Conservation 96: 83-94.
- Soehartono, T., and A.C. Newton., 2001. *Conservation and sustainable use of tropical trees in the genus Aquilaria: II. The impact of gaharu harvesting in Indonesia*. Biological Conservation 97: 29-41.