CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

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Sixteenth meeting of the Plants Committee
Lima (Peru), 3-8 July 2006

Review of Significant Trade in specimens of Appendix-II species

SPECIES SELECTED FOLLOWING COP11 AND COP12

1. This document has been prepared by the Secretariat.

Species selected following CoP11

Background

2. At its 12th meeting (Leiden, May 2002), the Plants Committee selected the following species for review in accordance with Resolution Conf. 8.9 (Rev.) [which has now been replaced by Resolution Conf. 12.8 (Rev. CoP13)]: *Prunus africana, Aquilaria malaccensis, Pericopsis elata* and *Aloe* species from East Africa used as extracts. The Plants Committee completed its work on the latter three taxa, categorizing range States and formulating recommendations. This was, however, not done for *Prunus africana*.

Prunus africana

3. At its 12th meeting (Santiago, 2002), the Conference of the Parties directed Decision 12.74 to the Plants Committee, calling for a review of *Prunus africana* and thereby confirming the selection already made by this Committee.

4. At the 15th meeting of the Plants Committee (PC15, Geneva, May 2005), the Secretariat reported that a consultant had been contracted and that it would submit the report to the Committee in accordance with Resolution Conf. 12.8 (Rev. CoP13) paragraph j).

5. Dr A.B. Cunningham, expert in this species and member of the IUCN/SSC Medicinal Plants Specialist Group, was engaged to compile information about the biology and management of and trade in *Prunus africana*, and to provide a preliminary categorization of this species in compliance with paragraphs h) and i) of Resolution Conf. 12.8 (Rev. CoP13).

Species selected following CoP12

Background

6. At its 14th meeting (Windhoek, February 2004), the Plants Committee agreed that, under the terms of paragraph b) of Resolution Conf 12.8, a review of trade in *Galanthus woronowii, Podophyllum hexandrum, Cyathea contaminans, Cibotium barometz, Dendrobium nobile* and an orchid species from Belize (to be selected), should be undertaken. The Secretariat notified the range States of these species, explained the reason for this selection and requested comments regarding possible problems

with the implementation of Article IV. At PC15, the Committee reviewed the available information according to paragraph f) of Resolution Conf. 12.8 (Rev. CoP13) and decided to eliminate *Podophyllum hexandrum* from the review [see document PC15 WG2 Doc.1 (Rev.1)].

7. The IUCN-World Conservation Union was engaged to compile information about the biology and management of and trade in *Galanthus woronowii, Cyathea contaminans, Cibotium barometz* and *Dendrobium nobile*, and to provide a preliminary categorization of these species in compliance with paragraphs h) and i) of Resolution Conf. 12.8 (Rev. CoP13).

8. The reports from the consultants are attached to this document in the following Annexes:

   Annex 1: *Prunus africana*
   Annex 2: *Cibotium barometz*
   Annex 3: *Cyathea contaminans*
   Annex 4: *Dendrobium nobile*
   Annex 5: *Galanthus woronowii*.

9. Information and comments from range States that the Secretariat received within the 60-day deadline are included in Annex 6 to this document in the language in which they were submitted. Annex 6 will be distributed to the Plants Committee at the beginning of the present meeting. Additional copies will be made available to the Plants Committee or its working group on the Review of Significant Trade as appropriate.

10. The reports referred to above present conclusions about the effects of international trade on the selected species, the basis on which such conclusions are made, and problems with the implementation of Article IV of the Convention. The reports provide preliminary categorizations of the selected species into three categories as outlined in Resolution Conf. 12.8 (Rev. CoP13) as follows:

    i) 'species of urgent concern' shall include species for which the available information indicates that the provisions of Article IV, paragraph 2 (a), 3 or 6 (a) of the Convention are not being implemented;

    ii) 'species of possible concern' shall include species for which it is not clear whether or not these provisions are being implemented; and

    iii) 'species of least concern' shall include species for which the available information appears to indicate that these provisions are being met.

Actions required by the Plants Committee

11. In accordance with paragraphs k) and l) of Resolution Conf. 12.8 (Rev. CoP13), the Plants Committee is requested to review the reports and the responses received from range States and, if appropriate, to revise the preliminary categorizations proposed by the consultant. Problems identified that are not related to the implementation of Article IV paragraph 2 (a), 3 or 6 (a) should be referred to the Secretariat.

12. In accordance with paragraphs m) to o) of the same Resolution, the Plants Committee is also requested to formulate recommendations for species in categories i) and ii). Such recommendations should differentiate between short-term and long-term actions, and be directed to the range States concerned. Species of least concern shall be eliminated from the review.

PRUNUS AFRICANA

CITES Significant Trade Review of *Prunus africana*

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CITES Significant Trade Review of *Prunus africana*

1. Summary

Prunus africana (Hook f) Kalkman (Rosaceae)[1] is the only indigenous representative in Africa and Madagascar of a genus of over 200 species (Mabberley, 1997; Schatz, 2001)[2]. Often referred to by its previous name, *Pygeum africanum*, *Prunus africana* is a wild relative of several commercially important fruit crops (peaches, plums, almonds, apricots) and a plant genus of great commercial significance (Phillips and Meilleur, 1998). Endemic to high conservation and catchment value mountain forests in Africa and Madagascar, *Prunus africana* was listed as a CITES Appendix-II species in 1995. Although cultivation is taking place on a small scale in Cameroon, Kenya and Madagascar, all bark entering the international market is from wild harvest. Over the past 40 years, *Prunus africana* bark harvest has shifted from subsistence use to large-scale commercial use for international trade. From two initial brand-name products produced in France and Italy to treat benign prostatic hypertrophy (BPH), there now are at least 40 brand-name products using *Prunus africana* bark extract. These are marketed directly in 10 countries and globally through the internet. Patents for new *Prunus africana* bark products have proliferated where doctors received approximately 4.5 million visits per year for a diagnosis of BPH (Wei, Calhoun and Jacobsen, 2005).

Since 1995, international trade networks have become more complex and seven range States now export *Prunus africana* bark. Encouraging developments since CITES Appendix II listing are that an inventory and estimation of sustainable harvest have been carried out on Mt. Cameroon (Acworth et al, 1998), and that in 2003, the Ministry of Environment, Water and Forests of Madagascar has worked with multiple-stakeholders to develop a National Plan of Action for sustainable production of *Prunus africana* (DGEF, 2003). In both range States, it was assumed that wild harvest of half the tree trunk bark (a quarter taken from opposite sides of the trunk) on a 5 year rotation would be sustainable. Recent studies on the impacts of wild harvest on *Prunus africana* populations in Cameroon show that this is unlikely (Stewart, 2001, 2003a,b). Based on detailed research and matrix population modelling, Stewart (2001) showed that exploitation of large *Prunus africana* tree is unsustainable and leads to population decline. Matrix population modelling showed that *Prunus africana* population growth rates are most sensitive to death or low survival rates of the large trees producing the most seed (Stewart, 2001). Harvest was only sustainable if the large, seed producing trees are conserved, not harvested (Stewart, 2001). With commercial bark harvest, the opposite situation to Stewart's (2001) sustainable harvest scenario generally occurs: bark harvesters focus on the largest trees. This easily occurs in remote forests or rough terrain where controls over harvest are limited by few forestry staff and funds. As large trees become scarcer, harvesters are travelling further and further to find mature trees to debark. In Cameroon, bark harvesters are now exploiting trees in the Adamawa Plateau (Laird et al, 2004). Debarking of *Prunus africana* often occurs within Afromontane forest habitat of global conservation significance (Olson and Dinerstein, 2000; Stattersfield et al, 1988; Stattersfield et al, 1998; Butynski and Koster, 1994). Clearing for agriculture, followed by timber extraction by small-scale loggers (pit-sawyers), forest understorey browsing and trampling by livestock and fire on forest margins are major threats to this forest type. Control over these factors is difficult in range States that are currently affected by armed conflict (Burundi, DRC, Sudan).

Five main recommendations are made. Firstly, that *Prunus africana* is maintained under CITES Appendix II listing. Secondly, that the terms "extract" and "powder" is clarified for reporting purposes. Thirdly, that independent, peer reviewed ecological studies and matrix population modelling are conducted in Kenya, Tanzania, Madagascar, Equatorial Guinea and Uganda. Neither research nor managed, sustainable harvests are likely in Burundi and the DRC until political stability returns, and then only with adequate training and support. Fourthly, it is recommended that when a bark harvest quota is set by exporting countries (such as Cameroon and Equatorial Guinea), that European Union (EU) importing countries adopt the quota level set by the exporting Range State. To date, no EU importing country has implemented this simple measure. Finally, it is recommended that range States and international agencies support and monitor cultivation of *Prunus africana*. At best, wild harvest is a short-term measure. *Prunus africana* needs to make the transition to agroforestry or plantation production. *Prunus africana* cultivation is an economic proposition (Cunningham et al, 2002). Bark production from most other tree species

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1 **Note**: Trade and vernacular names for *Prunus africana* are given on the following page.

2 Although Kalkman (1965) suggested that a separate species, *Prunus crassifolia* might occur in the Kivu region, DRC, this has been not been confirmed as was disregarded by Schatz (2001) and in this review.

commercially harvested on a large scale, such as cinnamon, cassia, cork oak, quebracho (*Schinopsis quebracho-colorado),* chestnut (*Castanea vesca*) and black wattle (*Acacia mearnsii*) are produced in agroforestry or plantation systems. *Prunus africana* can do the same (Figure 1).

Trade names for *Prunus africana*

Pygeum, Red stinkwood, Afrikansche Stinkholz-rinde, African cherry

Local or vernacular names for *Prunus africana* by region

Southern Africa: *muchambati* or *muchati* (Central Shona), *umdumezulu, inkhokhokho, umlalume, ingobozinyeweni* (isiZulu), *umkhakhazi, inyazangoma* (Xhosa and Zulu), *mulala-maanga* (Venda), *mogotlhori* (North Sotho), rooistinkhout (Afrikaans) (Wild, Biegel and Mavi, 1972; Palmer and Pitman, 1972; Pooley, 1993).

South-Central Africa: *Dedzi* (chiChewa), *msista* or *mkunu* (Yei), mzumira (Tu), *mmdondole* (Ngoni) and *mpuema* (Mg) (Williamson, 1975).

East Africa (Kenya, Uganda, Tanzania): *Muiru* (Kikuyu), *Mutimailu* (KiKamba), *ol-Koijuka* (Maa), *Tenduet* (Elgony, Kipsigis, Ndorobo), *Mueri* (Stand), Mweria (Meru), *Twendet* (Nandi), *mkonde-konde, msendo, muuri* and *mudy* (Chagga), *konde-konde* (Meru), *mdundulu* (Nguu), *ligambo* (Nyiha), *wami* (Rangi), *gwaami* (Fiome), *mufubia* (Zinza), *mfila* (Fipa), *mwiluti* (waHehe), *Murugutu* (Watende), *Armaatet, Oromoti* (Sebei), *Kiburubura* (Kisii), *Mwiritsa* (Luhya); *Ntasesa* (Luganda), *chiramat*, *chirumandi, gulumati, gumwirumani, namwini* (Lugisu), *mukombo* (Rukiga) *ngoti* (Lukonjo), *mugote* (Runyankole), *ntasera* (Lunyoro), *oromoti* (Sebei) (Beentje, 1994; Hamilton, 1991; Mbuya et al, 1994).

Ethiopia highlands: Tikur inchet (Amargna), *Beru* (Gimirigna), *Arara* (Haderigna), *Bouraio*, *Buraya, Homi* and *Mukoraja* (Oromugna), *Mrchiko* (Sidamgna) and *Garba* or *Onsa* (Wolayeigna) (Bekele-Tesemma, 1993).

West Africa: *Bihasa* (Buhi), used on Bioko. In Cameroon, *wotangue* (Bakweri) *dalehi* (Fulani), *eblaa* (Oku), *elouo, mowom* and sola (Kom), *kanda stick* (Pidgin) and *kirah* (Banso).

Madagascar: *Kotofihy* (most widespread name), also *sofintsohihy* (and *kotofihy*) in the Amparafaravola, Brickaville and Vohimena areas, *tsintsefintsohihy* (and *kotofihy*) in Ambatondrazaka area, *saripaiso* or *sary* (Bealanana, Mandritsara and North Befandriana, Paisoala (Betsileo area) and *tsipesopeso* (Moramanga).

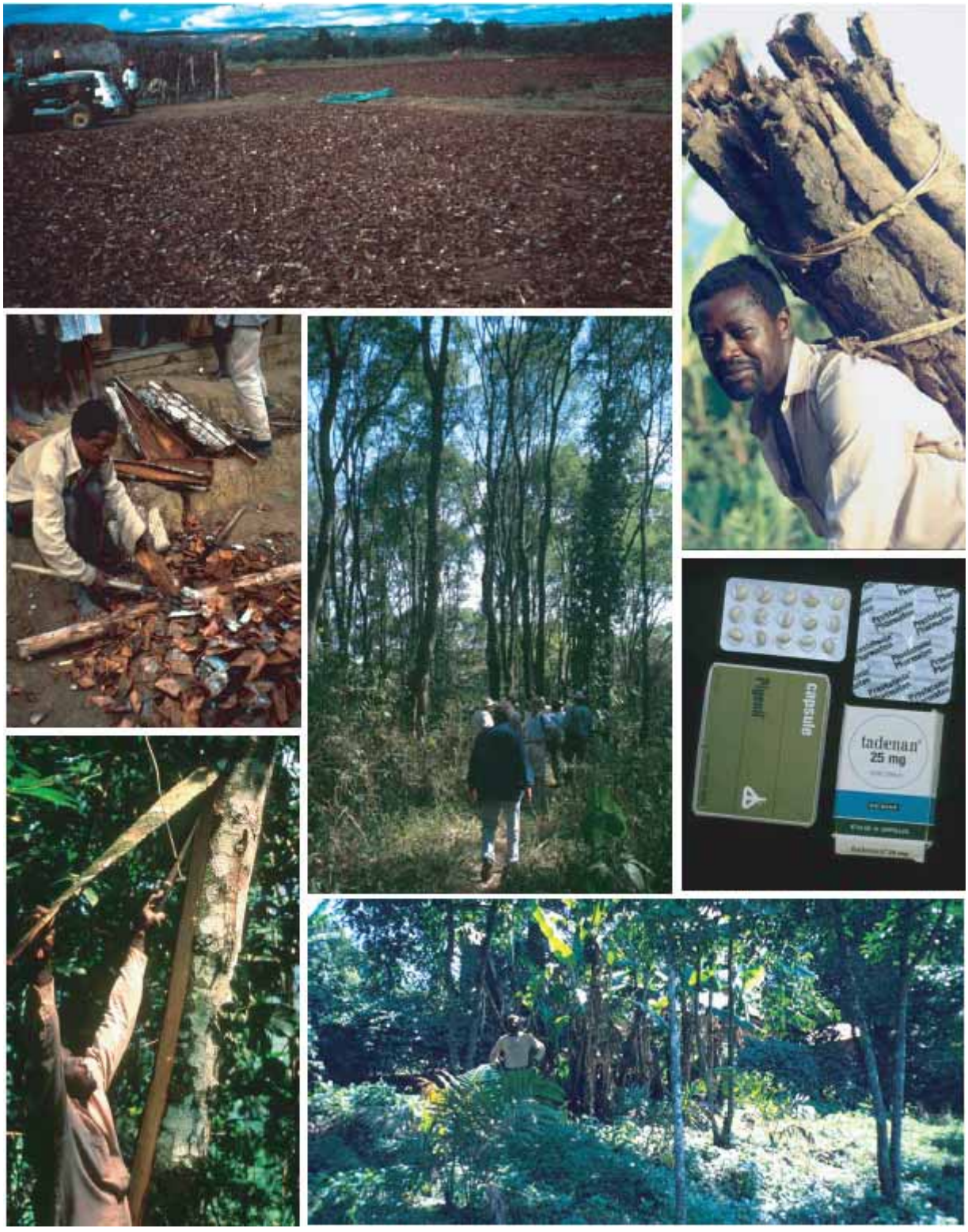

Figure 1. Tracking the shift from wild harvest to sustained production in plantations or agroforestry sytems.

Clockwise from top left: 1. A mass of wild harvested dark surrounds a home near Antsevabe, Madagascar before being sent to the factory in Fianarantsoa. **2.** Carrying a load of *Prunus* bark in Cameroon. **3.** Final products- Tadenan and Pigenil. **4.** The system of sustainable harvest attempted in Cameroon, 1972-1987 before monopoly control was lost to 50 Cameroonian licencees. **5.** In densely populated highlands, *Prunus africana* production in agroforestry systems has the potential to transform landscapes, livelihoods and create buffer zones around globally important conservation areas. **6.** Chopping bark, Antsevabe, Madagscar. **Centre:** The future: plantation production- a 1950's planting, western Kenya.

2. Species biology and conservation status

2.1 Life history and ecology

Prunus africana is a tall (6-30m high), light-demanding evergreen tree patchily distributed in montane forests, forest remnants or forest margins. *Prunus africana* is restricted to Afromontane forests and to small patches of montane forest in Madagascar. In the tropics, *Prunus africana* is found between 1200-3000 m above sea level, but further south, where cooler latitudes compensate for altitude, it occurs at lower elevations (Letouzey, 1978; White, 1983). At the extreme southern end of its range, at the Bloukrans river, Cape province, South Africa, it therefore occurs close to sea level.

As a light-demanding tree species that reproduces primarily from seed, *Prunus africana* is generally single stemmed, developing multi-stems when saplings are browsed. Although young trees resprout, for example if browsed by forest antelope or goats, large trees have weak resprouting capability. Coppice production (resprouting) can occur when surface roots are damaged.

The fruit is a bitter tasting drupe < 10mm in diameter, which are eaten by a wide range of animals (Table 1). Seeds are recalcitrant and germinate best when fresh, losing viability quickly so that few seeds older than 6 months old are viable. Germination rates of 60-80% can be attained if planted within 50 days (Mbuya et al, 1994). Ripe fruits germinate well in partial sunlight (but not full sunlight and not when heavily shaded) after a short (4 hr) drying period in an airy, shaded place. The seeds are dispersed by birds and non-human primates. Despite the fact that *Prunus africana* leaves contain higher levels of cyanogenic glycosides compared to most other Afromontane tree species, their leaves one of the most preferred food sources for red colobus monkeys (Chapman and Chapman, 2002) and black and white colobus monkeys (Fashing, 2004). Die-off of *Prunus africana* trees is causing serious concern about colobus monkey conservation in Kakamega forest, Kenya (Fashing, 2004).

Table 1. Animals observed eating the fruits or leaves of *Prunus africana* in the Kilum-ijim forest, NW Cameroon (Stewart, 2003b), illustrating the ecological importance of this species as a food resource and the role that range bird and animal species dispersing seed. In East Africa, colobus monkeys replace guenons as consumers of *Prunus africana* leaves, but main frugivorous bird groups (starlings, turacos) are the same.

ORDER	FAMILY	SPECIES	COMMON NAME
Primates	Cercopithecidae	*Cercopithecus preussii*	guenon
		Cercopithecus nictitans	Putty-nosed guenon
		Papio anubis	Olive baboon
Rodentia	Sciuridae	*Paraxerus cooperi*	Cooper's green squirrel
	Muidae	*Cricetomys gambianus*	Gambian giant rat
Carnivora	Viverridae	*Viverra civetta*	African civet
Hydracoidea	Procavidae	*Procavia ruficeps* (hojas)	Large-toothed rock hydrax
Artiodactyla	Bovidae	*Cephalophus dorsalis*	Bay duiker
		Cephalophus nigrifrons	Black-fronted duiker
		Tragelaphus scriptus	Bushback
Cuculiformes	Musophagidae	*Tauraco bannermani*	Bannerman's turaco
		Tauraco persa	Green turaco
Columbiformes	Columbidae	*Columba arquatrix*	Cameroon olive pigeon
Passeriformes	Turdidae	*Turdus olivaceus pelios*	African thrush
	Fringillinae	*Linurgus olivaceus*	Oriole finch
	Pycnonotidae	*Pycnonotus tephrolaemus*	Mountain greenbul
	Sturnidae	*Pycnonotus montanus*	Cameroon montane greenbul
		Phyllastrephus poensis	Cameroon olive greenbul
		Onychognathus walleri	Waller's red-winged starling
		Lamprotornis splendidus	Splendid glossy starling

A recent study by Wubet et al (2003) in Ethiopia has shown for the first time that arbuscular mycorrhizae are predominant in the dry Afromontane forests, including in the roots of *Prunus africana*. This has important implications for reforestation using indigenous species such as *Prunus africana*. Microscopic analysis of the mycorrhizal status of the indigenous trees revealed that all formed arbuscular mycorrhizas, but that no ectomycorrhizae were found. Appressoria with branched penetrating hyphae were common in roots of *Prunus africana*, as well as *Podocarpus. falcatus, Ekebergia capensis, Syzygium guineense* and *Hagenia abyssinica* (Wubet et al, 2003). This mycorrhizal association is important for mineral nutrition and optimal growth of *Prunus africana* and the potential of this species for reforestation, land rehabilitation and agroforestry or forestry production (Haselwandter, 1997).

Although it is a light demanding tree species which under good conditions can grow to 14 m high and 37cm diameter at breast height in 18 years, *Prunus africana* is a long-lived tree species with very heavy, dense wood. At 12% moisture content, the wood weighs 1090kg/m3 (Goldsmith and Carter, 1992). Fruit production starts when trees are around 15 years old and increases with tree age, with high fruit production years alternating with low fruit production years (Stewart, 2001). As a shade-intolerant (light demanding) tree species, natural forest disturbance coupled to fruit dispersal into canopy gaps or on forest margins are important to landscape level population biology of *Prunus africana.* This also accounts for the scattered distribution of this species in Afromontane forests. The annual mortality of adult-sized *Prunus africana* trees in natural populations was considered to be 1.5% per year (Stewart, 2001), based on studies of other tropical tree populations (Swaine, 1987a, b). Based on a 15 year study of tree growth and mortality in Afromontane forest in South Africa (van Daalen, 1991), mortality rates of trees > 10 cm diameter at breast height (dbh) averaged 0.71% per year. Mortality of *Prunus africana* trees > 30cm dbh in commercially harvested wild populations can be more than 50 times higher than natural mortality rates. The implications of this for sustainable harvest of *Prunus africana* populations and non-detriment findings (CITES Article IV, paragraph 2) are discussed below in the section on *Population distribution, status, trend and threats by range States.*

Comparison between forest gap formation due to natural disturbance and gap formation due to girdling of *Prunus africana* trees is also relevant. Afromontane forests have a high degree of stability and low species turnover rates (Midgley et al, 1997). Rates of disturbance are low and canopy gap size generally small. In the Knysna forest, South Africa, only 2-10% of the canopy occurred as measureable gaps and most trees died standing (70%) (Midgley et al., 1997). Although the proportion of forest in canopy gap phase is higher on steep slopes, due to tree falls, girdling and felling of *Prunus africana* trees greatly increases the proportion of forest in canopy gap phase.

2.2 Global distribution – range Status of the species

Prunus africana is the only African representative of a genus of over 200 species, also found in Madagascar (Mabberley, 1997; Schatz, 2001). It is not found outside of Africa and Madagascar. *Prunus africana* is a wild relative of several commercially important fruit crops (peaches, plums, almonds, apricots) and a plant genus of globally commercial significance. All range States are shown in Table 2 below, indicating those exporting *Prunus africana* on a significant scale and the importing countries involved. Two additional range States are suggested, although these are on margins of *Prunus africana* distribution: first, Lesotho, based on a *Prunus africana* specimen collected in Sehlabathebe National Park and a field record from another locality. Second, Nigeria, based on the likelihood that *Prunus africana* occurs on the Mambila Plateau, across the border from NW Cameroon. This needs further investigation.

Table 2. Range States of *Prunus africana*, showing those countries which are exporting *Prunus africana* bark and those where only subsistence use of this tree species take place. Although *Prunus africana* is distributed in montane "islands" across Africa and Madagascar, restricted to high altitude (1500-3100m) montane forests in tropical Africa, many of which have been cleared for farming. Major exporting countries, in order of importance are Cameroon, Kenya, Madagascar, Equatorial Guinea (from the island of Bioko), followed by the DRC and Burundi. The most important importers are France, Italy, Belgium and Spain. Sources of information on uses numbered below.

Range State	**Recorded Bark Export (1995-2004)**	**Export > 1000 kg /bark*/yr**	**Importing countries (Including re-exports)**	**Other uses of *Prunus africana* in range State**
Angola	NO	NO	-	No data, but subsistence use for fuelwood and traditional medicine likely
Burundi	YES	YES	Belgium, France	Traditional medicine, timber, fuelwood
Equatorial Guinea (Bioko)	YES	YES	Spain	No data
Ethiopia	NO	NO	-	Firewood, charcoal, poles, timber, medicine (leaves, bark), bee forage, mortars (1).
Cameroon	YES	YES	France, Spain, Canada*	Firewood, traditional medicine
DR Congo	YES	YES	Belgium, France, Madagascar, India	Firewood, traditional medicine, timber (2)
Kenya	YES	YES	France, China, USA	Timber for house building and furniture & traditional medicine (3)
Lesotho	NO	NO	-	Only 2 trees known, one of which has died (9)
Madagascar	YES	YES	France, Italy, India, Slovenia*	Fuelwood, charcoal, medicine
Malawi	NO	NO	-	Used for timber (4)
Mozambique	NO	NO	-	No data, but use for traditional medicine and fuelwood likely
Nigeria	NO	NO	-	No data
Rwanda	NO	NO	-	Fuelwood, timber, traditional medicine
Sao Tome and Principe	NO	NO	-	No data
South Africa	YES*	NO	Germany*, Netherlands*, Switzerland*	Commercially traded for traditional medicine (5)
Sudan	NO	NO	-	No data
Swaziland	NO	NO	-	Use for traditional medicine
Tanzania	YES	YES	USA, plus < 5kg to Madagascar and South Africa	Firewood, charcoal, construction timber, poles, utensils (mortars), medicine (6)
Uganda**	NO	NO	-	Beer fermentation troughs ("beer boats"), traditional medicine, fuelwood, building poles, timber (2)
Zambia	NO	NO	-	No data.
Zimbabwe	NO	NO	-	Traditional medicine, timber (7, 8)

References: 1 = Bekele-Tesemma, 1993; 2 = Cunningham, 1996; 3 = Bentje, 1994; 4 = Williamson, 1975; 5 = Cunningham, 1993; 6 = Mbuya et al, 1994. 7 = Gelfand et al, 1985; 8 = Goldsmith and Carter, 1992; 9 = Golding, 2002.

Notes to Table 2 above: *Quantity 50 kg in 2003 for entire period (1995-2003). **In 1992, prior to CITES App.II listing, Uganda exported *Prunus africana* bark to France via Kenya, but this was stopped due to destructive effects on Kalinzu-Maramagambo Forest Reserve. Uganda has recently applied for a CITES permit. This needs to be considered with caution. The integrity of Kalinzu-Maramagambo Forest Reserve, which has high conservation value, but is under threat by illegal activity (hunting, charcoal burning, small-scale gold panning)) (Howard, Davenport and Balzer, 1996) and Bwindi-Impenetrable National Park has recovering *Prunus africana* stocks and vulnerable mountain gorillas popuations, this recent request from Uganda needs to be carefully considered.

2.3 Population distribution, status, trend and threats by range States

Although listed as Vulnerable in the World List of Threatened trees (Oldfield et al, 1998) *Prunus africana* is not listed in the IUCN Red List of Threatened Plants (Walter and Gillet, 1998), although 20 other *Prunus* species are listed. Conservation status of *Prunus africana* varies by range State (Table 3). *Prunus africana* populations are small and scattered in southern Africa, but are larger in East Africa (particularly Ethiopia) and prior to commercial bark harvest, large healthy populations occurred in West Africa (Cameroon, with smaller populations on Bioko (Equatorial Guinea). Most of southern Africa is semi-arid, so only a very small area (less than 0.5% of the total land area) is covered by forest (Midgley et al., 1997) and even less by Afromontane forest. Key questions that need to be addressed are:

– Which are the priority range States and locations for *Prunus africana* conservation and management?

– How effective are different management interventions and techniques for sustainable wild harvest of *Prunus africana?*

– Where should scarce resources be invested in *Prunus africana* for sustainable bark production to meet commercial demand: wild harvest or cultivation?

In assessing conservation status of *Prunus africana* at a global, regional and national scale, it is crucial that the marked genetic and chemical differences between populations is taken into account. Chemical differences in bark from *Prunus africana* populations in Cameroon, Kenya, Madagascar and the DRC were recognized 20 years ago (Martinelli, Seraglis and Pifferi, 1986). More recently, random amplified polymorphic DNA analysis has shown that distinct genetic variation between *Prunus africana* populations in Ethiopia, Kenya, Cameroon, Uganda and Madagascar (Barker et al., 1994; Dawson and Powell, 1999). As would be expected from their long separation from African populations, Madagascan *Prunus africana* populations are very different from those in Africa (Dawson and Powell, 1999).

At a national level, range States need to develop *in situ* and *ex situ* genetic management strategies for genetically distinct populations. Statistically significant ($p > 0.05$) differences were found, for example, between *Prunus africana* populations in Mantadia and Manakambahiny-Est in Madagascar (Dawson and Powell, 1999). *Prunus africana* populations in Mt. Kilum, Mandakwe and Mt. Cameroon were also very different ($p > 0.05$) (Dawson and Powell, 1999). A summary of *Prunus africana* population distribution by range States is given in Table 3 below.

Table 3. Range States of *Prunus africana*, summarizing the status of *Prunus africana* throughout its range. Conservation values of the forest habitat in which *Prunus africana* is exploited is also shown. Although *Prunus africana* is widely distributed across Africa and Madagascar, it is restricted to high altitude (1500-3100m) montane forests, many of which have been cleared for farming. Major exporting countries, in order of importance are Cameroon, Kenya, Madagascar, Equatorial Guinea (from the island of Bioko), followed by the DRC and Burundi. The most important importers are France, Italy, Belgium and Spain.

Range State	Distribution in Range State	Status of *Prunus africana* population	Global significance of habitat & current threats
Angola	Bailundu highlands, Mt. Moco	IUCN Category status **Vulnerable (VUA1cd)** (2). Small population, no effective protection yet Mt. Moco and the Bailundu highlands have been affected by over 20 years war	Forest islands in montane grassland vulnerable to fire and clearing for farmland.
Burundi	Montane forest, Albertine Rift, possibly from Mt. Heha/Ijenda, Mt. Bururi or Teza forest.	**Data deficient,** research needed due to current commercial trade. May be threatened and in long-term decline.	Additional threats are deforestation and unregulated timber felling by pit-sawyers, both of which have been worsened by warfare

Range State	Distribution in Range State	Status of *Prunus africana* population	Global significance of habitat & current threats
Cameroon	Bamenda highlands (Mt Kilum, Oku, Mt. Manenguba, Adamawa plateau and Mt. Cameroon	**Vulnerable** (4). Current harvest levels considered unsustainable by Stewart (2001). Few large trees alive in NW and West Cameroon, and Western. Commercial exploitation has now spread to the remote Adamawa plateau.	Montane forests of Cameroon are critically important for bird conservation, with a high number of endemic species (Stattersfield et al, 1998). The spread of large scale commercial *Prunus africana* bark harvest to the Adamawa plateau is of serious concern. Forest clearing outside Forest Reserves is a major threat in these densely populated highlands.
DR Congo*	Kivu region, Rwenzori and Virunga mountains, and within Kahuzi-Biega National Park, probably also on Itombwe massif.	**Data deficient**. Bark harvest is opportunistic and unregulated. Densely populated surrounding area (up to 300 people/km2). Controlled harvest not possible due to armed conflict.	Kahuzi-Biega NP is declared a UNESCO World Heritage site in danger. Additional threats are deforestation and unregulated timber felling by pit-sawyers, both of which have been worsened by warfare. Hunting and fuelwood harvesting for or by Rwandan 0.5 million refugees has also been issue near Kahuzi-Biega.
Equatorial Guinea	Pico Basilé and Grand Caldera de Luba on the island of Bioko	Harvest considered unsustainable given impacts of large trees and current level of trade (8). More recent research conducted with funding from Spain, but report unavailable for this review.	Pico Basilé is the most important habitat for bird conservation on Bioko. Also a habitat high in endemic plant and primate species. Forests a focus of a massive bushmeat trade (5).
Ethiopia	NW highlands to Lake Tana and SE Highlands to Harar. Widespread in montane and valley forests of Harerge (eg: Dindin forest), Illubabor, Kefa, Arsi, Wolega and other regions 1500-2300m asl.	Probably not threatened. Subsistence use of bark only, although considered as a source of supply to France in the 1970's. Direct impacts due to fuelwood, charcoal and timber use (3). Poor recruitment of *Prunus africana* in Bale mountains (7)	Livestock and clearing of forests are a major threat to montane forests.
Kenya	Mt. Kenya, Mt Elgon, Mau forests	Needs non-detriment assessment of current bark harvest by sole exporter.	Forest habitats important for bird and wildlife conservation and for their catchment values.
Lesotho	One collection from Rock pools area, Sehlabathebe, but that tree no longer survives. One specimen reported from Maphotong Gorge (2)	**Rare**. Only known from one sighting and one collection record. IUCN Category status **Data Deficient (DD).**	Marginal habitat, forest patches vulnerable to fire.
Madagascar	Patchy distribution in moist Montane forests (1000-2000m asl) such as Zahamena Strict Nature Reserve, Mantadia, Antsevabe and Manakambahiny-Est.	**Vulnerable.** Poor recruitment, few young trees and poor compliance with Forestry regulations. This could improve under the National Action Plan for *Prunus africana* (6)	Forest clearing for farming, charcoal and fuelwood collection.
Malawi	Mt Mulanje, Zomba and Vipya planteaus	IUCN Category status **Vulnerable (VUA1cd)** (2)	Harvesting for medicinal bark and timber.

Range State	Distribution in Range State	Status of *Prunus africana* population	Global significance of habitat & current threats
Mozambique	Mt Chiperone and Chimanimani mountains and Mt. Gorongosa	**Data deficient.**	Habitat loss to clearing for subsistence farming.
Nigeria	Mambila plateau, SE Nigeria	**Data deficient.** Not recorded as a Range State by WCMC-UNEP, but small population may occur in this locality. Needs further investigation.	Forest clearing for farming.
Rwanda	Virunga mountains, Mukura and Nyungwe forests	**Data deficient.** Populations probably secure in the Virunga mountains and Nyungwe forest unless commercial bark harvest starts.	Forest clearing for farming, timber cutting by pitsawyers.
Sao Tome e Principe	Central Principe, near the volcanic plugs of Joao Dias Pai e Filho and montane Sao Tome from 1200-1400m asl.	**Data deficient,** probably not threatened unless commercial harvest starts. Habitat destruction the biggest threat.	The second most important of all 75 African forests for bord conservation (Collar & Stuart, 1988)
South Africa	Afromontane forest patches from Mpumalanga through KwaZulu/Natal to the Knysna forest	**Not threatened.** Internal commercial trade in *Prunus africana* bark for traditional medicines, but most populations relatively secure	Nationally important habitat covering < 0.5% of the country.
Sudan	Imatong mountains (1)	**Data deficient.** Status unknown due to warfare, montane forests in upland grassland vulnerable to felling and fire.	Half of all Sudan's plant species (1400 species, including 12 site endemics). Forest within the Imatong Mountains Central Forest Reserve, but not accessible due to warfare.
Swaziland	Forest patches near Malolotja (Forbes Reef) and Mbabane.	IUCN Category status **Endangered C2aD** (2). Small populations vulnerable to bark exploitation for traditional medicine traded internally and cross-border trade to markets in Johannesburg, South Africa.	Nationally important habitat covering < 0.5% of the country.
Tanzania	Moist evergreen forests in NE Tanzania, including Mt Kilimanjaro	**Data deficient.** Status of populations unknown and needs investigation due to increased commercial trade.	Forest habitats important for bird and wildlife conservation and for their catchment values.
Uganda**	SW Uganda, particularly Kalinzu, Bwindi, Mgahinga and Mt. Elgon and in the Imatong mountains on the Sudan border	**Not threatened.** Healthy populations secure in Bwindi-Impenetrable National Park and Kalinzu Forest Reserve.	Globally important habitat for Mountain gorillas (Bwindi, Mgahinga) and East Africa's highest diversity Afromontane forest.
Zambia	Relict forest patches in fire maintained upland grasslands	IUCN Category status **Lower Risk-nt,** widespread but uncommon habitat (2).	Fire and forest clearing.
Zimbabwe	Chimanimani mountains and Inyanga	Rare and restricted to small montane forest patches in eastern Zimbabwe. Secure at present.	Fire and clearing of forest habitat.

References: 1 = Friis, 1992; 2 = Golding, 2002; 3 = Songwe, 1990; 4 = Katende, 1995; 5 = Fa, 2000; 6 = DGEF, 2003; 7 = Tesfaye et al (2002); 8 = Sunderland and Tako, 1999.

3. Conservation and management

3.1 Habitat protection

Commercial exploitation of *Prunus africana* bark coincides with habitat of global conservation significance in Africa and Madagascar (Garbutt, 1999; Olson and Dinerstein, 2000; Stattersfield et al., 1998). In several cases, such as on the island of Bioko (Equatorial Guinea) and the Adamawa Plateau, Cameroon, the commercial value placed on *Prunus africana* bark provides the incentive for men to go into forests they may otherwise have avoided. This has secondary effects (hunting, trapping, fire) in addition to changing habitat (forest) structure due to girdling or felling of *Prunus africana* trees and is a critically important issue on Bioko where a massive bushmeat trade threatens several rare primate populations (Fa, 2000). Priority range States for CITES, grouped by ecoregion, are:

– **Cameroon** (Mt Cameroon, Adamawa Plateau, NW Cameroon), **Equatorial Guinea** (the island of Bioko) and probably in **Nigeria** (the Nambla Plateau). These forests have high levels of endemism, particularly amongst birds and plants. Endemic birds include the Fernando Po speirops, white tailed warbler and Bannerman's turaco, endemic reptiles chameleon's (*Chameleo montium, Chamelo quadricornis*) and endemic mammals Preuss's guenon and the northern needle-clawed bushbaby. Seven non-human primates inhabit Bioko, including the drill, *Mandrillus leucophaeus poensis*. Bioko is considered a global "hotspot" for primate conservation (Butynski and Koster, 1994). At least 50 species and three genera of plants are strictly endemic to what Olson and Dinerstein (2000) term Cameroon Highland Forest and 50 more species are endemic to Mt. Cameroon and associated lowland forest;

– **Democratic Republic of Congo (DRC), Burundi** and **Uganda:** the Afromontane forests within the Albertine Rift have a diverse flora due to the overlap in ranges with some lowland forest species. As a result, they have much higher species diversity than Afromontane forests elsewhere in East Africa or in southern Africa. This ecoregion contains 37 endemic bird species (Stattersfield et al., 1998), endemic frogs, chameleons, chimpanzees and the mountain gorillas (in the Volcanoes National Park, DRC and across the border in Uganda). Surveyed in 1996 for the first time in 30 years, the Itombwe forests are considered the single most important site for bird conservation in Africa (Hart et al, 1999). The current conflict in the eastern DRC poses major problems for conservation (Inogwabini, Ilambu, and Gbanzi. 2005) and circumstances under which sustainable use of *Prunus africana* is not possible. Uncontrolled exploitation of *Prunus africana* has been taking place in forests of Kahuzi-Biega National Park near Bukavu, which was declared a World Heritage Site in Danger by UNESCO in 1997. have been exploited There are 7 protected areas in this ecoregion, but the Itombwe mountains, Lendu plateau and Mt Kabobo in the DRC have no protection. Most of the Lendu plateau has been deforested, with Djuga forest the most important remaining area.

– **Madagascar:** *Prunus africana* occurs from 1000-2000 m above sea level (Schatz, 2001), within mid-altitude and high altitude montane forest patches. *Prunus africana* bark exploitation has been taking place near (and possibly within) Zahamena Special Forest Reserve (from Anosivola, Monafeno, Ambohimanjalo villages), eastwards of Didy towards Mangerivola Special Reserve and from Saklava village towards Mantadia National Park. Mid-altitude montane forests (800-1300m) have very high mammal diversity, including the highest diversity of the endemic families Tenrecidae (tenrecs, 6 of 8 genera) and Nesomyinae (forest rats) as well as all five lemur families, including 12 of the 14 genera (Garbutt, 1999). Species diversity is lower in high altitude montane forests, but these forests are still globally important for conservation.

– **Kenya** and **Tanzania:** Until trade from Kenya was stopped pending non-detriment findings, it was a major source of *Prunus africana* bark to France. The most recent shipment was in 2003, which included dried bark from the exporters warehouse in Nairobi, rather than freshly harvested bark. The Mau forests were an important source of supply, but harvesting also occurs on Mt. Kenya and in the Kakemega forest, where recent die-offs of *Prunus africana* have been reported (Fashing, 2004). In South Nandi Forest Reserve, Kenya, *Prunus africana* has also been commercially logged for plywood production. Export of *Prunus africana* bark from Tanzania to the USA has increased since CITES Appendix II listing. In 1997, it was recommended that further investigation of the *Prunus africana* export trade from Tanzania was required to assess if exports were from forests in Tanzania or if bark was coming into Tanzania from the DRC. This does not appear to have been followed up. Sources of supply in Tanzania may be from Mt. Kilimanjaro, Mt. Meru or possibly forests in the southern highlands (Mt. Rungwe and Mdando forests). Forests on Mt Meru and Mt. Kilimanjaro form part of a

globally important endemic bird area, which include Vulnerable species such as Abbott's Starling (Stattersfield et al., 1998).

Although *Prunus africana* is widespread in the Central highlands of Ethiopia, there is extensive habitat modification in this range State. According to Wubet et al (2003), forest cover has been reduced at an alarming rate from 35 to 40% cover reported at the turn of 19th century, to less than 2.8%. Forest loss in Madagascar has also been dramatic. Between 1950 and 1985, forest clearing rates in eastern Madagascar averaged 110000ha per year (Green and Sussman, 1990). In western Madagascar, primary forest cover declined from 12.5% in 1950 to 2.8% in 1990 (Smith et al, 1997). According to Smith et al (1997) approximately 23% of remaining forest in western Madagascar is located within reserves, but this was no guarantee of protection, with forest cover in the Andranomena Reserve declining by 44% since 1950.

3.2 Regulation of wild harvesting

By comparison with trees studied for timber production, few data are available for bark yields or regression equations to estimating bark biomass from tree standing stocks, whether from wild or cultivated species. This limits the development of sustainable yields harvesting, for which this is a necessary requirement (Figure 2).

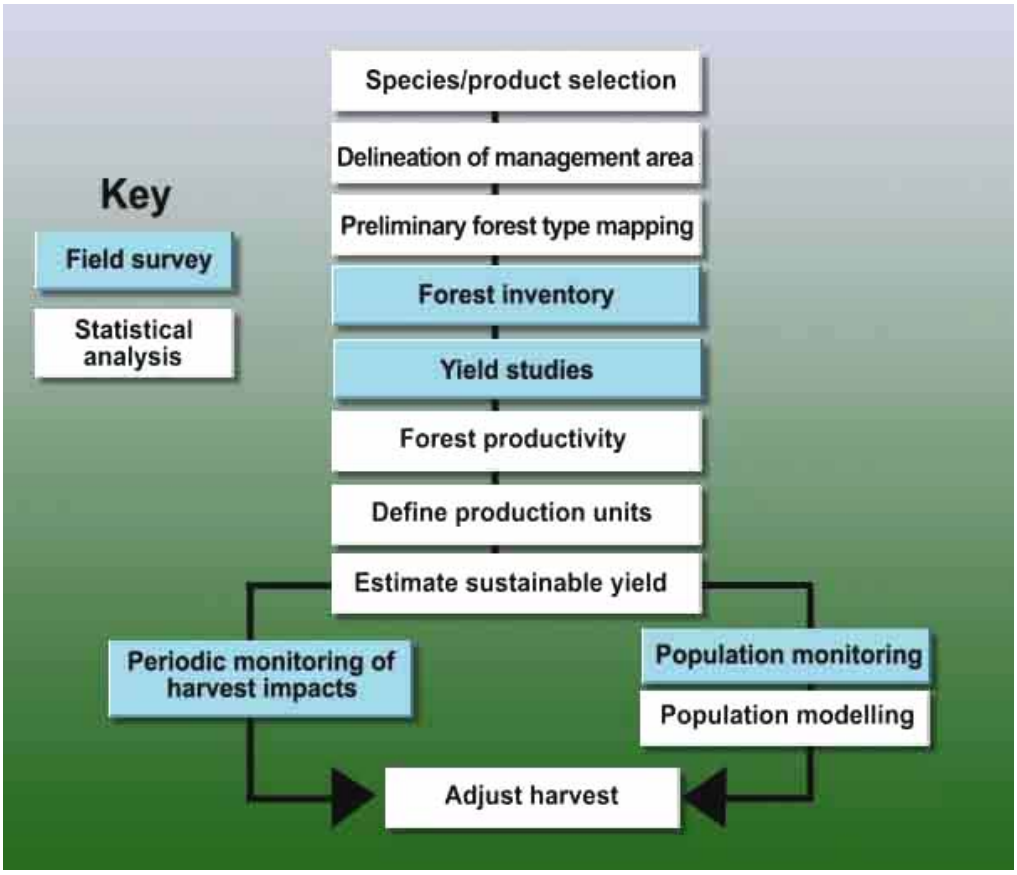

Figure 2. Steps taken to assess sustainable harvest in an adaptive management process (redrawn from Wong et al, 2000). The matrix population modelling process followed by Stewart (2001) for *Prunus africana* is an important assessment step.

Bark yields and prediction equations have mainly been developed for commercially valuable tree species cultivated for their tannins (*Acacia mearnsii*), cork (*Quercus suber*) and paper (*Pteroceltis tatarinowii):* (Schonau, 1970, Fonseca and Parresol, 2001; Fang, Li and Fu, 2004; Ribeiro and Tomé, 2002). Regressions for assessing bark mass in wild species are less well developed and there is a real need for additional research. Exceptions are regression equations developed for bark production from *Prunus africana* in Cameroon (Cunningham et al, 2002) and *Rytigynia* species in Uganda (Kamatenesi, 1997). Practical methods for assessing sustainable harvest are available (Cunningham, 2001; Peters, 1996).

With the exception of the study on Mount Cameroon (Acworth et al, 1998) all range States where commercial harvest takes place set harvest quotas without an inventory of standing stock or assessment of sustainable harvest. Property rights (tenure) over wild populations in natural forests is weak. Near Dschang in Cameroon, even enrichment plantings have been illegally exploited. By contrast, rights to harvest from private agroforestry production in Cameroon or State plantation production trials (in western Kenya since 1919) are generally respected.

State regulation of wild harvest in most of range States is difficult due to lack of financial resources and trained staff to implement management or monitoring systems. Forests that are sources of supply of *Prunus africana* bark are often remote, with difficult access for Forest Department staff. In addition, Forest Departments in range States have low numbers of staff compared to forest area they control. Armed conflict in the Democratic Republic of Congo (DRC) and Burundi further weakens State capacity to regulate wild harvest (Table 4).

In some range States such as Cameroon, access and resource use to certain forests such in Oku, NW Cameroon were controlled under customary law (Cunningham and Mbenkum, 1992). Traditional controls through local authorities have weakened with commercialisation of *Prunus africana* bark (Cunningham and Mbenkum, 1992; Stewart, 2003b).

Table 4. Basic criteria for regulated management of wild harvest and whether these are met in range States.

RANGE STATES KEY QESTIONS	**BI**	**CD**	**CM**	**KE**	**GQ**	**MG**	**TZ**
Forest tenure rights secure, judging from hunting, encroachment or illegal resource extraction?	NO	NO	YES (Mt. Cameroon only)	NO	NO	?	NO
Active monitoring system for forest against illegal logging, clearing or resource extraction?	NO	NO	YES	YES	YES	YES	YES
Forest management plans developed for *Prunus africana* bark harvest (inventory, maps, methods to enhance regeneration, monitoring systems)	NO	NO	YES (Mt. Cameroon only)	NO	In pro-gress	YES (being pre-pared)	NO
Permanent plots or transects to monitor regeneration?	NO	NO	NO	NO	NO	NO	NO
Bark yield data available?	NO	NO	Yes	NO	NO	NO	NO
Harvest teams trained and monitored?	NO	NO	Mt. Cameroon only	Trained, but not fully monitored	NO	YES (in pro-gress)	NO
Effective prevention against girdling (ring-barking) of trees?	?	NO	NO	NO	NO	NO	?
Minimum DBH for first harvest specified?	?	?	YES (> 30cm dbh	NO	?	YES (> 30c m dbh)	?
Minimum DBH for first harvest being followed by harvesters?	?	NO	NO	NO	NO	NO	?
Protection of some large, seed producing trees within harvested populations specified?	Unknown, but unlikely	NO	NO	NO	NO	YES	Unknown, but unlikely
Is protection of a specified proportion or density of mature, seed producing trees/ha followed in practice?	Unknown, but unlikely	NO	NO	NO	NO	NO	Unknown, but unlikely

Without adequate base-line information on abundance, distribution, standing stock and yield, the objective of achieving a sustainable harvest of *Prunus africana* is just not possible. Worldwide, forestry training has concentrated on timber production (Philip, 1994), with little emphasis on studies of non-

timber forest products like bark. Research and pratical training materials on bark production, yields and sustainable harvest are scarce (Cunningham, 2001). This gap in knowledge and training on how to manage and exploit the resource *in situ* also inhibits the potential for sustainability.

Most recommendations made by Besong et al (1991) and Cunningham and Mbenkum (1992) for regulation of harvest in Cameroon have not been followed up. The only exception to this is a study conducted on Mt Cameroon through a joint project between ONADEF and international donors, where sustained yield was estimated to be 300 tonnes of fresh bark per annum, when the French company operating in Cameroon at the time had a quota for 1500 tonnes of bark per year, and were expecting to harvest 700 tonnes of this from Mt. Cameroon (Acworth, Ewusi and Donalt, 1999).

On Bioko (Equatorial Guinea), the 1997 Appendix to the 1995 Forestry Law of Equatorial Guinea (*Reglamento de Aplicacion de la Ley Sobre el Uso y Manejo de los Bosques EQG/96/002*) makes reference to the sustainable management of commercially exploited NTFPs such as *Prunus africana* and *Piper guineensis* (*Articulo 62º*).

In Madagascar, the license between the President of the Special delegation of Fivrondronnana d'Ambatondrazaka and the CODIMEX company gave the right to harvest *Prunus africana* branch bark in certain forests (Fokontany de Fionanana-Ambohibe, Amboarabe, Faritany de Toamasina) but not on private property. Instead, whole trees are commonly felled (Dawson and Rabevohitra, 1996). Bark harvesters are supposed to leave 2 trees/ha undamaged as a source of seedlings, with no felling allowed within 10m of a watercourse. Permits were issued for 2 years, with no limit placed on the quantity of bark that each person could collect (Walter and Rakotonirina, 1995). In December 2003, Madagascar launched a National Plan of Action for Sustainable Use of *Prunus africana* (DGEF, 2003) which aims to undertake inventory work, implement closer controls over montane and catchment forests as well as undertake research into the ecological, chemical and socio-economic aspects of *Prunus africana* harvest. Three pilot study harvest sites have been proposed at d'Antsohihy and research on domestication and plantation production is planned. Recent harvest guidelines in Madagascar are based on experience in Cameroon, with debarking of a quarter of the trunk bark on each side of trees > 30cm dbh, starting at 1m from the ground and ending at the first branch. This system reduced tree mortality in moist forest sites Cameroon while there was a monopoly on harvest and export by Plantecam (1972-1987), but failed when additional licences were granted to Cameroonian concessionaires (Cunningham and Mbenkum, 1992). Even with this system, tree mortality is still high in dry sites (Cunningham et al, 1997) and given recent evidence from Stewart's (2001, 2003a) studies, may lead to long-term population decline. If so, then investment in cultivation is likely to be the best long-term investment.

3.3 Regulation of trade

The thoroughness of monitoring *Prunus africana* exports by CITES Management Authorities varies across range States and importing countries. For this reason, implementation of European Commission regulations (EC 338/97 and its amendments (EC Reg. 2724/2000 and 1497/2003) by major importers within the European Union (France, Spain, Belgium, Italy) is very important.

When a bark harvest quota is set by an exporting country, it would also be useful for relevant EU importing countries to similarly adopt the quota level set by the exporting Range State. In 1999, the Equatorial Guinea Forestry Department set an annual export quota for *Prunus* bark at 500 tonnes per annum in consultation with the CITES authority in Malabo (Sunderland and Tako, 1999), and in Cameroon, a sustainable harvest level was estimated for Mt. Cameroon (Acworth et al., 1998). Adoption of quotas based on thorough inventory and yield studies would provide a simple yet effective tool that could be implemented by importing countries in the European Union.

3.4 Monitoring

This section of the report refers only to monitoring of trade, not to population level monitoring, which is a necessary complement to trade data (see Section 3.5). Monitoring of the quantity of *Prunus africana* bark products in exports is useful in terms of gaining a better understanding of the market, but says little about sustainability of harvest. As far as I have been able to establish, however, no permanent plots or transects have been established for long-term monitoring of *Prunus africana* populations. For this review, the trade data from the WCMC-UNEP database was examined in three different ways after consulting the CITES Trade database Interpretation Guide (ver. 6.0). Firstly, printouts from Comparative Tabulation reports. Second, Gross Export trade reports and thirdly, all data from Comparative Tabulation reports

(1995-2003) was put into a Spreadsheet for selection and examination of trade data. The synthesis of trade records (1995-2003) from the UNEP-WCMC CITES Trade database are shown in Appendix 1.

There is no doubt of the value of the UNEP-WCMC CITES trade records as an indication of estimated mass of *Prunus africana* products in trade, of trends and the growing complexity of this trade. The extract trade is a good example (Appendix Table 3b). A further examples is records of trade between range States such as (i) export from the Democratic Republic of Congo to Madagascar; (ii) from Cameroon to Madagascar (via France) when new permits weren't issued by the Ministry of Environment, Water and Forests, Republic of Madagascar. These would not have been noticed if it weren't for the diligence of the relevant CITES Authorities.

France continues to be the major importer of bark from the Democratic Republic of Congo, Kenya and Madagascar, while Belgium is the major importer from Burundi, a fairly recent range State in the export trade (since 2001), while the USA is the major importer of bark from Tanzania (Appendix Tables 1a and b). It is appreciated that monitoring trade of this type isn't easy. There are aspects of trade monitoring that would make the data even more useful, however. In an effort to contribute to improving trade monitoring is a positive way, the following observations are based on reviewing the UNEP-WCMC CITES trade records (1995-2003):

a) Clarification of terms: Three main products dominate trade: bark, bark powder and bark extract, with small quanities of carvings, derivatives, roots, leaves, timber, sawn wood, specimens also exported (Table 5). The focus of this report is on bark and the products derived from bark (extract and powder). In some trade reports there appears to be confusion between the terms "powder" and "extract" in terms of exports from Burundi, Democratic Republic of Congo, Kenya and Tanzania. Extract is produced using a solvent (such as ethanol), with extract yield about 5kg per for each metric tonne of bark (1000kg).

Table 5. Terms and units used in monitoring export of *Prunus africana* products, showing the exporting countries recorded on the WCMC-UNEP database, 1995-2004.

TERM	UNIT	Number of exporting countries
bark	kg	**Kenya, Cameroon, DRC, Madagascar, Tanzania, Burundi**
powder	kg	**Cameroon, Equatorial Guinea**
extract	kg (sometimes in grams)	**Spain, France, Madagascar, USA, Cameroon, Germany, Switzerland**. Burundi*, DRC*, Equatorial Guinea*, Kenya*, Tanzania*.
dried plants	kg	**Belgium,** Small quantity (origin CM), **Tanzania**
roots	g	**USA**
leaves	g	**Madagascar**
derivatives	g	**France** (origin MG), **Chile, Austria, Italy, Spain**
Sawn wood	Cubic metres	**Cameroon** (75 cubic metres, to Belgium)
Timber	kg	**South Africa & Madagascar** (educational purposes/sample), **Cameroon**
carvings	-	**Kenya** (one consignment to Sweden)
specimens	g	**Kenya & Cameroon** (2 consignments only), **Germany** (from MG and CM), France (from MG)
unspecified	-	**Italy**

* indicates countries for which there appears to be confusion between the terms "powder" (which is ground bark powder) and extract.

While it is relatively easy to get equipment to grind bark into powder, it is costly to set up a factory with the equipment to produce bark extract and to recycle the relatively costly solvents. Extracts are produced by the factory owned by Indena SpA in Fianarantsoa, Madagascar, which has the capability of processing 800 tonnes of *Prunus africana* bark per year. Until the factory was closed in 2000, the Plantecam factory at Mutengene, Cameroon also had this capability. As far as I have been able to establish, none of the following range States reported as exporting "extract" (Burundi, Democratic Republic of Congo, Kenya and Tanzania) have this capability. They do have the capability of exporting powdered bark. Until 1997, for example, only dried, unprocessed bark was exported from Bioko. Then Aprovechamiento Agricola (APRA), a subsidiary of NATRA, a Spanish company exporting agricultural products started to grind *Prunus africana* bark into powder form for export (Sunderland and Tako, 1999). This is possibly what is being recorded as "extract" in trade data.

b) Quantity of extract in trade may be over-estimated: Even if range States reported as exporting "extract" when they are in fact exporting powdered bark ("powder") are excluded from the WCMC-UNEP Trade data, the quantity of extract seems extremely high if extract is converted back to the equivalent quantity of bark. Extract yields are about 5kg per 1000kg of bark (1:200) or even higher, as is the case in Madagascar where Indena SpA has recently improved the efficiency of the extraction process. It is recommended that a "resource pack" with actual samples of bark, bark powder and bark extract is provided to Customs and CITES Management Authorities in range States to correct this situation. Until the question of "extract" vs. "powder" is resolved, it is not possible to estimate total mass of bark traded. It is still possible, however, to examine bark trade data to assess the quality of reporting.

c) Quality of reporting: There is a need to:

i) Need to encourage reporting by some relatively new exporters and importers: It would be useful to encourage India to report *Prunus africana* imports and Burundi to report exports. India has not yet reported the 59781kg of bark it imported from Cameroon and Madagascar from 1999-2003. Burundi did not report export of 60000kg of bark (40000kg to Belgium, 20000kg to France). Trade reports by the USA (as a fairly recent importer) and Tanzania are generally good, although there are some discrepancies. Two reports of bark trade between Tanzania and the USA match, but during 1999/2000, the USA reported importing 3000kg of bark while Tanzania reported an export of 5000kg of bark.

ii) Try to address reporting gaps between Equatorial Guinea and Spain or Cameroon and Spain: Given the global conservation significance of Bioko, it would be useful to fill some of the gaps in reporting of *Prunus africana* bark to Spain from Bioko (Table 6).

Table 6. Export of *Prunus africana* bark and powder (which as ground bark is assumed to have equivalent mass to the category "bark") over the period 1995-2003, comparing various sources. Note that production of bark powder started in 1997.

SOURCE	TERM	1995	1996	1997	1998	1999	2000	2001	2002	2003
CITES/WCMC-UNEP	bark	0	0	0	0	0	0	0	75.2	0
CITES/WCMC-UNEP	Powder*	-	-	0	719.5	161.7	224.7	0	0	0
Sunderland & Tako, 1999	bark	98	178	267	120*					
CITES SRG data 10/5/2/2 (Schippmann, 2001)	bark		250	270						

* **Note:** grinding bark into powder started in 1997 (Sunderland and Tako, 1999).

d) Solve the mystery of exports from Congo (Brazzaville): CITES Trade data indicate 20000 kg of *Prunus africana* bark (in 2003) and 60000 kg of "extract" (in 1998) were exported from Congo (Brazzaville) to France. This is not a range State, so two explanations are possible: (i) that bark and "extract" (which is probably "powder" or chopped bark (for reasons given above) were transported from Bukavu to Kisangani, then down the Congo river towards Kinshasa (Democratic Republic of Congo) was diverted across the river (the border) and exported from Congo (Brazzaville) or (ii) there is an understandable error due to understandable confusion between the Congo (CG) and with the Democratic Republic of Congo (DRC) (or by CITES Trade data initials, CD).

3.5 Basis of non-detriment findings

CITES Article IV requires the relevant CITES Scientific Authorities to determine that exports are not detrimental to the survival of the species, do not result in unplanned range reduction or long term population decline. Based on the evidence provided below, *Prunus africana* populations in several range States are in long-term decline.

Three main issues need to be considered in terms of continued CITES Appendix II listing of *Prunus africana*. Firstly, the effects of commercial harvest at a species population level. Secondly, how habitat level disturbance patterns affect recruitment of young trees into the population. Thirdly, that the remnant Afromontane forests of tropical Africa from which most bark is commercially harvested are surrounded

by Africa's most densely populated rural landscapes with political instability making basic conservation, let alone fine-tuned sustainable harvest, extremely difficult (Fimbel and Fimbel, 1997).

Detailed evidence is now available based on field studies and matrix population models for *Prunus africana* that simulated bark harvest impacts on population growth rates. Simulation models are now a widely used tool for assessing impacts of harvest on plant populations, including a number of species or genera of interest to CITES. Examples are studies of Amercian ginseng, *Panax quinquefolius* (Nantel et al, 1996), cycads (Raimondo and Donaldson, 2003), *Aloe peglerae* (Pfab and Scholes, 2004) and the African tree species *Pterocarpus angolensis* (Desmet et al., 1996) and *Prunus africana* (Stewart, 2001).

Stewart's (2001) research showed that maintenance of viable *Prunus africana* populations depended on the survival of large trees. This was shown in sensitivity analysis, harvest simulations and elasticities. This is a common conclusion with long-lived trees (Desmet et al, 1996), palms (Pinard, 1993) and cycads (Raimondo and Donaldson, 2003). Based on harvest simulation modeling, Stewart (2001) suggested a scenario where sustainable harvest is theoretically possible:

– in a *Prunus africana* population that had returned to pre-harvest conditions with positive population growth;

– with bark harvest limited to medium sized trees only;

– harvesting frequency needs to be greater than 10-15 years, as *Prunus africana* population growth dropped to very low levels and long-term population decline in all simulation models where the harvest frequency allowed by current harvest levels was followed.

The above sustainable harvest scenario is unlikely in any range State commercially harvesting *Prunus africana* bark is for the following reasons:

– large trees are favoured for *Prunus africana* bark harvest;

– a return to pre-harvest conditions requires a ban on harvest of remaining stocks for an extended period (c. 40-50 years) and compliance is unlikely;

– regulation of harvest of wild populations is weak to non-existent;

– limited capacity of Forest Departments to undertake inventory and yields studies or enforce, "slot size" restrictions (minimum and maximum tree diameter at breast height), a situation exacerbated by warfare (DRC, Burundi).

In late 2002, the CITES management authority for Kenya objected to the continued harvest without a Detriment Study and harvest was stopped. The most recent shipment of bark was in 2003, from bark accumulated in a warehouse in Nairobi. A non-detriment study is urgently required in Kenya. Due to political and economic interests involved, independent, peer reviewed scientific studies should also be conducted in Madagascar, Tanzania, Equatorial Guinea and Burundi of the ecological impacts of *Prunus africana* bark harvest to supplement the work done by Stewart (2001, 2003a,b) in Cameroon.

A study by Ewusi et al (1996) on Mount Cameroon showed that recruitment of *Prunus africana* is affected by harvest and that natural populations have been reduced by 50%. In their inventory on Mt. Cameroon, 20% of all *Prunus africana* trees were dead and of the remaining living trees of exploitable size (> 30 cm diameter), 40% had been excessively stripped of bark (Acworth et al, 1998). On Pico Basilé, Bioko, a field survey by Sunderland and Tako (1999) found that 21% of exploited trees are actually dead, with a further 47% showing varying degrees of die-back and reduction in leaf area. Only 32% of the recorded trees could be classed as healthy, with many of these being the most recently-exploited individuals and probably not yet exhibiting the effects of bark harvesting. On Moca mountain during the same survey, Sunderland and Tako (1999) recorded 4% of trees harvested since 1996 were dead, with a further 93% showing of crown die-back. Only 2.5% of trees showed no immediate crown effects of harvesting, some of which were recently harvested individuals. In addition there was evidence of felling and complete removal of some older trees.

Prunus africana populations were considered threatened in Madagascar (Dawson and Rabevohitra, 1996; Quansah, 1999; Walter and Rakotonirina, 1996 (Figure 2). The development of the National Action plan for *Prunus africana* in Madagascar is a positive step to addressing this situation (DGEF, 2003).

The CITES Guidelines to assist Parties in making non-detriment findings (Part IV) provide basic guidelines to determine whether exploitation is detrimental to populations or not. Reasons for concern about commercial bark harvest based on the CITES Guidelines on non-detriment findings relate to the following factors:

– *Prunus africana* is a long lived tree species which is harvested for multiple purposes (timber and fuel) in addition to bark exploitation in Cameroon, Burundi, DRC, Equatorial Guinea (Bioko), Kenya, Madagascar and Tanzania;

– Where no exploitation takes place, the annual mortality of *Prunus africana* trees > 10 cm dbh is very low. Based on a 15 year study of tree growth and mortality in Afromontane forest in South Africa (van Daalen, 1991), mortality rates of trees > 10 cm diameter at breast height (dbh) averaged 0.71% per year. Stewart (2001) based her simulation model on an annual mortality rate of adult *Prunus africana* trees in natural populations of 1.5% per year (Stewart, 2001). Mortality of *Prunus africana* trees > 10cm dbh in commercially harvested wild populations is 50-100 times higher than natural mortality rates.

– Reproduction is primarily from seed, with low seed dormancy (seeds are recalcitrant), so long-lived soil seed banks do not develop);

– In undamaged trees, low fruit yield years alternate with high fruit yield years (Stewart, 2001), but debarking often causes die-back of the tree crown and no (or low) fruit yields;

– Large debarked or felled trees have weak resprouting ability, increasing the vulnerability of tree populations to overharvest;

– *Prunus africana* is a light demanding tree species that needs to regenerate in canopy gaps or on forest margins. In some Afromontane forests, only 2-10% is in canopy gap phase (Midgley et al., 1997), so successful reproduction from seed is like a lottery, largely determined by whether seeds are dispersed into a gap or not;

Patchy distribution across many of Africa's montane "island forests" and the fact that commercial harvest does not take place in all range States means that some *Prunus africana* populations are secure within Forest reserves and National Parks. Ironically, however, protection of forests and forest recovery from human disturbance means that shade tolerant species are favoured with a shift to old growth forest. Light-demanding species such as *Prunus africana*, on the other hand, are at a disadavantage, as formal protection decreases proportion of the forest in canopy gap phase due to human impacts (timber logging, clearing, roads and logging tracks). Poor regeneration of *Prunus africana* is reported from transect studies in the Bale Mountains, Ethiopia (Tesfaye, Teketay and Fetene, 2002) and Kakmega forest, Kenya (Fashing, 2004).

A key factor in deciding on a sustainable harvesting system is its similarity to the natural disturbance regime. If tighter harvest controls were likely and *Prunus africana* populations were able to return to preharvest levels, then an alternative system of harvest may be more applicable. This is the Senility Criteria Yield Regulation (SCYR) system used in the Knysna (Afromontane) forest, South Africa to sustainably harvest high value hardwoods such as *Ocotea bullata* within this "fine-grain" forest (Seydack et al., 1995a,b). In order to minimize change from natural disturbance patterns and minimize management inputs, the SCYR system is based on pre-empting mortality, judged by factors such as tree crown health and level of crown die-back, stem rot, branch loss and production of "agony shoots" from the trunk. Based on a selected felling cycle, this system is sustainable for two reasons. First, because amounts removed are within the range of productivity (basal increment) of the stand and second, because timber harvesting is within the natural disturbance regime and life-histories of component species (Seydack et al, 1995 a,b). Given the local value of *Prunus africana* timber, the Senility Criteria Yield Regulation system could be appropriate for *Prunus africana* management. This would be based on felling and total bark removal from 0.71 –1.5% of trees in the process of dying, based on expected mortality rates. Without tight controls, however, this system is open to abuse. Given the value of *Prunus*

africana bark in range States with widespread poverty and unemployment it is important to be realistic about the gap between theory and practice in design of sustainable harvest systems.

Despite CITES listing for a decade, management plans for sustainable harvest of bark from Prunus africana populations are unavailable in most Range States. In addition, political turmoil in the Great Lakes region would make implementation of those management plans very difficult to implement even if they were available. Based on the information provided in this report, I would therefore recommend the following:

i) '***Prunus africana* species populations of urgent concern** shall include species for which the available information indicates that the provisions of Article IV, paragraph 2 (a) or are not being implemented;

With the exception of Mount Cameroon, where an inventory of *Prunus africana* trees has been carried out and an estimate of sustainable harvest made, inventories of standing stock, estimates of sustainable off-take and establishment of a monitoring system are urgently required in most Range States commercially exporting bark. Population matrix modeling, as mentioned above, can be a useful guide in this process. Base-line data on the status of unharvested populations is generally unavailable, weakening the ability to demonstrate non-detriment findings. Madagascar has recently made very useful moves toward a National Plan for sustainable production of *Prunus africana* in this direction, but formal, scientifically based management plans to assess sustainable harvest and whether this is commercial viable or not. This will help guide policy on whether plantation or agroforestry production would be a better long term option, given low densities of adult trees and the small size of remaining montane forest patches**.** Based on Stewart's (2001, 2003a,b) work in Cameroon, plantation or agroforestry production of *Prunus africana*, not wild harvest are recommended. Cameroon is included in this category, as an inventory of *Prunus africana* trees has been carried out and an estimate of sustainable harvest made. Non-detriment findings by independent, third-party scienitific assessors are urgently needed is the following Range States:

- **Bioko (Equatorial Guinea)**
- **Cameroon**[2]
- **Madagascar**
- **Democratic Republic of Congo**
- **Kenya**[3]
- **Tanzania**

ii) '***Prunus africana* species populations of possible concern'** shall include species for which it is not clear whether or not these provisions are being implemented:

Nigeria is included below although not recorded as a Range State by WCMC, it is possible that *Prunus africana* occurs within Nigeria in forests of the Mambila Plateau. These populations may be harvested to link into the commercial export trade from Cameroon. This deserves further investigation.

CITES trade data show recent commercial exports from Burundi. Given the porous borders of the DRC and Rwanda and the large populations of *Prunus africana* in Rwanda (eg: Nyungwe forest), it would be useful to include Rwanda in this category as well:

- **Burundi**
- **Nigeria**
- **Rwanda**

iii) '***Prunus africana* populations of least concern'** where (a) CITES provisions are being met or (b) Range States from which no export occurs and trade is limited to internal trade for traditional medicinal purposes, timber or fuelwood;

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2 It should be noted, however, that in NW Cameroon, Stewart's (2001, 2003a, b) work show that commercial export of bark has had a detrimental effect on *Prunus africana* populations.

3 Kenya needs non-detriment assessment of the impact of bark harvest by the sole exporter. It would also be useful to determine whether there still is export of plywood made from *Prunus africana* trees. In 1997, a large company based in Eldoret was logging *Prunus africana* trees for this purpose in South Nandi Forest Reserve, despite very low salvage rates of plywood from felled trees. This may have changed with the change of government in Kenya since then.

a) **Range States where provisions are being met:** South Africa (very small quantities exported (samples)), Swaziland (exports are through an informal sector trade into South Africa for traditional medicine purposes and on a relatively small scale).

b) **No commercial export of known:** Angola, Ethiopia, Lesotho, (included as a Range State, but on the margins of *P. africana* distribution), Malawi, Mozambique, Sao Tome e Principe, Sudan, Zambia, Zimbabwe.

4. Overview of trade

Demand for *Prunus africana* bark needs to be viewed against future demand for herbal medicines to treat benign prostatic hypertophy (BPH), a common disease of men over 45 years old. In the USA, for example, BPH affects almost 75% men over 70 years old. Doctors received approximately 4.5 million visits per year for a diagnosis of BPH, with almost 8 million visits were made with a primary or secondary diagnosis of BPH (Wei, Calhoun and Jacobsen, 2005). The most popular herbal treatments for treating BPH are derived from saw palmetto (*Serenoa repens*) fruits or *Prunus africana* bark. This fits in with a common trend to avoid invasive surgery for prostate problems and an increase in medical management of BPH, through allopathic medicines, herbal medicines (and neutriceuticals). In the USA alone, direct and indirect costs to the private sector related to BPH treatment are estimated to be US$3.9 billion per year (Saigal and Joyce, 2005).

In Europe, the incidence of men with BPH is similar (Anon, 1992), but the regulatory market differs from the USA, with big differences between tight regulation in Germany and more liberal markets such as in the UK (Gruenwald and Mueller, 2003). Two new European Community (EC) directives are also expected to have an important effect on the herbal medicines market, as they are expected to harmonize regulations within the EC. These are the Traditional Herbal Medicine Product Directive (THMPD) and the Food Supplement Directive, which may be expanded to include herbal medicines and extracts (Gruenwald and Mueller, 2003).

Although some companies selling *Prunus africana* products are small, such as Krauterpfarrer Künzle AG (Father Herbalist Künzle Company) in Minusio, Switzerland, two large multi-national companies dominate marketing of herbal products from *Prunus africana* bark:

– Fournier Pharma, which markets Tadenan, the best known product from *Prunus africana*. In 2004, Fournier Pharma, supplied by plant extracts by the chemical plant Synchem, had 3400 employees and an estimated turnover of Euro 596 million (c. USD715 million), with offices or subsidiaries branches in 30 countries (Fournier Pharma, 2005);

– Indena SpA, which developed Pigenil and now also markets Prunuselect. In 1999, Indena SpA had sales revenue of nearly 336 billion lire (USD150 million). The USA is Indena's largest market, with sales of over 60 million dollars (www.indena.com).

In the USA, smaller companies such as Solaray and Nature's Way lead the marketing of *Prunus africana* products.

Between 1972, when *Prunus africana* export trade to France started, and 2004, the trend in the *Prunus africana* bark trade has fluctuated, but in general trend grew in size in the 1990's and now is stable (or declining in some countries). Trade complexity has increased. The total area of Afromontane forest and health of *Prunus africana* populations, on the other hand, has declined. Monitoring of trade through CITES is therefore extremely important and is carried out best by France.

4.1 International trade

All *Prunus africana* bark currently in trade is wild harvested with the possible exception of a relatively small quantity of bark harvested from long established plantation trials in western Kenya. Since *Prunus africana* bark and bark products were commercialized in France in the late 1960's, there has been a dramatic increase in the quantity of bark exported. The diversity of brand name products containing *Prunus africana* bark, bark powder or bark extract has also increased (Table 5). In 1976, for example, 10 tonnes of *Prunus africana* bark were exported from Cameroon compared to an average of 1797 tonnes exported annually from 1986 – 1995 (United Republic of Cameroon, 1976; Cunningham et al., 1997).

Worldwide exports of dried bark in 2000 were estimated at 1350-1525 metric tons per year, down from its peak of 3225 tons in 1997 (Stewart, 2003).

Secondly, since the French company first took out a patent in 1966 for use of *Prunus africana* extract to treat benign prostate hypertrophy, there has been a proliferation of patents for new products based on *Prunus africana* bark or bark extract, with nine new patents taken out since 2000, four of them registered in 2002 alone. These range from products to reduce hair-loss to treat prostatitis in novel ways (Table 7), the majority registered by US-based companies. A review of the 19 scientific publications between 1996-2005 on Tadenan (the most widely sold commercial product with *Prunus africana* extract) is also interesting in terms of the USA as a growing market for *Prunus africana* products: 47% (9 scientific papers) were based on research carried out in the USA, compared to 21% (4) done in France, 10.5% (2) in Spain and the remainder in Japan (1), Korea (1) and Hungary (1).

Thirdly, there has been a marked shift from a market largely based in Europe to the potentially large North American and Asian markets. Indicators of this are scientific reviews of the efficacy of *Prunus africana* bark extracts in the USA (Barry, 2002; Dvorkin and Song, 2002), sale of *Prunus africana* bark products as nutriceuticals by US companies and the importation of *Prunus africana* bark in significant quantity by the world's largest producers and consumers of herbal medicine products: China (200 kg bark imported in 2001, 17 000 kg in 2002) and India (10 000kg in 1999). In addition, ethanol extracts from *Prunus africana* have recently been shown to have an antimitogenic effect on prostate cancer cells and benign prostatic hyperplasia epithelial cells (Margalef et al., 2003).

Companies importing *Prunus africana* bark say that product sales are stable, or are declining in some countries (Laird et al, 2004). According to Laird et al (2004), several other sources of evidence suggest the opposite in Cameroon, the world's largest supplier of wild harvested *Prunus africana* bark, where exporters have reported increased demand for bark since 2002. In Cameroon, this is likely to be due to demand from:

– alternative exporters to the French owned company in Cameroon that closed down it's factory at Mutengene in 2000;

– demand from the French parent company (Fournier Pharma/Synkem) following consumption of its 2-year supply of extract in 2000;

– and difficulties met in other source countries, particularly armed conflict in the eastern DRC and Burundi and political instability in Madagascar in 2001/2002.

In December 1999, as part of the government of Madagascar's policy privatization to reduce debt, the Société pour le Dévelopment Industrielle des Plantes de Madagascar (SODIP) was sold to Indena SpA, a Milan-based company which manufactures *Prunus africana* products. Bark extract is exported from Madagascar mainly to France, in addition to Italy and Switzerland.

Table 7. Brand names, form, company and country of origin of *Prunus africana* herbal preparations sold within Europe, South America and the USA. In the USA due to strong Federal Drug Administration (FDA) controls, *Prunus africana* herbal preparations are sold as nutriceuticals.

BRAND NAME	FORM	COMPANY	COUNTRY
Acubiron	Capsules	Laboratorios Bohm	Spain
African Pygeum	softgel	Nature's Plus	USA
Bidrolar	capsules	Spyfarma	Spain
Foudaril	capsules	GA Pharmaceuticals	Greece
Gernide	capsules	Vita	Spain
Nature's Way Pygeum	softgel	Nature's Way, Inc.	USA
Normobrost	tablets	Spedrog Caillon SAIC	Venezuela
One Daily Pygeum Extract	capsules	Solaray	USA
One Daily Saw Palmetto and Pygeum	softgel	Solaray	USA
PhytoEstrogen*	capsules	Solaray	USA
Pigenil	capsules	Pharmafar	Italy
Prolitrol	capsules	Millet Roux	Brazil
Pronitrol	capsules	Infofarma	Spain
Prostamed	capsules	Laboratórios Baldacci	Brazil
Prostatonin	capsules	Pharmaton SA**	Switzerland

BRAND NAME	FORM	COMPANY	COUNTRY
Prostageum	capsules	Solaray	USA
Prosta-Max	tablets	Country Life	USA
Prostasol	capsules	Dr Donsbach	USA
Prostem	capsules	Laboratórios Baldacci	Brazil
Prostem	capsules	Baldacci	Brazil
Prunuselect	capsules	Indena SpA	Italy
Pyrafricum	capsules	Sarget	Spain
Pygeum	liquid	Herb Pharm	USA
Pygeum Bark	liquid	Gaia Herbs, Inc	USA
Pygeum africanum extract	capsules	Solaray	USA
Pygeum africanum Kunzle	capsules	Krauterpfarrer Kunzle	Switzerland
Pygeum Extract	capsules	Vitamin Shoppe	USA
Pygeum & Saw Palmetto	capsules	Solaray	USA
Pygeum-Power	softgel	Nature's Herbs	USA
European Stnd w/CranActin	capsules	Solaray	USA
Rotamat	tablets	Uni-Pharm	Greece
Saw Palmetto & Pygeum Extract	capsules	Country Life	USA
Saw Palmetto and Pygeum	capsules	Veglife	USA
Super Saw Palmetto Plus	capsules	Action Labs	USA
Tadenan	capsules	Fournier Pharma	France
Tadenan	capsules	Laboratoire Debat	France
Tadenan	capsules	Diamant	Portugal
Tadenan	capsules	Roussel	Italy
Trianol	capsules	Lek	Yugoslavia
Tuzanil	capsules	Carulla Vekar	Spain
800 Prostate Support	capsules	Nature's Life	USA

Table 8. Patents registered for products from *Prunus africana*, 1985-2002, showing the large number of patents taken out in the USA, probably the largest new market for *Prunus africana* products.

Patent No.	Applicant(s)	Date Issued	Title
US06197309	Wheeler Ronald E (US)	06-03-2001	Prostate formula (Delphion)
WO0007604	Wheeler Ronald E (US)	17-02-2000	Prostate formula from esp database
WO0056269	Chizick Stephen (CA); Delorscio Rico (CA)	28-09-2000	Natural preparation for treatment of male pattern hair loss from esp database
US05972345	Chizick Stephen (CA); Delorscio Rico (CA)	26-10-1999	Natural preparation for treatment of male pattern hair loss
US05750108	Regenix Marketing Systems, Inc., Beverly Hills, CA	12-05-1998	Hair treatment system and kit for invigorating hair growth
US05543146	Prostahelp INC (US)	06-08-1996	Dietary supplement for alleviating the symptoms associated with enlargement of the prostate gland
FR2605886	Debat LAB (FR)	06-05-1988	Novel use of *Prunus africana* extract in therapy for disorders of senescence (in French)
AU3555101	Pharmascience LAB (FR)	2001-07-20	Use of isoflavones and/or *Prunus africana* extracts for preparing a composition designed to inhibit 5-alpha-reductase activity
ES8500622	Euromed S A (ES)	1985-01-16	Pygeum africanum extracts
US6444237	Heleen Pamela A (US)	2002-09-03	Herbal composition for enhancing sexual response
US2002001633	Revel Chase (US)	2002-01-03	Method and composition for the treatment of benign prostate hypertrophy (BPH) and prevention

Patent No.	Applicant(s)	Date Issued	Title
			of prostate cancer
US2002001632	Revel Chase (PA)	2002-01-03	Method and composition for the treatment of benign prostate hypertrophy (BPH) and prevention of prostate cancer
CA2339356	Wheeler Ronald E (US)	2000-02-17	Prostate formula
US6482447	Braswell; Glenn, Miami, FL	11/19/2002	Method and composition for the treatment of benign prostate hypertrophy (BPH) and prevention of prostate cancer
US6399115	Braswell; Glenn, Miami, FL	06/04/2002	Method and composition for the treatment of benign prostate hypertrophy (BPH) and prevention of prostate cancer

4.2 Domestic trade

Small-scale trade in fuelwood, timber and bark for traditional medicine takes place in more densely populated range States such as Ethiopia, Uganda, Kenya, Madagascar and Cameroon. Felling of *Prunus africana* for timber is rare in southern Africa, but a small-scale trade in Prunus africana bark does occur in South Africa (Cunningham, 1993). In NW Cameroon, *Prunus africana* is considered the most important medicinal plant, with a wide variety of uses recorded by Stewart (2003b). The fact that unsustainable harvest of *Prunus africana* bark in countries like Cameroon has undermined this important resource base for rural people needs to be taken into account.

5. Other relevant information, including on cultivation

Cultivation and certification: On a global scale, in terms of wild harvest, *Prunus africana* bark is harvested in largest quantity of any tree species, followed by quillay (*Quillaja saponaria,* Rosaceae), which is exported from Chile as a source of industrial saponins for everything from fire extinguishers to fish food, with 872 tonnes bark exported in 1997, representing 60 000 trees/yr (FAO, 2001; San Martin and Briones, 1999). This has also had a high impact on *Quillaja saponaria* populations (San Martin and Briones, 1999).

Unlike *Prunus africana*, most bark producing tree species in international trade have made the transition from wild harvest to production from cultivated sources in plantations or agroforestry systems. Best known are the aromatic barks from trees in the Lauraceae, which are a major source of spices, flavouring and essential oils. World trade in cinnamon bark, for example, is 7 500 - 10 000 tonnes annually and cassia (*Cinnamomum aromaticum*), 20 000 to 25 000 tonnes/yr or cork (*Quercus suber*) bark (350000 tonnes/yr). Economic analysis shows that *Prunus africana* production can be commercially viable (Cunningham et al, 2002). Cultivation in buffer zones around high conservation value sites in range States can also help restore degraded habitat. What is required is support at a policy level and in practice to achieve this goal. This would link to increased consumer and corporate awareness in “clean, green” products and in forest product certification in Europe and North America (Shanley et al, 2003). *Prunus africana* bark sales from cultivation could also provide an important source of income to poor rural farmers.

Although a regeneration tax is paid to the Government of Cameroon, it is rarely used for *Prunus africana* planting. Laird et al (2004) have suggested that simple mechanisms should be developed to transfer taxes to communities and local groups responsible for harvesting and cultivating medicinal plants. The commercial importance of *Prunus africana* in north-west Cameroon has been an important stimulus to rural farmers to start growing this tree from seed, and some farmers in this area started planting *Prunus* as early as 1977, most cultivation has taken place since 1990 with support from local and international NGO's. Cunningham et al (2002) compared the economics of cultivating *Prunus africana* and *Eucalyptus camaldulensis* (a popular introduced species in montane Africa), showing that while *Eucalyptus camaldulensis* cultivation is 30% more profitable than *Prunus africana* production, there are reasons (such as the negative effects of *Eucalyptus* on crop yields) why farmers might rather invest in *Prunus africana* than in *Eucalyptus* trees. The 3500 farmers already planting *Prunus africana* in north-west Cameroon are evidence of this. ICRAF have been also supporting *Prunus africana* agroforestry production in Kenya,

Cameroon and Uganda. In Madagascar, Cornell University have been funded to work on propagation with funds from the United States Agency for International Development - Landscape Development Initiative (USAID - LDI), supported by Pronatex, a Malagasy exporting company and Phelps Dodge, an American mining corporation.

The necessary shift from wild harvest to cultivated stocks raises a dilemma that CITES has encountered before with crocodile farming. How to encourage intensive production of a species to take pressure off wild stocks that have been over-exploited in the wild, yet avoid wild harvested products being sold under the guise of legally produced stocks? It is recommended that CITES takes steps towards legal recognition of legitimate growers.

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Synthesis of *Prunus africana* trade data (1995-2003) using data from the UNEP-WCMC CITES Trade database (2005)[4]

COUNTRY CODES USED

AR Argentina **AT** Austria **AU** Australia **BE** Belgium **BI** Burundi **BR** Brazil **CA** Canada **CD** Congo, Democratic Republic of. **CG** Congo **CH** Switzerland **CL** Chile **CM** Cameroon **CN** China **CS** Serbia and Montenegro **CZ** Czech Republic **DE** Germany **EG** Egypt **ES** Spain **FR** France **GB** United Kingdom **GQ** Equatorial Guinea **GR** Greece **HK** Hong Kong **ID** Indonesia **IN** India **IT** Italy **JP** Japan **KE** Kenya **KR** Korea, Republic of; **MA** Morocco **MG** Madagascar **MX** Mexico **NL** Netherlands **PE** Peru **PH** Philippines **PL** Poland **RU** Russia **SI** Slovenia **TZ** Tanzania, United Republic of; **UG** Uganda **US** United States of America **UY** Uruguay **VE** Venezuela **XF** Africa **XX** Unknown **ZA** South Africa **ZM** Zambia **ZW** Zimbabwe

Separate Appendix Tables are given below for bark (1a, import data, 1b, re(export) data), powder (2a, import data, 2b, re(export) data) and extract (3a, import data, 3b, re(export) data).

Annex Table 1a. *Prunus africana* bark import data from 1995 to 2003 (data from UNEP-WCMC CITES Trade database, 2005)

Exporter	Importer	Origin	Bark imported (kg)
BI	BE		40,000
	FR		20,000
CD	FR		260,000
	BE		80,000
	MG		40,000
CG	FR		20,000
CM	FR		685,832
	ES		280,147
DE	CH	ZA	4
ES	CH	CM	200
GQ	ES		7,521
KE	FR		1,050,000
MG	FR		490,732
TZ	US		5,566
	BE		5
			TOTAL 2,980,007

[4] **Note:** Trade data for 2004 were not taken into account as it seems that some trade data for 2004 still has to be processed.

Annex Table 1b. *Prunus africana* bark (re-)export data from 1995 to 2003 (data from UNEP-WCMC CITES Trade database, 2005). Additional abbreviations not given in Table 7a above: XX Unknown, AR Argentina, DE Germany, IN India, IT Italy, KR Korea, Republic of; NL Netherlands SI Slovenia.

Exporter	Importer	Origin	Kg Bark (re-) exported
BE	FR	CD	60,000
CA	FR	CM	3
	XX	CM	3
CD	FR		754,000
	MG		140,000
	BE		100,460
	IN		39,781
CM	ES		67,000
	FR		3,000
FR	EG	CM	50
	KR	CM	10
IT	AR	CM	196
KE	FR		1,904,002
	CN		17,200
	US		5,000
MG	FR		947,029
	IN		20,000
	IT		6,000
	SI		10
TZ	US		8,066
	MG		2
	ZA		1
ZA	DE		50
	NL		1
			TOTAL 4,071,864

Annex Table 2a. *Prunus africana* bark powder import data from 1995 to 2003 (data from UNEP-WCMC CITES Trade database, 2005).

Exporter	Importer	Origin	Powder imported (kg)
BI	FR		20,000
CD	FR		60,000
CG	FR		60,000
ES	GQ		1,105,807
	CM		663,672
	US	GQ	255
	CH	GQ	50
FR	CM		876
	US	GQ	372
KE	FR		300,400
MG	CM		158,000
MG	CD	FR	825
TZ		US	5,000
TZ		KE	4,450
US	ES	GQ	170
			TOTAL 2,379,877

Annex Table 2b. *Prunus africana* bark powder (re-)export data from 1995 to 2003 (data from UNEP-WCMC CITES Trade database, 2005).

Exporter	Importer	Origin	Powder (re-) exported (kg)
CH	GB	GQ	100
ES	CM		1,256,360
	GQ		525,357
	CH	GQ	600
	US	GQ	456
	PL	GQ	2
	HK	GQ	1
FR	CM		1,099,712
	CD	AR, US	335
	US	GQ	270
	EG	GQ	230
	KE	BR	65
	CA	GQ	30
	KE	MX	30
	KR	GQ	30
	PL	GQ	30
	KE	UY	24
	AR	GQ	22
	MG	CM	20
	SM	GQ	0
GB	CM		100,000
KE	FR		450,000
IN	CM		18,000
IT	CM		502
MG	CM		112,000
	CD	FR	825
SG	CM		150,000
TZ	FR		4,450
	US		3,000
US	CM		29,000
ZA	CM		10
			TOTAL 3,751,461

Annex Table 3a. *Prunus africana* bark extract import data from 1995 to 2003 (data from UNEP-WCMC CITES Trade database, 2005).

Exporter	Importer	Origin	Extract imported (kg)
CG	FR		60,000
CH	ES	CM	500
	DE	CM	0
CM	FR		88,387
DE	US	MG	100
ES	CH	CM	355
	PE	CM	16
FR	US	MG	1,230
	US	CM	282
	CH	MG	199
	PL	CM	120
	AU		10
	CA	CM	3
	JP	MG	0
IN	DE	MG	50
	US	CM, MG	50
MA	FR	CM	1,683
MG	FR		307,287
	FR	CM	220
US	AT		1
	DE	XX	0
			TOTAL 460,494

Annex Table 3b. *Prunus africana* bark powder (re-)export data from 1995 to 2003 (data from UNEP-WCMC CITES Trade database, 2005).

Exporter	Importer	Origin	Extract (re-) exported (kg)
CH	ES	CM	150
	ES	CM	150
	PL	CM	60
	NL	CM	1
CM	FR		7,604
	ES		648
	IT		200
DE	US	MG	100
	CH	CM	30
	PE	CM	10
	CH	MG	4
ES	US	CM	5,074
	CH	CM	2,249
	YU	CM	274
	SI	CM	209
	BR	CM	156
	CH	GN	125
	AR	CM	50
	RU	CM	29
	PE	CM	25
	KR	CM	25
	CA	CM	5
	PY	CM	1
FR	US	MG	4,603
	US	MG	2,750
	US	CM	2,174
	US	XF	1,021
	EG	MG	1,021
	AR	MG	978
	CH	MG	727
	PL	MG	540
	US	CM	536
	SI	MG	485
	CA	MG	378
	KR	XF	305
	EG	XF	290
	AR	XF	261
	IN	XF	252
	CH	CM	219
	SI	XF	210
	KR	MG	201
	US	XX	190
	BR	CM	177
	EG	CM	131
	ID	MG	127
	PL	CM	120
	CL	MG	116
	AR	CM	103

Exporter	Importer	Origin	Extract (re) exported (kg)
FR	BR	MG	100
	KR	CM	100
	EG	KE	99
	CN	MG	85
	CA	XF	82
	CA	CM	73
	UY	MG	62
	BR	XF	55
	MG	MG	36
	MX	CM	30
	UY	CM	29
	AR	GN	25
	EG	CF	25
	UY	XF	22
	MA	CM	20
	IN	CM	15
	CH	XF	11
	TH	MG	8
	TH	CM	5
	TH	XF	2
	RU	CM	1
	HK	MG	1
	HR	MG	1
	IR	CM	1
	PH	CM	0
	SI	CM	0
	JP	MG	0
	MY	MG	0
	IN	MG	0
	PL	XF	0
	IL	MG	0
	US	GN	0
	VE	MG	0
	PH	MG	0
IN	DE	MG	50
	KR	MG	39
	US	MG	30
	US	CM	5
IT	PE	MG	20
	SI	MG	923
	US	MG	126
	PL	MG	0
MA	FR	CM	1,683
MG	FR		65,675
	CH		1,015
SI	XX	VM	61
US	ES	GN	170
	DE	XX	0
		TOTAL	**105 781**

CIBOTIUM BAROMETZ

Cibotium barometz (L.1753) J. Smith 1842

FAMILY: Dicksoniaceae

COMMON NAMES: Scythian Lamb, Tartarian Lamb, Golden Lamb, Chain Fern Rhizome, Cibot Rhizome, Cibota, Cibotum, Lamb of Tartary (English)

GLOBAL CONSERVATION STATUS: Not listed in the *1997 IUCN Red List of Threatened Plants* (Walter and Gillett, 1998) nor in the 2004 *IUCN Red List of Threatened Species* (IUCN, 2004).

SIGNIFICANT TRADE REVIEW FOR: Viet Nam

Table 1: Range State selected for review

Range State	Exports* (1994-2003)	Urgent, possible or least concern	Comments
Viet Nam	See below	Possible Concern	Large scale exports and domestic use; information on the status of the species is incomplete; the basis of non-detriment findings is unknown, although it is reportedly an adaptable species with good cultivation potential.

*Excluding re-exports

SUMMARY

Cibotium barometz is a large tree fern that grows in tropical evergreen forest from 500-1,600 m. It has a large range covering most of Asia. A valued medicinal species, *C. barometz* is collected for meeting high demand within range States as well as for export. Both the rhizomes and hairs on the rhizomes are used. Although sometimes grown as an ornamental, *C. barometz* is not known to be cultivated on a commercial scale.

Viet Nam and China are the main exporters of this species. Gross exports from Viet Nam between 1994 and 2003 totalled 783,809 kg of roots and 524,000 kg of dried plants, almost all of which were imported by the Republic of Korea. Population estimates for Viet Nam are lacking and reports on its abundance vary. It has been described as becoming rare in most range States owing to uncontrolled collection for the medicinal trade, but has also been described as common and even locally prolific in disturbed sites in Viet Nam. It is listed as 'insufficiently known' in the *Viet Nam Plant Red Data Book*. The basis of non-detriment findings for exports from Viet Nam is unknown, and trade therefore of Possible Concern.

SPECIES CHARACTERISTICS

Cibotium barometz is a large terrestrial fern that occurs from north-eastern India to southern China and Taiwan, Province of China, throughout continental South-East Asia and to Sumatra, Java and the Philippines and north to the Ryukyu Islands (de Winter and Amoroso, 2003). The following are range States for this species: China, Indonesia, India, Japan (only Ryukyu Islands), Myanmar, Malaysia, Papua New Guinea, the Philippines, Thailand, Taiwan, Province of China, and Viet Nam (Schippmann, 2001). De Winter and Amoroso (2003) believe that it is becoming rare in most range States due to the uncontrolled collection of rhizome parts for medicinal use. Available information on distribution and status in Viet Nam is provided in more detail below. The species is reported as rare in the Philippines (Amoroso, 1990) and Taiwan, Province of China (Taiwan Endemic Species Research Institute, 1995), as abundant in the Khasi hills of Meghalaya and widely distributed in upper Assam in India (Nautiyal, 1997), as not threatened in

Japan (Nakaike, 1992) and Thailand (Tagawa and Iwatsuki, 1979) and, in Malaysia, common in open situations in forest on steep slopes in the hills and mountains and possibly abundant amongst secondary growth in clearings where forest is regenerating (Piggott, 1988). Considered seriously depleted by collection for the internal and international medicinal trade in some areas in China, although in general the resources in the country are still abundant (Zhang *et al.,* 2002).

C. barometz grows from spore, has spreading fronds and is easily recognised by its leaves, which are dark and shiny above, but light green below (So, 1994). The stout prostrate trunk may reach one metre in height, but is usually creeping. It is covered with golden hairs up to four cm long or more. Fronds can grow to more than three metres long. The stipe is as long as 1.2 m. Colonies of plants may form through the progressive growth and rotting of the trunk (Large and Braggins, 2004). The name *barometz* is from a Tartar word meaning lamb and refers to the appearance of the woolly rhizome (Large and Braggins, 2004). *C. barometz* grows on open hill slopes and stream banks in tropical evergreen forest at 500-800 m altitude, and in lower mountain forest at 1,000-1,600 m altitude, preferably on non-calcareous soils. In the wild it possibly chiefly spreads by the establishment of new plants on landslides (de Winter and Amoroso, 2003). In Viet Nam it grows in wet and shady ravines in mountainous regions (Anon., 1990).

INTERNATIONAL TRADE

The rhizomes of *Cibotium barometz* are used medicinally in much of its range, including as a tonic to treat various ailments in bones, muscles and other areas, to promote fertility and for laxative and digestive properties. The golden coloured hairs on the rhizomes and young parts of *C. barometz* have been used as stypic to stop bleeding since ancient times in China and South-East Asia (Perry, 1980). Pieces of rhizome are also used to ward off evil in the Philippines, Malaysia and Taiwan, Province of China (de Winter and Amoroso, 2003). The hairs are harvested whenever needed, but, for medicinal use, its rhizomes are said to be best dug in late autumn and early winter (Do Tat Loi, 2004; Ton That Tung *et al.,* 1986). International trade in rhizome hairs for medicinal use can be considerable. For example a single French company was reported as processing 100 kg of 'pili cibotii' (hairs of this species) a year (de Winter and Amoroso, 2003) imported from Indonesia (Rifai and Kartawinata, 1991). The species is also used for ornamental purposes in India (Misra *et al.,* 1998), China (Jia, 1998) and Viet Nam.

Table 1: Exports excluding re-exports of *Cibotium* spp. and *C. barometz* from Viet Nam, 1994-2003

Taxon	Term and unit	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	*Totals*
Cibotium barometz	Dried plants (kg)	0	0	0	0	43000	213000	0	113000	97000	58000	**524000**
Cibotium barometz	Roots (kg)	7 000	210000	50000	0	40000	0	185000	153000	138809	0	**783809**
Cibotium spp.	Dried plants (kg)	0	0	0	0	0	10000	0	0	0	0	**10000**
Cibotium spp.	Roots (kg)	0	0	0	0	0	0	10000	3000	0	0	**13000**
Cibotium spp.	Extract (g)	0	0	0	0	0	0	0	0	30	0	**30**
Cibotium spp.	Live	0	0	0	1	0	0	16	0	0	0	**17**

(Source: CITES trade statistics derived from the *CITES Trade Database*, UNEP World Conservation Monitoring Centre, Cambridge, UK)

Table 2: Exports excluding re-exports of *C. barometz* from all countries, 1994-2003

Export country	Term	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	*Total*
Viet Nam	Dried plants (kg)					43000	213000		113000	97000	58000	**524000**
Viet Nam	Roots (kg)	7000	210000	50000		40000		185000	153000	138809		**783809**
China	Derivatives						1200	1				**1201**
China	Derivatives (bags)				30							**30**
China	Derivatives (bottles)					240		10000	423			**10663**
China	Derivatives (boxes)					10000			500			**10500**
China	Derivatives (cartons)					363	1910	1696	1889			**5858**
China	Derivatives (g)					230	500			900		**1630**
China	Derivatives (kg)	31000	4000				19	505	6776	2456	11832	**56588**
China	Dried plants (kg)	100									100	**200**
China	Extract (bottles)								3			**3**
China	Live					720				50		**770**
China	Powder (kg)										50	**50**
China	Roots							4				**4**
China	Roots (kg)	16000	328000	27470					14200	39400	4039	**429109**
China	Stems (kg)										1000	**1000**
Thailand	Live							27				**27**
Hong Kong	Live (kg)			25								**25**

(Source: CITES trade statistics derived from the *CITES Trade Database*, UNEP World Conservation Monitoring Centre, Cambridge, UK)

COUNTRY ACCOUNT

Viet Nam

Status:

Cibotium barometz is the only *Cibotium* species recorded from Viet Nam. It has been found in mountainous forests in Lai Chau, Lao Cai, Ha Tay (Ba Vi Range), Lang Son, Phu Tho, Cao Bang and Thai Nguyen in the north, Quang Binh, Quang Tri (Rang Cop mountains), Thua Thien-Hue (Bach Ma Mountains), Nha Trang and Lam Dong (Langbiam-Da Lat) in the centre of Viet Nam (Viet Nam National University and Institute of Ecology and Biological Resources, 2005). It is also recorded in a number of nature reserves and proposed nature reserves.

The population of *C. barometz* in Viet Nam is not monitored and its size has not been estimated (Lange and Schippmann, 1999), with the species listed as 'insufficiently known' in the *Viet Nam Plant Red Data Book* (Phan Thuc Vat, 2003). It is described as common in open forest, on road cuts and slopes in areas at 200-1,700 m and even prolific in disturbed sites (Large and Braggins, 2004). Populations have been characterised as 'limited, almost depleted' in two communes in Tua Chua District, Lai Chau Province because of 'resource over-exploitation for market purpose i.e. lack of resource management and because of rapid deforestation mainly due to conversion of forest lands into agricultural lands' (Lecup and Quang Tu, 2000).

Management and Trade:

Viet Nam is the largest reported exporter of *C. barometz*, the gross export of 783,809 kg of roots (rhizomes) and 524,000 kg of dried plants (similarly likely to be rhizomes) reported from 1994 to 2003. Reported exports of roots peaked in 1995 (210,000 kg) and of dried plants in 1999 (213,000 kg). A further 13,000 kg of roots and 10,000 kg of dried plants described as *Cibotium* spp. were exported during the period. Taken together, this amounted to an average export of approximately 133 t per year.

Virtually all products were exported to the Republic of Korea, and all were reported as wild-collected. Large-scale, cross-border trade outside of CITES trade controls is also suspected.

Domestic use of the species in Viet Nam in traditional medicine is extensive, but un-quantified (Ninh Khac Ban, 2000). It has been estimated that perhaps a total of 200-500 t of *Cibotium* is harvested annually in Viet Nam for international trade and domestic use (Ngyuen Tap, 2004). There is no indication of the number of individual plants involved in harvest for domestic use and/or international trade. Should 'hairs' form a significant component of the trade, then it would involve a very large number of individual plants.

The main harvest sites are not known with any precision, although it is known that large quantities are collected by local people and sun-dried along the sides of large roads in Lai Chau, Lao Cai and Lang Son Provinces. In northern Viet Nam, the Ninh Hiep commune of Gia Lam district has been known as an important place of collection of medicinal plants, including *C. barometz*, from where they are transported to different markets, notably those in China (Manh *et al. in litt.,* 2006.).

Viet Nam became a Party to CITES in 1994 and introduced CITES implementing legislation in 1996 imposing restrictions on imports and exports. Since that time a variety of legislation has been added. Within the country, the Forest Protection Department is responsible for controlling illegal wildlife hunting and trade (Nooren and Claridge, 2001). In May 2003 the Government issued Directive 12 calling for an urgent need to strengthen controls on forest resources (The World Bank, 2005). In October 2004 the Government endorsed a comprehensive National Action Plan to address the country's wildlife trade management priorities and is determined to address illegal and unsustainable trade issues (TRAFFIC International, 2004). In addition the Government has adopted Directive 12/2005/TTg to take up urgent measures to protect and develop forests. The Decree 48/2002/ND-CP on protection of rare species and the Decree 11/2002/ND-CP on the import, export and re-export of wildlife are being revised and are to be enacted in February 2006 (Manh *et al. in litt.,* 2006).

China and Viet Nam have also been engaged in dialogue meetings in order to address the problem of cross-border illegal wildlife trade.

No information was identified regarding the basis for non-detriment findings for exports of this species from Viet Nam. A significant trade study for medicinal plants (Lange and Schippmann, 1999) recommended that Viet Nam be requested to review harvest practices and assess the population status and the sustainability of collection of *C. barometz* as a basis for non-detriment findings in the process of permit issuance.

C. barometz was identified by local farmers for further investigation as an important non-timber forest product (NTFP) that could increase cash income and provide for subsistence needs in the Social Forestry Development Project in Tua Chua district, Lai Chau Province(Lecup and Quang Tu, 2000). The Protected Areas Resource Conservation Project (PARC) is designed to improve the basic living conditions in two villages in Bac Can Province and Tuyen Quang Province. Sustainable harvesting of medicinal plants was recommended by PARC and *C. barometz* was identified as one species that had a large demand at local and national levels, selling at VND 2000 (USD 0.14) per kilogram (Khac Ban, 2000).

C. barometz is easily propagated (Qin and Dong, 2003), but is not currently cultivated commercially (de Winter and Amoroso, 2003). The plant is hardy and research on the possibilities for its cultivation outside its natural habitat may be considered to meet the increasing demand for trade (de Winter and Amoroso, 2003). Oldfield (1995) highlighted the potential for the sustainable production of tree ferns and for plantation development. Sobey (1998) includes *C. barometz* in a list of endangered species from the Hoang Lien mountains for research by trial planting to determine conditions for future survival and to supply the needs of the health industry.

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CYATHEA CONTAMINANS

Cyathea contaminans (Wallich ex Hook.) Copel. 1909

FAMILY: Cyatheaceae

COMMON NAMES: Blue Tree Fern (English)

GLOBAL CONSERVATION STATUS: Not listed in the *1997 IUCN Red List of Threatened Plants* (Walter and Gillett, 1998) nor in the *2004 IUCN Red List of Threatened Species* (IUCN, 2004).

SIGNIFICANT TRADE REVIEW FOR: Indonesia

Range State selected for review

Range State	Exports* (1994-2003)	Urgent, possible or least concern	Comments
Indonesia	1 million kg per year	Least concern	Reported exports are in the order of 1 million kg (probably equivalent to 10,000 – 50,000 ferns) per year. No information was available on the basis of non-detriment findings or associated export quotas. However, species is fast growing, common, widespread and opportunistic; it grows well in disturbed ground. Exports are thus unlikely to be unsustainable at present levels.

* Excluding re-exports

SUMMARY

Previously known as *C. glauca* (Jones, 1987).

Cyathea contaminans is a large tree fern, most numerous in undergrowth of moist forest and also common in rather open locations at 200-1600 m. It flourishes in disturbed ground, is often abundant in forest edges along roads and, in Java, grows as a weed in tea plantations. It is the most widespread *Cyathea* species in Southeast Asia, occurring from northern India and Myanmar east to Papua New Guinea and the Philippines.

C. contaminans is used in building and hedging, ornamentation, for food, and as a medium for growing orchids. Indonesia was by far the largest reported exporter of the species between 1994 and 2003, the main commodity being timber products (strictly a misnomer as tree ferns do not produce timber) with Japan as the major importer. A substantial amount was also exported to Taiwan, Province of China. The species is also exported as a wide range of other commodities, with the representation of these in Indonesian export statistics complicating interpretation of CITES trade data. Indonesia's exports are most frequently reported in kilograms, with total exports in 2002 and 2003 just under the annual export quotas of one million kg for each of those years. With *C. contaminans* stems estimated to weigh 20-100 kg, annual international trade could represent from 10,000 - 50,000 plants per year. All *C. contaminans* exported was recorded as wild-collected. The amount of domestic use is unknown but believed to be extensive. Although fast growing, plants take about 10 years before stems reach a harvestable size.

The species is not protected in Indonesia, the total population size there is unknown, and there does not appear to be a regular population monitoring programme. The basis of current non-detriment findings and export quotas are unknown. However, given that the species is widespread and does well in disturbed

ground it seems unlikely that current export levels are unsustainable. Trade from Indonesia is therefore considered Least Concern.

SPECIES CHARACTERISTICS

A large to very large tree fern very common in forests throughout Malesia (Large and Braggins, 2004). Its upper part is densely covered with scales of petiole bases and its base is much thickened by adventitious roots. The leaves form a rosette at the top of the stem. *C. contaminans* is easily recognised by the glaucous, purplish and thorny stipe bases (de Winter and Amoroso, 2003) and can be very fast growing (Jones, 1987). It is one of over 600 currently recognized species of *Cyathea* (Mabberley, 1997), of which at least 80 are recorded as occurring in Indonesia (UNEP-WCMC, 2006).

C. contaminans is the most widespread *Cyathea* in Southeast Asia (Large and Braggins, 2004). Native range States are: India, Myanmar, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand and Viet Nam. It is reported to be common in rather open locations at 200-1600 m altitude, often abundant in forest edges along roads and near streams in forests; it needs sun on its crown and moisture on its roots (Large and Braggins, 2004; de Winter and Amoroso, 2003). It commonly grows as a coloniser (Jones, 1987).

The plant has a range of uses. Old fern stems or trunks are strong and remarkably durable and are used for building and hedging, they are harvested when tall and at least 10 years old (Croft, 1982; de Winter and Amoroso, 2003). They are also a source of fern-fibre, used as a growing medium for ferns and orchids, or planted upside down to decorate gardens. The fibre is often used as a substrate (de Winter and Amoroso, 2003). In Papua New Guinea woody parts of the trunks of *C. contaminans* are used on ceremonial occasions (Croft, 1982). In some countries various parts of the plants, and especially the leaves, are used for food; it is an economically important food plant and medicine in the Philippines (Arances *et al.,* 2002; Kambuou, 1996; de Winter and Amoroso, 2003).

INTERNATIONAL TRADE

Table 1: Exports excluding re-exports of *Cyathea contaminans* from Indonesia, 1996-2003
NB: no exports were recorded in 1994 or 1995

Term	1996	1997	1998	1999	2000	2001	2002	2003	Totals
Bark			400						400
Carvings								2550	2550
Chips								32995	32995
Dried plants (kg)								2478	2478
Flower pots			5500						5500
Stems	38897		183564			1000			223461
Stems (kg)							195984		195984
Timber *	61300	307462							368762
Timber * (kg)						997529			997529
Timber pieces*		39879	313986	405788	276184	124588	866780	426888	2454093
Timber pieces* (bags)			170220	147638				168295	486153
Timber pieces* (kg)						125446		900	126346
Timber pieces* (sets)								1000	1000

(Source: CITES trade statistics derived from the *CITES Trade Database*, UNEP World Conservation Monitoring Centre, Cambridge, UK.)
* Pieces of stem; see below for discussion of the use of the term timber

Table 2: CITES Export Quotas for *Cyathea contaminans* from Indonesia 1997-2005 compared to exported volumes (excluding re-exports)

Year	Exports (total weight)	Quota (unit)	Notes
1997		90 000	Tree fern stalks; includes those of other *Cyathea* species
1999		45 000	Stalks
2002	866 780 kg	1 000 000 kg	Not specified
2003	978 965 kg	1 000 000 kg	Dry hair, in the form of sticks, boards, chips, pots, etc.
2004		400 000 kg	Fibrous roots, used as sticks, boards, chips, pots etc.
2005		1 000 000 kg	Fibrous roots, used as sticks, boards, chips, pots etc.*
2006		1 000 000 kg	Fibrous roots, used as sticks, boards, chips, pots etc

(Source: CITES, 2006)

*Updated 03/03/2005

COUNTRY ACCOUNTS

Indonesia

Status:

C. contaminans has been recorded in Gede Pangrango National Park, West Java (Boyle, 2001); Gn. Halimun National Park, West Java (Suzuki, 2002); Kutai National Park, East Kalimantan (Suzuki, 2000); in the Jambi lowlands, Sumatra (Beukema and van Noordwijk, 2004) and in Karakelang Hunting Parks, Sulawesi (Colijn, 2005). No information on population trends in Indonesia has been located. However it is described as common from Java to New Guinea by Large and Braggins (2004). Jermy (*in litt.,* 2006) describes it as a weed. It often grows as a weed in tea plantations in Java (de Winter and Amoroso, 2003).

Management and trade:

Indonesia was by far the largest reported exporter of *C. contaminans* between 1994 and 2003. A wide range of commodity descriptions was given in Indonesia's CITES annual reports (i.e. bark, carvings, dried plants, flower pots, live plants, stems, 'timber', packing, sticks, bundles of sticks, board, sieur, pieces of sieur, chips, bags of chips, and pieces of vase). The range of terms used complicates data analysis. The use of the term 'timber' is strictly a misnomer, as tree ferns do not produce timber, but refers to the stem. However, timber is the commonest category recorded in exports. The plant is also widely used as a medium for growing orchids and is exported in small quantities as live plants for ornamental use.

In recent years exports have been reported by Indonesia in kilograms, which provides a more quantitative measure of trade than does reporting of trade by the number of products (e.g. 'timber' pieces) involved. The total weights of exports in 2002 and 2003 were 866,780 kg and 978,965 kg respectively. Both figures are less, but close to, the export quota of one million kilogrammes for those years. The total weight of exports in 2004 was also just under the export quota, which was 400,000 kg in that year (Caldwell *in litt.,* 2006). When e.g. one million kilogramme of timber pieces are exported (e.g. 979,000 in 2003) and weight of a single trunk is 20-100 kg, exports may very roughly represent harvest of 10,000 - 50,000 plants.

Japan was the major importing country for products recorded as timber during the period; a substantial amount was also exported to Taiwan, Province of China, China and the Republic of Korea. Germany (timber pieces) and the Netherlands (live plants) were the other major importers of *C. contaminans* from Indonesia.

Within Indonesia *C. contaminans* is often used as an ornamental plant as it is the largest and often considered the most handsome of tree ferns (de Winter and Amoroso, 2003). Other main uses in Indonesia are as a building material and as a medium for growing orchids (Anon., 2003). In Java the hollowed trunks have been filled with carbide to make cannons for celebrations (de Winter and Amoroso, 2003). The level of harvest for domestic use within Indonesia is unknown.

C. contaminans is not legally protected within Indonesia. The population is not believed to be monitored. It is not known whether harvest is regulated in Indonesia, nor on what basis non-detriment findings, if any, have been made, and hence what the justification for the current quota is. Indonesia's CITES Scientific Authority has recommended that the species not be harvested within Java (Irawati, 2006). However, as the species is common, widespread, fast growing and opportunistic, it does not appear that exports of *C. contaminans* from Indonesia are detrimental to the species, with the result that trade from this country is considered of Least Concern.

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DENDROBIUM NOBILE

Dendrobium nobile Lindl.

FAMILY: Orchidaceae

COMMON NAMES: Dendrobium Stem (English)

GLOBAL CONSERVATION STATUS: Not listed in the *1997 IUCN Red List of Threatened Plants* (Walter and Gillett, 1998) nor in the 2004 IUCN Red List of Threatened Species (IUCN, 2004).

SIGNIFICANT TRADE REVIEW FOR: Lao PDR and Viet Nam

Range States selected for review

Range State	Exports* (1994-2003)	Urgent, possible or least concern	Comments
Lao PDR	400,000 kg roots	Possible Concern	Population status is unknown; China reported imports of 400,000 kg of roots in 2001 but no trade reported since then; exports banned under national legislation but may continue illegally.
Viet Nam	302,927 kg roots/dried plants; 5,000 kg derivatives	Urgent Concern	Species reported to be rare in Viet Nam. Very large exports of roots and dried plants reported during the period. Illegal exports also believed to be significant. No cultivation.

*Excluding re-exports

SUMMARY

Dendrobium nobile is widely distributed in the Himalaya. This orchid is much used in traditional Chinese medicine (TCM) and is also one of the most popularly grown ornamental *Dendrobium* species. Lao PDR, Viet Nam and China were the main reported exporters between 1994 and 2003. Most of the reported trade concerned roots, dried plants and/or derivatives for the medicinal trade. During this period gross exports for Viet Nam totalled.

141,427 kg of roots, 161,500 kg of dried plants and 5,000 kg of derivatives, all of which were imported by the Republic of Korea, plus 2,581 live plants, nearly all imported by Japan. China reported the import of 400,000 kg of roots from Lao PDR in 2001. Illegal trade from both Viet Nam and Lao PDR is believed to be significant.

In Viet Nam, the species is listed as rare and is protected by law. Trade is regulated, with trade controls for this and other CITES-listed species having increased in recent years. No information was available on the basis of non-detriment findings for these exports. Its status in Lao PDR is unknown. All international trade in wildlife from Lao PDR is illegal under national laws and no trade has been reported since 2001.

D. nobile is a slow-growing species and regeneration after harvest is likely also to be slow. There is little information on populations and population trends. The proportions of *D. nobile* collected for internal and international trade are unclear. As a result, impacts of the international trade on wild populations are very difficult to assess. However, it seems likely that harvest for the substantial declared exports from Viet Nam and Lao PDR and the evidently substantial undeclared exports, from Viet Nam at least, are having a

significant impact on wild populations of the species. Trade from Viet Nam has therefore been classified as Urgent Concern and that from Lao PDR as Possible Concern.

SPECIES CHARACTERISTICS

D. nobile is an evergreen orchid, a perennial reaching up to 0.6 m, that thrives in warm temperate forests. It is mainly epiphytic but also grows on sunny rocks in mountain forests from 500 – 2,000 m. It flowers from February to May. The attractive white-purple flowers, which are hermaphrodites, vary in size and colour with a maximum size of 6 cm (White and Sharma, 2000). The species occurs in the Himalayas from central Nepal in the west to southern China and Taiwan, Province of China in the east and south to Lao PDR and Viet Nam, and is native to Bhutan, China, India, Lao PDR, Myanmar, Nepal, Thailand, Taiwan Province of China, and Viet Nam (Hara *et al.*. 1978; Hawkes, 1965; Pearce and Cribb, 2002; Roberts *et al.,*1997; Royal Botanic Gardens Kew, 2005; Seidenfaden, 1972; Shiu, 1972; White and Sharma, 2000). Status and population trends for *D. nobile* are poorly documented for most range States.

INTERNATIONAL TRADE

D. nobile is by far the most widely used of *Dendrobium* species in traditional Chinese medicine (TCM) (Kong *et al.,* 2003). The plant contains a number of alkaloids including dendrobine that have the effect of raising blood sugar levels in the body (Tao Wang, 1999-2003). *D. nobile* is used as a tonic and strengthening medicine and has many other healing properties (Kong *et al.,* 2003). In Viet Nam the entire plant is used as a tonic to treat various ailments and diseases and as a decoction, pills or powder; it is collected, washed, dried and imbued with alcohol and steam-cooked before use (Anon., 1990). The best time for harvesting is at the end of the year. *D. nobile* is also one of the most popular ornamental *Dendrobium* species because of its robustness, ease of culture, beauty and the readiness with which it hybridises (Anon., 1996).

Table 1: Exports excluding re-exports of *Dendrobium nobile,* 1994-2003

Exporter	Term	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total
Lao PDR	Roots (Kg)								400000			**400000**
Viet Nam	Derivatives (Kg)			5000								**5000**
Viet Nam	Dried plants (Kg)					20000	67000		16500	22000	36000	**161500**
Viet Nam	Live				250	400	1776	130	25			**2581**
Viet Nam	Roots (Kg)		28175		24500	39000		23000	13000	13752		**141427**
China	Derivatives						600					**600**
China	Derivatives (Kg)			1000				56	3050	6		**4112**
China	Derivatives boxes							490				**490**
China	Derivatives cartons	145						165	320			**630**
China	Extract Bottles								1			**1**
China	Extract (Kg)										1	**1**
India	Live			21								**21**
Thailand	Live	13099	747	835	477					1000		**16158**

(Source: CITES trade statistics derived from the *CITES Trade Database*, UNEP World Conservation Monitoring Centre, Cambridge, UK.)

COUNTRY ACCOUNTS

Lao PDR (CITES Party since 2004)

Status:

No information was identified on the status of the species or on population trends.

Management and trade:

Reported international trade is limited to the reported import by China of 400,000 kg of wild-collected roots in 2001. The importance of *D. nobile* in local medicinal use and the intensity of harvest for such use are not known.

The Forestry Law (1996) provides the legal umbrella for all legislation relating to the management and protection of forests and forest products in Lao PDR (Nooren and Claridge, 2001). Lao PDR became a Party to CITES in 2004. International trade in all wildlife is illegal; nevertheless many species are exported, including wild orchids for use in TCM (The World Bank, 2005). The extent of illegal exports is unknown, however. There does not appear to be any monitoring of population sizes or trends of *D. nobile* in Lao PDR.

Viet Nam

Status:

D. nobile is listed as rare in Viet Nam's 2003 *Red Data Book* (Phan Thuc Vat 2003). The species is recorded in the wild in forested mountains in northern Viet Nam (Do Tat Loi, 2004), especially in Son La, Lai Chau and Lang Son. It is also found in Ha Tay (Ba Vi mountains), Nghe An (Canh Trap), Quang Nam (Phuoc Son and Can Xoi), Kon Tum (Ngoc Linh), Lam Dong (Do Lat), Dong Nai (Nam Cat Tien) (Viet Nam National University and Institute of Ecology and Biological Resources, 2005), and the Hoang Lien mountains including Hoang Lien Nature Reserve in Sa Pa district (Sobey, 1998).

Few data on population status or trends have been located, although in 2003 it was described as vulnerable in the Lang Cung Mountains in Van Ban District, Lao Cai Province due to the current levels of local exploitation and habitat destruction (Averyanov, 2003).

Management and trade:

Substantial quantities of wild-harvested *D. nobile* plant materials were exported from Viet Nam in every year from 1995 to 2003, amounting to total gross exports of 141,427 kg of roots (with a peak of 39,000 kg in 1998); 161,500 kg of dried plants (peak exports of 67,000 kg in 1999); and 5,000 kg derivatives (all in 1996). All trade was to the Republic of Korea. Much smaller amounts of artificially propagated materials were reported in trade (reported exports of 3,500 kg of roots in 2001, probably corresponding to the reported import by Republic of Korea of 4,000 kg in 2002). The total imports of roots and dried plants reported from Viet Nam by the Republic of Korea was 228,927 kg, more than double the amount reported by Viet Nam as exported to this country (103,500 kg). A total of 2,581 live plants was also reported as exported by Viet Nam, all of wild origin, and almost all imported by Japan. No trade from Viet Nam is recorded in the CITES data for 2004, although data are as yet incomplete.

D. nobile is used nationally as a medicinal herb for numerous problems, but the extent of its use and level of domestic harvest and hence the relative importance of this compared with collection for export is unknown. Lecup (1996) estimated that 80-90 % of all medicinal plants produced in the north of the country are exported in the form of dried plants or extracts and that only 10-20 % are consumed or processed domestically. Further information would be required to determine if this is the case for *D. nobile.*

Major collection centres for *D. nobile* are not known in detail. Medicinal plants are collected from Dah The where collecting was reported as not appearing to be excessive and non-timber forest product extraction is currently considered a low threat (Nguyen Xuan Dang *et al.,* 2004). *Dendrobium* are reported to be commonly collected for export as medicinal plants from the Lang Cung Mountains, although the species involved are not identified (Averyanov, 2003).

Viet Nam became a Party to CITES in 1994 and introduced CITES implementing legislation in 1996 imposing restrictions on imports and exports. Since that time a variety of legislation has been added. Within the country the Forest Protection Department is responsible for controlling illegal wildlife hunting and trade (Nooren and Claridge, 2001). *D. nobile* is protected by Government Decree 48/2002/ND-CP on protection of rare species, and is classified in Group IIA as a species for which trade is restricted (Government of Viet Nam, 2002). This decree and Decree 11/2002/ND-CP on the import, export and re-export of wildlife are being revised and will be enacted in February 2006 (Manh *et al. in litt*., 2006).

Enforcement of controls on the trade in wild species used for traditional medicines, including *D. nobile*, is not considered to be effective (Manh *et al. in litt*., 2006). In referring to the illegal wildlife trade more generally, Song (2003) cites the high demand for and profitability of the trade; the lax implementation of protection policies; and the lack of manpower, funding, and equipment to implement the policies and also levy the relevant fines.

In May 2003 the Government issued Directive 12 calling for an urgent need to strengthen controls on forest resources (The World Bank, 2005). In October 2004 the Government endorsed a comprehensive National Action Plan to address the country's wildlife trade management priorities and is determined to address illegal and unsustainable trade issues (TRAFFIC International, 2004). In addition the Government has adopted Directive 12/2005/TTg to take up urgent measures to protect and develop forests. China and Viet Nam have also been engaged in dialogue meetings in order to address the problem of cross-border illegal wildlife trade.

Export of *D. nobile* outside of CITES and national trade controls is believed to be significant, particularly to China. According to Manh *et al.* (*in litt.,* 2006), *D. nobile* is collected in the form of dried plants, roots etc. from local communities by middlemen before being illegally exported to China. As noted above, reported imports by the Republic of Korea are approximately double reported exports from Viet Nam.

Although *D. nobile* is cultivated in Viet Nam for its ornamental flowers (Anon., 1990), it is not reported as cultivated in this country for medicinal use.

PROBLEMS IDENTIFIED THAT ARE NOT RELATED TO THE IMPLEMENTATION OF ARTICLE IV, PARAGRAPHS 2(a), 3, or 6(a)

As noted above under the country reports for Lao PDR and Viet Nam, illegal trade in this species is believed to be significant.

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GALANTHUS WORONOWII

Galanthus woronowii Losinsk. in Kom.

FAMILY: Amaryllidaceae

COMMON NAME(S): Snowdrop (English); Galanth perce-neige (French)

GLOBAL CONSERVATION STATUS: Not listed in the 1997 *IUCN Red List of Threatened Plants* (Walter and Gillett, 1998) nor in the *IUCN Red List of Globally Threatened Species* (IUCN, 2004).

SIGNIFICANT TRADE REVIEW FOR: Georgia

Range State selected for review

Range State	Exports* (1994-2003)	Urgent, possible or least concern	Comments
Georgia	100.5 million	Least concern	Current annual export quota (18 million bulbs) well below estimated harvest potential on cultivated land. However system to assess stocks and establish export quotas not fully functional.

*Excluding re-exports

SUMMARY

Galanthus woronowii is one of 19 species of snowdrop, a popular bulbous garden plant in Europe and North America. *G. woronowii* is found in Turkey, Georgia and the Russian Federation. It grows at altitudes between 20 and 1500 m, mainly from 200-600 m, and occurs in a wide range of habitats, and reproduces through seed and by offsets. It can reportedly be very abundant locally. The species dominates international trade in snowdrops as recorded under CITES with around 90% originating in Georgia and the remainder in Turkey. In Georgia, bulbs are harvested from cultivated land where the species naturally occurs. In 2003, Georgia reported the export of 18 million live specimens (likely to be bulbs), exceeding its export quota of 15 million (exports for the previous year were 12 million against an export quota of 15 million). Production surveys in 2001 indicated that this was well within the productive capacity of the available production area (90 ha excluding rotation plots). However, survey methods are not clear. The Georgian CITES Authorities are supposed to establish annual export quotas on the basis of assessments of harvestable stock, but lack of resources has meant that the quotas are based on partial assessments only. Collection of bulbs from natural plant communities is prohibited, but enforcement is weak and more natural habitat has been transformed into cultivated land. The total area of currently cultivated land with *G. woron*owii should nevertheless largely be sufficient to meet the global demand for bulbs from Georgia. Therefore, trade in this species from Georgia is considered Least Concern.

SPECIES CHARACTERISTICS

G. woronowii is one of 19 currently recognised species of snowdrop in the genus *Galanthus*¸ a group that occurs widely in southern Europe and western Asia, with a centre of diversity in Anatolian Turkey. *G. woronowii* mainly occurs in the Pontus Mountains in north-eastern Turkey, and in the western Caucasus around the eastern part of the Black Sea coast in western Georgia and in the southern part of the Russian Federation. It is found less frequently in the central Caucasus in Georgia, and only rarely in the northern Caucasus in the Russian Federation. The largest and most extensive populations probably occur in Georgia, in the provinces of Adzhariya and Abkhazia, and in the southern part of the Russian

Federation. The species is also reported as an occasional escape in the Netherlands and the United Kingdom (Davis *et al.* 1999).

G. woronowii is a low- to mid-altitude species, occurring from 20 to 1,500 m but more usually from 200 to 600 m. It occurs in a wide range of habitats, often in woodlands. It is commonly found in mixed deciduous and other types of woodlands. In cooler, high rainfall parts of its range it may occur in shallow soils on top of large rocks, in scree, on cliff ledges and sometimes on moss-covered trees. It predominantly grows on limestone. In its natural habitat, it flowers from January to April. The bulb reproduces by seed and through offsets, of which two to three may be produced by each parent bulb annually (Anonymous, undated; Davis *et al.*, 1999).

INTERNATIONAL TRADE

Snowdrops in general are extremely popular ornamental plants, widely grown in gardens in Europe and North America. The great majority of those in cultivation are *G. nivalis.* Until relatively recently the species was regarded as a variety (*latifolius*) of *Galanthus ikariae* and is still sometimes traded under this designation or as *G. latifolius*. Under these names it has been cultivated in gardens as an ornamental for many years. The true *Galanthus ikariae* is endemic to Greece, occurring on some Eastern Aegean Islands, and is rare in cultivation (Anonymous, 1999; Anonymous, undated; Bishop *et al,* 2001).

Table 1: Exports* excluding re-exports of *Galanthus woronowii*, 1994-2003, millions of bulbs

Country	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total
Georgia	0.5[1]	0.04[1]	10[1,3]	10[3]	10[3]	10[3]	15	15	12	18	**100.5**
Turkey[2]	2	0	1[3]	1[3]	2[3]	2[3]	0	0	2	2	**12**
Total	**2.5**	**0.04**	**11**	**11**	**12**	**12**	**15**	**15**	**14**	**20**	***113***

Source: CITES trade statistics derived from the *CITES Trade Database*, UNEP World Conservation Monitoring Centre, Cambridge, UK.

[1] = Recorded as re-exports from the Russian Federation (other re-exports excluded)
[2] = Excludes re-exported imports from Georgia
[3] = Recorded as *G. ikariae*

* figures based largely on reported exports; reported imports (almost all from the Netherlands), indicate slightly lower levels of trade (ca. 90 million in total)

Snowdrops are heavily traded as bulbs and, domestically, as growing plants. The genus *Galanthus* was listed in CITES Appendix II in 1989 (CoP7). *Galanthus woronowii* is the main snowdrop species in recorded international trade. CITES annual report data indicate that around 110 million bulbs were in trade during the period 1994-2003 (referred to as 'roots' and 'live specimens' in the CITES trade database), of which 40 million, essentially those in trade between 1996 and 1999, were recorded as *G. ikariae.*

Nearly 90% of *Galanthus woronowii* recorded in trade have evidently originated in Georgia, from which reported exports began in 1994. Until 1997, when Georgia became a Party to CITES, export was regulated through the CITES Management Authority of the Russian Federation. Permits issued by the Russian Federation indicate export to the Netherlands (the centre of the international bulb trade) of just over half a million bulbs of Georgian origin in 1994, 40,000 bulbs in 1995 and 10 million in 1996. Subsequently most Georgian exports (ca 75 million bulbs) have been to Turkey for re-export to the Netherlands, although in recent years Georgia has also exported substantial numbers directly to the Netherlands (five million in 2000 and two million in each of the years 2001-2003). Turkey's CITES annual report data do not show corresponding imports from Georgia, although they do record substantial re-exports of bulbs with Georgia, the stated country of origin.

The only other *Galanthus* species recorded in trade in any number during the period 1994-2003 were *G. elwesii* (62 million) and *G. nivalis* (38 million), neither of which reported as exported from Georgia. *G. nivalis* is in fact the most heavily traded species, but this trade is mainly domestic or between European Community member countries and thus not recorded in CITES annual reports.

COUNTRY ACCOUNTS

Georgia

Status:

The CITES Scientific Authority for Plants for Germany visited Georgia in 2001 and noted that there were numerous healthy and evidently unexploited populations of *G. woronowii* in the region where the species is harvested, both near to and distant from bulb cultivation sites (CITES Scientific Authority for Germany, 2001).

Management and trade:

In Georgia plants for export are harvested from cultivated land (chiefly cornfields and tea and citrus plantations) in the southwest of the country, mainly in Ajara Autonomous Republic but also in the Guria region. Most such land is within areas where the species may be expected to grow naturally but some is evidently outside this (CITES Scientific Authority for Germany, 2001).

Bulbs are harvested in May or June, when the leaves have died back, and are taken to a sorting centre. Here they are mechanically filtered, with the larger bulbs retained for export and the smaller bulbs returned to the fields for growing on and harvest in subsequent seasons. In some cases, bulbs are harvested after seeds have ripened, with the seeds being worked into the soil to increase regeneration. *Galanthus* stock on land within the range of the species is believed to consist of remaining wild plants from when the area was taken into cultivation as well as transplanted bulbs and, in some cases, the products of seed regeneration. The origin of stock in fields outside the natural area of distribution is unclear, but thought likely to be replanted undersized bulbs from previous harvests (CITES Scientific Authority for Germany, 2001).

Harvest began in 1994, with active cultivation probably beginning in 1998 (CITES Scientific Authority for Germany, 2001); by 2001 some 1,500 local people were reportedly involved, supplying two or three processing and export companies.

As of 2001 the total area of *G. woronowii* production was reportedly around 90 ha in 157 plots with a further 60 ha in over 200 different plots available on a rotational basis. Samples taken in 1999 indicated a mean density of around 50 harvestable bulbs/ m^2 (range 20-80 bulbs/m^2). However, it was not clear if this applied to the entire 90 ha or so of recorded plots, or only to those parts of the plots where the species was growing in noteworthy quantities. Information provided in the 1999 Review of trade in *Galanthus* and *Cyclamen* in Turkey and Georgia (Anonymous, 1999) indicates that the distribution of *G. woronowii* within the plots was highly variable, often described as scattered. It is not clear if harvest can be maintained in any one plot on an annual basis. The CITES Scientific Authority for Germany (2001) noted that rotation of harvest sites did not seem to be carried out on a very systematic basis.

In addition to these mixed cultivation plots one commercial company was said in 2001 to have been renting approximately 30 ha since 1995 for specific cultivation of *Galanthus;* of this 13 ha was reportedly given over to production in 1999 with an increase planned for 2002 (Anonymous, 1999). No further details on this have been located. In 2004, exporting companies had submitted 268 plots for approval as sources for *G. woronowii*, covering an unknown total area (Anonymous, 2004).

Table 2: Export quotas for Georgia

Year	**1997**	**1998**	**1999**	**2000**	**2001***	**2002**	**2003**	**2004**	**2005**	**2006**
Quota (million bulbs)	10	10	10	10	15	15	15	18	18	-

Source: UNEP-WCMC Species Database (2006).

* Figure provided in Association “Green Alternative” (2002), who note that permits for only 15 million bulbs were issued by the CITES Management Authorities.

Georgia has established annual export quotas on the species since 1997, when the quota was 10 million but rising to 18 million in 2004. Exports for 2003 were recorded at 18 million bulbs, 3 million over the quota at that time of 15 million, while those for 2002 were recorded at 12 million, 3 million under the quota. It seems likely therefore that the 2003 figures represent the unused quota from 2002. At a density of 50 harvestable bulbs/ m^2, these quotas could be filled from 20 ha and 36 ha respectively, so that, if the estimated figures for density of harvestable bulbs are reasonably representative of the production plots as a whole, the quotas appear to be well within the productive capacity of the areas set aside for harvest, assuming that these currently cover at least as great an area as they did in 2001, and allowing for some annual rotation of harvest sites.

In 2000 Georgia designated a CITES Scientific Authority for plants. Before then, an *ad hoc* 'licensing council', comprising representatives of government departments, the Georgian Academy of Sciences and NGOs, recommended export quotas for *G. woronowii* and *Cyclamen coum*, the only two CITES-listed plants exported in commercial quantities from Georgia at that time. From 2000 a more formal system was established (Association "Green Alternative" 2002):

1. The exporting company submits an application to the Georgian CITES Management Authority along with a list of cultivated plots and copy of the agreement with the importing company;

2. The CITES Management Authority asks the CITES Scientific Authority for Plants for an assessment of the cultivated plots and recommendations for an export quota;

3. The CITES Scientific Authority nominates experts who visit the area where *Galanthus woronowii* is grown and conduct stock assessments on the plots; and

4. On the basis of their stock assessment, the annual export quota is established and export permits issued.

In reality, lack of resources has prevented this system from functioning fully. In 2004 it was reported that the plots submitted by the exporters were not officially registered and that no comprehensive database of them existed at the CITES Management Authority. Furthermore, financial constraints usually made it difficult or impossible for the CITES Scientific Authority to organise an annual visit to the cultivation area at the appropriate time (spring) to make a systematic stock assessment and set quotas for that year (Anonymous, 2004). Even when visits have taken place, only a portion of the plots has been visited (in 2001: 50 out of 167) (Association "Green Alternative" 2002). Effectively, therefore, it seems that quotas have been established more based on only a partial assessment of harvestable stock. In principle, confirmation of the state of the plots and the abundance of *G. woronowii* in them would be necessary to ensure that exports under current quotas are sustainable. However, even the higher recent quotas (18 million bulbs) seem well below the capacity of the likely exent of the currently cultivated area, based on the results of the earlier surveys and the assumption that cultivation and harvest are maintained on the same plots from year to year with a suitable rotation period. Exports from Georgia are therefore considered Least Concern.

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