3.0 ANALYSIS OF TRADE OF *INTSIA SPP*. IN NEW GUINEA

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FOREWORD

Under the Terms of Reference (TOR), it was intended that this Report will cover the whole island of New Guinea. This assertion was based on the distributional range of kwila/merbau and also on allegations of illegal logging on the whole island. Since the island is politically divided into two sovereign nations; Papua New Guinea on the eastern half and Indonesia on the west, it became apparent that data and information specific to the TOR would be difficult to obtain especially in a very short period of time.

Much of what is presented in this report is based on data and information collected in Papua New Guinea. Limited data or information obtained from sources in the Indonesian Province of West Papua are incorporated in appropriate sections in the report.

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COVER PHOTO: A one meter tall seedling of *Intsia bijuga* planted at the University of Papua New Guinea in 2005.

EXECUTIVE SUMMARY

- Kwila or merbau is a widely distributed timber species on the island of New Guinea.
- There are three species recorded on the island but only two species attain timber size trees; *Intsia palembanica* and *I.bijuga*. The former is common in the western half of New Guinea, the Indonesian province of West Papua. The latter is common to the eastern half of New Guinea which comprises Papua New Guinea.
- Kwila is a high quality hardwood timber species because of its durability and attractive dark red-brown wood. It is especially favored in house building, furniture and woodcarving.
- It is one of the highly priced tropical hardwood timber on the market. Current market prices range from US$100 for round logs and up to US$600 per m^3 for processed logs.
- In Papua New Guinea, kwila contributed less than 2% of the total volume exported.
- In West Papua up to 50% of the export volume is kwila.
- Because of high demand for this timber species in Asia, Europe and the America, most of the processed kwila logs that end up in international markets are being obtained through illegal activities.
- In West Papua approximately 90% of all logging is illegal. Large shipment loads of kwila have been confiscated by the Indonesian Authorities.
- In Papua New Guinea there are no firm cases of illegal logging of kwila although it was the case 20 years ago. However, there are minor discrepancies in shipment that may be categorized as illegal activities. The monitoring by SGS on behalf of the PNGFA has successfully minimized illegal activities.
- In West Papua, there appear to be no controlling mechanisms resulting in the current illegal logging of kwila. The Indonesian Government has laws on forestry matters but overlooked by developers. Currently the Indonesian Government is pushing for Kwila to be listed under Appendix III of the CITES Species List. Similarly some NGOs are also pushing the main importer countries to be mindful of illegally acquired kwila and other timber sold on the market.
- The current analysis of trade in kwila concludes that, although there are laws, policies and regulating mechanisms already in place, these must be strengthen where necessary, then implemented by all stakeholders to manage this very important resource.

3.1 BIOLOGICAL DATA

3.1.1 Background

Kwila or merbau (*Intsia spp.*) is undeniably one of the most highly valued trees in Papua New Guinea including West Papua and most Pacific islands, both in terms of its traditional and cultural importance and, its value as a commercial timber. Its attractive dark red-brown wood, durability and easy-to-work with properties are especially favored for use in house building, furniture, and woodcarving.

The population status of kwila is little known and there is concern that population density of mature trees is decreasing in most parts of New Guinea and the surrounding islands due to over-exploitation and to indiscriminate and often illegal commercial logging.

Kwila tolerates a very wide range of environmental conditions. It grows in rough limestone terrain, in sandy and muddy coastal soils, and on the inner margins of mangroves as well as in very dry climates. It seems to do well in seasonally wet coastal habitats, along freshwater streams and particularly along ridges.

Human population pressure, and increasing logging (legal/illegal) coupled with lack of replanting, has rendered exploitation of the present populations unsustainable (Thaman *et al*., 2006). According to the UNEP World Conservation Monitoring Center (UNEP-WCMC) kwila is categorized as vulnerable (Vu A1cd) (Anon. 2006). This means, the species is at a high risk of extinction should the current exploitation trends continue unabated. This general fear of species extinction stems largely from the lack of scientific knowledge on the general biology and silviculture of kwila. There is therefore a critical need for a concerted effort to systematically strengthen the current laws, policies and, their associated regulatory mechanisms. At the same time a vigorous scientific research needs to be undertaken to provide the necessary information for the sustainable management of kwila.

3.1.2 Botanical Description

Intsia Thour

Family

Fabaceae (legume family), subfamily Caesalpinoideae

Common names
kwila, iban, mboan, bon, menau, arir, ariri, babili, babrie, bat, bauw, bendoro, bon, duhum, epna, ferraai, ganam, gommagome, haboe, haero, jep, kaboei, amele, mep, milimbu, paseh, patoem, pian, pota, rang, raung, rong, seka, tangibe, wohne, yambwan (Papua New Guinea),
rang, tangibe, kayu besi, pakvem, bat, jem, babili, piam, sekka, osa, kaoei,(West Papua)
choyo, show, kebuk (Pohnpei) *cohu, faux teck* (French)
dort, thort, zort, zolt, show, wantal (Yap)

dort (Palau)
fehi (Tonga)
fesi (Rotuma)
ifilele (Samoa)
ifit, ifet, ipil (Guam and Mariana Islands)
ipil, Moluccan ironwood, Borneo teak (English)
kohu (New Caledonia)
kubok, kubuk (Marshall Islands)
tora, tor, atora, nator, n'tor,
nitortat, nato, tou, nip, niv, ni-iv, we-iv, nipf, kimau,
hmau, umau, nakumau, purkam, botpamau, vumalatora,
noghuma, leav, hive, ntarauvi, liv, vutora, nator,
aivornarat, ekmau, nokomo, nokmo miel (Vanuatu)
u'ula (Kwar'ae), *nyia nwola, vei, nkengia, kivili, huhula,*
rurula, gugura (Solomon Islands)
vesi, vehi, vesiwai, vesi dina ("true vesi") (Fiji)

Other regions
ipil, ipeh, ipil tandok, malapari, merbau ayer, merbau
changkat, merbau laut (Malay Peninsula)
ipil, ipil laut (Philippines: Tagalog)
merbaoe, merbau, merbo, taritish (Java)
merkau, merkau ajer (Sumatra)
praduu thale, lumpho-thale (Thailand)

Trade name: Kwila/Merbau

The following descriptions are taken from the book *A Manual of New Guinea Legumes* (Verdcourt 1979).

Small to large, tree evergreen or deciduous trees up to 42 m tall; bole sometimes of poor shape, branchless up to 20 m; slight buttress 60-75 cm to huge buttress up to 2 m; diameter at breast height up to 160(-250) cm with spreading crown; bark 0.5-1 cm thick, smooth to dimpled or scaly or rarely with boat-shaped fissures, grey to brown-red, flaking off in small pieces; outer bark blue-grey to reddish, the depressions paler grey; inner bark very firm, fibrous, sometimes with an obscure granular layer at the surface, orange or pale yellow brown to cream against the white to pale sapwood; heartwood orange-brown to golden brown with small bright yellow deposits; when dry small areas of lead-like appearance are visible in the timber. Leaves alternate, paripinnate with 2-4(-5) pairs of leaflets; stipules connate at base, forming a persistent scale; leaflets opposite or subopposite, often with a gland at the base on one or both sides, otherwise glabrous except for the midrib. Flowers arranged spirally in simple racemes or branched terminal or lateral panicles; bracts and bracteoles deciduous; sepals 4, with a distinct tube, imbricate, unequal, pulverulent; petals 1, large, clawed; stamens 3, very long, connate at base with the 4-7 filiform staminodes; ovary stipitate, connate to the dorsal side of the calyx tube, with many uniseriate ovules, style with a small dark stigma. Fruit a stipitate pod, compressed, dehiscent with more or less leathery valves, with several seeds. Seed large, hard, without an aril, dark brown at maturity. Seedling with epigeal germination.

Intsia is a widely distributed genus of about 9 species in tropical Asia and on the coast of the Indian and Pacific Oceans (Verdcourt, 1979). In New Guinea, three separate species have been recorded. The differences between these three species, *Intsia bijuga, I. palembanica,* and *I. acuminata* are however somewhat inconclusive. The species are similar in all aspects except for few minor differences in the number of leaflets per rachis and the shape of the leaflet apices. The following key separates the three species.

1. Leaves with 1-2 pairs of leaflets……..*I. bijuga*
1. Leaves with 3-4(-5) pairs of leaflets……...2

2. Leaflets distinctively acuminate at apex……...*I. acuminata*
2. Leaftets blunt or rounded at apex……..*I. palembanica*

The genus *Intsia* closely resembles *Afzelia* (formerly called *Pahudia*) but differs from *Afzelia* by its three fertile stamens, its flat seeds lacking an aril, and its leathery pods.

Intsia acuminata Merr.

Very similar to *Intsia palembanica* but the leaflets are distinctively acuminate. Verdcourt (1979) in his treatment on New Guinea Legumes sighted several specimens from West Papua, in the Asmat region that were determined as *I. acuminata,* and commented that they were scarcely different from *I. palembanica* except the leaflets were certainly acuminate.

Intsia bijuga (Colebr.) O. Kuntze
Syn. *Afzelia bijuga* (Colebr.) A. Gray, *Intsia amboinensis* DC., *I. bijuga* f. *glabra* Meijer Drees).

This is the most common species of kwila/merbau on the island of New Guinea including the satellite islands.

Intsia palembanica Miq.
Syn: *Afzelia palembica* (Miq.) Bak., *Intsia pluriguga* Harms).

Tree very similar to *I. bijuga* but with more numerous leaflets, usually stated to attain a larger size but the New Guinea material is 15-40 m tall with a bole ranging from 15 to 22 m, and diameter from 40 to 100 cm.

3.1.3 Origin and Geographic Distribution

The genus *Intsia* is an old world tree genus and occurs from East Africa through tropical Asia to the tropical islands of the Pacific Ocean and northern Australia (Johns *et al*., 1994). In New Guinea, two species are often encountered. *Intsia palembanica* has limited occurrence in eastern New Guinea (Papua New Guinea) compared to *I. Bijuga.* In West Papua however, *I. palembanica* is common while *I. bijuga* is restricted. *Intsia bijuga* nevertheless is widespread from East Africa (Zanzibar), the Indian Ocean Islands, India, Indo-china, Melanesia, Micronesia, Polynesia and northern Australia.

3.1.4 Distribution in New Guinea

Intsia bijuga occurs in all lowland areas of Papua New Guinea below 500 m altitude. According to Verdcourt (1979), *I. bijuga* occurs from sea level up to 450 m above sea level. Hammamaster and Saunders, (1995) reported occurrence of *Intsia* on upland forests and sometimes in association with *Araucaria* forests suggesting its range to be much higher than 500 m altitude. These records were probably of *I. palembanica* which has an altitudinal range of 0-850 m (Verdcout 1979), and up to 1000 m (Johns *et al.* 1994). In the Western Province, kwila occurs along the coast in the South Fly (Daur per obs.) and around Benchback (Saulei pers. comm.) but appears to be either rare or absent within its ideal altitudinal range in forests of the North Fly area, some 200 km inland.

In West Papua, occurrences of *Intsia spp.* are recorded in the Vogelkop, Geelvink Bay, Fakfak, Mimika, Digul, and Jayapura (Verdcourt, 1979). A generalized distribution is given in figure 1.

3.1.5 Ecology

Intsia occurs on beaches, behind mangroves, at the edges of swamps, in gullies and on spurs. Its most preferred habitat is on well drained soils on hills and ridges around 50 to 100m elevations. This is where over 70% of all the commercial kwila is recorded in New Guinea. Common associates are *Palaquim, Myristica, Pometia, Anisoptera* and *Hopea*. It requires canopy opening for rapid initial growth typical of many secondary species. Once established, it requires partial shade to grow. It can grow on a variety of soil types except on peat soils.

3.1.6 Populations

Stocking of *Intsia* in Papua New Guinea vary greatly between different forest areas. Highest densities occur on the northern regions of the country in Madang and the East and West Sepik provinces. In the forests of Vanimo a stocking of 7 – 10 stems per hectare of trees 15 cm dbh and up was reported by White (1976). In the Madang province the high densities observed in Gogol were probably established after the droughts of 1918-1920 (Johns *et al.*, 1994). Logging similarly encourages high germination of seedlings as observed in the Oomsis area of the Morobe province. Although *Intsia* was not dominant in the original forest, the opening of the canopy resulted in an abundant growth of *Intsia* seedlings.

Pockets of reasonably good stands also occur along the eastern coast line from Ioma in the Oro province right around to Abau/Magarida in the Central province in the south. It commonly occurs on lowland hill forest in association with *Pometia*, *Anisoptera* and *Hopea*. In these pockets *Intsia* may be a common constituent of the main forest canopy but rarely as the most dominant species. Moderate stocking of around 4 to 6 stems per hectare of commercial size kwila can occur. Seedling germination can be high particularly in natural or man made gap opening but only a small proportion reach sapling stage.

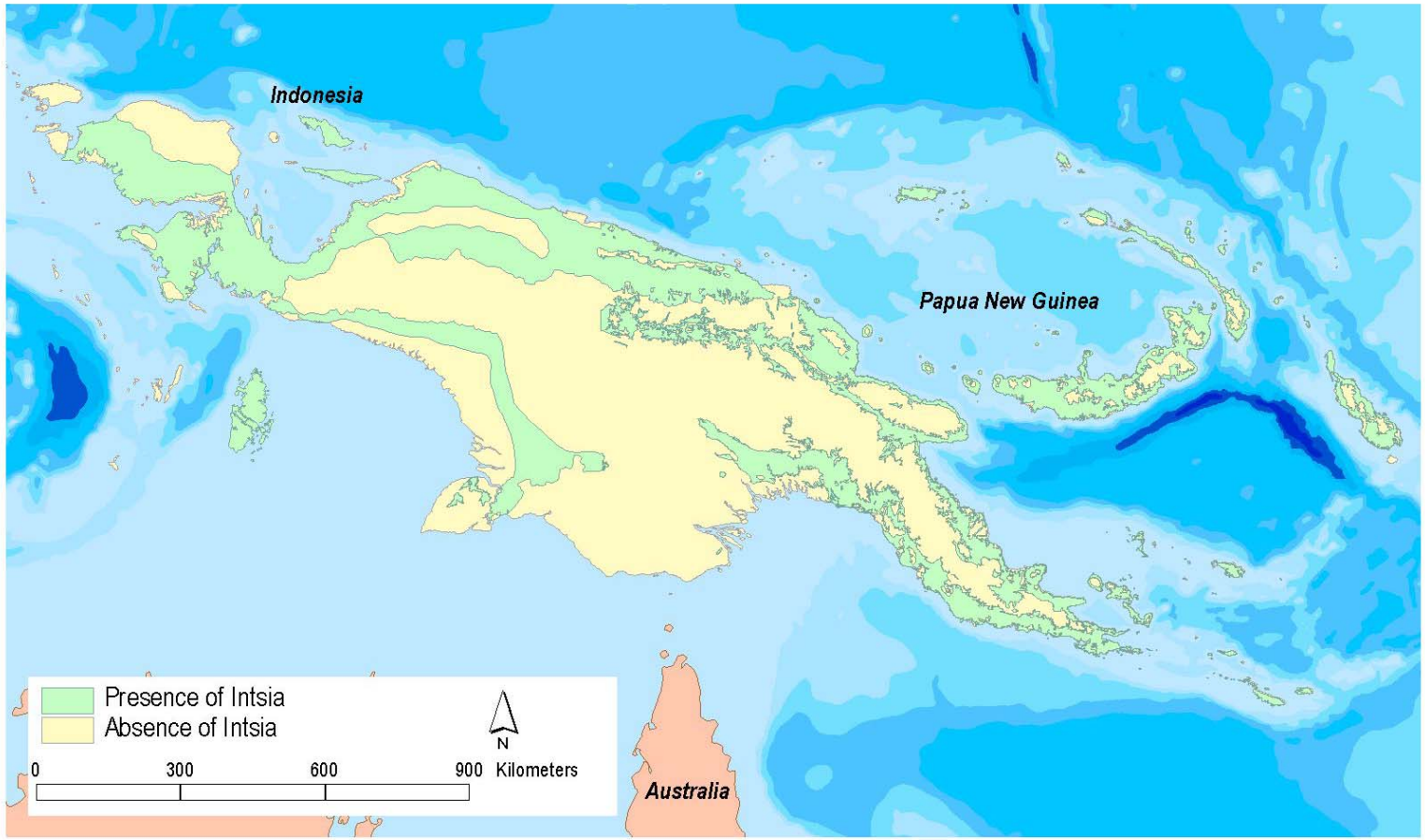

Figure 1. Generalised distribution map of kwila species in Papua New Guinea and West Papua.

In other lowland forests of Papua New Guinea stocking of commercial sized trees (50 cm dbh and above) is much lower sometimes with 1 or 2 stems per hectare or only 1 stem within several hectares.

In West Papua, kwila stockings appear to be comparatively higher as suggested by the regeneration enumeration (Table 1). No stocking of commercial size trees are shown however based on the stocking of seedlings, saplings and pole size trees kwila appears to be a major constituent of the lowland rain forest of West Papua.

Table 1. Stockings of *Intsia* regeneration enumerated per hectare (ha) in unlogged forest and logged over forest areas in selected regions of West Papua, Indonesia.

No	Forest Area	Unlogged Forest			Logged Over Area		
		Seedling	**Sapling**	**Pole**	**Seedling**	**Sapling**	**Pole**
	Manokwari						
1	Oransbari	14,337	1,274	155	-	-	-
2	Bintuni	7,850	1,150	120	7,260	991	28
	Sorong						
3	Klamono	17,200	3,150	130	8,670	1,690	85
	Yapen-Waropen						
4	Sumuta-Barapasi	8,230	964	165	7,012	717	106
	Nabire						
5	Kwatisore	9,725	1,080	144	9,665	875	98

Data from Hasil-hasil penelitian BPK Manokwari (1993 – 2001; *unpublished*).

3.1.7 Growth and development

Experiments showed that the cotyledons contribute to seedling development up to the stage of the first pair of leaves (Johns *et al.*, 1994). Initial growth of the seedling is fast; seedlings reach an average height of 40-55 cm after 3 months. Then growth will slow down, and in the period from 3-10 months after germination it averages only 5-6 cm. Kwila seedlings need a high light intensity for optimal growth, and in the open growth is much faster than under closed canopy conditions. However, experiments in Indonesia showed that growth of seedlings under shelter or under shade tree was faster than in full sunlight. At Bogor, Indonesia, an 8-year-old stand of *I. bijuga* had an average height of 10.7 m and an average diameter of 15 cm. In Papua New Guinea, trial plantings of *I. bijuga* yielded an average diameter of 30 cm in 20 years (Saulei; *unpublished*). The maximum diameter reached in 40 years is 43 cm for *I. Palembanica* (Johns et al 1994).

3.1.8 Uses

Kwila or merbau is a very good general-purpose timber. It is suitable for a wide range of purposes because of its favourable physical and mechanical properties, as well as a high natural durability and an attractive appearance. Kwila is used in construction work in house building, especially for high-class exterior joinery such as windows, solid panel doors, framing, and weatherboarding. It is also an excellent timber for high-grade flooring for both light and heavy pedestrian bridges. Other uses include furniture making, panelling, stairs, handrails, shopfittings, truck bodies, turnery, poles, fence posts and carving.

Kwila is also particularly useful for waterwork construction such as bridges, wharves, sluices and sheet piles, and it is generally free of ship worm. The timber is suitable for making decorative veneer but is generally too hard for plywood manufacture. In a recent survey of kwila utilization, it was found that the timber is now highly favoured as wood flooring in Europe and North America. This is due to a general shift from traditional carpet and linoleum flooring to tropical exotic species (Telapak/EIA, 2006).

3.2 HARVESTING AND TRADE

3.2.1 Forest inventories and logging acquisition

The total land area that is accessible for forest development in Papua New Guinea alone is estimated at 15.2 million hectares out of 39.3 million hectares of forest land (ITTO, 2005). On an annual basis, the current estimate of potential sustainable production land from natural forest projects stands at 3.14 million ha.

Accessing information on forest resources and up to date forest inventories is difficult in Papua New Guinea. Any datasets generated from sampling plots in logged or unlogged forest areas are not readily shared between institutions. The lack of a central repository for such information made information gathering for this desktop study difficult. Information on commercial timber stands, density and volume is therefore limited and the best available information are extracted from the compilation of inventory data as presented by Hammermaster and Saunders (1995) and those conducted by forest developers themselves as part of the requirement under the Environmental Plan. Data on stand densities and volumes may not truly represent the actual timber stand. For instance, Hammermaster and Saunders (1995) did not record commercial volumes of kwila in North Solomon, Manus and Western Provinces although its occurrences had been sighted by Piskaut on Bougainville and Manus, Daur along coast of South Fly and Saulei around Benshback in the Western Province. No kwila is reported in the Highlands areas above 1000 m altitude. Neither has kwila been sighted or reported in the inland forest areas of the vast Fly River flood plains.

Although kwila is common throughout the country, commercially exploitable volumes are reported in few provinces (Table 2). It comprises an estimated 5% of the total forest production land. The commercially extractable volume of kwila on average is estimated at around 26 million cubic meters or approximately 6% of all potential timber species put together. This on average equates to about 2 to 5 stems

greater than 50 cm dbh (the minimum allowable size) per hectare. This is comparable to stocking reported in Malaysia (eg Johns *et al.,* 1994). The figures presented above are based on selected timber concession areas and do not represent the gross volume and density of kwila in all forested areas in Papua New Guinea.

The acquisition of potential forest areas for forest development follows a very long process from landowner consultation through to the final issuing of the timber permit. The process referred to as the "Thirty Four Steps" (see Appendix I). According to the Forest Act 1991, all commercial harvesting of forest products require a permit issued by the PNGFA. A permit is required regardless of whether the forest products involved are grown on state, freehold or customary land. Different permits are issued by the PNGFA that are applicable to the type of forest project. Important to the final approval and issuing of timber permits, the proponent or intending developer provides a forest working plan (FWP) and an Environmental Plan (EP) that takes into account the timber area's topography, the resource density and biological environment of the area. These plans serve as the benchmark for sustainable management.

The extraction of kwila and other timber species in natural forests follows the coupe logging method or volume based harvesting system. This is the recommended method based on sustained yield management. Depending on the stand volume, coupes of varying sizes (from as low as 1000 ha to 15000 ha) are established. Sizes of coupes are determined by volume of timber on a per hectare basis. The volume of each coupe represents a 5 year cutting cycle and are divided into subunits called set-ups. Each set-up covers approximately 150 hectares of forests and represents a one year cutting cycle.

There are no set policies specific to the exploitation of kwila and other timber species classified under the MEP group 1 timbers. However, the government has put in place general guidelines controlling the exploitation and export of kwila. Base on timber volumes in logging concessions, the Forest Authority determines the maximum allowable exploitation or endorsed volume to be extracted. The endorsed volume differs for each timber species or species group and varies from area to area (SGS Reports 2002-2005) depending on stand densities and volume.

Table 2. Composition of Kwila in percentage of the estimated volume per hectare of commercial trees in Papua New Guinea. Data extracted from Hammermaster and Saunders (1995).

Province	Forest Region	Forest location	Mean Volume* (m^3/ha)	% Kwila composition
New Ireland	Southern New Ireland		31	3
	Central new Ireland		32	6
	Northern New Ireland		23	5
	New Hanover		33	1
East New Britain	Gazelle		44	1
West New Britain	Central New Britain		44	2
	West New Britain		41	1
Milne Bay	D'Entrecasteaux	Normanby Island	36	6
	Luoisiade	Sudest East	28	1
	Milne Bay	Sagarai/Gaidasu	39	7
Central	Central South	Abau-Magarida	40	4
	Central North	Aroa-Dilava Block	51	2
Gulf	Kerema		33	3
West Sepik	Oenake		35	10
	Pual River		35	22
	Aitape		44	5
	Bevani-Sepik		30	23
	Sepik South		30	10
East Sepik	Sepik Coastal		35	9
	Sepik Plains		22	20
	Bewani Sepik		29	23
	Sepik South		30	4
Madang	Madang-Bogia		50	3
	Gogol-Ramu		49	8
	Ramu-Bismarck		50	6
Morobe	Finisterre-Huon		50	5
	Finisterre-Huon		55	4
	Lae		55	2
	Watut		60	3
	Morobe		70	1
Oro	Oro		32	7

** Mean volume of all commercial trees present.*

3.2.2 Log Export

The log export industry in PNG initially focused on the Islands region because of high stocking densities and easy access. Although the area under concession quadrupled between 1982 and 1991 there was no corresponding increase in reported log export volumes.

The log export of all commercial trees peaked in the mid 1990's when log export levels reached about 3 million m^3 each year. However, since then there has been a steady decline in export volumes to a low of 1.5 million m^3 in 2001. From 2002 to 2004 experienced a slight increase in log export levels reaching 2 million m^3 (SGS Log Monitoring Reports: 2003-2004). This trend was very pronounced in kwila (Figure 1). This was probably attributed to resource rich concessions being logged out and the companies being forced into less desirable forest areas with lower stockings.

It is difficult to ascertain the quantity of kwila logs harvested in concession areas. The only records available are logs in shipments that were declared to the authorities. Since the engagement of SGS in the mid 1990s, there was a sharp reduction in undeclared log shipments and deliberate misidentification of species which has cost millions of kina in lost revenue to the government.

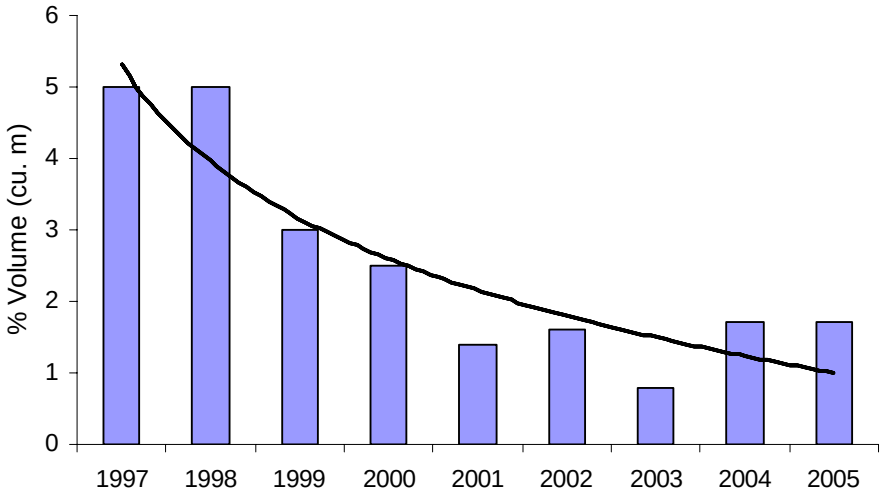

Figure 2. Percentage volume of kwila exported from 1997 to 2005 (www.pngfia.org.pg, SGS Log Monitoring Report, 2002-2005).

Kwila contributed 5% (150,000 m^3) of the total volume exported in 1997. Since then there has been a steady decline reaching 1% of the total volume exported in 2003 (Figure 2). Between 2001 and April 2005 kwila export levels increased slightly (Figures 2 and 3).

In 2004 alone 22,000 m^3 of kwila was exported with a value of US$2.2 million. In comparison to all timber species, kwila accounted for 2% of the total revenue of US$6.2 million collected during the period 2003 to 2004 (Figure 4).

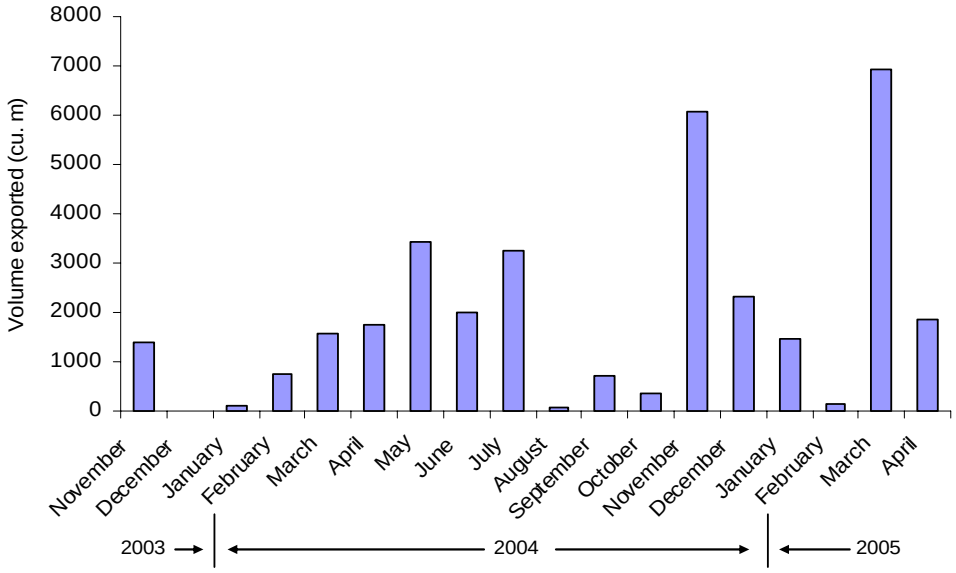

Figure 3. Monthly mean volume of kwila timbers exported from November 2003 to April 2005 (*Source: SGS Log Monitoring Report 2003-2004*).

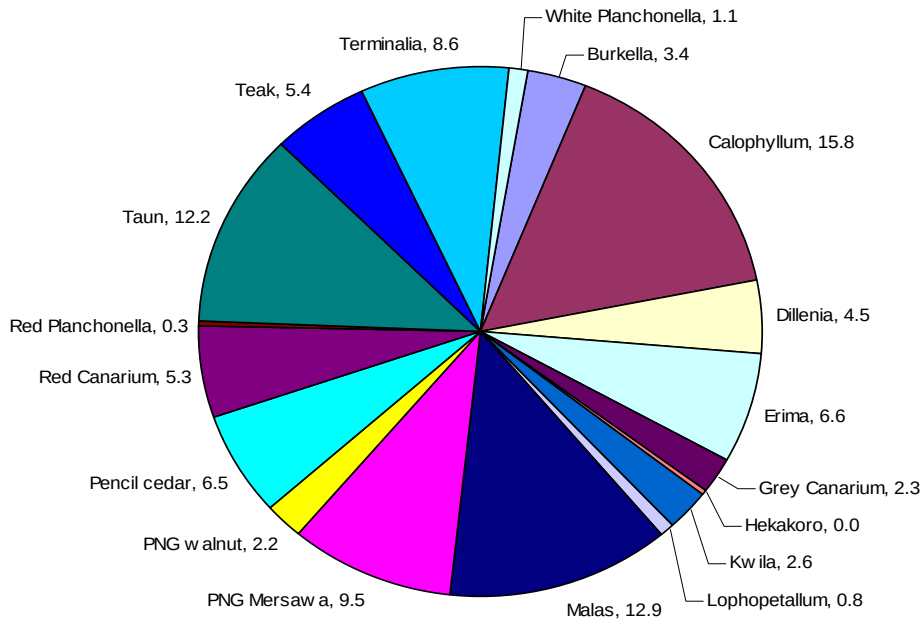

Figure 4. Percentage revenue contribution of major timber species exported between 2003 and 2004 (*Source: SGS Log Monitoring Report 2003-2004*).

Kwila was less important in Indonesia until recently. In 1990 the export of sawn kwila timber was 1700 m^3 with a value of US$ 825 000. In 1991 the export was much larger, amounting to 17 000 m^3 with a value of US$7.8 million. The total production of kwila in 1992 in Indonesia was about 137 000 m^3. The main production areas are Aceh and the Moluccas (each about 8000 m^3/year), and particularly West Papua (about 121 000 m^3/year). In West Papua there was an unabated increase in kwila production, reaching 252 million m^3 in 2002 (Table 3). Based on FOB US$400/$m^3$, the total value would be around US$1 billion. This far exceeds the total volume produced in Papua New Guinea.

Table 3. Log production by logging company in West Papua in 2002 by Species Groups.

No	Type group	Production (m^3)	Percentage
1	Meranti	80,817,09	16.69
2	Kwila/Merbau	251,816,41	52.00
3	Rimba Campuran Mixwood	10,242,76	31.02
4	Kayu Indah Precious wood	1,416,31	0.29
	Total	**484,292,57**	**100.00**

Note the values given in Table 3 are declared log volumes submitted to relevant government authorities, and does not include volumes shipped through dubious logging deals.

3.2.3 Processed Kwila Export

Table 4 gives a summary of processed kwila timbers exported in 2001, 2002 and 2004 in Papua New Guinea alone. Total export volume for 2001 was 18,357 m^3 with a value of US$7.4 million. There was a slight increase in 2002, with total export of 23,468 m^3 and total value of US$8.9 million.

In West Papua, around 423 million m^3 or 59% of the total volume was processed into finished products (furniture, board, decks, beams and planks).

Table 4. Export of processed kwila from 2001 to August 2004 .

Country	US$/ m3	Volume (m3)	FOB $	Country	US$/ m3	Volume (m3)	FOB $
2001				*2004*			
Australia	424	6307	2,678,099	Australia	484	4,933	2,389,465
Belgium	384	2,577	989,568	Belgium	412	592	243,675
China	346	283	97,918	Denmark	397	429	170,089
Denmark	380	55	20,900	Europe	434	47	20,547
Tahiti	451	530	239,030	Tahiti	499	432	215,568
Germany	363	1,375	499,125	Germany	337	941	316,692
Indonesia	425	71	30,175	Japan	100	300	30,000
Korea	133	310	41,230	Malaysia	392	608	238,595
Malaysia	362	215	77,830	Netherlands	445	281	125,138
New Caledonia	445	1,561	694,645	New Caledonia	472	630	297,201
New Zealand	417	2,737	1,141,625	New Zealand	414	989	409,133
Singapore	393	2,059	809,187	Nomea	513	64	32,612
Spain	397	88	34,936	Singapore	437	121	52,949
Tahiti	453	188	85,177	Vanuatu	470	195	91,685
Tahiti	461	117	53,937	**Total**	**439**	**10,562**	**4,633,349**
United States	417	1	417				
Total		**18,357**	**7,439,862**				
2002							
Australia	411	9,653	3,965,070				
Belgium	333	1,537	511,586				
China	450	29	13,019				
Denmark	280	396	110,877				
Tahiti	425	799	339,199				
Germany	318	928	295,301				
Korea	153	510	78,200				
Malaysia	388	233	90,417				
New Caledonia	431	657	283,403				
New Zealand	371	7,532	2,796,329				
Portugal	433	15	6,495				
Singapore	334	985	329,270				
Spain	355	105	37,279				
Taiwan	405	40	16,219				
Vanuatu	506	49	24,977				
Total	**380**	**23,468**	**8,897,641**				

Source: www.pngfia.org.pg

3.2.4 Trade Flow

The major trade flow for kwila based on SGS Log Export Monitoring statistics are presented in Figure 5. China is by far the main importer of tropical logs followed by Japan, Korea. Up to 60% of PNG sawn logs were exported to China between 2003 and April 2005. Of this total up to 9% were kwila.

Figure 5. Trade flow in the international market of kwila logs from PNG logs.

Of the processed logs, Australia and New Zealand are the two biggest importers of kwila (Table 3). The processed kwila are mostly exported as rough timbers, beams, flitches and as square logs.

Most of the processed logs in West Papua are sold to all parts of Java Island, Celebes, as well as Borneo and Sumatra.

3.2.5 Export Discrepancies

As kwila is common throughout the island of New Guinea, and the satellite islands it is anticipated that a stocking of at least 1-5 stems would occur per hectare. Current export records for 2004 and 2005 show that felling and export of kwila only occur in few areas; Vanimo, West Sepik Province, Arawe, West New Britain Province, Vailala and Turama, Gulf Province and Central New Ireland, New Ireland Province (SGS Log Export Monitoring Reports, 2004-2005). Other logging areas do not show what proportion of their timber production is kwila. This discrepancy in itself suggests

either that kwila logs were processed for domestic market or were intentionally lumped with other species for export.

The Vanimo Forest Products was by far the largest producer of kwila. The company exported approximately 12,000 m^3 of kwila logs valued on average at US$1.1 million in 2004. However, within the same period the company also recorded high discrepancies in shipment records. Around 2000 m^3 of sawn logs, valued at US$100,398 were misidentified, or undeclared before and during shipment. It is difficult to ascertain the identity of undeclared and misidentified species. However, in one shipment of September 2004, Vanimo Forest Products exported 408 m^3 of kwila, 58 m^3 more than the PNGFA permitted volume of 350 m^3.

Other records of kwila export discrepancies are listed in Table3 showing actual shipped volumes in access or below permitted volumes as approved by the PNGFA.

Table 3. Kwila export discrepancies in volume exported for March and April 2005.

SGS Ref. no.	***Logging Company***	***Area***	***Permitted Volume (m^3)***	***Shipped Vol. (m^3)***	***Percentage Discrepancy***
8742	Cakara Alam (PNG) Ltd	ARAWE	10	22.91	129.08
8691	Cakara Alam (PNG) Ltd	ARAWE	2	4.52	126.05
8696	Cakara Alam (PNG) Ltd	ARAWE	22	33.92	54.20
8668	Cakara Alam (PNG) Ltd	ARAWE	5	7.01	40.20
8804	WTK Realty	VANIMO	1000	1114.88	11.49
8758	Cakara Alam (PNG) Ltd	ARAWE	10	5.36	-46.31
8798	Frontier Holdings Ltd	VAILALA	70	29.65	-57.64

Source: SGS Log Export Monitoring, March and April 2005

These discrepancies raise some questions for instance:

- the validity of the forest inventory survey – whether it was a case of over or underestimation of timber volumes.
- elements of illegal logging where companies are encroaching into areas outside the demarcated boundaries.
- volumes below approved permitted volumes may imply intentional lumping with lower grade logs.

It is worth noting that, logging companies employ certified forestry officers who conduct inventory survey, prepare, organize and supervise log exports. Often prepared export documents comprising species lists and volumes may be knowingly altered to favour the log exporters.

Examples of recent illegal logging in West Papua are alarming. Either the mechanism(s) for regulating and controlling of timber harvests is lacking or ineffective. This has resulted in illegal logging of kwila. In 2001, approximately

660,000 m^3 of undeclared kwila logs were shipped. Cases of illegal trade are given in Appendix II (Anon, 2003).

3.3 MANAGEMENT AND REGULATION

The fourth goal of the Papua New Guinea Constitution which states

> *"….for Papua New Guinea's natural resources and environment to be conserved and used for the collective benefit of us all, and to be replenished for the benefit of future generations."*

This is the cornerstone for forest policy formulation that ensures forest resources of the country are used and replenished for the collective benefit of all Papua New Guineans now and for future generations.

3.3.1 Statutory Requirements

The management and regulation of kwila falls under the Forestry Act 1991 as amended in 1993, 1996, 2000, and 2005. This Act was introduced in response to the findings of a Commission of Inquiry in the 1989 that exposed widespread mismanagement and corruption in the forestry sector. The Act introduced a completely new statutory framework for the management and control of forest harvesting operations and established the PNG Forest Authority as the principle regulatory agency. Key requirements in the Act are*:*

- Conservation and renewal of forest resources as an asset for succeeding generations
- Administration of the management, development and protection of forest resources by the PNG Forest Authority
- Development of forest resources only in accordance with the National Forest Plan
- Timber harvesting allowed only under a permit or authority issued under the Act
- Other forest industry activities to be regulated by licenses
- Registration of all forest industry participants

The Act also provides a detailed framework for the development and allocation of timber harvesting rights and gives powers to enforce the Act against defaulting companies and individuals.

3.3.2 Informed Consent

In Papua New Guinea, local populations retain legal control of land under a system designated as 'customary land tenure.' Under this system, the rights to manage forest resources and to harvest and sell timber are bound to the land and are clearly vested in the people and not the State.

The Forestry Act 1991 clearly states that the rights of customary owners of the forest resource *'shall be fully recognized and respected in all transactions.* Under the Act, the first stage in the development of a timber harvesting project is for the State to acquire the forest management rights from the landowners. This is done through a contract known as a Forest Management Agreement that must be in writing and set out all the monetary and other benefits the landowners will receive in return for giving logging and marketing rights to the State. It is a basic tenant of the Law of Contract that when a person gives their agreement in a legally binding contract they must be giving 'free and informed' consent. This means that they understand the nature of the contract and their rights and obligations under its terms.

However, given low levels of literacy and general education, effective communication presents special challenges to those seeking to obtain customary rights.

3.3.3 Sustained Timber Yield

The requirement in the Forestry Act for forest resources to be 'conserved and renewed as an asset for succeeding generations' has been interpreted in the National Forest Policy emphasizing that timber harvesting be managed on a sustained yield basis.

3.3.4 Harvesting Regulations

Compliance with harvesting regulations and other requirements relating to the planning and management of field operations is a key parameter in the assessment of the legality of forestry projects".

Papua New Guinea's policies, laws and regulations relating to the administration of forest management provide a detailed framework for the planning and conduct of harvesting operations and post-harvest assessments. This includes: requirements for detailed five-year and annual working plans; compliance with a Logging Code of Practice and key standards governing harvesting operations, road construction and post-harvest treatments; and approved Environmental Plans.

3.3.5 Contractual Requirements

Forest management in general and timber harvesting operations in particular are underpinned by a series of contractual relationships between the key stakeholders: resource owners, the State, the licensed holder of the timber harvesting rights and the logging company. The exact set of contracts to be found in any one forest management project can vary depending on the legislation that applied at the time the project was initiated, the form of the resource-owner mobilization, the type of license-holding entity and the size of the harvesting operation. However, whatever the exact form of the contractual relationship, there is always at the core a series of obligations that the logging company owes to the resource owners, whether directly or indirectly, that are to be performed in return for the right to harvest and remove timber. These obligations invariably include three key elements:

1. Direct financial payments (royalties)
2. Building of infrastructure
3. Installation of timber processing facilities

3.3.6 Environmental Plans

A valid Environmental Plan for all timber harvesting operations is a legal requirement under the Environmental Planning Act and a legal prerequisite to the issuing of a Timber Permit under the Forestry Act.

3.3.6 Effectiveness of Forestry Act

The effectiveness of the above summarized sections of the Forestry Act were recently reviewed with regard to compliance by current logging companies. Evidence from the reviews indicates that although all timber harvesting operations may be officially licensed, there are serious issues of legal non-compliance at almost every stage in the development and management of these projects (Forest Trends 2006). For these reasons the majority of forestry operations are considered illegal. Most, if not all companies have not complied with the national laws and regulations. The most widespread and manifest problems are the failure to secure informed consent and the inability of the State to ensure sustained yield management in natural forest areas. In order to be regarded as 'legal,' a timber harvesting operation needs far more than just an official permit or license. It is generally expected that the operator must be able to demonstrate:

- Broad compliance with prevailing legal principles in their instruments which underpin the operating rights;
- A general observance of statutory and regulatory controls in the harvesting operation itself; and
- A more general conformity to the legal standards governing all business operations in Papua New Guinea.

3.5 Recommendations

The following are offered as recommendations based on past experiences, the analysis presented above and possible loopholes in the forestry policies that can have negative effect on kwila:

- Immediate scientific research be conducted on kwila to address the following important areas:
    - the impact of exploitation on kwila population
    - Distribution and abundance and stand density studies
    - regeneration capacity in log-over areas and growth rates
    - silviculture treatment in natural forest
    - phenology studies, seed dispersal and germination
    - taxonomic revision of kwila
    - genetic resource pool studies

- create time series model to predict population trends base on volume

- There is downward trend in kwila volume indicating decline in population sizes. There is urgent need to strengthen existing laws to control and regulate this high quality timber.

- For every concession area that is under negotiation, a proper and more reliable forest inventory data should accompany each Forest Working Plan and Environmental Plan.

- Proper and more frequent monitoring of logging operations by genuine government foresters.

- Forest resource data, at least in Papua New Guinea, is lacking or outdated. There is urgent need to clearly define local distribution, density and volume and population viability in natural forest for individual timber species. According to the Forestry Act 1991, as amended in 1993, 1996, 2000, and 2005 the PNGFA should promote scientific studies and research into forest resources towards maintaining ecological balance consistent with the national development objectives. The PNG Forest Research Institute, the research arm of PNGFA is poorly funded and has not been able to address this situation adequately. Other institutions that can assist in research include the University of Papua New Guinea, University of Technology and Research based NGOs such as WCS, WWF, and TNC.

- Identify a central repository for all information relating to forest resources, research information and their harvest. This information should be accessed freely by the general public or any interested parties.

- Better networking between stakeholders to facilitate information sharing

3.6 REFERENCES

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Appendix I

The "**Thirty Four Steps**" is a step by step procedure of acquiring forest land for development purposes.

1	Landowner awareness campaign
2	Timber rights acquired through a Forest Management Agreement
3	Consent of customary landowners obtained
4	Certification of landowners consent and authenticity of their tenure
5	Ministerial approval
6	Development Options Study
7	Study provided to the Minister and local Forest Management Committee
8	Draft project guidelines prepared
9	Project guidelines approved
10	Project advertised
11	Project proposals lodged
12	Proposals referred to Provincial Committees for evaluation
13	Evaluation of project proposals
14	Invitation to provide further information
15	Detailed report to the National Board
16	Board consider the report and consults the Minister
17	Minister provides comments to the Board
18	Negotiation parameters set by Board and Provincial Committee
19	Board directs further negotiations
20	Project Agreement negotiated
21	Board considers the final draft Project Agreement
22	Agreement returned for further negotiations as necessary
23	Board consults with other stakeholders
24	Minister for Provincial Affairs consults with the Provincial Government
25	Board obtains the approval of the Minister for Finance
26	Project Agreement executed
27	Board recommends to the Minister to grant a timber permit
28	Minister invites proponent to apply for a timber permit, or
29	Refers the recommendation back to the Board
30	Board considers the Ministers referral and makes a final recommendation
31	If the Minister accepts the recommendation he invites the proponent to apply for a timber permit
32	If the Minister does not accept the recommendation it is referred to the National Executive Council
33	NEC can accept or reject the project proposals and give directions. If the Minister is directed to accept the recommendation he must invite the proponent to apply for a timber permit
34	If NEC rejects the proposal it is renegotiated or readvertised

Appendix II

Cases of Illegal Merbau Trade Since November 2001

January 2004: Police in Bintuni, West Papua, arrest 15 Malaysians for illegal logging and seize 10 000m3 of merbau logs and heavy equipment imported from Malaysia.

December 2003: The Indonesian navy intercepts the cargo vessel Bravery Falcon (*see picture at left*) loading merbau logs off the island of Daram, West Papua. The vessel is found to be flying a false Indonesian flag and has 17 000m3 of merbau logs on board. The crew state the intended destination is China.

In the same month police in the Aifat district, near Sorong, seize a barge carrying 400 merbau logs with a volume of 9 000m^3.

October 2003: Vessel Irawati is reported to be sailing from West Papua to Singapore with a load of 10 000m^3 of merbau logs.

September 2003: Vessel Lok Prakesh reportedly sailing from West Papua to the port of Zhangjiagang in China with a cargo of 9 000m3 of merbau logs.

February 2003: EIA/Telapak field investigation documents 2 700m3 of cut merbau logs awaiting collection at a loading point in Srer, in the Seremuk district of West Papua. Research shows there are no legal permits for logging operations in the area.

January 2003: Police raid a logging camp in Manokwari district, West Papua, and discover 16 000m3 of illegal merbau logs. The operation results in the arrest of nine Malaysians linked to the company PT Rimba Kayu Arthamas.

November 2002: The Indonesian navy intercepts the vessel Surabaya Express off the island of Madura, north of Java. The vessel is carrying 5 000m3 of illegal merbau logs from the Serui district of West Papua.

October 2002: EIA/Telapak field investigation discovers large merbau logs awaiting loading inside a nature reserve the island of Batanta, Raja Ampat.

Above: Illegally-felled merbau logs, Seremuk, West Papua. Photo: Dave Currey, Environment Investigation Agency/Telapak.

APPENDIX III

Selected Photographs of Kwila.

Abandon logs at Kapari sawmill, Central Province. Photo: Pius Piskaut.

Kapari Sawmill, Central Province. Obsolete machines that lasted for two weeks. The company JCA did not have the capital to fund the operation. Photo: Pius Piskaut.

Kapari Sawmill, Central Province. Kwila logs wasted. Photo: Pius Piskaut.

Kapari Sawmill, Central Province. Abandon sawn kwila timber. Photo: Pius Piskaut

Kwila's club-like buttress (*Intsia bijuga*). Picture taken along the Rigo Highway, Central Province, Papua New Guinea. Photo: Pius Piskaut

Pale brown stem of kwila (*I. bijuga*). Photo: Pius Piskaut.