

# THE FINAL FRONTIER

TOWARDS SUSTAINABLE MANAGEMENT  
OF PAPUA NEW GUINEA'S  
AGARWOOD RESOURCE

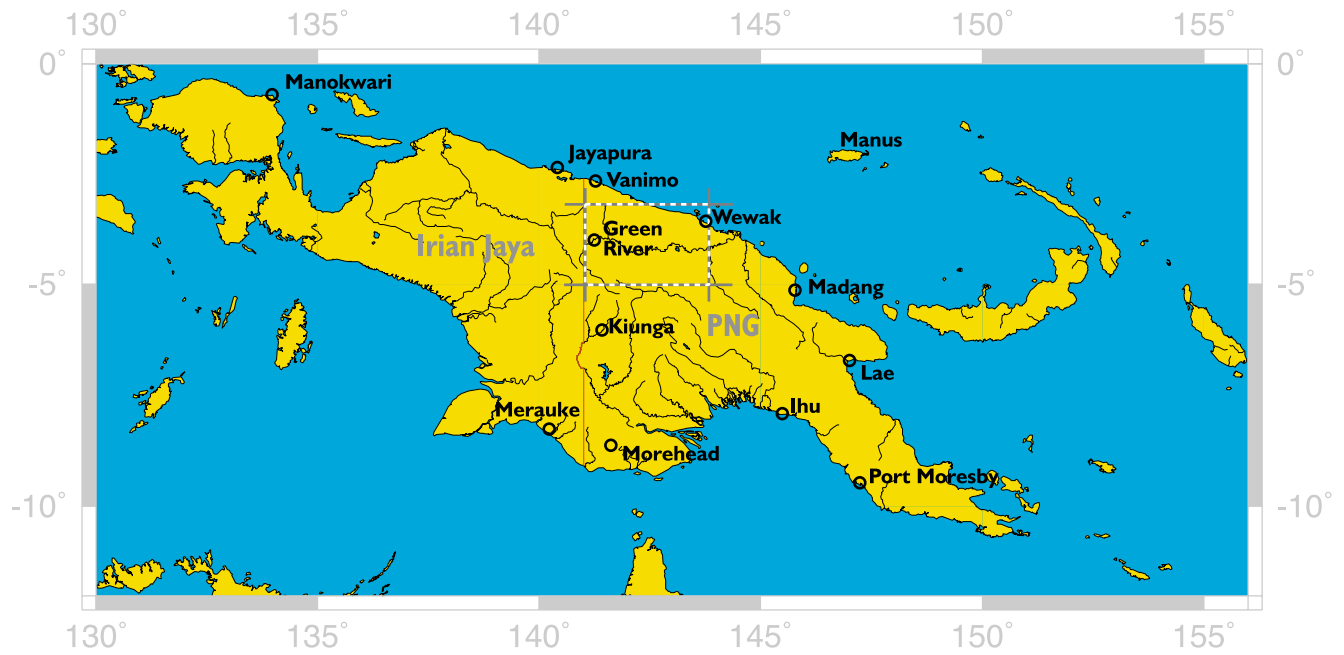
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A TRAFFIC OCEANIA REPORT  
IN CONJUNCTION WITH  
WWF SOUTH PACIFIC  
PROGRAMME

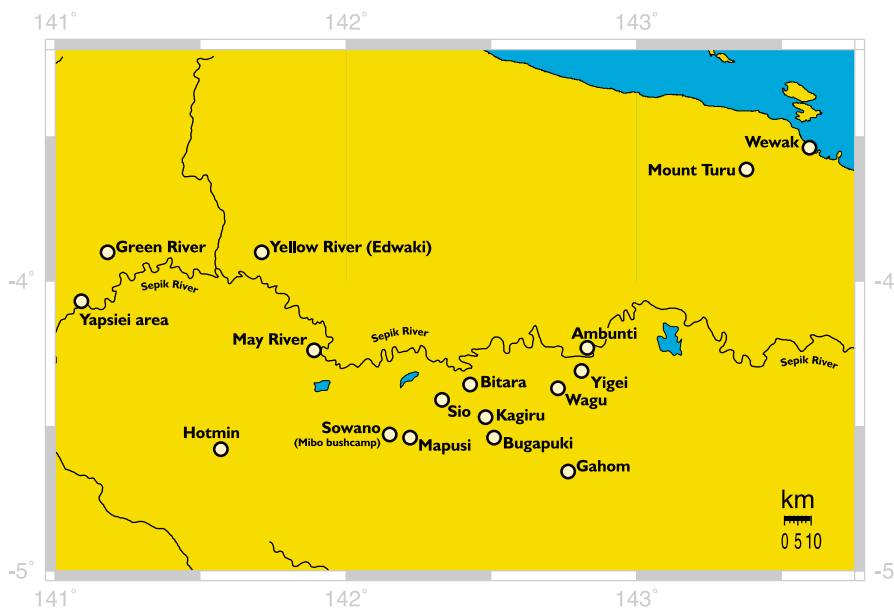


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The island of New Guinea (above) is divided into two political entities: the Indonesian province of Irian Jaya (now known as Papua) and independent Papua New Guinea. Field surveys were carried out in the lowland forests of the Sepik River region of PNG (below).



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## BACKGROUND

Agarwood (also known as aloeswood, eaglewood and gaharu, among many other common names) is a fragrant wood that has been traded since biblical times for its use in religious, medicinal and aromatic preparations. High consumer demand, particularly from Middle Eastern and Asian markets, combined with decreasing supply has pushed prices progressively higher to the extent that top grade agarwood can sell for over USD10,000/kg in end-use markets (Barden *et al*, 2000).

Agarwood-producing species are found from India eastwards to the island of New Guinea, including all Southeast Asian countries and north to Hainan Island in southern China. Historically, India played a central role in supplying the global agarwood trade, in particular the high-demand markets of the Middle East, but overharvest of agarwood in Assam and other north-eastern Indian states has meant that India now depends mainly on imports to meet domestic and overseas market requirements. In Southeast Asian countries, such as Vietnam, Malaysia and parts of Indonesia, agarwood collection is reportedly becoming more difficult year-on-year as supplies of mature trees dwindle.

The island of New Guinea is the known eastern extreme of the agarwood-producing species' range, and could also be the world's last frontier for substantial wild agarwood stocks. But even New Guinea's agarwood faces the threat of unprecedented levels of harvest and trade that have expanded over the past five years.

Global demand for agarwood currently exceeds the available supply, which is naturally restricted owing to the nature of its formation. Agarwood is found naturally in only a small percentage of trees in the Thymeleaceae family – with the highest-grade “product” usually harvested from certain species in the Genus *Aquilaria*. Although research into the formation of agarwood is ongoing and results are by no means clear cut, it appears that the fragrant oleoresin that permeates the heartwood of some trees is produced as a response to wounding and/or a fungal infection. Gianno (1986, cited in LaFrankie, 1994) suggested that only 10% of mature trees above 20cm diameter at breast height (dbh) produce agarwood. Chakrabarty *et al*. (1994) stated that infected trees produce resin from the age of 20 years onwards, while Sadgopal (1960, cited in Soehartono, 1997) postulated that trees aged 50 years and over produce the best yields of agarwood.

Lack of external signs of the presence of agarwood leads to trees often being felled indiscriminately in the search for the precious darker wood. Populations of eight *Aquilaria* species have declined to the point where they are categorized as threatened according to IUCN Red List Categories. Of these, six are considered at risk from over-exploitation for agarwood (Oldfield *et al*, 1998, cited in Barden *et al*, 2000).

TRAFFIC researched and published a review of global agarwood trade in 2000, entitled *Heart of the Matter: 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 engaged in harvest and trade in



Credit: James Compton/TOC/WWF SPP

Trees can grow for 20 years or more before producing gaharu

agarwood: Bhutan, India, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam, while also describing the domestic and international legislative frameworks in these countries. Papua New Guinea was not included in the report.

One key issue dealt with by the report was the confusion between *A. malaccensis* and other agarwood-producing species at ‘product’ level – *i.e.* wood chips, larger pieces, oil, powder or incense sticks.

Concerns about the status and trade of *Aquilaria malaccensis* led to the proposal by the Government of India in 1994 to include that species in Appendix II of the Convention on International Trade of Endangered Species of Wild Flora and Fauna (CITES). An Appendix II listing covers species not necessarily threatened with extinction, but where trade must be controlled in order to avoid the species becoming threatened with extinction. International commercial trade in *A. malaccensis* is thus permitted but controlled, and a CITES export permit or re-export certificate is required for each incidence of export.

Since 1995, better reporting of trade in *A. malaccensis* has been facilitated by the tracking of CITES permits issued by exporting and re-exporting states. 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 continuing confusion between *A. malaccensis* and other agarwood-producing species at ‘product’ level led to the issuance of CITES Decision 11.112, which tasks



Gaharu pieces and chips harvested from the Hunstein Range

the CITES 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).”

#### New Guinea in the context of global agarwood trade:

The island of New Guinea is divided into two political entities: the Indonesian province of Irian Jaya (now known as Papua<sup>1</sup>) and the independent state of Papua New Guinea (PNG).

Irian Jaya makes up the western half of New Guinea and is a known source area for agarwood (or gaharu, as it is referred to in Bahasa Indonesia/Malay languages) exported from Indonesia. In 1997, Indonesia specified a total gaharu harvest quota of 70 tonnes from the province of Irian Jaya. That same year, the country underwent a monetary crisis and a concurrent rise in harvesting activities was noted. 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 (*Kompas* (Indonesia), 12th August 1997, cited in Barden *et al*, 2000). The 2002 export quota for gaharu harvested from *Aquilaria filaria* in Irian Jaya and the Maluku islands is 125 tonnes (Indonesian Ministry of Forestry, 2002), the

same amount as the quota for 2001.

On the Papua New Guinea side of the border, harvesting is believed to have been prevalent since 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 in Irian Jaya.

The catalyst for this ‘sudden’ discovery of gaharu in PNG is most likely associated with Asian traders visiting the Sepik provinces bordering Irian Jaya, but could also involve Melanesian clan groups whose traditional lands traverse both sides of the border. Prior to the past five years, most indigenous Papua New Guineans had never heard of the “gaharu tree”, nor used it for any traditional applications. It was widely regarded as just another forest tree unsuitable for making canoes or houses.

At this point in time, unexploited stands of gaharu-producing trees 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* woodlots.

Of particular interest to TRAFFIC Oceania and WWF South Pacific Programme is the potential economic benefit this trade offers to rural communities in Papua New Guinea. With that in mind, a joint TRAFFIC/WWF project was initiated in April 2001, with the objective of identifying species being harvested for gaharu, clarifying the existing national regulatory framework and mapping the current harvest and trade dynamics. The village-level research was concentrated in the Hunstein Range, in Ambunti District of East Sepik Province, where the WWF Sepik Community Land Care project has been working with landowner groups over the past three years.

In addition, TRAFFIC and WWF attended two meetings of an Inter-Agency Committee (IAC) set up by the PNG National Forest Service (NFS) to specifically discuss the trade in gaharu. This IAC includes representatives from the PNG Office of Environment and Conservation (OEC, PNG’s CITES Management Authority), PNG Internal Revenue Commission (IRC), the PNG Forest Research Institute (FRI), and is chaired by the National Forest Service.

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. Contact has also been maintained with CSIRO’s Forestry and Forest Products division, which has a mutual interest in harnessing the potential of gaharu.

<sup>1</sup> 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. In PNG, the traded commodity produced by agarwood trees is known as gaharu or eaglewood, referred to in this report as gaharu.



Consultation with villagers in the Hunstein Range

## INITIAL FINDINGS

Field research was carried out in two provinces of PNG, Sandaun (aka West Sepik) and East Sepik. The western border of Sandaun is also the territorial border between PNG and Indonesia. Actual surveys of forest habitats were conducted in East Sepik Province from 14 April until 7 May 2001, during which time eight villages and adjoining landholdings were visited. A Participatory Rural Appraisal approach, adapted from Chatterton and Means (1996), was used in each village community, including the following steps:

- Introductory session in which the survey team introduced themselves and informed the community about the purpose of the visit;
- Semi-structured interviews with the community and with individuals;
- A session on concerns and opportunities with either the community or individuals;
- Resource mapping to attempt to identify the range of habitats in which agarwood trees were found in the village and the areas where harvesting was occurring;
- Forest transects to collect quantitative data on abundance and population structure of agarwood trees

**Identification and taxonomy:** 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 Indonesia (H. Wiriadinata, Herbarium Bogoriense, Indonesia, *in litt.* to TRAFFIC Oceania, 2001)<sup>2</sup>.

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, five of which are found on the island of New Guinea: *Gyrinops ledermannii*, *G.*

<sup>2</sup> *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. The quota set for CITES-listed gaharu exports in 2002 is 75 tonnes. A separate export quota for the non-CITES listed *Aquilaria filaria* species from Irian Jaya and the Maluku islands has been set at 125 tonnes, bringing the total Indonesian gaharu export quota in 2002 to 200 tonnes (Indonesian Ministry of Forestry, 2002), the same as the quotas set for 2001.

*salicifolia*, *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 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. had been recorded from PNG. Until June 2001, no 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), and is believed to have been destroyed in the World War II bombing of Berlin.

Botanists Hallier (1922) and Ding Hou (1960) both 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 the petals (*i.e.* 10) while in *Gyrinops* there are equal numbers of stamens as petals (*i.e.* 5).

Hallier 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 analysis of the Thymeleaceae family for the publication *Flora Malesiana*, but 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).

*Gyrinops ledermannii* (Domke) was first described and formally published by Domke (1932) from a single



Leaves and fruit of *Phaleria macrocarpa* or 'puk-puk gaharu'

specimen collected by Ledermann (No. 7401, 25 May 1912) at Station Mt. Pfindst, Sepik River (actually on the May River, between the present May River government station and the village of Hotmin). Ledermann was a member of the German Kaiserin-Augusta-Fluss expedition in 1912-1913 that explored and mapped the Sepik River and most of its tributaries. Domke's original description of the species is in German, and no illustration was ever published.

Ding Hou took his description of the species from Domke's original published description and agrees that it appears to be a species distinct from two closely related species, *Gyrinops moluccana* (Miq.) Baill. (found in the Moluccas) and *Gyrinops decipiens* (Ding Hou) (found in Sulawesi). *G. ledermannii* is distinguished from these species by a combination of floral characters and leaf shape. Specimens collected in East Sepik during this study differ in certain characters from the description given by Domke and Ding Hou. This is attributed to Domke's original description being made from only one specimen.

All villages visited during this survey also knew of a species referred to by the Tok Pisin name "puk-puk gaharu", derived from the Bahasa Indonesia/Malay "gaharu buaya" (English translation: crocodile gaharu). This vernacular name is known to be associated in Indonesia (Kalimantan) and Malaysia (Sarawak) with another gaharu-producing species, *Aetoxylon sympetalum*, harvested from the island of Borneo. "Puk-puk gaharu" plants observed in PNG have been identified as *Phaleria macrocarpa* (Scheff.) Boerl.

Villagers in the study area reported that they were shown the plant and told this name by Asian buyers during their first visit in search of gaharu and to train villagers in collecting techniques. Villagers were told by buyers that "puk-puk gaharu" produces a low grade or "false" gaharu that they would not buy. Inexperienced buyers have occasionally bought "puk-puk gaharu" and then been unable to sell the product to Asian buyers. There are also reports of villagers mixing true gaharu with "puk-puk gaharu" and selling this to buyers. Mistakes like this have led to substantial losses for some local agents and traders.



Researcher Jacob Kwaramb (second from right) with Sepik landowners



*Gyrinops ledermannii* trees in the Hunstein Range

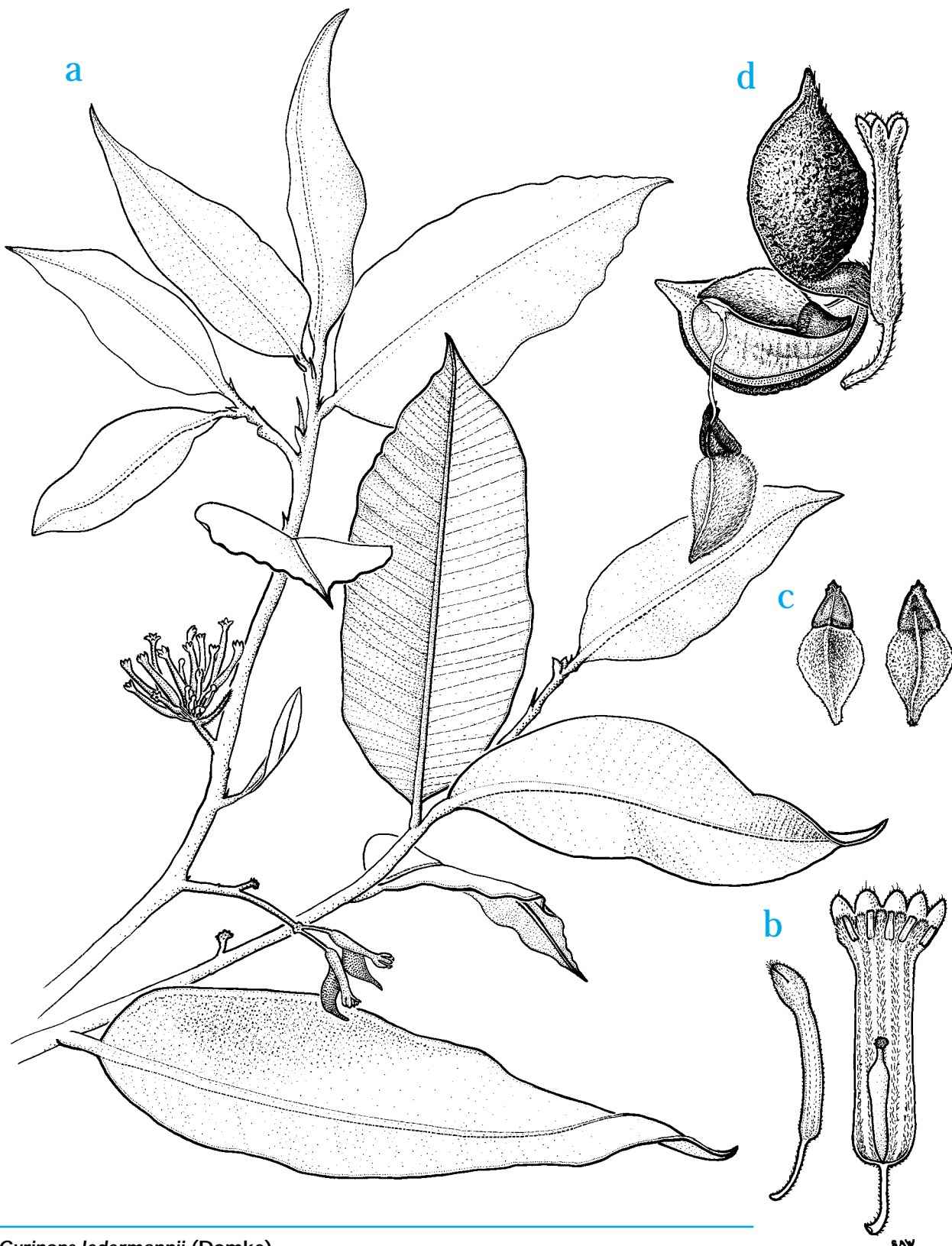
**Geographical and Ecological Distribution:** The occurrence of *G. ledermannii* in PNG has been confirmed from East Sepik Province (Ledermann, 1912; Zich, 2001) and Sandaun Province (R. Kiapranis, 2001). Only one other recorded specimen has been collected from PNG, an indeterminate *Gyrinops* or *Aquilaria* species recorded near Ihu in Gulf Province on the southern coast of the mainland (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 PNG, including Manus, Madang, Gulf, Western and the island of 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 localized density of trees.

Trees greater than 5cm diameter at breast height (dbh) were sometimes seen flowering. Most trees in each population were weak-stemmed and leaning, and occasional straight-trunked trees on the slopes and hills were taller at 15-20m. The largest tree recorded was 22cm dbh and 26.5m tall. Trees of this and larger dimensions were reported during interviews as occurring in the higher hills and mountains throughout the survey area.

Credit: Frank Zich/TOC/WWF SPP

Credit: Frank Zich/TOC/WWF SPP



***Gyrinops ledermannii* (Domke)**

a- habit

b- flower bud (left), opened flower (right)

c- seed dorsal view (left), ventral view (right)

d- dehiscent fruit emerging from lateral slit of floral tube with one seed hanging out on funicle

Herbarium specimen Zich 315, CANB Accession Number 531408.

Botanical Illustration: Sharyn Wragg



Credit: James Compton/TOC/WWF SPP

Many young saplings are being cut in the hope they will yield gaharu



Credit: Frank Zich/TOC/WWF SPP

When not impregnated with resin, the wood of *Gyrinops ledermannii* remains white



Credit: James Compton/TOC/WWF SPP

The white wood is scraped away from the darker, resinous wood when preparing gaharu for sale

## HARVEST AND TRADE DYNAMICS

Staff at the PNG National Herbarium in Lae began receiving inquiries from potential gaharu buyers in the mid-1990s, with interest focusing on the possible occurrence of *Aquilaria sp.* 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 Province (R. Kiapranis, PNG 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 organized gaharu trade from PNG began in 1997 in Sandaun Province. Trade from East Sepik Province began in 1998.

Asian buyers are mostly based in Vanimo (the provincial capital of Sandaun) though several have been reported to buy in Wewak (the provincial capital of East Sepik) when there is supply. Most Asian buyers have PNG nationals working for them who are sent as 'agents' out to the village communities to assay and purchase gaharu. These buyers (or their local partners) visited the villages and instructed individuals in basic techniques of identifying the presence of gaharu, harvesting and cleaning gaharu.

Villagers were taught to look for external signs of gaharu formation:

- ants around a wound in the trunk leaking resin;
- insect damage or holes on the trunk;
- broken branches in the canopy;
- broken or damaged roots.

At these points they were told to look for blackened, resinous and aromatic gaharu. They were also told to cut into the trunk using a bush-knife to check for the presence of gaharu in the heartwood. If the wood is just starting to turn black (lower than Grade B or C), they were told to leave it until it is fully ready for harvesting. Villagers were also told that they could help induce the formation of gaharu by damaging trees in this way.

Another sign villagers were taught to look for was the presence of brown or yellow leaves. If the tree did not exhibit signs of damage, either on the trunk, branches, roots or through discoloured leaves, more experienced harvesters may cut into the tree trunk to induce pathological responses. Ideally, three cuts should be made, 1m apart, and the tree should be left for 3-5 years. This process of inducing gaharu formation is known in Tok Pisin as *makim diwai sik* or *wok gaharu*.

If gaharu is present in small quantities in the branches and roots and in small pockets in the trunk, they were told to cut it out using their knives, but leave the tree standing. If there were large amounts of gaharu in the heartwood then they could cut the tree down. Villagers were told that if there were shoots present on the trunk, they could cut the trunk above the shoots and the tree would continue to live. If the trunk was cut and there were no shoots then the tree would die.

It appears that the harvesting techniques villagers



were taught were relatively non-destructive and could allow for sustainable harvesting. In practice, villagers find these techniques time consuming and physically demanding (to climb trees). As a result trees are often chopped down to check for gaharu in the trunk and branches, and roots are dug out. Villagers have realised that checking for the presence of gaharu in the trunk (often by cutting more than half way through the trunk) frequently leads to tree death.

In one Hunstein Range village, however, villagers often make a ladder to climb into the trees. If they find gaharu they cut it out, and if there are gnarls or wounds on the trunk they cut them open. Some villagers have recently been told that use of a hand drill to check for the presence of gaharu in the trunk could be a less destructive method.

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 began<sup>3</sup>.

Following extraction of the wood from the tree the white wood must be removed using a metal scraper (usually provided by the Asian buyers, or bought from Jayapura) to expose the darker, resinous wood.

When extracted, resinous wood is often moist, which prevents assessment of the real grade and value. To dry the wood, it is left in the sun for not more than 30 minutes, but if harvesters or buyers are concerned that the oil might evaporate, they will dry it in the shade.

#### 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 all suspected gaharu-bearing trees being cut regardless of infection. In some areas villagers often expressed their assessment that all adult trees containing gaharu on their land would be felled within the next 1-2 years. Further data, such as the range and distribution of the species, is required to enable confident application of an IUCN Red List conservation category (IUCN, 1994) for *Gyrinops ledermannii*.

#### Grading and Prices:

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. Chips are usually one to a few centimetres in length; larger pieces can be approximately 10 or more centimetres in length.

Resin content of gaharu is often tested by igniting the wood and smelling the smoke, while watching for bubbling of resin as the wood burns. When there is a large amount of gaharu to be graded, buyers often make the first sort by using the water test, separating pieces that float (because of lower resin content) from those that sink (high resin content, better quality). After they are dried again, pieces are graded based on colour and

size. Mixed chips of good quality (black, black and brown) are graded as C and often fetch a higher price per gram than large pieces of A and B grade. Villagers will often try to discolour white wood with coffee grounds or oil to make them appear like high-grade gaharu.

Prices paid to collectors in East Sepik and Sandaun Provinces are made in PNG Kina (PGK) per gram or kilogram<sup>4</sup>.

Average (reported) prices paid by buyers to collectors		Prices recommended by the PNG Forest Authority	
May 2001	Grade A - PGK 1140/kg	May 2002	Super A - PGK 2000/kg
	B Grade - PGK 791/kg		Grade A - PGK 1500/kg
	C Grade - PGK 575/kg		B Grade - PGK 1000/kg
	D Grade - PGK 372/kg		C Grade - PGK 500/kg
			D Grade - PGK 50/kg



Credit: James Compton/T-OC/WWF SPP

Large pieces of gaharu for sale in Hong Kong, 2001

#### Export of gaharu from PNG:

The 18.3 tonnes of gaharu that have been legally exported from PNG during the period October 1999-June 2002 break down as follows:

<b>1999 - 1.01 tonnes, FOB value USD 136,880</b>
<b>2000 - 2.67 tonnes, FOB value USD 541,442</b>
<b>2001 - 10.59 tonnes, FOB value USD 1,644,685</b>
<b>2002 - 4.10 tonnes, FOB value USD 273,270 (to June)</b>

(PNG National Forest Service, in litt. to TRAFFIC Oceania, 2002)

While there are numerous anecdotal reports of illegal trade across the border to Jayapura (Indonesia) from Vanimo by land and sea, little evidence of 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 Jayapura<sup>5</sup>.

<sup>3</sup> If January 1998 is used as an approximate starting point for harvesting in the survey area, this refers to a 42-month period.

<sup>4</sup> May 2001: PGK1 = USD0.299; May 2002: PGK1 = USD0.275

<sup>5</sup> The only recorded incident during the survey period was on 11/4/2001 when 120 kg of gaharu was reported by a PNG customs official to have been exported to Irian Jaya via the Wutung border crossing.

When it does occur, transport of gaharu from PNG to Indonesia is most likely to be 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. No quotas had been set for export or harvest. However, the PNG NFS has specified that the following documents need to be obtained in order to export "Eaglewood" (gaharu) legally from PNG:

1. Certificate of Company Registration;
2. Forest Industry Participant Certificate;
3. Timber License (plus PGK50,000 bond);
4. Export License for each shipment.

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

The Inter-Agency Committee set up specifically to discuss the trade in gaharu has met on three occasions since April 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. However the following topics have been proposed as priorities for further action by the IAC:

- Need for development of policy guidelines for sustainable harvest and trade, and guidelines for benefit sharing between landowners and participating individuals/companies (NFS/OEC with assistance from TRAFFIC and WWF);
- Need for a resource inventory to identify species being harvested in PNG and their geographical/ecological distribution (FRI/NFS);
- Consideration of imposing a (voluntary) CITES Appendix III listing on specific gaharu-producing species until the harvest and trade situation is further clarified (NFS, IRC and OEC);
- Consideration of an export tax for gaharu and other "minor" forest products (NFS and IRC)<sup>6</sup>;
- Need to examine the regulatory model used on the Indonesian side of the border (regardless of whether the target species are CITES-listed or not) towards developing an appropriate framework of controls for PNG, with relevant application to forestry, conservation and revenue departments (NFS, IRC, OEC);
- Need for international agency assistance to build capacity for NFS officers to understand gaharu gradings, and to monitor the trade in the product.

<sup>6</sup> On February 14, 2002, the PNG Forest Authority gazetted a 10% levy on all eaglewood (gaharu) exports from PNG (PNG National Gazette No. G 31, 14/2/02).

#### RECOMMENDATIONS FOR FURTHER ACTION:

These actions are recommended for implementation by TRAFFIC and WWF, in collaboration with the NFS, the FRI, the OEC and the IRC. Links with CSIRO's Forestry and Forest Products division, also involved in researching agarwood-producing species with FRI and NFS, are also encouraged.

- **Raise awareness:** Information materials need to be developed and should be targeted at different stakeholder groups. These should include landowners, traders, government officials and other commercial operations to ensure people are fully informed about the 'best-practice' sustainable harvest guidelines, protection of seedlings and young trees, grading, local and national conservation issues and legal obligations. Until more knowledge is available on the management needs of the species being harvested, the focus should be on promoting less destructive harvesting, the conservation of immature trees, and planting regimes.

- **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 full, funds and relevant expertise need to be identified immediately.

- **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*



Some landowners have already begun planting seedlings in the hope they will yield gaharu

Credit: James Compton/T-OC/WWF SPP



Active collaboration with stakeholders is essential to achieve long-term management goals

management 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 woodlots is also needed in tandem with better management of wild gaharu-producing trees to ensure future access to a gaharu resource. PNG would benefit from co-operation with organizations 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). Identify importers/re-exporters in Singapore and other international market centres and work with them on issues of sustainability and ensuring future supply. An economic assessment of the value of gaharu as a component of rural livelihoods and as a potential revenue source for National Government should also be conducted.

- **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 prioritization by relevant PNG authorities – namely the NFS, OEC and IRC. Further enhancement of co-operative efforts between PNG and Indonesia would also benefit the management of gaharu harvest and trade. Policies and guidelines developed in cooperation with resource owners, government agencies and conservation organizations such as TRAFFIC and WWF should then be used to address issues such as licensing and regulating harvesters and traders based on annual quotas of weight and/or value and the establishment of a national mechanism for regulating and tracking the trade of gaharu, including a possible CITES listing of gaharu-producing species. The development of legislation, policy guidelines, and enforcement/

management capacity regarding gaharu trade would undoubtedly be useful in addressing the regulatory needs of general wildlife 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 PNG 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 FRI in Lae. Community groups and other stakeholders (including buyers, middlemen and traders) must be further engaged in the decision-making and management process.

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The TRAFFIC Network is the world's largest wildlife trade monitoring programme with offices covering most parts of the world. TRAFFIC is a programme of the conservation organization WWF and IUCN-The World Conservation Union, established to monitor trade in wild plants and animals. It works in close co-operation with the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The TRAFFIC Network's international headquarters is co-located in the United Kingdom with the UNEP World Conservation Monitoring Centre.

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