

**AN OVERVIEW
OF THE USE AND TRADE
OF PLANTS AND ANIMALS IN
TRADITIONAL MEDICINE
SYSTEMS IN CAMBODIA**

David Ashwell
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A TRAFFIC SOUTHEAST ASIA REPORT

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Forest products on sale at a Cambodian market

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	5
ABBREVIATIONS AND ACRONYMS	5
EXECUTIVE SUMMARY	6
A PRELIMINARY INVESTIGATION INTO THE USE AND TRADE OF WILD PLANTS AND ANIMALS IN TRADITIONAL MEDICINE SYSTEMS IN CAMBODIA	13
INTRODUCTION	13
What is Traditional Khmer Medicine?.....	13
Traditional Khmer Medicine in Cambodian Society	14
Traditional Chinese Medicine and Traditional Vietnamese Medicine in Cambodia	15
Traditional Medicine and the Formal Healthcare Sector	15
Traditional Medicine and the Law	16
METHODS	17
Researchers	17
Interviews	17
Observation	17
Sources of Information.....	18
RESULTS	19
Popularity of Traditional Medicine in Cambodia.....	19
Plants and Animals in Medicine.....	19
Previous Research into the Use of Wildlife in Traditional Medicine in Cambodia	20
The Current Use of Wildlife in Traditional Medicine in Cambodia	21
DISCUSSION	28
Plants in Traditional Medicine	28
Animals in Traditional Medicine	29
Captive-Breeding and Cultivation.....	31
The Export of Cambodia's Plants and Animals for Traditional Medicine	31
CONCLUSION	33
RECOMMENDATIONS	34

A PRELIMINARY INVESTIGATION INTO THE USE AND TRADE OF MEDICINAL PLANTS IN CAMBODIA	36
INTRODUCTION	36
METHOD.....	37
Database Development.....	37
Assessment of Vulnerability of Species.....	37
Market Chains of Select Species – Case Studies	38
Interviews upon Collection, Use, Trade and Legislation	39
RESULTS.....	40
Diversity and conservation significance of medicinal plants.....	40
Case Studies in Trade and Use – Key Points	44
Interviews upon Collection, Use, Trade and Legislation	55
Transport.....	55
Legislation and Regulatory Arrangements.....	56
CONCLUSIONS.....	57
Overall Diversity and Origins	57
Principal Habitats of Medicinal Plants.....	58
Vulnerabilities of Species.....	58
Key Medicinal Plant Collection Areas.....	58
General Trade Scenario	59
Regulatory Framework.....	60
DISCUSSION.....	62
RECOMMENDATIONS	64
REFERENCES	68
APPENDICES.....	72
Appendix 1 Animal Product Prices.....	72
Appendix 2 Survey of Pharmacies in Phnom Penh	73
Appendix 3 List of Animal Species Used in TM in Cambodia	75
Appendix 4 Wildlife Species Confiscated by WILD-AID.....	77
Appendix 5 Medicinal Plants of Cambodia Database Development	82
Appendix 6 Principle habitats and distribution patterns of Cambodia's medicinal plant species	85
Appendix 7 Assessment on the Vulnerability of Medicinal Plant Species in Cambodia	87
Appendix 8 Letter of Request for Stopping Mreah Prov Production.....	104
Appendix 9 Notice for Reduction of Import Tax.....	105

LIST OF TABLES

Table 1: Total number of Cambodia's medicinal plant species by region of origin	40
Table 2: Cultivated and naturalized species along with those with unknown habitat preferences.	41
Table 3: Principle habitats of Cambodia's medicinal plants	42

LIST OF FIGURES

Figure 1: Map of Cambodia showing featured locations	12
Figure 2: Description of Market Chain for Moem Thnam Chin.....	46
Figure 3: Description of Market Chain for Romdeng Prey	47
Figure 4: Description of Market Chain for Romeit Prey	48
Figure 5: Description of Market Chain for Mreah Prov	50
Figure 6: Description of Market Chain for Vohr Romiet	52
Figure 7: Description of Market Chain for Tepiru	53
Figure 8: Description of Market Chain for Dey Khla	55
Figure 9: Key collection areas and case study areas	59
Figure 10: General Trade Scenario	61

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ABBREVIATIONS AND ACRONYMS

ASEAN	Association of Southeast Asian Nations
ATCH	Association of Traditional Cambodian Healers
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
FA	Forestry Administration
IKH	Institute of Khmer Habitat
IUCN	International Union for Conservation of Nature
MAFF	Ministry of Agriculture, Food and Fisheries
TM	Traditional Medicine
NCTM	National Center of Traditional Medicine
TKM	Traditional Khmer Medicine
TVM	Traditional Vietnamese Medicine
TCM	Traditional Chinese Medicine
WCS	Wildlife Conservation Society

EXECUTIVE SUMMARY

This published document consists of two separate reports produced between 2005 and 2007. These reports have been maintained as separate reports in order to maintain their respective integrities as source documents.

The first report '**A Preliminary Investigation into the Use and Trade of Wild Plants and Animals in Traditional Medicine Systems in Cambodia**' by **Naomi Walston** represents a preliminary examination of the use of Cambodia's wildlife in Traditional Medicine (TM) systems. It examines the use of wildlife and plants in Traditional Khmer Medicine (TKM) and briefly discusses the use of Cambodian wildlife and plants to supply other TM systems, such as Traditional Chinese Medicine (TCM) and Traditional Vietnamese Medicine (TVM).

Plants and animals are central features of TKM and since a significant proportion of Cambodia's population still uses TM, this has ensured that there is a continuing demand for plants and animals for medicinal purposes. However, some changes in the supply of and markets for plants and animals for TM have taken place:

- The rarity and consequent expense of some animal species has reduced the ability of the majority of Cambodians to afford to keep or purchase animal products for medicinal use. However, the belief in and demand for these animal parts remains strong, as verified by the sale of fake animal products and the marketing strategies of some traditional healers.
- Many traditional healers in Cambodia cannot afford to purchase these animal parts to include in their remedies. Where possible, they are substituting plant for animal ingredients or recommending to their clients that they source or purchase the animal-based ingredients themselves rather than relying on the healer to include them in pre-prepared remedies.
- Some animal products are still openly sold at TM outlets (i.e. the species considered to be of a lower financial value, since the Forestry Law dictates a system of fines according to the perceived financial value of the species). Other species are still available for sale but remain either in the traders' private premises or are provided on a "to order basis". The reasons for this appear to be that enforcement activities have encouraged trading activities to continue 'out of sight' and that many wildlife products are now so expensive to buy from middlemen, that traders prefer to buy them only when they have a confirmed customer.
- Some traditional healers (who also collect the ingredients for remedies) have noticed a decline in the wild of some of the medicinal plant species they use in their remedies.

Current social and political concerns in Cambodia are also influencing the use of TM and its impact on the country's wildlife:

- TM has become popular amongst the wealthy and urban population as Cambodian society looks for cures for diseases that western medicine has so far failed to treat.
- TM is encouraged by the government but little is done to monitor its production. The processes by which remedies are produced are little known and it is difficult to ensure accountability among TM practitioners.
- Cambodia has a new Forestry Law, which contains powerful rhetoric on how the illegal exploitation of Cambodia's natural resources is to be addressed. However, those responsible for enforcing the law "on the ground" lack the capacity and knowledge to do so.

This report, in addition to the gaps in the knowledge concerning the use of Cambodia's wildlife in TM, makes the following recommendations:

- To conduct further research, led by the following priorities:
 - A need for better understanding of the dynamics of domestic and international trade in plants and animals from Cambodia
 - A need for additional investigation into the restaurant trade
- To work closely with the Royal Government of Cambodia, particularly:
 - the Customs Department, Ministry of Finance
 - the Forestry Authority, Ministry of Agriculture, Forestry and Fisheries
 - the Department of Drugs, Food and Cosmetics, in the Ministry of Health
- To work closely with the National Center of Traditional Medicine and with *kru khmers*

The second report '**A Preliminary Investigation into the Use and Trade of Medicinal Plants in Cambodia**' by **David Ashwell** focuses entirely on the medicinal plant trade in Cambodia, an often overlooked aspect of species trade but one that has enormous consequences for the biodiversity of the country and, potentially, the wider region.

The diversity and taxonomy of medicinal plants in Cambodia is poorly understood and underrepresented in published literature. The first part of this report attempts to clarify taxonomic issues in order to provide a basis for further trade-related research, including a conservation assessment that prioritises species based on perceived vulnerability in the wild. A brief market chain analysis was also conducted for several of these plant species. Key results include:

- Over 800 species of medicinal plants (native and introduced) were identified. This figure represents over 35% of Cambodia's native flora.
- Eighty species are considered of high priority for conservation due to limited abundance, habitat threat, narrow ecological range and high demand.
- The case studies describe a well organized and active network of traders, outlets and point to some key collection areas in Cambodia.
- Anecdotal evidence and recent changes in the market chain, with a strong centralized system in Phnom Penh suggest many species are becoming hard to obtain locally, and traditional medicine practitioners find it easier to go through centralized wholesalers to obtain the selected plant products.

The findings of this report, leads the researchers to make a number of detailed recommendations. The key recommendations relate to:

- Several species of plants should be proposed by the Cambodia Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Management Authority to the CITES Committee for inclusion to CITES Appendices I, II or III: *Dysoxylum lourieri* (Mreah Prov Phnom); *Gardenia ankorensis* (Dey Khla); *Cinnamomum cambodianum* (Tepiru); and *Coscinium usitatum* (Vohr Romiet).
- Formation of a National Working Group comprised of Government Agencies in forest protection, environment and health, traditional medicine organisations, and NGO's active in health and conservation.

- Development by the Royal Government of a National Strategy for the Conservation and Sustainable use of Medicinal Plants.
- Further research by national organisations and NGOs on use and trade of plants and animals, distribution and abundance of plants, and market analysis for select species, particular animals and an examination of the restaurant trade.
- Holding a National Workshop by the Royal Government to inform stakeholders of the research and draft National Strategy.
- Improved regulatory environment and law enforcement by the Royal Government. In particular this includes passage publication of a list of threatened species as described in the *Law of Forestry*.
- A public awareness campaign by the Royal Government, in association with relevant national organisations and NGOs, on the sustainable use and trade of medicinal plants in Cambodia.

សេចក្តីសង្ខេប

ឯកសារដែលបានបោះផ្សាយនេះមានរបាយការណ៍ពីរដាច់ឡែកពីគ្នា ដែលបានធ្វើឡើងនៅឆ្នាំ ២០០៥ និង ២០០៧ ។ របាយការណ៍ទាំងពីរនេះត្រូវបានរក្សាទុកជារបាយការណ៍ដើមសំរាប់ធ្វើជាប្រភពឯកសារស្រាវជ្រាវ ។

របាយការណ៍ទី ១ មានចំណងជើងថា “ **ការសិក្សាលើការប្រើប្រាស់សំណាកសត្វ និង រុក្ខជាតិ ធ្វើជាឱសថបុរាណក្នុងប្រទេសកម្ពុជា** ” សរសេរដោយលោកស្រី Naomi Walston គឺជាការពិនិត្យមើល ជាលើកដំបូងលើការប្រើប្រាស់សត្វព្រៃ ក្នុងប្រទេសកម្ពុជា ធ្វើជាឱសថបុរាណសម្រាប់ព្យាបាលជម្ងឺ ។ របាយការណ៍ នេះបានលើកឡើងពីការប្រើប្រាស់ផលិតផលសត្វព្រៃ និងរុក្ខជាតិព្រៃសំរាប់ធ្វើឱសថខ្មែរបុរាណព្យាបាល ជម្ងឺផ្សេងៗ និងក៏បានរៀបរាប់ដោយសង្ខេបផងដែរពីការប្រើប្រាស់ផលិតផលសត្វព្រៃ និងរុក្ខជាតិព្រៃដើម្បីផ្គត់ផ្គង់ប្រព័ន្ធឱសថ បុរាណផ្សេងៗទៀត ដូចជា ឱសថបុរាណចិន និងឱសថបុរាណវៀតណាម ជាដើម ។

សត្វព្រៃ និងរុក្ខជាតិព្រៃគឺជាវត្ថុធាតុដើមយ៉ាងសំខាន់សំរាប់ផលិតជាឱសថបុរាណខ្មែរព្យាបាលជម្ងឺផ្សេងៗ ហើយរហូតមកដល់បច្ចុប្បន្ននេះ ក៏នៅមានប្រជាជនខ្មែរមួយចំនួនធំនៅតែប្រើឱសថបុរាណខ្មែរដើម្បីព្យាបាលជម្ងឺ តម្កាត់ផ្សេងៗផងដែរ ដោយសារហេតុផលបែបនេះហើយ ទើបវាចេះតែមានតម្រូវការយ៉ាងខ្ពស់ខាងសត្វព្រៃ និង រុក្ខជាតិព្រៃធ្វើជាឱសថបុរាណ ។ ទោះបីជាយ៉ាងណាក៏ដោយ វាមានការប្រែប្រួលខ្លះខាងការផ្គត់ផ្គង់ និងទីផ្សារលក់ សត្វព្រៃ និងរុក្ខជាតិព្រៃធ្វើជាឱសថបុរាណសម្រាប់ព្យាបាលជម្ងឺ ដោយសារកត្តាមួយចំនួនដូចខាងក្រោម:

- ភាពកម្រ និងភាពបាត់បង់ប្រភេទសត្វព្រៃជាបន្តបន្ទាប់កាន់តែធ្វើឱ្យប្រជាជនខ្មែរមិនអាចរកទិញបាន ផលិតផលសត្វព្រៃធ្វើជាឱសថខ្មែរបុរាណតទៅទៀត ។ ទោះបីជាបែបនេះក៏ដោយ ក៏ជំនឿ និងតម្រូវការខាងបំណែក ផ្សេងៗនៃសត្វព្រៃនៅតែមានកម្រិតខ្លាំង រហូតដល់ថ្នាក់មានការលក់ផលិតផលសត្វព្រៃក្លែងក្លាយ និងយុទ្ធសាស្ត្រ ទីផ្សាររបស់គ្រូឱសថបុរាណខ្មែរដើម្បីបោកប្រាស់អ្នកទិញ ។
- គ្រូខ្មែរបុរាណជាច្រើនមិនអាចរកទិញបាននូវបំណែកសត្វព្រៃទាំងនោះជាឱសថព្យាបាលរោគ ។ ប្រសិន បើអាចគ្រូខ្មែរបុរាណនឹងយករុក្ខជាតិព្រៃមកជំនួសថ្នាំដែលផ្សំពីបំណែកសត្វព្រៃវិញ ឬ ក៏ប្រាប់អ្នកមករកថ្នាំឱ្យទៅរក ទិញឱសថផ្សំពីបំណែកសត្វព្រៃដោយខ្លួនពួកគេផ្ទាល់ ។
- ផលិតផលសត្វព្រៃមួយចំនួននៅតែត្រូវបានដាក់លក់ដោយបើកចំហ នៅតាមទីផ្សារតូចៗលក់ឱសថ បុរាណ ។ ប្រភេទសត្វព្រៃ និងរុក្ខជាតិព្រៃខ្លះនៅតែមានលក់ នៅតាមតូបលក់ឯកជនរបស់អ្នកជួញដូរ ឬតាមការ កម្មង់ទិញ ។ ដោយសារហេតុផលបែបនេះហើយ ទើបផលិតផលសត្វព្រៃមានតម្លៃថ្លៃ ដែលទិញពីល្អិតពួកណាស់ ហើយអ្នករកស៊ីចូលចិត្តទិញផលិតផលសត្វព្រៃ តែនៅពេលដែលពួកគេមានអតិថិជនរកទិញតែប៉ុណ្ណោះ ។
- គ្រូឱសថបុរាណមួយចំនួនបានកត់សម្គាល់ឃើញមានការធ្លាក់ចុះប្រភេទរុក្ខជាតិឱសថមួយចំនួនពីក្នុងព្រៃ ដែលពួកគាត់អាចយកមកធ្វើថ្នាំព្យាបាលជម្ងឺ ។

ការព្រួយបារម្ភពីបញ្ហាសង្គម និងនយោបាយនៅពេលបច្ចុប្បន្ននេះ ក៏កំពុងជះឥទ្ធិពលទៅលើការប្រើប្រាស់ ឱសថបុរាណ និងផលប៉ះពាល់របស់វាទៅលើប្រភេទសត្វព្រៃក្នុងប្រទេសកម្ពុជា ។

- ឱសថបុរាណកំពុងតែមានប្រជាប្រិយភាពពីសំណាក់ប្រជាជននៅទីក្រុងដែលមានជីវភាពធូរធារ ដោយសារ ជម្ងឺខ្លះឱសថបុរាណ (សម័យ) មិនអាចធ្វើការព្យាបាលបាន ។

- ឱសថបុរាណត្រូវបានរាជរដ្ឋាភិបាលអនុញ្ញាតឱ្យដាក់លក់ និងប្រើប្រាស់ ប៉ុន្តែវាមានការត្រួតពិនិត្យមើល តិចតួចណាស់ទៅលើការផលិតឱសថនោះ ។ ដំណើរការនៃការផលិតឱសថបុរាណត្រូវបានគេដឹងតិចតួចណាស់ និងវា មានការលំបាកណាស់ដើម្បីធានាឱ្យមានការគណនេយ្យភាព និងការទទួលខុសត្រូវក្នុងចំណោមគ្រូឱសថបុរាណ ។

- ប្រទេសកម្ពុជាមានច្បាប់ថ្មីស្តីពីព្រៃឈើ ដែលមានវេហ្សាសាស្ត្រដ៏ខ្លាំងក្លាទៅលើការជួញដូរ និងការដក ហូតដោយខុសច្បាប់នៃធនធានធម្មជាតិ ។ ទោះបីយ៉ាងនេះក្តី ក៏អ្នកដែលទទួលខុសត្រូវចំពោះការអនុវត្តច្បាប់ នៅតាមមូលដ្ឋាន ខ្វះសមត្ថភាព និងចំណេះដឹងដើម្បីពង្រឹងការអនុវត្តច្បាប់នេះ ។

បន្ថែមពីលើគំនិតនៃចំណេះដឹងដែលទាក់ទងទៅនឹងការប្រើប្រាស់សត្វព្រៃ ក្នុងប្រទេសកម្ពុជាសំរាប់ធ្វើជា ឱសថបុរាណនោះ របាយការណ៍នេះសូមផ្តល់ជាអនុសាសន៍ដូចខាងក្រោម :

១. គួរធ្វើការសិក្សាស្រាវជ្រាវបន្ថែម ដោយផ្តោតទៅលើចំណុចអាទិភាពចំនួន ២ ខាងក្រោមនេះ
 - ត្រូវការជាចាំបាច់នូវការយល់ដឹងកាន់តែលម្អិតនៃបណ្តាញនៃការជួញដូរសត្វព្រៃ និងរុក្ខជាតិព្រៃ ក្នុង ប្រទេស និងនាំចេញទៅក្រៅប្រទេសកម្ពុជា ។
 - ត្រូវធ្វើការស៊ើបអង្កេតបន្ថែមទៅលើការជួញដូរសត្វព្រៃនៅតាមភោជនីយដ្ឋាននានា
២. ត្រូវសហការឱ្យបានជិតស្និទ្ធជាមួយរាជរដ្ឋាភិបាលកម្ពុជា ជាពិសេស រដ្ឋបាលគយ នៃក្រសួងសេដ្ឋកិច្ច និង ហិរញ្ញវត្ថុ រដ្ឋបាលព្រៃឈើនៃក្រសួងកសិកម្ម រុក្ខាប្រមាញ់ និងនេសាទ និងនាយកដ្ឋានឱសថ ម្ហូបអាហារ និងគ្រឿងសំអាង នៃក្រសួងសុខាភិបាល ជាដើម
៣. ត្រូវសហការឱ្យបានជិតស្និទ្ធជាមួយមជ្ឈមណ្ឌលជាតិឱសថបុរាណ និងគ្រូខ្មែរ ជាដើម

របាយការណ៍ទី ២ មានចំណងជើងថា **"ការស៊ើបអង្កេតជាមួយបង្កើននៃការប្រើប្រាស់ និងការ ជួញដូររុក្ខជាតិឱសថក្នុងប្រទេសកម្ពុជា** ដោយលោក **David Ashwell** ផ្តោតទាំងស្រុងទៅលើការជួញដូរ រុក្ខជាតិឱសថក្នុងប្រទេសកម្ពុជា ជាបញ្ហាដែលគេមិនសូវចាប់អារម្មណ៍ ប៉ុន្តែវាមានផលប៉ះពាល់យ៉ាងធ្ងន់ធ្ងរទៅលើ ជីវៈចម្រុះក្នុងប្រទេស និងក្នុងតំបន់ទៀតផង ។

នានាភាព និងអំបូរនៃរុក្ខជាតិឱសថនៅក្នុងប្រទេសកម្ពុជាមិនសូវត្រូវបានគេយល់ដឹងច្បាស់ និងបកស្រាយ លម្អិតនៅក្នុងឯកសារដែលត្រូវបានបោះពុម្ពនោះទេ ។ ផ្នែកទី ១ នៃរបាយការណ៍នេះគឺបង្ហាញពីអំបូរ និងប្រភេទ ដើម្បីផ្តល់ជាមូលដ្ឋានគ្រឹះសំរាប់ធ្វើការសិក្សាស្រាវជ្រាវលើក្រោយបន្ថែម ដែលទាក់ទងទៅនឹងការជួញដូររុក្ខជាតិ ឱសថ រួមមានការវាយតម្លៃពីស្ថានភាពអភិរក្សដើម្បីកំណត់ថាតើប្រភេទរុក្ខជាតិឱសថណាខ្លះកំពុងទទួលនូវរងការ គំរាមកំហែង នៅក្នុងព្រៃ ។ ការវិភាគដោយសង្ខេបទៅលើខ្សែសង្វាក់នៃទីផ្សារត្រូវបានគេធ្វើឡើងទៅលើប្រភេទ រុក្ខជាតិឱសថមួយចំនួន ដោយទទួលបានលទ្ធផលសំខាន់ៗដូចខាងក្រោម :

- គេបានកំណត់រកឃើញប្រភេទរុក្ខជាតិឱសថជាង ៨០០ ប្រភេទ រាប់ទាំងប្រភេទរុក្ខជាតិក្នុងស្រុក និង នាំចូល ។ តួលេខនេះស្មើនឹង ជាង៣៥ ភាគរយនៃប្រភេទរុក្ខជាតិក្នុងប្រទេសកម្ពុជា ។

- មានរុក្ខជាតិចំនួន ៨០ ប្រភេទត្រូវបានគេចាត់ទុកថាមានអាទិភាពខ្ពស់សំរាប់ការអភិរក្ស ដោយសារភាពសំបូររបស់ពួកវាមានកម្រិត ការគំរាមកំហែងទៅលើទីជម្រក លក្ខណៈអេកូឡូស៊ីទាប និងមានតម្រូវការខ្ពស់ ។

- ករណីសិក្សានេះបាននិយាយរៀបរាប់ពីបណ្តាញអ្នកជួញដូរដែលមានការរៀបចំបានយ៉ាងល្អ និងប្រកប ដោយប្រសិទ្ធភាពទីផ្សារតូចៗលក់ផលិតផលរុក្ខជាតិព្រៃ និងបង្ហាញពីកន្លែងប្រមូលទិញរុក្ខជាតិសំខាន់ៗនៅក្នុង ប្រទេសកម្ពុជា ។

- ភស្តុតាងមិនច្បាស់លាស់ និងការផ្លាស់ប្តូរឌីអុក្លូខែនសង្វាក់នៃទីផ្សារ ដោយមានប្រព័ន្ធទិញលក់ផលិតផលរុក្ខជាតិព្រៃដ៏រឹងមាំនៅក្នុងទីក្រុងភ្នំពេញបានបង្ហាញឱ្យឃើញថាមានការលំបាកណាស់ក្នុងការរកទិញប្រភេទរុក្ខជាតិព្រៃនៅតាមមូលដ្ឋាន ហើយត្រូវខ្វះបុរាណមានភាពងាយស្រួល ដោយទៅរកទិញពីអ្នកលក់ដុំនូវផលិតផល រុក្ខជាតិ ដែលចង់ បាននោះ ។

លទ្ធផលរកឃើញនេះធ្វើឱ្យក្រុមអ្នកសិក្សាស្រាវជ្រាវផ្តល់នូវអនុសាសន៍លម្អិតមួយចំនួនដូចខាងក្រោម :

- ប្រភេទរុក្ខជាតិមួយចំនួន គួរតែត្រូវបានស្នើសុំដោយអាជ្ញាធរគ្រប់គ្រង អនុសញ្ញាស្តីពីការធ្វើពាណិជ្ជកម្មអន្តរជាតិទៅលើប្រភេទសត្វព្រៃ និងរុក្ខជាតិដែលជិតផុតពូជ ក្នុងប្រទេសកម្ពុជា ទៅលេខាធិការដ្ឋានសាយតេស ដើម្បីបញ្ចូលប្រភេទរុក្ខជាតិទាំងនោះទៅក្នុងឧបសម្ព័ន្ធ សាយតេស ទី I II ឬ ទី III មានដូចជា ម្រះព្រៅភ្នំ *Dysoxylum lourieri* ដៃខ្លា *Gardenia ankorensis* តែពីរ្យ *Cinnamomum cambodianum* and វល្លិ៍រមៀត *Coscinium usitatum* ។

- បង្កើតក្រុមការងារថ្នាក់ជាតិដែលមានសមាសភាពមន្ត្រីមកពីរាជរដ្ឋាភិបាលខាងផ្នែកការពារព្រៃ ឈើ បរិស្ថាន និងសុខាភិបាល អង្គការឱសថបុរាណ និងបណ្តាអង្គការសុខភាព និងអភិរក្ស ។

- គួរធ្វើការអភិវឌ្ឍន៍ដោយរាជរដ្ឋាភិបាលទៅលើយុទ្ធសាស្ត្រថ្នាក់ជាតិសំរាប់ការអភិរក្ស និងការប្រើប្រាស់រុក្ខជាតិឱសថប្រកបដោយនិរន្តរភាព ។

- គួរធ្វើសិក្សាស្រាវជ្រាវបន្ថែមដោយអង្គការជាតិ និងអន្តរជាតិទៅលើការប្រើប្រាស់ និងការជួញដូររុក្ខជាតិ សត្វព្រៃ របាយ និងភាពសំបូរនៃរុក្ខជាតិ និងការវិភាគនៃទីផ្សារទៅលើប្រភេទដែលបានជ្រើសរើស ជាពិសេស សត្វព្រៃ និងការពិនិត្យមើលការជួញដូរសត្វព្រៃនៅតាមភោជនីយដ្ឋាននានា ។

- គួររៀបចំសិក្ខាសាលាថ្នាក់ជាតិដោយរាជរដ្ឋាភិបាលដើម្បីជូនដំណឹងដល់ភាគីពាក់ព័ន្ធទាំងអស់ពី ការសិក្សា ស្រាវជ្រាវ និងការពង្រឹងយុទ្ធសាស្ត្រថ្នាក់ជាតិ ។

- គួរតែមានការកែលម្អទៅលើច្បាប់បរិស្ថាន និងពង្រឹងការអនុវត្តច្បាប់ដោយរាជរដ្ឋាភិបាល ដូចជាការបោះពុម្ពផ្សាយពីការអនុម័តពីបញ្ជីប្រភេទដែលកំពុងទទួលបាននូវការគំរាមកំហែងដូចដែលបានរៀបរាប់នៅក្នុងច្បាប់ ស្តីពីព្រៃឈើ ។

- គួរតែធ្វើយុទ្ធនាការណ៍អប់រំផ្សព្វផ្សាយជាសាធារណៈដោយរាជរដ្ឋាភិបាល ដោយសហការជាមួយបណ្តា អង្គការជាតិ និងអន្តរជាតិ ស្តីពីការប្រើប្រាស់ប្រកបដោយនិរន្តរភាព និងការជួញដូររុក្ខជាតិឱសថក្នុងប្រទេសកម្ពុជា ។

Figure 1

Map of Cambodia showing featured locations



Source: Naomi Walston

A PRELIMINARY INVESTIGATION INTO THE USE AND TRADE OF WILD PLANTS AND ANIMALS IN TRADITIONAL MEDICINE SYSTEMS IN CAMBODIA

Naomi Walston

INTRODUCTION

This paper examines the use of Cambodia's flora and fauna in traditional medicine, focusing on the Cambodia markets and discusses the implications that this use has on the conservation of Cambodia's wild plants and animals.

Although the beginnings of Traditional Khmer Medicine (TKM) are unclear, it is known that plants and animals have been used for hundreds of years in traditional remedies in Cambodia. It is also known that a significant proportion of the Cambodian population depends on private sources for its healthcare, including traditional healers (Sav and Maclean, 2001). Other countries in the region also depend on natural products for their traditional medicine systems and, compared to these countries, many of the fauna and flora species of Cambodia are still relatively abundant. Therefore, it is important to determine if Cambodia's natural resources are supplying those countries that have exhausted their own wildlife supplies, since such a situation would have serious implications for Cambodia's flora and fauna and the healthcare of its people.

What is Traditional Khmer Medicine?

TKM uses plants, animals and minerals. Little is known of its origins but there is strong evidence to suggest that indigenous Khmer medicine, which developed during the Angkor period (9 to 15 century AD), borrowed foreign theories and practices from Ayurvedic and Chinese medicine systems (Chhem, date unknown). These theories were adapted to local beliefs and superstitions to create a medical system unique to the ancient Khmers but which has similarities with other TM systems of the region that value natural products. The Angkor period offers some insight into the history of Khmer medicine through the architectural and archaeological data surviving from the era. The temple, Neak Poan, is thought to be the Angkorian seat of traditional medicine (Ly and Sloan, 2002, Moun Vanna, Director of the Association of Traditional Cambodian Healers, pers. comm., August 2004) and the ruins of the hospitals built under the Buddhist King Jayavarman VII (1181-1218) attest to a strong Indian influence on the medical practices of the day (Wiert, 2002). Since the fall of Angkor, Khmer medical manuscripts written in the Pali language on palm-leaf represent some of the main surviving media of transmission of ancient medical knowledge and can still be seen today in many of the country's pagodas (Suy, 2002).

To this day, TKM relies on two major diagnostic techniques - clinical techniques, involving the questioning and examination of the patient, and magico-religious techniques, involving divination and the use of supernatural explanations for illness (Chhem, date unknown). Much of the traditional medicine practiced in Cambodia is carried out in conjunction with prayers, "magic" and other spiritual activities (Rasbridge and Kemp, 2003, Sav and Maclean, 2001). The supernatural world can cure or cause illness and therefore the definitions between what is medicinal and what is spiritual is often blurred. This is relevant to this study because plants and animals are used in both of these diagnostic methods (C. Poole, Wildlife Conservation Society (WCS), pers. comm., August 2004). They provide the raw materials for remedies prescribed using the clinical method and are used in the form of amulets and charms in magico-religious diagnosis.

In Traditional Chinese Medicine (TCM) and in the medicine systems derived from TCM, the prevention of disease is as important as the cure. Disease can be prevented by maintaining the balance of the body and by restoring energy to the levels that help maintain health (Nooren and Claridge, 2001). Various foodstuffs, including the meat of wild animals, can help to do this. Wild animal parts are also eaten to promote the

strength, vitality and sexual prowess of the consumer, all of which are related to a person's health. Thus, wildlife used for medicine is also closely connected to that which is used for food and in many cases the two need not be separated. Indeed, during this research, animals for meat and animals for medicine were often found for sale on the same market stall.

Unlike other countries in the region, such as Viet Nam (Nooren and Claridge, 2001) and South Korea (Kang and Phipps, 2003), Cambodia does not have formal academic and training opportunities for would-be TM practitioners. Practitioners of TKM have usually developed their skills through apprenticeships, personal research and the knowledge of their family and community elders. A number of European scholars such as Martin (1971), Menault (1930), Petelot (1952-1954) and Vidal *et al.* (1969) have published works on the *materia medica* of Cambodia, particularly the medicinal plants, but these cannot reflect the variety and the constant change, both within regions of Cambodia and over time, in the everyday use of TKM remedies. Such remedies vary from place to place, between different ethnic groups and can be influenced by the local beliefs surrounding a particular illness or condition (Houn Chhum, *kru khmer*, pers comm., July 2004 and Antoine Schmitt, ethnobotanist, pers comm., September 2004). The myriad beliefs surrounding pregnancy and childbirth in Khmer culture for example, ensure that there are numerous medicines and remedies in TKM specifically devoted to pregnancy.

Traditional Khmer Medicine in Cambodian Society

Many Cambodians will mix western medicine with traditional healing practices. They will for example, consult western and traditionally trained medical practitioners simultaneously, consume medicines from both disciplines and request visits from a medium (who will summon the spirits to treat the patient) while staying in a hospital.

Traditional healers are known by a variety of different terms depending on their speciality, but *kru khmer* is a comprehensive term, which can encompass all types of healers. The *kru khmer* who prescribe medicines usually provide their remedies in the following forms:

- Dried plant medicine: usually provided to the customer as a mixture of dry wood, twigs, roots and leaves. Water is added to the mixture, it is boiled and then drunk.
- Liquid medicine: often dark in colour, these liquids can contain ground-up plant and/or animal products. In this form, it is not possible to verify the contents of the medicine visually.
- Steeped medicine: these are made of medicinal raw materials, steeped in alcohol. The customer pays to drink the alcohol. Usually it is not possible to verify the contents of the medicine visually.
- Powders: the medicinal materials are ground into a powder and given to the customer, either as a powder or as a pill or capsule. It is not possible to confirm the contents of the medicine visually.
- Loose ingredients: can be roots, twigs, seeds or animal parts. If the materials have not been ground first, then it is usually possible to identify the ingredients visually.
- Topical medicines: for external application. Visual verification of the ingredients is not possible (Sav and Maclean, 2001).

Pre-prepared TKM medicines are available in markets, from premises owned by *kru khmer* and from other individuals such as monks and traditional birth attendants. These medicines are used singly or in combination.

Local remedies are also known and used within villages and households without consultation with a healer. These home remedies will involve the collection of plants and animals for personal consumption and will be highly variable in terms of the type, quality and quantity of natural materials used. A large percentage of the rural population will depend on these remedies - particularly those who have no cash income or who live at a distance from the nearest settlement.

Traditional Chinese Medicine and Traditional Vietnamese Medicine in Cambodia

The Chinese in Cambodia make up one per cent of the country's population, making them the second largest ethnic minority after the Vietnamese (Chandler and Rooney, 2005). Sixty percent of the ethnic Chinese are urban dwellers and are typically involved in the import-export business, the sale of pharmaceuticals, transportation, the hotel and restaurant business and traditional medicine and dentistry. In the early 1990s, the Chinese community in Cambodia undertook a "massive renaissance of Chinese cultural identity" (Edwards and Chan, 1996). This included the reopening of Chinese temples, schools, businesses specifically identified as Chinese and the publication of Chinese newspapers.

The ethnic Vietnamese make up five per cent of Cambodia's population (Chandler and Rooney, 2005). The ethnic Vietnamese community is generally concentrated in Phnom Penh, and in the south-eastern provinces of Cambodia (Jordens, 1996).

Traditional medicine has a strong following within both of these ethnic groups. TCM makes use of a wide range of animal products in its preparations and it is estimated that approximately 10 per cent of the materials in TCM come from animals (Donovan, 1998 in Nooren and Claridge, 2001). Furthermore, though most animal groups will be used in TCM, there is an added value given to medicine made from animals that are endangered, dangerous and wild (Nooren and Claridge, 2001). Traditional Vietnamese Medicine (TVM) recognizes over 1000 medicinal plants and a book published in the 1990s lists 36 vertebrates whose parts can be used in TVM (Do Tat Loi, 1991 in Nash, 1997).

TCM and TVM shops and practitioners are evident all over Cambodia. These shops sell patented medicines imported from China and Viet Nam and they also prescribe and manufacture remedies containing locally-sourced natural materials. TCM and TVM practitioners are subject to the same laws as TKM practitioners but, due to the secrecy surrounding their remedies, their clients and their communities, their activities are difficult to monitor (Hang Sokhom, National Center of Traditional Medicine, pers. comm., July 2004).

Traditional Medicine and the Formal Healthcare Sector

During the Khmer Rouge regime in the 1970s, when western teachings were banned, traditional remedies were the only medical care available to the population. Following the fall of the regime in 1979, when those with knowledge of western medical practices were either dead or had fled the country, traditional medicine was formally encouraged by the Cambodian government (Anon., 1998). Traditional healers from all over Cambodia were invited to Phnom Penh in the early 1980s to share their knowledge, and each district health centre had a *kru khmer* with whom it would work closely. It was at this time that the first inventory of medicinal plants was compiled in the Khmer language by a group of *kru khmer* working with the National Center of Traditional Medicine (NCTM) in Phnom Penh (Hang Sokhom, NCTM, pers. comm., July 2004).

In 1998, a Sub-decree on the National Policy on Drugs was passed which states that traditional medicine should be boosted, particularly within primary health care, through training, scientific research and technology to develop traditional medicines (Anon., June 1998). As recently as July 2004, Cambodia's Prime Minister declared that, "The Royal Government will continue to encourage the use of traditional medicines with appropriate information and control in conjunction with the use of modern medicines" (Anon., July 2004a). However, traditional medicine is still predominantly used and practised at the household and community levels with few linkages to the formal healthcare sector. This makes the practice, components and trends of traditional medicine difficult to monitor.

Within the government, TM is represented by the Department of Drugs, Food, Medical Materials and Cosmetics, in the Ministry of Health. Two other formal institutions exist - the National Center of Traditional Medicine, which receives minimal financial assistance from the Ministry of Health (Heng Punley, NCTM, pers. comm., July 2004) and the Association of Traditional Cambodian Healers (ATCH), which does not (Moun Vanna, ATCH, pers. comm., August 2004).

Another sub-decree, the Sub-decree on the Production, Import, Export and Commerce of Traditional Medicine in the Public Sector defines legal guidelines for the manufacture and trade of TM. For the purposes of the law, TM is defined as medicine made from "natural" materials outside of laboratory conditions. Any person can manufacture and/or sell traditional medicine provided the purpose of their activities is deemed to be of benefit to the Cambodian people. To manufacture, import, export and sell TM, a license is required from the Ministry of Health. Traditional medicines that are imported into Cambodia must be approved by the Ministry of Health (Anon., April 1998). A list, and samples of all approved medicines manufactured outside of Cambodia is kept at the Ministry and it is the responsibility of the importer to ensure that their products match these samples. The Ministry of Health also maintains a list of traditional medicines it considers dangerous to human health.

Although both of these sub-decrees appear to indicate a willingness on the part of the government to support traditional medicine practices, it is not clear to what extent the government will intervene if rare and/or endangered wildlife (plants and animals) are used in the manufacture of traditional medicine. Just as Baird (1995) found in Lao PDR, there appears to be discrepancy in what the Ministry of Health will allow under its sub-decrees concerning the manufacture of traditional medicine and what the Ministry of Agriculture, Forestry and Fisheries will allow under its sub-decrees concerning wildlife.

The regulation of traditional medicine practitioners, particularly in terms of the quality and compositions of their medicines, is largely the concern of the Association of Traditional Cambodian Healers and the National Center of Traditional Medicine. However, lack of funding and the very fact that the nature of traditional healer practices are secretive, make this an extremely difficult task to accomplish (Hang Sokhom, NCTM, pers. comm., July 2004).

Traditional Medicine and the Law

In Cambodia's Forestry Law (2002), the term "Forestry By-products" includes, among other non-timber forest products, the plants and animals harvested for traditional medicine. Local communities are permitted to use such by-products provided the impact on the forest is only "minor" (Anon, 2002). It is prohibited to harvest "rare tree species" or to hunt, possess, transport, trade and export "rare and endangered wildlife species" (Anon 2002). Those who are caught doing so are supposed to be fined three times the commercial value of the item and the item is confiscated. However, the Ministerial Decree that will determine the criteria by which each animal and plant species is categorised (as endangered, rare or common) and that will name those species categorised as rare and outline the corresponding levels of protection, has yet to be approved.



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Police checkpoint in Cambodia

Enforcing the Forestry Law is the responsibility of each provincial office of the Forestry Administration (FA). However, a lack of understanding of how to implement the law in addition to poor salaries ensures that forestry officials are unaware as to what species are at risk, are unclear as to the confiscation formalities and are working with a process of fines and royalties that is easy to exploit (Todd Sigaty, Village Focus, pers. comm., September 2004). All over the country, "unofficial" fines are collected and sometimes the wildlife is not confiscated (Suon Phalla, pers. comm., October 2004). However, it should be noted that this refers to the general situation with provincial forestry officials and does not refer to the activities of the WPMU (Wilderness Protection Mobile Units) which are specially trained and have clear guidelines on the confiscation and disposal of wildlife.

METHODS

Researchers

This research was completed between July and December 2004, by an international consultant, a national consultant and two Cambodian assistants. The Cambodian nationals collected data from the provincial areas as it was understood that market traders and local *kru khmer* would be more comfortable talking to Cambodian nationals and that their stories, of why they were asking questions, would be more feasible. So as to engage in conversation with traders, the national consultant and his assistants would sometimes pose as buyers of products for their personal use. This allowed them to gather information on price and availability. Prices quoted throughout this report are correct as of August 2004.

Interviews

Nine semi-structured interviews were held with individuals who had knowledge of either traditional medicine or trade in plant and animal species. They included representatives of government, non-governmental and research institutions, as well as TM practitioners. Informal conversations were also held with shop and market stall owners, *kru khmer*, former middlemen and a restaurant owner. Such conversations were stopped as soon as it was felt that they were becoming restless or uncomfortable with the nature of the questions. In some situations, previously arranged interviews were cancelled, or failed to obtain much information, because the interviewee became reluctant to answer questions. Interviews with the Director of the National Center of Traditional Medicine and the Director of the Association of Traditional Cambodian Healers (see below) are two such examples.

Observation

Shops and market stalls selling traditional medicine were visited in Phnom Penh, Kompong Speu, Ratanakiri, Stung Treng, Pursat, Battambang, Poipet (in Banteay Meanchey province), Phnom Kulen (in Siem Reap province) and Kratie. Additional information was also collected from Preah Vihear and Mondulhiri. Data was collected on the animal/animal part for sale and its price (for summary see Appendix 1) and whenever possible, time was also spent looking at the other products in the shop and recording product name, packet design, ingredients, number of packets observed, price and expiry date. Due to time constraints most data collection was confined to the provincial capital towns. Unlike Phnom Penh, it is rare to observe *kru khmer* business premises in the provinces because most *kru khmer* would practice from their own houses.



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Medicinal products sold at market

Observations from some areas include information on the sale of wild meat. Wildlife hunting in Cambodia takes place, in general, on a seasonal basis, with most hunting occurring between March and July, i.e. at the end of the wet season/beginning of the dry season (McKenney, *et al.*, 2004). Had this research been conducted just a couple of months earlier, it is possible that more wildlife would have been seen for sale in the markets, for medicine and for meat.

Information on what the animal species were used for in TM should not be considered definitive. Animal parts are often used for different medical reasons depending on the location, the instructions of the healer, the TM system, and the needs of the customer (Houn Chhum, *kru khmer*, pers. comm., August 2004). As well as this, accurate translation during this survey of body parts and diseases could not always be confirmed between the traders and healers, research assistants and international consultant; and use of the animal and/or plant part may differ depending on the market to which it is destined. For example, in Cambodia, the vine *Voer Romiet Coscinium* sp. is usually processed as an astringent. However, this vine is also exported in quantity to the Vietnamese TM market for its anti-diarrhoea properties.

Sources of Information

Further sources of information, which provided documents and access to examples of medicinal plants and traditional Khmer medicines were: the National Center of Traditional Medicine (NCTM), the Association of Traditional Cambodian Healers (ATCH), the Buddhist Institute Library, the Forestry Administration (FA), the Ministry of Health, the Cambodian Cooperation Committee, the Wildlife Conservation Society (WCS), WildAid (now Wildlife Alliance), the World Health Organization (WHO) and Medicam (the umbrella organisation for health NGOs working in Cambodia).

There was some concern amongst a number of interviewees that this research was of a political nature and therefore it was deemed by some to be too risky to enter into discussion. This was a particular problem while interviewing the permanent members of the ATCH. The role of the Association is to regulate *kru khmer* and their practices. According to the Director, it took a great deal of lobbying on his part before the government allowed the Association to function as a registered institution. He was therefore wary that any information he or the other permanent members divulged, that then went on to be published in a report, would be construed as exploiting the good faith agreement held with the government. Therefore, the Association members refused to discuss wildlife in medicine, or the possible decline in medicinal materials.

Prices quoted in this section are correct as of August 2004.

RESULTS

Popularity of Traditional Medicine in Cambodia

Cambodia has one of the world's lowest rates of use of a government health care system. The reasons for this are the difficulties accessing public health providers, due to factors related to culture, language, poverty, corruption and the healthcare system itself. This leaves people with a difficult choice; to access western medicine through private suppliers and risk spiralling into debt or, to use traditional remedies.

Compared to Western medicine, traditional medicine in Cambodia is inexpensive, accessible and trusted. While western medicine is accessible to the higher income groups, traditional medicine remains the only accessible healthcare for the majority of the population. Moreover, in recent times, traditional medicine has experienced a boost in popularity, even amongst the most wealthy of Cambodians, as people search for cures for seemingly incurable conditions, such as AIDS (Moun Vanna, ATCH, pers. comm., August 2004).

Plants and Animals in Medicine



Vender selling turtles



Forest products sold at market



Vine species on sale

It is not known for how long animals have featured in TKM, or what the origins are of the remedies in which animals are used. It is clear, however, that over time, animals, as well as plants, have become a central feature in both the clinical and spiritual branches of TKM.

In rural areas *kru khmer* function in a number of different ways. Those *kru khmer* who make their own remedies, either collect the raw materials for their medicines themselves, employ people to collect the materials, or buy the ingredients from suppliers (such as hunters, harvesters and middlemen). However, it is also common for *kru khmer* to only diagnose the patient and not provide the medicine or the materials for the medicine. Instead the customer is told what they need to find in the forest or purchase from a hunter, middleman or medicine seller (Sav and Maclean, 2001).

Some of the *kru khmer* interviewed during this research spoke of their efforts to replace animal ingredients with plant-based ingredients in their remedies and maintained that, generally, this did not reduce the effectiveness of the medicine.

It is usually very difficult to find out what plant and/or animal materials have been included in a remedy. *Kru khmer* prefer not to discuss the ingredients and "recipes" behind their medicines on the basis that one *kru khmer* could steal a successful recipe from another and that their knowledge represents an economic asset. Another theory was also put forward that *kru khmer* were reluctant to discuss traditional medicine materials with foreigners because of the risk of their remedies and materials being "poached" and marketed by western pharmaceutical companies (Huon Chhum, *kru khmer*, pers. comm., July 2004). This secrecy has also allowed

traditional healers to 'exoticise' their medicines by telling the customer that the ingredients came from distant and inaccessible forest and mountain regions. The stated need to travel and collect rare materials is often the reason given for the increasing prices of some traditional medicines. Another reason given for higher prices is the large number of ingredients in a single medicine. This is also used to imply that the medicine is effective and also that it is impossible to itemise ingredients on packets and labels (Sav and Maclean, 2001).

Previous Research into the Use of Wildlife in Traditional Medicine in Cambodia

"More than two-thirds of the sales value of wildlife products is from plants used mostly by Cambodians for medicinal purposes, but since 1989, following the relative recovery of the economy, there has been strong demand, especially from the Vietnamese, for animal products." (Martin and Phipps, 1996).

It is evident, from anecdotes and structured research, that many animal species have been used extensively for TM in Cambodia. Some species are highly valued for their medicinal properties and will be hunted primarily for this purpose. An example of this are the otter species of Cambodia (Poole, in Bennet and Rao, 2002), which are valued in helping to treat the conditions during labour and childbirth. Alternatively, animals used in medicine may have been caught opportunistically or for another purpose, such as food.

Prior to 1997, wildlife could be seen openly for sale in traditional medicine shops in every town in Cambodia (David Ashwell, Conservation International, pers. comm., August 2004) and throughout the 1990s, Cambodia was widely considered to be a major source for Tiger *Panthera tigris* parts for the international medicine markets (Martin and Phipps, 1996, Nowell, 2000, Srifa *et al.*, 1997). Reports suggested that Tiger bone sourced in Cambodia had only a limited domestic market and that the majority were shipped to Thailand and Viet Nam at ever-increasing prices (Cat Action Treasury (CAT)/Wildlife Protection Office (WPO) 1998, unpublished, in Nowell, 2000). Despite this, until at least 1996, it was possible to see alleged Tiger parts, such as hairless Tiger skin (for the relief of fever), on sale in Phnom Penh (Bezuijen, 1994; Martin and Phipps, 1996). A study by Heng Kimchhay (1999) found that in the late 1990s the medicinal trade in Tiger parts was still continuing in Cambodia but at a decreased level. Most of the Tiger parts sourced in Cambodia were being exported, while remedies in the domestic marketplace usually contained the bones of other animals and herbal substitutes. The reason given for this was that prices of medicine containing Tiger bone were too high for locals (Heng, 1999 in Nowell, 2000).

Cambodia has also been an important source, trans-shipment point and market for bear parts. There is limited domestic consumption and the main markets for bear parts harvested in Cambodia are Viet Nam, South Korea and China. In the early 1990s, bear gallbladders were fetching USD10 per gram, and in the late 1990s, adult live bears (Asiatic Black Bear *Ursus thibetanus* and Sun Bear *Ursus malayanus*) could be bought in Phnom Penh for USD700 (see also Mills, 1991; Suon, 1999).

In 1994, a TRAFFIC survey identified Phnom Penh, Neak Lung and Moc Bai (both on the main overland route to Ho Chi Minh city), Poipet (on the Thai-Cambodian border) and Banlung and Lomphat (in Ratanakiri province, on the border with Viet Nam), as the main retail sites for wildlife trade in Cambodia (Martin and Phipps, 1996).

In Phnom Penh, this survey located 22 shops selling wildlife products adjacent to O'Russe market, the principle area for the sale of TM in Phnom Penh. The wildlife parts sold in these shops for medicinal purposes included:

Asian Elephant <i>Elephas maximus</i> skin, for acne,	USD6 per kg
Smooth-coated Otter <i>Lutrogale perspicillata</i> tail, for labour pains,	USD45 per kg
Reticulated Python <i>Python reticulatus</i> bone, for fever,	USD3 per kg
Sun Bear <i>Ursus malayanus</i> bile, for fever,	USD1000 per kg
Tiger <i>Panthera tigris</i> bone, for rheumatism,	USD100 per kg
Tortoise sp. shell, for post-partum tonics,	USD6 per kg.

And in Poipet, wildlife parts seen for sale for medicinal purposes included:

Sunda Pangolin <i>Manis javanica</i> scales, for circulation of the blood,	USD12 per kg
Deer sp. penis, to enhance sexual performance,	USD8 each
Asian Brush-tailed Porcupine <i>Atherurus macrourus</i> stomach, for post-partum tonic,	USD3 each
Reticulated Python <i>Python reticulatus</i> fat, for skin disease,	USD2 per 200ml

(Martin and Phipps, 1996).

As recently as 2002, elephant parts were seen on sale in Phnom Penh and Stung Treng, some of which were being sold for medicinal purposes (Martin and Stiles, 2002, Suon and Ou, unpublished, 2003). Suon and Ou's survey also showed that elephant products, including skin, tails and teeth, as well as ivory, were often transported to Viet Nam by road on Route 78 and to Thailand on Route 6.

The Current Use of Wildlife in Traditional Medicine in Cambodia

Phnom Penh



Market stall

A total of 96 TM shops are known by the NCTM to be open for business in Phnom Penh. Twenty-two of these shops are TCM businesses, one sells TVM and the rest sell TKM. This figure does not give an accurate indication of how many traditional medicine practitioners there are in Phnom Penh because, as in rural areas, many will choose to practice from their own homes and will not report their activities. Of these 96 shops, the NCTM is aware that 56 do not have a license from the Ministry of Health to open business premises and manufacture and sell TM. Furthermore, most of the remaining 40 legal premises will still be making unauthorised medicinal products. The

definition of "unauthorised medicine" is, importantly for this research, one where the raw ingredients are not divulged to, or approved by the NCTM (Hang Sokhom, NCTM, pers. comm., August 2004).

It is notable that while reports were written in the mid 1990s that describe a large variety of species openly for sale for medicinal purposes in the markets and shops of the Cambodian capital (e.g. Bezuijen, 1994; Martin and Phipps, 1996) such variety and quantities of animals have disappeared from sight from these premises in more recent years. During the course of this research, 38 shops, 29 of which specialised in traditional medicine (TKM, TVM and TCM) were visited in central Phnom Penh. The majority of these were in the O’Russei market area (streets 166 and 217). A large variety of patented medicines and medicinal plants were on sale but no terrestrial animal parts were seen, (apart from dried frogs and pickled insects), with the exception of one TCM shop, which had eight jars of tonics containing snakes, including cobra sp, on display. However, various marine animals such as species of starfish, seahorse, (which proprietors report to be imported from Viet Nam), horseshoe crab and pipefish, in addition to fish stomachs, coral and ornamental seashells were seen for sale in numerous medicine shops. Marine species come under the authority of the Fisheries Department, not the Forestry Administration (FA). As such, they cannot be confiscated if these shops were to be targeted by the WPO enforcement teams, which are part of the FA. The presence of such wildlife suggests that firstly, medicine shops will display animal products if they feel they can do so without been harassed and secondly, that the demand for unprocessed animal products in medicine still exists.

In addition to the shops specialising in traditional medicine, ten pharmacies that sold modern and patented medicines were visited. Four of these are frequented by expatriates while the rest were open-fronted premises that catered to the Phnom Penh population in general.

In each of the shops, the researcher asked for specific products that feature in the Traditional Asian Medicine Identification Guide for Law Enforcers: Version II (Cameron *et al.*, 2004). In general, the patented medicines in these shops were manufactured and/or imported from China, Viet Nam or Malaysia. While these shops are now unlikely to display raw animal material (apart from marine animals as discussed above), patented medicines allegedly containing animal ingredients are openly displayed on the shelves. Of the medicines examined, none had passed their sell-by date and most had been manufactured in the last two years. This could suggest that there is a market for these products in Phnom Penh and that turn-around of the products is keeping up with supply. Although the researcher deliberately tried to time the visits to coincide with a quiet time of day, all the shops visited had customers when the researcher was present. Nobody was observed buying any of the products that were known to contain animal products. Some customers asked for specific medicines, while others discussed their ailment with the retailer and purchased what he suggested. In all of the TCM shops, at least one customer in each shop conversed with the proprietor in Chinese. Generally, all the customers appeared relatively well-off. All medicines, including those allegedly containing endangered animal products such as Tiger bone, were less than USD5 per item.

The researchers visited 19 TCM shops. Every one of these shops sold at least one patented medicine that features in the Identification Guide (Cameron *et al.*, 2004) or sold patented medicines that may contain CITES-listed species. They all sold dried plant material and some also had a medical consultation service. According to one proprietor, customers prefer to have medicines specially made for them rather than buy pre-packaged medicines, as these are believed to be less effective.

The researchers visited six TKM and four TVM shops. None of these currently sold patented medicines containing CITES-listed species.

On Street 130 in central Phnom Penh, there is a well-known shop that diagnoses customers and treats them with TKM. On the day of the researcher’s visit the shop was being supervised by the owner’s son. He said that his father had forbidden him to give any details – but he could confirm that they were still ordering in all kinds of unprocessed animal products. The owner would let the middleman know what he wanted and the requested animal parts would be delivered to his house. This included bear gall bladder. According to the son, one gall

bladder would cost his father USD300 in the late 1990s. He would not say how much it would cost now. At the time of the visit, there were three female customers waiting for a consultation. They were Khmer and appeared to be less well-off than the customers in the TCM shops.

Retailers of four of the TCM shops were asked if they had bear gall bladder in stock. All of them replied that they used to stock bear gall bladder but not longer did.

Annex 2 summaries the findings of the survey of Phnom Penh's pharmacies and TM retail outlets.

Kompong Speu town, Kompong Speu province



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Pre-packaged medicinal packets

In Kompong Speu town, four medicine stalls were found in the market. All of them display raw plant material and also some pre-packaged medicines in packets and bottles. None openly sold wild animal parts but when asked, one seller showed the researcher a porcupine (*Atherurus/Hystrix*) stomach hidden from view. In TKM, porcupine stomach is usually used to treat post-partum complaints. The same seller said a middleman had recently offered to provide her with bear gallbladder at a cost of USD300-500 per gallbladder, depending on its size. The seller told the researchers that she had declined on the grounds that it was too expensive for her; because

she would not have been able to confirm if the article was genuine or not; because she did not have a guaranteed buyer; and because she would be committing an offence under the Forestry Law.

The market vendors believe the middlemen to be bringing the wildlife from the areas of Kirirom National Park and the Cardamom Mountains, in south-western Cambodia.

Banlung town, Ratanakiri province

One souvenir shop was found selling animal parts in Banlung, Ratanakiri's provincial capital. Since protection from physical harm offered charms and amulets plays a part in traditional medicine, it was decided that the contents of this shop was important to include in the research. This shop contained:

- 10 canine teeth of Wild Pig *Sus scrofa*
- 10 amulets of unidentified animal bone
- 2 canine teeth of bear species
- 3 jaws of porcupine species (*Atherurus/Hystrix*)
- 6 gallbladders of python species

In the past, the shop sold otter skin. In TKM, otter skin is considered helpful during labour and childbirth. The shop owner explained that hunters only ever offered him the skin of small otters since the pelts of big otters were offered to middlemen who paid high prices and exported the pelts to Viet Nam.



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Market vendor in Stung Treng

The shop owner also said he had Slow Loris *Nycticebus coucang* specimens in his house selling for USD5 each. It is interesting to note that this is the same price quoted to the researcher for a Slow Loris in Ratanakiri in 1999. The trader used to sell porcupine *Atherurus/Hystrix* stomach but told the researcher that porcupines were less available in the rainy season because there is less hunting. He also told the researcher that he occasionally sells flying squirrel (probably *Petaurista*) specimens and the fat of Hog Badger *Arctonyx collaris*.

The same shop owner told the researcher that it was still easy to buy elephant tail hair, although none was currently available at his shop. Elephant tail hair is popular for rings and bracelets.

According to the shop owner, in February 2004, a WPMU enforcement team went to Banlung and confiscated merchandise from his shop. Much of the animal material for sale in August 2004 was purchased recently to replace the stock that had been confiscated in February. Wildlife confiscated by WildAid from premises in Banlung in February 2004 included:- Eld's Deer *Cervus eldii* horn, Smooth-coated Otter *Lutrogale perspicillata* skin, Sun Bear *Ursus thibetanus* claws and the fresh meat of Sambar *Cervus unicolor* and Red Muntjac *Muntiacus muntjak* (WildAid, *in litt.*, 2004).

There were three shops outside the market, which sold animal parts as well as gold and gems. In these shops it was possible to see canine teeth of Wild Pig *Sus scrofa*, hair of elephant and claw of bear (eight claws were seen in one shop). The shops owners said it was also possible to buy Tiger *Panthera tigris* canines, which could reach prices of up to USD120 each. It was not clear if these Tiger canines would be old or new and there is, of course, the possibility that they would be not be genuine.

Three hairdressers were also found that sold pre-packaged traditional medicines. These medicines had been brought to Ratanakiri from Phnom Penh. Animal parts were listed on some of the labels but the owners of the hairdressers were unaware if the animals were really in the medicine or not.

A *kru khmer* was interviewed in Banlung. He finds all his medicinal plants himself and shares the widely held belief that the root is the most effective part of the plant. He said he never uses animals in his remedies because they are expensive and hard to find. He is also a believer that all animal-based remedies have plant-based substitutes. This *kru khmer* has lots of customers and said that people return to TM after western medicine fails them. He used to be able to find the plants he needs near his house but now he has to travel much further, a situation which he blames on land encroachment. He said if a customer wanted to buy an animal-based remedy, he would advise the customer to purchase the animal from either a hunter or trader and make the remedy himself.

The researcher also visited a restaurant situated on the border between the Stung Treng and Ratanakiri provinces that regularly serves wild animal meat, such as muntjac sp., monitor lizard sp., Sambar *Cervus unicolor* and Banteng *Bos javanicus*. The restaurant owner explained that a recent crackdown on guns had resulted in local hunters changing their hunting techniques to poison and bamboo traps. This restaurant is very popular with military personnel (Heng Bunny, WWF, pers. comm., August 2004).

Stung Treng town, Stung Treng province

Three medicine shops in the central market of Stung Treng town were selling wildlife at the time of the researcher's visit. He counted 11 Slow Loris *Nycticebus coucang* specimens, 22 porcupine *Atherurus/Hystrix* stomachs, 20 pieces of Sambar *Cervus unicolor* skin, one Lesser Oriental Chevrotain *Tragulus javanicus* specimen and one muntjac (the latter two species being sold for meat). It is common for more wildlife to appear for sale in the afternoons as hunters arrive from remote areas.



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At market, loris for sale

The researcher was able to interview one *kru khmer*, who is ethnic Lao, in Stung Treng town. Most of his medicines are plant-based. He is finding it increasingly hard to find the plants he needs for his remedies and often has to pay someone to harvest plants for him from remote areas. Despite this, he says his client base is growing. He was not willing to discuss the use of animal parts in his preparations but did admit that he still included python and pangolin gallbladders and the horn of Gaur *Bos gaurus* in his remedies, all of which are used for cooling the body. He buys these animal parts from hunters. He believes that not all animals can cure disease but some, like python and pangolin, can cure lots of diseases.

Kratie town, Kratie province

Three shops were found in the central market of Kratie town that sold TKM and TCM. Only one of these openly sold animal parts and they were marine animals such as starfish (possibly used for hemorrhoids) and horseshoe crab. The shell of the latter is ground up, mixed with coconut oil and used to treat itchy skin. These species are transported from Kompong Som on Cambodia's coast. The vendor sells three to four starfish per day. One stall owner explained that only these marine animals were on display because of the concerns about enforcement. Other wildlife, such as loris species and Chamar Bar (which is used in remedies for rheumatism) were kept at vendors' houses. Chamar Bar is the Khmer name for flying squirrel although it can be used to describe the much rarer Sunda Colugo *Cynocephalus variegatus*. Chamar Bar specimens are often brought "to order". Customers request them and vendors then order them from middlemen who pay hunters to catch the animal.

Preah Vihear province

For the benefit of this research, informal data collection was also carried out by personnel from WCS working in Preah Vihear. Information collected from this remote northern province, which shares its borders with Thailand and Lao PDR, confirms that local demand for wildlife in traditional medicine is still high. Usually, the more common species, such as porcupine *Atherurus/Hystrix*, Slow Loris *Nycticebus coucang*, soft-shell turtle species and flying squirrel species are caught opportunistically when people are in the forest, tending their chamkar (i.e. non-paddy agriculture) or collecting non-timber forest products (NTFPs). The meat is consumed and the parts valued for medicine are dried and kept until they are required. Other species are purchased directly from the hunters. The smaller and less expensive animals are purchased whole, and the parts not needed for medicine are eaten. In the case of larger and more expensive species, such as Gaur *Bos gaurus*, the parts are sold into either the medicine or meat trade, via middlemen, who take them to Phnom Penh, Siem Reap or the border areas. Local *kru khmer* do not provide the medicinal parts of wild animals to their customers but advise them to collect them from the forest themselves or purchase from hunters. Wildlife traders from Lao PDR and Thailand frequent the border areas, particularly near the mountain temple of Prasat Preah Vihear and at the border market town of Anses, but most deal in wildlife for the meat markets. Species that are seen at these sites and thought to be for the meat markets include: wild pigeon, Wild Pig *Sus scrofa*, civet and flying squirrel species. One source mentioned that Sunda Colugo *Cynocephalus variegatus* was a very popular meat amongst Thai visitors. Its rarity has pushed the price up to THB600 (USD15) for one Sunda Colugo and it occasionally appears at markets near the border with Thailand.

One medicine stall was found in T'beang Meanchey, Preah Vihear's capital, that still regularly sold porcupine *Atherurus/Hystrix* stomachs, porcupine teeth, Lesser Oriental Chevrotain *Tragulus javanicus* jaws and Slow Loris *Nycticebus coucang* and Pygmy Loris *Nycticebus pygmaeus* specimens. According to the stall owner, she only stocked these species regularly because they were the cheapest to purchase from local hunters and she was concerned about how much she would be fined if FA officials found species of a higher value at her stall. Most of her customers are local people. Occasionally she sells wildlife parts to visitors from Phnom Penh who find it difficult to find the genuine article in the capital - for example, pig stomach is sometimes substituted for porcupine stomach. (Kong Kim Sreng, WCS, pers. comm., August 2004).

Pursat town, Pursat province

A total of seven premises were observed selling TM in Pursat town, one of which was selling TCM. The TCM shop did not stock any observable animal parts. The six premises selling TKM were observed selling the parts of 14 different species including the skin and shin bone of Southern Serow *Naemorhedus sumatraensis*, the foot of Red Junglefowl *Gallus gallus*, whole loris sp. and flying squirrel (probably *Petaurista*) and the carapace of Asian Box Turtle *Cuora amboinensis*. One vendor offered to sell what she said was bear skin. She also told the researchers that, given advance warning, she would be able to obtain a large bear gallbladder. Her selling price for this item was USD300. She would sell a small bear gallbladder for USD50. The same seller said she had recently sold a Tiger bone for KHR25 000 (USD6.25) per kg, although at that low price, (see Martin and Phipps, 1996), the veracity of this report is doubtful. The vendors said the source of this wildlife was from the Veal Veng area of Pursat province - an area in the centre of the Cardamom Mountains range.



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Local animal wine

Battambang town, Battambang province

Eight shops selling TM were found in Battambang town. In the shops selling TKM, it was possible to see cobra and other snakes in wine, starfish and turtle shell but most of the medicines seen for sale were pre-packaged in bags or bottles and therefore it was not possible to identify the ingredients. Much of this pre-packaged medicine had been brought from wholesalers in Phnom Penh. Although no wildlife was seen for sale in the TCM shops, local moto-taxi drivers said that all the TCM vendors sold wildlife including loris sp., snake sp, porcupine *Atherurus/Hystrix* stomach and bear gallbladder, but tended to do so "under the counter". According to the moto-taxi drivers, this wildlife was brought by middlemen from locations within Battambang province.

Poipet, Banteay Meanchey province

Two markets that sold wildlife parts were found in Poipet. One of the markets is located on the border with Thailand and its customers are mostly Thai nationals. This is a very big market and while five stalls selling wildlife parts were located, there may have been more. All these stalls were owned by Khmer nationals and they all said that the bear gallbladder, ivory and horn that they were selling openly were fake. This is supported by the low prices for these items – USD3.75 for one bear gallbladder and USD4.00 for one piece of elephant ivory. Five more stalls were found in the market in the centre of Poipet town. This market caters for Poipet locals and the stalls were selling starfish, horseshoe crab, loris sp. and porcupine *Atherurus/Hystrix* stomach. One vendor said she also had in her possession the gallbladder of a cobra, which she offered (but did not show) to the researcher for KHR60 000 (USD15). The terrestrial wildlife is reported by the vendors to come from the Anlong Veng area in Oddar Meanchey province.

Phnom Kulen, Siem Reap province

Phnom Kulen, in Siem Reap province, is one of Cambodia's most spiritually important sites. It is also very popular with both local and foreign tourists for its ruins, river carvings, waterfalls and forest. The mountain has numerous stalls scattered close to the main tourist and pilgrimage sites, which sell items for decoration and medicine. The horns, bones and teeth sold for souvenirs were so heavily carved, painted or varnished that most were impossible to identify by sight. The items displayed for medicine were usually old, fragmented and jumbled together in old boxes and plastic bags. However, items considered to have aesthetic quality were more prominently displayed. They included a bear skin and a skull that the stall owner said was a Tiger *Panthera tigris* skull. Also of note were some pangolin scales, an old and incomplete Leopard Cat *Prionailurus bengalensis* skin and skeleton, the Leopard Cat's gallbladder and two elephant teeth. The man selling the elephant teeth explained that these teeth were from an elephant that had died of natural causes. A possible reason why this information is offered is that parts of animals that have not been killed deliberately hold greater spiritual value (Martin and Phipps, 1996). Whole loris, East Asian Porcupine *Hystrix brachyura* quills, a pair of Red Muntjac *Muntiacus muntjak* antlers, a pair of Purple Swamphen *Porphyrio porphyrio* feet and the teeth of Wild Pig *Sus scrofa* were also for sale. Several stalls sold porcupine stomachs but they varied considerably in size, shape and colour and it is possible that while a few may have been genuine, the others were not.

Finally, the researcher counted 11 black, teardrop shaped gallbladders, all of which were about five centimetres long. The stall owners said they were all bear gallbladders. The prices quoted for these gallbladders ranged from USD30 to USD500. Although it should be noted that Phnom Kulen is visited by wealthy tourists, both local and from overseas, it would be highly unlikely to see genuine bear gallbladders in a market in Cambodia because firstly, the penalties, if caught, could be severe and secondly, most bear gallbladders are exported or sold to order. Since a customer for each bear gallbladder is almost guaranteed, it is doubtful that the stall owners would have been satisfied with waiting for customers to make the journey to the top of Phnom Kulen and therefore, these gallbladders are more likely to come from another animal species.

At first, most stall-owners said the wildlife was caught locally. This is said to add value to the item, since wildlife caught on Phnom Kulen would have inherited the spiritual properties of the mountain and therefore be more effective in medicine (C. Poole, WCS, pers. comm., 2004). Visitors also believe they are visiting a very "wild" site, so appreciate the authentic value of the wildlife. However, according to the guide, and this was eventually confirmed by the stall-owners, the majority of the wildlife for sale actually comes from the Anlong Veng area, Oddar Meanchey province. Traditionally a Khmer Rouge stronghold, Anlong Veng still has some relatively large areas of forest. However, the presence of the military and the high densities of firearms and landmines ensures that the area's wildlife is being steadily removed and taken directly over the border to Thailand or channelled through local and popular wildlife markets such as Phnom Kulen. The entire process - from hunting and transporting, to exporting and selling, is said to be co-ordinated by the army (Khoy Prorkrortey Neoung, ecotourism guide, pers. comm., Sept 2004).

DISCUSSION

Plants in Traditional Medicine

In Cambodia, relatively little research has been carried out on medicinal remedies and therefore the quantities and diversity of plants used in traditional medicine in Cambodia is unclear. Information collected for this research suggests that while there are some plants that are widely known to cure a variety of complaints, other plants are used according to the recipes of individual *kru khmer* or used according to the beliefs of different areas, ethnic groups and communities.



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Truei-Riaeng (Khmer) from Ramsar Site

In 2000, Pauline Dy Phon published the *Dictionary of Plants used in Cambodia*. This dictionary lists 1254 species of which 576 are described as having medicinal properties. The majority of these species have cultivated as well as wild sources and are found throughout a number of countries and are therefore not of known conservation concern (e.g. *Abelmoschus esculentus*, used in Cambodia as a poultice, *Ipomoea aquatica*, for fever, and *Zingiber officinale* for inflammation and dental problems). However, for a small minority of plant species known for their medicinal properties, anecdotal reports of the species as ‘rare’ or ‘common’ are often the only indicators of its availability as the conservation status of the species remains unknown. Examples of these species include *Altingia cambodiana* and *Gardenia angkorensis*. Furthermore, these reports rarely give insights into past or current trends of the use of the plant in TM, or into the causes of possible rarity e.g. due to loss of habitat or unsustainable extraction.

From discussions with *kru khmer* and traditional medicine researchers, and a review of the literature, it is clear that a significant number of plant species in Cambodia are in demand not only for their medicinal properties but also for the furniture and construction trades, posing further challenges in quantifying the effects of the TM trade on these species. Annex 3 gives details of the plant species with medicinal value identified during the course of this research that are possibly in decline in Cambodia. Where possible, the perceived causes of their decline are given in the table. It must be stressed, however, that there is no scientific basis for this data. All of these species, and probably many more, require further investigation to ascertain the actual nature and levels of decline.

One important consideration in the exploitation, and, therefore the conservation of medicinal plants, is the methods by which they are harvested (Marshall, 1998). Many traditional healers believe that the roots are the most effective part of the plant and it is often the roots that are in demand by medicine markets. Baird (1995) suggests that local users only take small parts of the roots and bark from individual plants in order to ensure future harvesting sustainability. However, high demand by international traders creates powerful incentives for local harvesters to extract entire root systems, preventing regeneration (Baird, 1995).

One example of a plant exploited for its medicinal value is known only by the local name of Plou Kgouk. This plant is in high demand in Thailand for its anti-ageing properties. According to the NCTM, middlemen pay harvesters in Cambodia KHR5000 (USD1.25) for every kg of Plou Kgouk and sell it to Thai businessmen for USD50 per kg. Plou Kgouk is now almost impossible to find in Prey Veng, south-eastern Cambodia, where it used to grow in the greatest concentrations (Hang Sokhom, NCTM, pers. comm., August 2004).

Another example is a yellow vine, known in Cambodia as Voer Romiet *Coscinium* sp. Yellow vine is found throughout Asia but is heavily exploited for medicinal use throughout its range. Well-known for its anti-diarrhoea and astringent properties, yellow vine has been extracted to the point of extinction (Outey Mea, IKH, pers. comm., Oct 2004) from south-western Cambodia, particularly from the Cardamom mountains and Bokor areas. The processing of the plant and its export is banned under Article 29 of the Forestry Law (Suon Phalla, pers. comm., Oct 2004). However, there is recent evidence that the vine is still collected from south-western Cambodia and used for medicinal purposes both in Cambodia and Viet Nam (Outey Mea, IKH, pers. comm., Oct 2004).

A third example is that of the Critically Endangered (IUCN 2004) *Aquilaria crassna*. This species is found in the Cardomom Mountains area of south-western Cambodia. By the late 1990s, the oil from Cambodia's *Aquilaria crassna* was internationally known for its high quality. The Ministry of Agriculture, Forestry and Fisheries declared a ban on the harvesting and processing of this tree in 1993, yet, in 1999 and 2000, over 40 tons of *Aquilaria* wood chips were confiscated from ships leaving Kompong Som port in south-western Cambodia, destined for Taiwan. A source from within the Royal Government of Cambodia knows of three *Aquilaria* processing plants that still operate in the Cardomom region. These plants are owned by one man, who pays unofficial "fees" to the provincial authorities to allow him to continue processing *Aquilaria* oil. These plants now produce far less *Aquilaria* oil than they did in the 1990s, because the tree is now so scarce, but the owner still makes the journey, every three to six months, from Phnom Penh airport to Singapore with small bottles of *Aquilaria* oil in his luggage to sell to dealers from the United Arab Emirates. It is also possible that he occasionally sells the oil to wealthy private customers within Cambodia.

A more comprehensive account of the use and trade of medicinal plants in Cambodia can be found in the second report contained in this document 'A preliminary investigation into the use and trade of medicinal plants in Cambodia' on p. 34.

Animals in Traditional Medicine

There is an unwillingness on the part of medicine sellers and practitioners to discuss the use of wildlife in their livelihoods. However, from discussions with Wildlife Protection Office officials, *kru khmer*, vendors and former middlemen, in addition to observations made in Phnom Penh and the provinces, it is possible to compile a minimum list of species that are allegedly used in traditional medicine (TKM, TCM and TVM) in Cambodia and/or are exported from Cambodia for the international medicine trade. This list can be seen in Annex 4. Where known, the part of the animal used in TM is also noted.

Dugong *Dugong dugon* and Mekong River Irrawaddy Dolphin *Orcaella brevirostris*

For international species conservation, the Dugong *Dugong dugon* and Mekong River Irrawaddy Dolphin *Orcaella brevirostris* are species of particular concern. These globally threatened species are highly valued in traditional medicine. The most recent confirmed report of a Dugong having been used for medicine was in 2001 when the tusks of an adult Dugong was sold to a dealer in Phnom Penh for USD200. Dugong tusks are valued for their medicinal and aphrodisiac properties. The skull and postcranial skeleton of the same Dugong had been cut into small pieces and sold for medicinal use (Beasley *et al.*, 2001). Additional, anecdotal evidence suggests that most parts of Dugongs can be used in traditional medicine - the oil is used for rheumatism, the bones for fever in children, the meat for consumption, the hair for tooth-ache and the tusks and flippers can be used to protect households from evil spirits (Hines *et al.*, 2004). Unlike dolphins, Dugongs are actively hunted, usually for their meat and medicinal value. It has been reported that Dugong parts have been exported from Cambodia to, at least, China and Viet Nam (I. Beasley, cetacean biologist, *in litt.* to N. Walston, 2004).

In Cambodia it is generally considered unlucky to deliberately kill a dolphin, but if a dead dolphin is found then the body parts are often used for TKM, for both livestock and humans. Examples include: dolphin bones ground into fine powder and placed in water for sick livestock or humans to drink; dried flesh hung in chicken coops to keep away evil spirits that cause chicken sickness; dolphin teeth placed in holes made in the horns of sick buffaloes; and dolphin teeth made into a necklace to be hung round the neck of a sick child (I. Beasley, cetacean biologist, *in litt.* to N. Walston, 2004). However, unlike Dugongs, it is not thought that the Mekong River Irrawaddy Dolphin *Orcaella brevirostris* is in demand by the international medicine markets.

Wildlife Trade

In 2001, the international NGO WildAid (now operating in Cambodia as Wildlife Alliance) sponsored the establishment of the Forestry Administration's Wilderness Protection Mobile Units (WPMU). These units confiscate wildlife from traders and other individuals within Cambodia and have kept records describing each confiscation since 2001. The records give details of the province in which the specimen was captured, the date of confiscation, species, quantity and body part. These records do not include information on why the specimen was captured (i.e. for the restaurant, pet or medicine trade etc) and whether the wildlife was to be traded domestically or internationally.

Appendix 4 summarizes the wildlife confiscated by WPMU since July 2001. Although it is not known what percentage of this wildlife was destined for medicine markets before it was confiscated, or what percentage of the overall trade in wildlife these confiscated individuals represent, these records provide one clear example of the wildlife species and parts that are in demand and have been exploited in Cambodia from 2001 through the present day.

Two threat analysis / stakeholder identification workshops conducted in September and October 2004, involving S project staff (involved in PLUP activities, wildlife monitoring and law enforcement), military police employed on the law enforcement teams, and Phnong guides associated with the project in Keo Siema district in Monduliri province (Nooren, 2004), indicate that "hunting for subsistence consumption and trade" is the predominant threat to local wildlife (compared to logging and agriculture) and a wide range of people in the area are involved in wildlife trade, including the border police, local communities and ethnic Vietnamese. Each group had interests in specific species as did the nine wildlife middlemen who were identified as working in the district. Some hunters and traders, for example, have a focus on turtles and ground-dwelling birds, such as the CITES-listed Green Peafowl, *Pavo muticus* (WCS Cambodia, unpublished data, November 2004).

Advertising and Marketing

Animals are still depicted on many packets, bottles and sachets containing traditional medicine. According to *kru khmer*, animal images and names do not indicate the ingredients in the medicine but are used as an attraction and as branding to indicate the effectiveness of the medicine. The beliefs that medicines containing animal derivatives are effective appear to remain entrenched in Cambodian society. A survey carried out in 1994 discovered that the popularity of a so-called "Loris wine" had dropped when it was rumoured to be mass-produced without the use of loris ingredients (Martin and Phipps, 1996). A *kru khmer* in Phnom Penh, interviewed for this research, said that he had given up using animal products on the grounds that they were too expensive and too hard to find. Indeed, with the exception of one tonic containing an unspecified toad, no evidence was found of the use of animals in his retail premises or workshop. However, on the label of his plant-based post-partum tonic it reads, "works in the same way as porcupine stomach". Another *kru khmer*, who has shops in Phnom Penh, Battambang and Oudong, also uses animals as a marketing strategy, saying in his advertisements in popular magazines that "No synthetic substances are used in my remedies, only natural ingredients, such as plants and the skin and gallbladders of animals." (Anon., July 2004b). This clearly wealthy

kru khmer offered to sell a bottle of his tonic containing gallbladders to the researcher for KHR45 000 (USD11.25). As a final example, a third *kru khmer*, located in central Phnom Penh, makes medicine for rheumatism, which, according to the label on the bottle contains seahorse, turtle carapace and *Gekko gekko*. This man's remedies are considered false and not endorsed by the National Center of Traditional Medicine. Whether or not his remedies do contain these species remains unverified, but the fact that such wildlife is still used as a marketing strategy is indicative of the continued existence of the beliefs in the potency of animal parts in medicine.

Captive-Breeding and Cultivation



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Captive-bred crocodiles

Officially, the only animal species bred in Cambodia for commercial use are the Siamese Crocodile *Crocodylus siamensis* and the Long-tailed Macaque *Macaca fascicularis* (e.g. Jelden *et al.* 2005). What proportion, if any, of these farmed animals that end up in the international medicine trade is unknown. The only cultivated medicinal plants found during this research were those planted for research purposes at the NCTM, and it is possible that some are cultivated at the household level. Potentially, the flora and fauna of Cambodia is very attractive for both domestic and international markets, since, in traditional medicine, the medicinal value of plants and animals harvested from the wild is often considered to be higher (Nooren and Claridge, 2001).

The Export of Cambodia's Plants and Animals for Traditional Medicine

Cambodia is situated between Thailand and Viet Nam, both of which have large domestic markets for traditional medicines and also close trade links with other major consumers of TM in the region (Baird, 1995). A study on the potential for cultivating and marketing medicinal plants, conducted by the Institute of Khmer Habitat (IKH) in 2004, stated that at that time no licenses had ever been issued by the Ministry of Health for the export of medicinal plants (Outey Mea, IKH, pers. comm., October 2004). However, the trade in wild animal and plant material for the international medicine markets is highly lucrative and it is likely that with its porous borders, its proximity to the major traditional medicine markets of Asia and its lack of enforcement, Cambodia's flora and fauna are being illegally exported in significant quantities. For example, data collected on import duties during a joint TRAFFIC and WWF survey for WWF's Asian Rhino and Elephant Action Strategy (AREAS) showed that in 2001/2, cross-border wildlife trade between Ratanakiri province and Viet Nam had increased, compared to other border crossings in other provinces. A senior member of Ratanakiri's provincial forestry department estimated that as much as 8000 kg of wildlife products had been illegally exported across the Ratanakiri border into Viet Nam in 2002 (Suon and Ou, unpublished, 2003).

Chelonians (turtles and tortoises) are often documented as coming under particular threat from TCM, and other TCM-based medicine systems, for the wide range of diseases and symptoms that chelonians and their parts can treat (Jenkins, 1995). Significant numbers of some turtle species that are traded through Viet Nam to China, are thought to originate from Cambodia e.g. Elongated Tortoise *Indotestudo elongata*, Big-headed Turtle *Platysternon megacephalum*, Southeast Asian Box Turtle *Cuora amboinensis* and Yellow-headed Temple Turtle *Hieremys annandalii* (Jenkins, 1995, Nash, 1997, Stuart *et al.*, 2000; see also Compton and Le Hai Quang, 1998). Trade routes and the means of transport between Cambodia and the rest of the region are likely to be numerous and varied.

High prices from foreign markets for the parts of rare animals and medicinal plants are affecting the local, and in many cases, sustainable use of Cambodia's natural resources. Attractive prices offered by middlemen may encourage local communities to harvest their natural resources, possibly at the detriment of their own health. The export market encourages unsustainable harvesting and, as demonstrated by the example of Plou Kgouk, the local communities receive less benefit than those traders who sell the plants and animals in the international markets.

From data collected in the 1990s, it is evident that for many species used commonly in TCM preparations, domestic supplies in China fell short of demand. Such species and species derivatives include pangolin scale, tortoise carapace and plastron, soft-shell turtle carapace, rat snakes, Banded Kraits *Bungarus fasciatus* and geckos. Assuming that demand for such species is still rising in China, supplies from other countries are likely to be called upon to supplement domestic resources (Guo *et al.*, 1996). Indeed, in the 1990s, the Lao PDR Department of Forestry prevented the export of large quantities of *Gekko gekko* to Thailand (and from there, for export to Hong Kong and Taiwan) for use in TCM (Baird 1995). Similarly, large quantities of pangolin scales were also exported from Lao PDR to Thailand, again for TCM use in the late 1980s and early 1990s (Baird, 1993). Large amounts of wildlife were shipped from Cambodia to China during the Pol Pot regime, including Tiger *Panthera tigris* products (Kiernan 1996 in Nooren and Claridge, 2001) and it was alleged that in 1996, between two and four tons of turtles were flown to China from Phnom Penh (Yoon, 1999 in Nooren and Claridge, 2001). Within China's huge population there is growing ability to pay for expensive products and an increasing demand for TCM. It is therefore likely that the pressure on wild-caught wildlife from other countries to help satisfy this demand will increase.

In January 2004, Cambodia entered into an agreement with China entitled *Cambodian Products Enjoying Special and Preferential Tariff Treatment Provided by the People's Republic of China* that allows many Cambodian-sourced products to be exported to China without tariffs. Under this agreement, dried pipefish, *hippocampi*, tuna and sharks' fins are listed specifically, but the agreement allows for almost any plant or animal to be traded, under such sections as; "plants and parts of plants used in pharmacy," "plants and parts of plants used in perfumery," and "all other meats." This agreement acts to facilitate the trade of wildlife from Cambodia to China, much of which has application in the Chinese TM industry.

CONCLUSION

Traditional medicine, in many forms, is still widely used in Cambodia. In some parts of rural Cambodia, TM is the only form of health care available. This ensures that the traditional beliefs in the healing properties of animals, as well as plants, continue to exist and that plants and animals are still exploited for medicinal purposes. At the rural household level, more common wildlife is often caught opportunistically and the parts used for traditional medicine are dried and kept until needed. Alternatively, local people will buy what they can afford from hunters.

Also at the household level, medicinal plants are either harvested from the wild by the individual, purchased from a medicine seller or occasionally provided by the *kru khmer* in raw or pre-packaged form. *Kru khmer* have noted that some medicinal plants have become harder to find and that it takes longer and involves greater distances before they are found.

Less common, and thus more expensive animal species are now beyond the spending power of local people to use in their medicines. Even if they were to catch the species themselves, it is likely they would sell it to a middleman, rather than keep the medicinal parts within the household. The traditional healers interviewed for this research appear to recognise and respond to the public's belief in the healing properties of animal parts but find animals too expensive to use themselves and will now only manufacture plant-based remedies.

The wildlife seen for sale at markets is likely to only represent a tiny portion of that which is traded for the domestic and international medicine markets. Most of the wildlife involved in the medicine trade is stored in traders' houses, or hidden in containers awaiting export (Suon Phalla, pers. comm., August 2004). Recent investigations in Monduliri province suggest that middlemen purchase wildlife from hunters, and then, to avoid detection, leave the specimens with the hunter in the forest until a designated collection day (WCS Cambodia, unpublished data, Nov 2004). Further evidence that the demand for animals in traditional medicine still exists in Cambodia is shown by the presence of marine animals and cheaper terrestrial animals for sale in medicine stalls all around the country. These species are either beyond the limits of the FA's enforcement activities or are considered common enough to be easily replaced, if confiscated, or affordable, if fined. Questioning of the medicine stall owners revealed that while these species may be the only ones on display, other, more valuable species are still available, but tend to be concealed. More significantly, the parts of particularly valuable species, such as bear gallbladder, are also apparently available, but it appears that the trade in these species exists on a "to order" basis. One of the reasons for this is possibly that the prices for these animal parts are now so high, that the sellers prefer to only purchase from the middlemen if they are confident they have a buyer.

Although it appears that the demand for wildlife in medicine is as strong as ever, pre-prepared remedies actually containing animal derivatives are usually now only available to the wealthy. Within Cambodia, wealthy nationals, while utilising western medicine, continue to consume TM remedies containing wildlife. Such products are available to them through traditional healers, traders and at sites specialising in the sale of traditional medicines. For those with enough money, it is also possible to employ these channels to order specific wildlife species. As the Director of the Association for Traditional Cambodian Healers said: "If you are very sick, and you believe that an animal can cure you, then you, or your doctor, can get it. It would be difficult, and expensive, but it would be possible" (Moun Vanna, ATCH, pers. comm., August 2004).

Moreover, as wild fauna and flora resources in other consumer countries diminish, it is likely that the plants and animals of Cambodia are being used to help satisfy the demands of the international medicine markets. Exporting wildlife from Cambodia has become highly lucrative and with the country's porous borders and lack of capacity to enforce the law, it is still a relatively easy activity to undertake. And if Cambodia is losing its plants and animals to the international medicine markets, then the vast majority of Cambodia's people are in danger of losing their only source of healthcare, as well as control over their traditional knowledge.

RECOMMENDATIONS

This research has learnt that wild animals from Cambodia are being used in TM. It is also clear that medicinal plants are used on a daily basis at the household level, and some species may be in demand by the international medicine markets. Although this research has not determined whether the medicine trade is the overriding threat to Cambodia's flora and fauna, a significant number of its plants and animals are affected by the trade to some degree. For some species, such as tortoises, turtles, Sunda Pangolin *Manis javanica* and bear species, the medicine trade is probably playing a key part in their decline. For others, such as species of deer, reptile and cat, the medicine trade is exacerbating the threats already felt by these species through the meat, skins and trophy trades and the loss of their habitat. It is also evident that TM is enjoying a popularity boom on a global scale (Anon., 2000). While this may have some positive effects on the use of wildlife in medicine, through education, research and enforcement, it also doubtless encourages uneducated and unscrupulous traders and practitioners who seek to capitalise on the flourishing demand for exotic cures and rare ingredients. Thus, it is essential that efforts be made rapidly to limit the impact the medicine trade is having on Cambodia's animal and plant life. As a result of this research, the following recommendations are made:

- **To conduct further research.**

Future research should be led by the following priorities:

- A need for better understanding of the dynamics of domestic and international trade in plants and animals from Cambodia
- A need for additional investigation into the restaurant trade.

Better understanding of the dynamics of domestic and international trade in plants and animals from Cambodia:

There is so much to be learnt about the trade in wildlife for the TM markets. For example, it is not known who the major stakeholders are in the trade of plants and animals for TM. At the local level it is important to determine whether it is *kru khmer*, hunters, specialised collectors or local people (collecting for their own use) who are responsible for extracting most of the raw materials from their wild sources. There is also insufficient information about middlemen and little is known about who controls the passage of supplies to the domestic and export markets.

Further research into this topic requires increased and sustained co-operation with those NGOs, government departments and individuals who gather information regarding wildlife trade, either as part of their remit or indirectly, as part of their research. For example, conservation organisations in Cambodia, such as WCS, WWF and WildAid are collecting data on wildlife trade on a continuous basis, yet this data is not ordinarily shared between the organisations. Sharing such data will permit a more comprehensive understanding of the national situation of illegal trade and, with respect to medicinal plants help lay the foundations for a clearer understanding of the existing and potential exploitation of Cambodia's medicinal plants. TRAFFIC, with its experience of monitoring the trade in plants and animals, could play a lead role in collating this data for the benefit of all parties in Cambodia and perhaps even using this data to link with similar information resources in the region.

One approach to learn more about the illegal trade of plants and animals for traditional medicine could be to conduct pilot projects on specific species and to follow the trade route from their harvesting from the wild to their sale into the medicine trade. The Sunda Pangolin *Manis javanica* is one such species that is known to be affected by the TM trade and is of current conservation concern. Focussing on such species will shed light on many of the significant aspects of the illegal trade for TM, such as transport routes, middlemen and markets, which affect all species. Some case studies for several plants species are outlined on pp 41-53.

The restaurant trade

Data collected during this study and data available from other sources, such as WildAid, shows that Cambodian wildlife is in demand for the meat trade. Just as with the medicine trade, wildlife harvested for its meat will be sold within Cambodia and to markets abroad. The close ties that food has with traditional healing, i.e. wild meat is eaten for strength, to restore the balance of the body, to increase sexual prowess etc, suggest that it would be logical to examine the meat trade and medicine trade together, since the two are likely to have a significant impact on Cambodia's wildlife and both can be tackled with similar education, training and enforcement campaigns.

- **To work closely with the Royal Government of Cambodia, particularly:**

- the Customs Department, Ministry of Finance
- the Forestry Authority, Ministry of Agriculture, Forestry and Fisheries
- the Department of Drugs, Food and Cosmetics, in the Ministry of Health

Customs Department

It is essential that Customs staff and other government personnel at border posts have the capacity to recognise and apprehend wildlife shipments. This capacity will require training in animal and plant identification, a greater familiarity with wildlife laws and sub-decrees, and the financial and institutional support from the relevant Ministries in Phnom Penh and from relevant NGOs.

Forestry Authority

Personnel from the FA who are responsible for monitoring markets, middlemen, hunting activities and trading posts should receive training and support to be able to enforce the Law on Forestry. This will require, for example, the publication and distribution of the Ministerial Decree, which will categorise species as "common" or "endangered". Training is necessary in animal and plant identification and there needs to be local-level support to enable FA personnel to implement the legal processes. Without both institutional and financial support for local FA personnel, traders who deal illegally in plant and animals species will always be in a position to negotiate their passage through the wildlife markets.

Department of Drugs, Food and Cosmetics

The import and export of raw materials for traditional medicine comes under the jurisdiction of the Department of Drugs, Food and Cosmetics, in the Ministry of Health. It is important to learn more about the policies of this department, particularly with reference to the Sub-decree on the Import, Export and Commerce of Traditional Medicine in the Public Sector (April, 1998). Information about medicinal plant exports or the exports of pharmaceuticals made from medicinal plants sourced in Cambodia can only be learnt if TRAFFIC approaches the relevant parties through the appropriate official channels.

- **To work closely with the National Center of Traditional Medicine and with *kru khmers***

Despite its limited budget, NCTM still conducts field trips to sites of importance for medicinal plants and plays an active role in regulating the activities of *kru khmer* in Phnom Penh. Many of the staff at the center are practising *kru khmer* and as such have an understanding of the changes in the availability, prices and demand for species. Currently, the use of plants and animals in TM usually occurs in different combinations and in different forms, such as powders and tonics. This, and the tendency for *kru khmer* to keep their recipes secret, leads to problems of identification and verification of what is commonly used and valued. A working relationship with NCTM and a number of selected healers located in different parts of Cambodia, particularly near important sites, will help to develop an understanding of the availability and the levels and nature of exploitation of species and help guide further research into the conservation status of specific medicinal plant species.

A PRELIMINARY INVESTIGATION INTO THE USE AND TRADE OF MEDICINAL PLANTS IN CAMBODIA

David Ashwell

INTRODUCTION

In Cambodia, relatively little published research has been carried out on medicinal plant remedies and therefore the quantities and diversity of plants used in traditional medicine in Cambodia is unclear. Information collected for this research suggests that while there are some plants that are widely known to cure a variety of complaints, other plants are used according to the recipes of individual *kru khmer* or used according to the beliefs of different areas, ethnic groups and communities.

In Traditional Khmer Medicine, the number of plant species used, as described in individual studies of plant species, generally varies from about 200 to over 550 species (eg. Martin 1971, Dy Phon 2001, and Kham 2004). However, some estimates place the number of medicinal plant species at over 1000 species, or about 40 percent of Cambodia's flora. In addition, some medicinal plant products available in Cambodia are imported. This extensive use of medicinal plants and their products within TM systems raises concern for the sustainability and legality of the trade in these species, and for the survival of some of these species in the wild.

This paper endeavors to develop an overview of the use and trade of medicinal plants in Cambodia with the following objectives:

- To elaborate upon some of the major domestic and international markets for some focal species products and the trade routes to those markets.
- To identify plant species that are likely to be unknown or potential threats from either the domestic or international traditional medicinal markets.
- To interpret the significance of the focal species and field surveys within the context of the body of knowledge of Cambodia's medicinal plants and the relevant regulatory instruments.
- To identify and discuss knowledge gaps in the overall trade scenario.
- To comment upon sites of elevated conservation value in Cambodia based on the presence of threatened, or potentially threatened, medicinal plants.
- To make clear recommendations to policy makers as to how additions/amendments to current legislation can be made to improve the protection of certain key species/products.

METHOD

This study comprised of three activities (i) A literature review and compilation of a database on the diversity and conservation significance of medicinal plants used in TKM; (ii) complementary targeted field assessment of a small number of species in the trade where investigators follow and document the market chain; and (iii) collection of supporting information through discussions and interviews with relevant institutions and other stakeholders including those directly involved in the market chains.

Database Development

The first step in the research behind this report involved the preparation of a credible list of medicinal plant species along with matching data on their origins, principal habitats, life form, relative abundance and international conservation significance as described in the CITES Appendices and The *World Conservation Union (IUCN) Red List of Plants* (2006). A number of concerns and constraints to the development of a useful database based upon accurate data were identified. These include the current lack of a main source of documented botanical information and the limited, albeit increasing, capacities in related botanical and pharmacological fields.

A database recording the diversity and conservation significance of Cambodia's medicinal plants was developed using Microsoft Excel. Data was derived from the key published accounts by Petelot (1952, 1953, 1954a and 1954b), Douc (1966), Martin (1971), Matras and Martin (1972), Hahn (1978), Dy Phon (2001) and Kham (2004).

The database was developed by combining data from the different publications following standardization of data for each attribute. This was first done for the "names-in use" and synonyms presented in these documents. Standardizing the taxonomy of the species described in all of the documentation used was key to establishing the true number of species concerned, and to enable data from different sources to be compared and combined as relevant. For each other attribute (origin, habitat etc.) all of the classes used in the different publications were aggregated then classified into a broader set of categories that were used for analysis and comparative purposes.

For a more detailed account of issues relating to the database development, and its content, please refer to Appendix 5.

Assessment of Vulnerability of Species

The second step was to conduct an assessment of the vulnerability of medicinal plant species. While a field based study was considered as a basis for the assessment of vulnerability, this was not conducted due to the size of such a survey and the likelihood of misleading results due to:

- Interviewees are generally reluctant to give this information or sometimes give conflicting information so as to protect their interests.
- The validity of market surveys is complicated by difficulties in identifying material with any taxonomic certainty.
- Comprehensive or reliable data upon distributions of most species within country are lacking.
- Many reports of the rareness or loss of species pertain to limited areas and are unlikely to reflect upon their national status.



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Conducting market surveys

Assessment of vulnerability was conducted by allocating each species to one of four priority groups reflecting potential levels of threat. The groups were identified by characterizing species by the level of endemism, their principal habitat requirements and – in the case of trees and large woody vines – their relative abundance as described by Dy Phon and Rollet (1999). Further discussion on priority group criteria and species composition of these priority groups is presented in Appendix 6.

Market Chains of Select Species – Case Studies

Documentation of market chains was designed and undertaken in a manner that complements and builds upon the broad market surveys described in the first TRAFFIC report ‘A Preliminary Investigation into the Use and Trade of Wild Plants and Animals in Traditional Medicine Systems in Cambodia’. Surveys described in the first report documented the existence and activities of a large number of traditional medicine shops. It also encountered a range of constraints concerning the reliability of information given by informants, as well as difficulty in obtaining enough suitable informants for discussing this trade on a national basis. The limited time and resources available required that field surveys focus upon documenting the market chains of seven Cambodian plant species rather than more general market surveys.

Fieldwork to gather relevant data on the trade and use of seven focal species was undertaken between 18th October and 18th November 2006. The principal steps in this activity were the:

- Development of an initial list of species of interest.
- Subsequent selection of a short list of species of interest and their associated source areas following a brief survey of markets in Phnom Penh. These focal species were selected to facilitate the discussion of the overall trade scenario in the context of the reviews of plant use and the regulatory framework.
- A series of field investigations that focused on the selected plants from the source areas to their destinations.

A team of three Khmer surveyors were hired to document these market chains. Surveyors were selected who had experience in undertaking low key field investigations. The initial list of plants to be considered for short-listing was developed following brief communication with national and international staff of natural resource management and community health related projects. A two-day survey of the medicinal plant shops at O’Russe and Sereypheap markets in Phnom Penh was then made by the investigating team to seek information on the likely source areas of these species. Upon discussion with the investigating team a short list of ten species together with their likely source areas was finalized. This selection was based upon the desire to facilitate discussion upon differing aspects of the trade in medicinal plants and the perceived likelihood of success. Aspects of the trade of interest included different source areas and destinations, domestic and international trade, plant parts utilized, general or special plants or products, overall value, conservation significance and threat.

The team embarked upon field investigations in four key areas. Initial investigations were centred upon:

- Battambang and Pursat provinces
- Kampong Thom and Oddar Meanchey Mondolkiri provinces
- Kampong Chhnang and Kampong Speu provinces
- Mondolkiri province

Team members separated and travelled to different areas to initiate investigations in a manner appropriate to the particular focal species. Once the focal species had been located the team undertook further investigations to follow the species in trade. Co-ordination of the movements of the team members was done by telephone whenever possible.

In the case of the perennial herbs initial investigation focused upon discussions with traditional medicine shops, taxi drivers and others involved with transport or sale. This led to the identification of key source areas which were then visited in order to meet with collectors. A similar approach was appropriate for *Cinnamomum cambodianum*. Conversely, a different approach was required for investigating *Dysoxylum loureiri* and *Coscinium usitatum* as they are both high value products that are collected and traded internationally and illegally. In these cases more care was required to seek out respondents that were willing to provide useful and reliable information.

Information was collected from local villagers and collectors, *kru khmer*, middlemen acting as traders, wholesalers and retailers as well as those involved in the transport and storage of these products. No information upon major factories that use large quantities of certain plants/plant products was provided during the course of these interactions.

Prices quoted in this section are correct as of October - November 2006.

Interviews upon Collection, Use, Trade and Legislation

These reviews and field studies were supplemented by semi-structured interviews and informal discussions with a range of people within Phnom Penh, provincial towns and other areas related to the development of the case studies in trade. These include collectors, middlemen/traders, wholesalers and retailers, traditional medicine practitioners (*kru khmer*) as well as some members of the working group co-ordinated by the National Center of Traditional Medicine, government officials and members of the NGO community.

For the most part these discussions served to guide the development of the case studies though it also provided additional information upon international trade to Viet Nam and transport arrangements. As in the first report there was some concern interviewees might consider this research was an 'imposition'. Therefore, work in the field was undertaken in a low-key manner, sometimes resembling that of undercover work. Conversely, sources in Phnom Penh were approached quite openly upon those aspects of the work that it was felt they would comment upon.

Over a dozen government officials from the Ministry of Agriculture, Fisheries and Forestry, Ministry of Environment, Ministry of Health were approached in order to identify whether any legislation or other regulatory instruments had been promulgated since 2004 with a view to updating information provided in the first report. This was complemented by discussions with a further eight NGO personnel and two consultants associated with donor-supported programs relating to commerce and trade.

RESULTS

Diversity and conservation significance of medicinal plants

Photographs © Antoine Schmitt



Dillenia ovata (*Mloobis*)



Lagerstroemia sp. (*PouLong*)



Afzelia xylocarpa (*beng*)

Overall Diversity and Origins

This study documents 824 species and confirms that a large number of Cambodia's plant species contribute to an extensive pharmacopoeia of traditional Khmer medicines. A summary of the abundance of Cambodia's medicinal plants by region of origin is presented in Table 1. A summary of cultivated and naturalized species along with those with unknown habitat preferences is presented in Table 2. Between 581 (70.5%) and 634 (76.9%) of these 824 species are native to Cambodia. These figures indicate that medicinal plants constitute an estimated 35% of Cambodia's known native flora, or 25% if introduced species and those without distributional data are included in the calculations.

Table 1

Total number of Cambodia's medicinal plant species by region of origin.

ORIGIN	Total
Endemic and "Near-Endemic"	57
Cambodia, Laos and Viet Nam	44
Cambodia, Laos and Viet Nam and one other country	25
Indochinese Peninsula	50
Indochinese Peninsula and possibly further afield	43
Cambodia and possibly further afield (additional data not available)	9
Widespread in Asia	253
Old World Tropics	55
Pan Tropical	45
Unknown Origins	53
Introduced	190
Grand Total	824

Sources: Petelot (1952, 1953, 1954a and 1954b), Douc (1966), Martin (1971), Matras and Martin (1972), Hahn (1978), Dy Phon (2001) and Kham (2004)

A total of 190 species have been introduced from a wide variety of regions including the tropical Americas, Brazil, the Caribbean, China, Egypt, Europe, India, Indonesia, Japan, Korea, Madagascar, Malaysia, Mauritius, Mexico, Persia, South America, Sri Lanka and West Africa as well as from neighbouring countries within the Indochinese peninsula. Of these introduced species, 152 species are cultivated, 23 species have become naturalized while two others lack habitat descriptions (Table 2). Another 21 species, including 19 species that are widespread outside Cambodia and two that are from either Cambodia or a neighbouring county, are also cultivated. It is unclear whether these were domesticated locally or introduced following domestication in other countries.

This pharmacopoeia consists of a wide variety of life forms including 204 trees, 268 shrubs and sub-shrubs, 77 lianas including climbing palms, 18 freestanding palms, 214 herbs and 13 other species types including aquatics, bamboos epiphytes and parasites. The group of native species is composed of 179 trees, 118 shrubs and sub-shrubs, 66 lianas including climbing palms, 13 freestanding palms, 108 herbs and 12 other species. Introduced species include 25 trees, 65 shrubs and sub-shrubs, 9 lianas, 3 freestanding palms, 87 herbs and a bamboo.



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Medicinal plant from Stung Treng province

Table 2

Cultivated and naturalized species along with those with unknown habitat preferences.

ORIGIN	Cultivated	Naturalized	Unknown Habitat
Endemic and "Near-Endemic"	1	-	-
Cambodia, Laos and Viet Nam	1	-	-
Cambodia, Laos and Viet Nam and one other country	-	-	-
Indochinese Peninsula	-	-	2
Indochinese Peninsula and possibly further afield	-	-	4
Cambodia and possibly further afield	-	-	-
Widespread in Asia	11	-	3
Old World Tropics	1	-	1
Pan tropical	7		
Unknown Origins	8	1	43
Introduced	152	23	2
Totals	181	24	56

Sources: Petelot (1952, 1953, 1954a and 1954b), Douc (1966), Martin (1971), Matras and Martin (1972), Hahn (1978), Dy Phon (2001) and Kham (2004)

Principle Habitats of Medicinal Plants

Detailed Tables of Principle Habitats and Distribution Patterns of Cambodian medicinal plants are presented in Appendix 6. A summary is provided below in Table 3.

Table 3

Principle habitats of Cambodia's medicinal plants

Habitat		Number of Species
Narrow Habitats	Narrow habitats	49
Dense Forests	Dense forests only	129
	Dense and semi-dense forests	11
Semi-dense forest	Semi-dense forests only	9
Dense and Open Forests	Dense and open forests	13
Open Forests	Open forests only	77
	Open forest and semi-dense forests	3
	Open forest and open areas	7
	Open forest and narrow habitats	7
Secondary Forests	Secondary forests only	62
	Dense forest/secondary forests	36
	Secondary and narrow habitats	8
	Secondary and open areas	3
	Secondary and semi-dense forests	4
	Secondary and open forests	7
Other Areas	Open areas	72
	Waste lands	18
	Wet areas	34
	Wide spread	14
Crops, weeds, etc	Cultivated	181
	Naturalized	24
	Unknown habitats	56
Total		824

Sources: Petelot (1952, 1953, 1954a and 1954b), Douc (1966), Martin (1971), Matras and Martin (1972), Hahn (1978), Dy Phon (2001) and Kham (2004)

The principal points to be taken from this data are:

- A significant number of species (49) are limited to narrow habitats. These habitats include beaches, flooded forests, limestone areas, mangroves and rear-mangroves.
- Larger numbers of species are associated with the more extensive principle forest types; these include dense forests (189 spp.), secondary forests (120 spp.) and open forests (114 spp.) while low numbers are associated with less extensive semi-dense forests (16 spp.).
- A high proportion (68.3%) of species associated with dense forests are restricted to dense forests only. Other species exhibit wider ecological amplitude and are also associated with semi-dense, secondary and open forests as well as some narrow habitats.

- The greater diversity of medicinal plants derived from dense forests than from other types is even more evident when comparisons are based upon those species that are limited to only one of these principal forest types. Here the difference between dense forests (129 spp.) and the other forest types increases. Secondary forests (62 spp.) and open forests (77 spp.) provide moderate and comparable numbers of medicinal plants while low numbers are associated with semi-dense forest (9 spp.).
- Other areas including agricultural lands, local swamps, unproductive lands and villages are also an important source of medicinal plants (138 spp.). Species with broad largely tropical distributions (that are either widespread in Asia, the “Old World Tropics” or are pan tropical) account for 76.1% of species in these habitats.

Vulnerability of Species

A total of 324 species of medicinal plants that are native to Cambodia were ranked in the four priority groups (Appendix 7). Together they constitute approximately 50% of the native medicinal plants documented here. This is equivalent to approximately 14% of Cambodia’s known flora. These include 121 trees, nine palm trees, 31 lianas, 127 shrubs and sub-shrubs, two ferns, 31 herbs, an epiphyte and three parasitic species.

Priority group I is comprised of 80 species. Only three of these species are CITES-listed (*Aquilaria crassna*, *Cycas rumphii* and *Khmeria duperreana*) while seven are included in the IUCN Red List. Eighteen of these species are timber species. This group includes 11 species listed by multiple criteria, 48 species are listed because they are endemic or near-endemic species, nine are timber species, eight are species from narrow habitats and an additional four species are CITES listed or listed by IUCN as threatened.

Priority group 2 is comprised of 99 species. None of these species are CITES listed while 14 are included in the IUCN Red List. Ten of these species are timber species. This group includes nine species listed by multiple criteria, 40 species are listed because they are endemic to the countries of former ‘French Indochina’, 28 are listed as being rare in Cambodia, nine are timber species, nine are species restricted to dense or semi-dense forest within the Indochinese Peninsula, and an additional five species are red-listed by IUCN as being of ‘lower risk’.

Priority group 3 is comprised of 82 species. This group includes 50 species that are endemic to the broader Indochinese Peninsula or are largely limited to the former ‘French Indochina’ but that also occur in one other country, 29 are species from narrow habitats and three are timber species. None of these species are listed by CITES or the IUCN Red List and only four are timber species. Priority group 4 consists of 63 species that are generally limited to dense forests though widespread outside the Indochinese Peninsula.

Generally speaking it is species from priority groups 1 and 2 that are likely to be threatened by domestic or international trade. In contrast, those belonging to priority groups three and four may become vulnerable in the longer term. The potential threat posed to Cambodian populations is the major concern here rather than the status of the species overall.



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Pterocarpus macrocarpus Burma Poudaok

Anecdotal reports suggest that some species are becoming rare in certain areas. These include:

Group 1: *Afzelia xylocarpa*, *Amomum villosum*, *Aquilaria crassna*, *Ardisia smaragdina*, *Bridelia cambodiana*, some *Calamus* species, *Cinnamomum cambodianum*, *Dysoxylum lourieri*, *Eleocarpus hygrophilus*, *Entada reticulate*, *Ficus variolosa*, *Garuga pierrei*, *Helicteres elliptica*, *Helixanthera longispicata*, *Intsia bijuga*, *Oldenlandia fraterna*, *Oldenlandia rosmarinifolia*, the palm *Oncasperma tigilirium*, *Pandanus* sp., *Spathoglottis eburnea*, *Stephania rotunda*, *Tarenna quocense*, *Tarenna vanpruckii*, *Thysanthera suborbicularis*, *Tournefortia montana* and *Walsura elata*;

Group 2: *Aporosa filicifolia*, *Dipterocarpus intricatus*, *Gardenia angkorensis*, *Lasianthus hoensis*, *Mangifera duperreana*, *Rauwenhoffia siamensis* and *Sindora siamensis*;

Group 3: *Fibraurea tinctoria*, *Melaleuca cajeputi* and *Pterocarpus macrocarpus*;

Group 4: *Spirolobium cambodianum* and *Eurycoma longifolia*.

These species include *Cinnamomum cambodianum*, *Dysoxylum lourieri* and *Gardenia angkorensis* for which market chains are presented below along with that for *Coscinium usitatum*. This latter species would probably also be included in Priority Group 4 if not for some uncertainty about its distribution within that of a broader species complex.

Case Studies in Trade and Use – Key Points

Case Studies in Trade and Use

Case studies including market chains are provided here for seven species. These are: *Alpinia ?conchigera*, *Cinnamomum cambodianum*, *Coscinium usitatum*, *Curcuma* sp., *Dysoxylum loureiri*, *Gardenia ankorensis* and an herb, Moen Thnam Chin, for which no scientific name was identified. Source areas for these species include Battambang, Kampong Chhnang, Kampong Speu, Kampong Thom, Koh Kong, Mondolkiri, Oddar Meanchey and Pursat provinces. They include three perennial herbs, two tree species, a liana and a shrub and demonstrate differing aspects of the trade in medicinal plants. The three herbs and one tree species (*Cinnamomum cambodianum*) are traded for domestic use while one tree (*Dysoxylum loureiri*) and the liana (*Coscinium usitatum*) are traded illegally to Viet Nam, all for medicinal purposes. The shrub (*Gardenia ankorensis*) is a medicinal plant that is traded to Thailand for its wood.

For the three perennial herbs it is their tubers that are valued for the domestic medicine trade, while for *Cinnamomum cambodianum* it is the bark that is traded for domestic use. In contrast, chemical extracts are derived from the wood of *Dysoxylum loureiri* and *Coscinium usitatum* through distillation or chemical extraction techniques. The wood of *Gardenia ankorensis* is also collected and traded for manufacturing purposes.

The tubers of the three perennial herbs and the bark of *Cinnamomum cambodianum* are traded as low cost components of traditional Cambodian medicines for domestic use and may be considered as being legally traded. In contrast, the chemical extracts derived from *Dysoxylum loureiri* and *Coscinium usitatum* constitute high cost products that are both collected and traded internationally and illegally. The wood of *Gardenia ankorensis* is a relatively cheap product that is traded illegally.

Cinnamomum cambodianum, *Dysoxylum loureiri* and *Gardenia ankorensis* are all plants of international conservation significance although none of them are listed in the CITES Appendices or IUCN Red List. *Cinnamomum cambodianum* is endemic to Cambodia whereas both *Dysoxylum loureiri* and *Gardenia ankorensis* are “near endemics” being found in Cambodia and contiguous parts of neighbouring countries. The National Priority Tree Species Workshop (Cambodian Tree Seed Project 2001) listed these three species as

endangered tree species. In contrast, *Coscinium usitatum* is more widespread in tropical Asia. While the three perennial herbs clearly all belong to the “ginger” family Zingiberaceae they were not reliably identified to the species level so their level of endemism could not be ascertained.

The market chains for each of the seven selected species and their focal areas are provided below along with details of their conservation significance, distribution and abundance, use and production.

Moem Thnam Chin

Scientific Name: Unknown

Family: ? Zingiberaceae

Khmer Name: Moem Thnam Chin

Conservation Status: The Moem Thnam Chin is a perennial herb. Its conservation status remains unknown as it was not identified to the species level.

Distribution and Abundance: Up until recent years this species was widespread and relatively common, however, it has more recently become difficult to obtain. It is currently collected from lowland areas north of Kirirom in Kampong Speu province, and in Kampong Chhnang province. The status of this species is reportedly in decline. This is in part due to habitat loss and because, like many medicinal plants, it is collected destructively.

Use and Production: The tubers (*moem*) of this perennial herb are traditionally used as an element in preparations for tonic, healing wounds, or sores. It is typically chopped and milled into a powder, which is then fried until burnt. The tubers are then mixed with alcohol, in the form of “khmer wine”, and other substances for sale.

This species produces two kinds of tubers that are locally referred to as being *male* and *female*, both of which are used in preparations. The larger “female” or parent tuber constitutes the main tuber of the plant from which the leaves and “male” daughter tubers develop. The parent tubers may be as much as 20-25 centimetres wide while the daughters are typically 15 to 20 centimetres long and attached to rhizomes that develop from the parent tuber. This species is collected wastefully as collectors remove the daughter tubers as well as the parent ones.

Focal Area: Pursat Market, Pursat Township, Pursat province.

Description of Trade Chain: This species was encountered in a medicinal plant shop in the Pursat provincial market. *Moem Thnam Chin* is now difficult to find in Pursat due to collection for the medicinal plant trade. As a result of increasing rarity prices are increasing and collectors are becoming less reliable as suppliers.

Consequently, the medicinal plant shop does not buy from local supplier but instead places large orders with medicinal plant shops in Phnom Penh - typically those located at O’Russeï and Sereipheap markets. Typically, plants are collect from lowland areas in Kampong Speu and Kampong Chhnang in the vicinities of mountain areas near Phnom Aural and Kirirom. Middlemen purchase the tubers from these source areas and then resell them to the wholesale traditional medicine shops in Phnom Penh.

The wholesalers then resell them back to other distributors such as the one located in the Pursat provincial market, which will then sell them to *kru khmer* for their own traditional practices, or use them in preparations that they sell directly to customers themselves. (see Figure 2)

Figure 2

Description of Market Chain for Moem Thnam Chin



Source: TRAFFIC Survey Data

Prices, Volumes and Levys: Large orders are placed with the resellers in Phnom Penh by the traditional medicine shop in Pursat about twice a month. These orders are usually from about KHR800 000 to 1 000 000 (USD200 - 250) per order. While they include some other medicinal ingredients, *Moem Thnam Chin* normally constitute the large majority of the plants purchased. With a purchase price of KHR4000 to 5000 (USD1.00 to 1.25) per kilogram this may be in the order of 100 to 150 kilograms per purchase.

The parent tubers are then resold in Pursat at KHR10 000 (USD2.50) per kilogram while the smaller daughter tubers sell for KHR7000 (USD1.80). The purchase, resale and transporting of this species, like that of many medicinal plants, is not regarded with suspicion or treated as being illegal. Thus the imposition of levies and bribes is thought to be limited to a small levy that is applied generically to transported goods.

Romdeng Prey

Scientific Name: *Alpinia ? conchigera* Griff.

Family: Zingiberaceae

Khmer Names: Romdeng Prey, M'deng, Romdeng.

Conservation Status: This herb is relatively widespread and locally common in Cambodia.

Distribution and Abundance: Romdeng Prey is a perennial herb that is found in a range of forest types but is particularly abundant in mountain areas such as Mondol Seima in Mondolkiri province, at Pich Nil, Kirirom and Mount Aural in Kampong Speu province, and in Rattanakiri.

Use and Production: This species is used traditionally as a diaphoretic and in the treatment of uterine disorders. It is also applied externally as a warming stimulant for the treatment of rheumatism.

Villagers collect the rhizomes for both local use and domestic trade. The dried rhizomes are macerated and mixed with alcohol in the form of “Khmer wine” prior to application.

Focal Areas: Mondol Seima district, Mondolkiri province, Pich Nil, Kirirom and Mount Aural in Kampong Speu province.

Description of Market Chain: Romdeng Prey is collected for commercial use in various parts of the country including Mondol Seima, Pich Nil, Kirirom and Mount Aural. Middlemen purchase the rhizomes from villagers and transport them directly to Phnom Penh by car, van or truck. They then resell them to wholesale traditional medicine shops that in turn sell to retailers and other end users in Phnom Penh including *kru khmer*. (see Figure 3)

Figure 3

Description of Market Chain for Romdeng Prey



Source: TRAFFIC Survey Data

Prices, Volumes and Levys: The prices middlemen pay collectors vary from place to place. In Kampong Speu and Mondolkiri it costs KHR900 to 1000 per kilogram and is resold to wholesalers in Phnom Penh for KHR1500 to 1700 per kilogram. Wholesalers then sell to retailers and other end users, including *kru khmer* for around KHR4000 per kilogram. As with many other species that are used in traditional medicine it is difficult to estimate volumes as these goods are transported with other medicines and agricultural products, and because of the general secrecy that surrounds the trade of TM. The purchase, resale and transporting of this species, like that of many medicinal plants, is not regarded with suspicion or treated as being illegal. Thus the imposition of levies and bribes is thought to be limited to a small tax that is applied generically to transported goods.

Romeit Prey

Scientific Name: *Curcuma* sp.

Family: Zingiberaceae

Khmer Name(s): Romeit Prey, Romiet Phnom.

Conservation Status: Romeit Prey is a perennial herb belonging to the ginger family and it is relatively widespread and locally common in Cambodia.

Distribution and Abundance: Romiet Prey is found in a variety of forest types and is locally abundant in mountain areas such as Mondol Seima in Mondolkiri province, at Pich Nil, Kirirom and Mount Aural in Kampong Speu province, and in Rattanakiri.

Use and Production: This species is traditionally used in combination with other species in post-partum medicine treatments. Villagers collect the rhizomes for both local use and trade. The dried rhizomes are macerated and mixed with alcohol in the form of “Khmer wine” prior to application.

Focal Areas: Mondol Seima district, Mondolkiri province; Pich Nil, Kirirom and Mount Aural in Kampong Speu province.

Description of Market Chain: As for Romdeng Prey, Romeit Prey is collected for commercial use in various parts of the country including Mondol Seima, Pich Nil, Kirirom and Mount Aural. Middlemen purchase the rhizomes from villagers, transport them to Phnom Penh and resell them to wholesale traditional medicine shops that in turn sell it to retailers and other end users in Phnom Penh.(see Figure 4)

Figure 4

Description of Market Chain for Romeit Prey



Source: TRAFFIC Survey Data

Prices, Volumes and Levys: The prices middlemen pay collectors vary from place to place. In Kampong Speu and Mondoliri it costs KHR500 to 700 per kilogram and is resold to wholesalers in Phnom Penh for KHR1300 to 1500 per kilogram. Wholesalers then sell to retailers and other end users including *kru khmer* for around KHR3000 per kilogram. As with many other species that are used in traditional medicine it is difficult to estimate volumes as these goods are transported with other medicines and agricultural products, and because wholesalers remain secretive about this. The purchase, resale and transporting of this species, like that of many medicinal plants, is not regarded with suspicion or treated as being illegal. Thus the imposition of levies and bribes is thought to be limited to a small levy that is applied generically to transported goods.

Mreah Prov

Scientific Name: *Dysoxylum lourieri* Pierre

Family: Meliaceae

Khmer Names: Mreah Prov Phnom, Sdau Phnom and (Daem) Chan Sa

Conservation Status: This species is endemic to Cambodia and southern Viet Nam. Although not listed by CITES or the IUCN Red List, the *National Priority Tree Species Workshop* identified *Dysoxylum lourierias* as a luxury timber species and ranked it in the top 20 endangered tree species in Cambodia (CTSP 2000). Commercial exploitation of this species for timber production is illegal in Cambodia as is the extraction of its aromatic oils.

Distribution and Abundance: *Dysoxylum lourieri* is endemic to Cambodia and southern Viet Nam. It is a large tree found at low altitude in wet dense forests, particularly near the coast. Within Cambodia it is fairly rare, apparently restricted to the mountains and contiguous lowland dense evergreen forest of south-west Cambodia. It is generally localised in certain areas within the central Cardamom Mountains or more westerly areas - including Chipat, Thmor Baing, O Saom, Veal Veng and Samlaut – where it tends to be associated with wet or basalt-derived soils. In recent years this species has become increasingly rare due to illegal commercial exploitation of its aromatic oils. Stocks have reportedly been seriously depleted from some areas, particularly in Samlaut and contiguous areas within Battambang Province such as at Kroupeu Bi.

Use and Production: This species is traditionally used in diuretic and cardiogenic medicines; while the aromatic timber is used for cultural products such as Buddhist carvings, incense, furniture and coffins.

This species has been targeted heavily for commercial production of aromatic oils and their export to Viet Nam and China following introduction of oil extracting technologies from Viet Nam in 1999. Export of these oils to Thailand has not been reported in spite of the fact that many of the collection areas border Thailand. Oils

An overview of the use and trade of plants and animals in traditional medicine systems in Cambodia **48**

extracted from this species are used for the production of massage balm and as preservatives in soft drinks, beer and canned foods. Reports that oils extracted from this species are used in the production of illicit drugs including amphetamines have attained an almost mythological status amongst some quarters in Phnom Penh but remain unconfirmed.

The oils from this species are extracted in large distillation vats within the forest. Wood, particularly from the roots but also from the trunk, is collected and transported to distillation sites where it is chipped into thin slices (less than a few millimetres wide) and heated with water in large vats up to 2.5 metres high. Oils are extruded from the woodchips upon boiling and collected. The trees are generally completely destroyed as the collectors frequently dig up the larger roots for processing.

Focal Area: Anlong Reab, Sre Peang and O Leak Meas communes in Veal Veng District, Pursat Province. These communes are centred upon the Phnom Samkos and Phnom Tumpor mountain areas.

Description of Market Chain: Some 27 distillation vats are believed to be located near water sources in the forest within this focal area. Following distillation the resulting oils are placed in 30 litre drums and transported by ox-cart, motorcycle, old Russian “Zill” trucks (Lanh Damrei Teuk) or by hand to a staging point at Bramouy in Veal Veng District; from there they are quickly sent to Pursat, a provincial town.

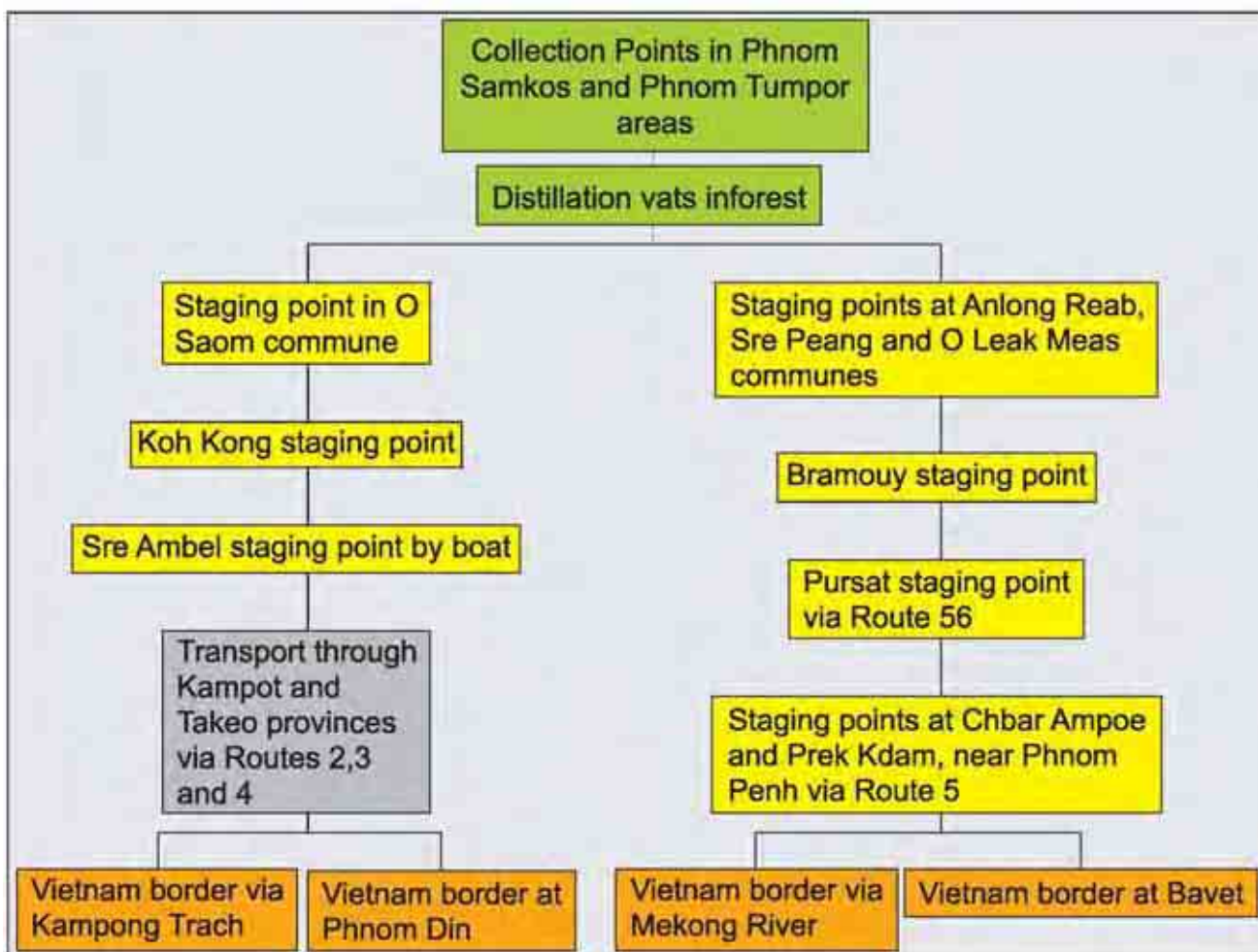
The oils may be held in Pursat for a few days until secure transport is obtained and then transported by road to Prek Kdam or Chbar Ampoe, near Phnom Penh. The oils are normally stored here for a week, but sometimes for as long as a month, awaiting further transport. Mreah Prov oils stored at Prek Kdam are sent to Viet Nam by boat along the Mekong River, whereas those stored at Chbar Ampoe may be sent to Viet Nam by either boat or by road. When the drums are transported by boat they are hidden underneath agricultural goods such as rice, lotus and peanuts. The number of drums transported by boat along in this manner is frequently more than 100 per boat.

Alternatively, distilled oils are sent from the communities of origin to Koh Kong from where they are transported to Sre Ambel by boat. From here they are usually quickly transported by road to Kampot via Takeo. They are subsequently transported by road to Viet Nam via Kampong Tralach or the Phnom Din border crossing.

The “coastal route” also services collection areas in the coastal hinterland as well as providing an alternative route for materials from Phnom Samkos and Phnom Tumpor. It is believed that these alternative routes are part of the same operation. The choice of the route to be used is either made to ensure that transport and export can be expedited without interference from authorities, or to reduce the levels of informal taxes that are to be paid to ensure that the trade can continue profitably. (see Figure 5)

Figure 5

Description of Market Chain for Mreah Prov



Source: TRAFFIC Survey Data

Prices, Volumes and Levys: The price of Mreah Prov oil is USD2.80 per litre in the forest (Anlong Reab, Sre Pain and O Leak Meas) but is considerably higher at the staging points near Phnom Penh (USD6.90/litre). This increases sharply to USD10.00/litre at the border.

In earlier years large volumes of these oils were extracted and transported illegally. This was reduced substantially for some years through concerted law enforcement actions. In recent years, however, production has resumed using the same commercial technologies and it is now difficult to estimate volumes transported. It is estimated that each of the 27 vats located within the focal area could produce approximately 70 per day, totalling nearly 2000 l/day. This volume is adequate enough to result in transport to Phnom Penh or Koh Kong on an almost daily basis.

It can therefore be estimated that the combined value of the final profits along with the cost of transport, handling and storage together with the associated levies and bribes is USD7.20/litre. It is believed that someone in Phnom Penh manages the overall market chain. Various individuals are paid for their services in ensuring that certain steps in the market chain are implemented effectively. This includes officials in the communes where the raw materials are collected and distilled, and in Bramouy, Pursat and other staging points where these products are stored temporarily.

Vohr Romiet

Scientific Name: *Coscinium usitatum* Pierre

Family: Menispermaceae

Khmer Name(s): Vohr Romiet Kraham, Vohr Romiet Sar and Vohr Romiet Thom

Conservation Status: This species is part of a species complex along with *Coscinium fenestratum* (Gaertn.) Colebr that is widespread within continental tropical Asia from India to Cambodia and Lao PDR. It is not listed in the CITES Appendices or the IUCN Red List. Commercial exploitation of this species is illegal in Cambodia.



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Coscinium usitatum (Vohr romiet)

Distribution and Abundance: *Coscinium usitatum* is a woody liana found in wet dense forest at low altitude. Within Cambodia it is fairly common and widespread within the mountains and contiguous lowland dense evergreen forest of south-west Cambodia, as well as Phnom Kulen and Mondolkiri. In south-west Cambodia it occurs as a large woody vine, however, in drier areas such as Mondolkiri its development is generally more limited. In recent years this species has become increasingly rare in south-west Cambodia due to illegal commercial exploitation. Stocks have reportedly been depleted from some areas – particularly in Kirirom, Phnom Bokor and parts of Koh Kong Province – although there are reports that this species regenerates well when left undisturbed.

Use and Production: This species is traditionally used as an analgesic and antipyretic. It contains a number of alkaloids, notably berberine and palmatine, some of which have been demonstrated to have anti-inflammatory effects. The commercial extraction of berberine from this species complex is well documented in India and Cambodia and such exploitation is making this species increasingly rare. Export from India is banned but permitted from Lao PDR where cultivation of *Coscinium usitatum* for production purposes is practiced in some areas.

Unconfirmed reports concerning the end use of these alkaloids vary widely from anti-malarial and cosmetic preparations to extracted alkaloids, possibly saponin, as a precursor in the manufacture of the illicit drug MDMA that is also known as “ecstasy”. Once again, unconfirmed reports that extracts from this species are used in the production of illicit drugs have attained an almost mythological status amongst some quarters in Phnom Penh.

This species has been heavily targeted in south-west Cambodia for commercial production of alkaloids since their export to Viet Nam following the introduction of acid baths as early as 1993. Export of these products to Thailand has not been reported despite the fact that many of the collection areas border Thailand and the chemicals used for extraction are bought from Thailand. There are also reports that this species was also collected commercially from parts of Kratie and from Chhlong district of Kampong Cham during the early to mid-1990’s.

In earlier years alkaloids were extracted in large semi-permanent acid baths that constructed with bricks from the forest. Wood from the trunk of the vine was collected and transported to the extraction sites where it was chipped into thin slices and bleached with a mixture of hydrogen peroxide and sulphuric acid. A yellow powder was then produced through subsequent evaporation. The resulting acid wastes were discharged directly into local rivers and streams. This activity has declined substantially in recent years due to increased enforcement but still continues on a lower scale.

Currently, collection and processing of yellow vine still occurs in some areas under a slightly modified mode of production. Large temporary baths are constructed by placing tarpaulins over a wooden frame. It is reported that different solvents are now used to extract the alkaloids instead of the potent acid cocktail used previously.

An overview of the use and trade of plants and animals in traditional medicine systems in Cambodia

The chipped wood is placed in these vats until most of the alkaloids have been extracted. The chips are then replaced with new ones and the extraction process continues. When the solution in the tank has been reduced to a low level through evaporation, it is drained and the resulting sludge is removed for drying in the sun. The resulting yellow powder is collected and placed into 50-kg bags prior to transportation.

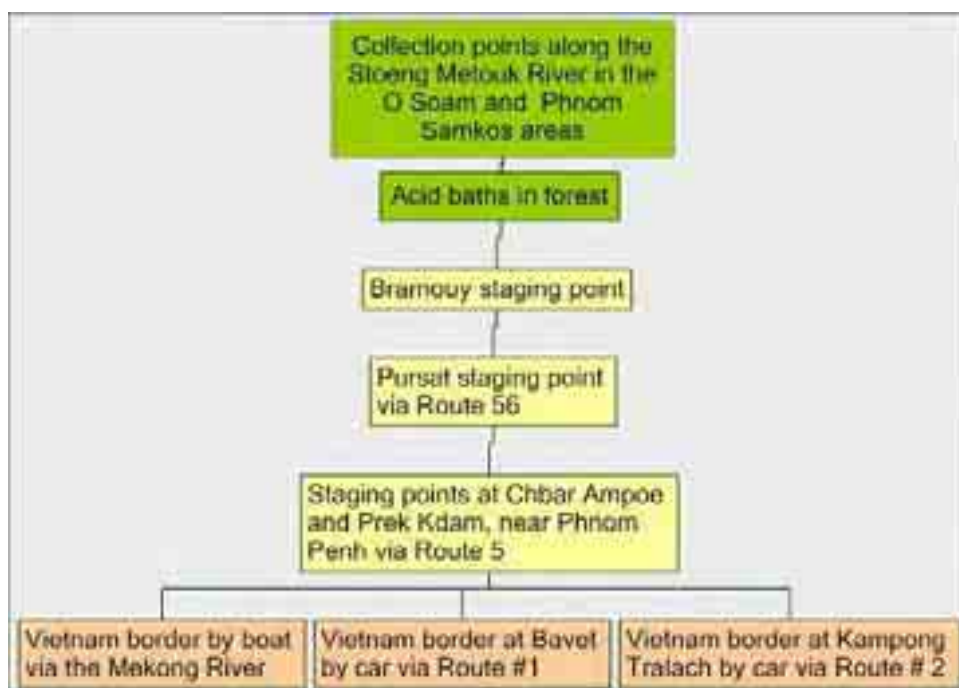
Focal Area: Stung Metoek River near O Saom and Phnom Samkos in Veal Veng District, Pursat Province.

Description of Trade Chain: Extraction sites are located along the Stung Metoek River within O Saom and near Phnom Samkos. Local villagers or migrant workers cut vines from nearby areas. They place bundles of vines along tracks for collection by pickup trucks for transportation to the extraction baths described above. Following the extraction process the yellow powder is then transported by car in 50-kg bags to a staging point at Bramouy, Veal Veng District where they are quickly sent to Pursat provincial town.

They may be held here for a few days until secure transport is obtained and they are transported by road to Prek Kdam and/or Chbar Ampoe, near Phnom Penh. As in the case of Mreah Prov oils, these products are also stored at Prek Kdam while awaiting transport to Viet Nam by boat along the Mekong River. Products stored at Chbar Ampoe may be sent to Viet Nam either by boat or road via Bavet on national route # 1 or Kampong Tralach on national route #2. (see Figure 6 below)

Figure 6

Description of Market Chain for Vohr Romiet



Source: TRAFFIC Survey Data

Prices, Volumes and Levies: Information on the price of Vohr Romeit extracts are difficult to obtain, though it is believed to be three to four times more expensive than for Mreah Prov oils. In earlier years prices were around USD10/kg at the production site and USD30 to USD40 at the Viet Nam border. It is possible that today's prices are even higher due the increased difficulty in obtaining these raw materials.

The similarity between yellow vine products and Mreah Prov oils in terms of source areas and transport routes implies strong links between these operations. It can therefore be expected that someone in Phnom Penh manages the overall market chain, and various individuals are paid for their services in ensuring that certain steps in the market chain are implemented effectively. This likely includes officials in the communes where the raw materials are collected and extracted, and in Bramouy, Pursat and other staging points where these products are stored temporarily.

Tepiru

Scientific Name: *Cinnamomum cambodianum* Lecomte Family: Lauraceae

Khmer Name(s): Tepiru

Conservation Status: This species is endemic to Cambodia. It is not listed in the CITES Appendices or the IUCN Red List. It is considered to be fairly rare and was ranked as an important NTFP species in Cambodia by the *National Priority Tree Species Workshop* (CTSP 2000).

Distribution and Abundance: *Cinnamomum cambodianum* is endemic to Cambodia. It is a medium-sized tree found in wet dense sub-montane forests at medium elevations within south-west Cambodia. It is fairly rare, apparently restricted to the mountains and contiguous lowland dense evergreen forest in the southwest of the country. It is also fairly widespread in Phnom Bokor, the central Cardamom Mountains, and in more westerly areas including Samlaut.

Use and Production: This species is used traditionally as a warming stimulant, carminative, anti-spasmodic and antiseptic. It has also been reputedly used for indigestion, tuberculosis and the regulation of menstrual pain. Its chemical constituents include significant concentrations of the volatile oils cinnamaldehyde and eugenol.

Tepiru trees are cut and the bark is removed from the base all the way up to the leaf-bearing twigs. The bark is dried in the sun and then transported to market. End users tend to boil the bark with water along with other medicinal plants. It may also be milled and used as a balm for sprains and similar injuries due to its warming action.

Focal Area: Samlaut district, Battambang province.

Description of Market Chain: Samlaut district is the main focal area for the collection of Tepiru. This is in part due to the impact of protection activities at Phnom Bokor and the Cardamom mountains. Local villagers collect the bark from hilly or mountainous forest areas in Samlaut and Phnom Tumpor Mountain as described above. The remaining wood is used either as firewood or as construction material if it is large enough. Middlemen buy the dried bark from villagers for direct transport to the traditional medicine shops in Phnom Penh. Small amounts may also be sold within Battambang for local use. (see Figure 7 below)

Figure 7

Description of Market Chain for Tepiru



Source: TRAFFIC Survey Data

Prices, Volumes and Levys: The middlemen pay collectors in Samlaut roughly KHR2000 per kg of dried bark and resell it to the major traditional medicine shops in Phnom Penh at a variety of prices, generally between KHR4000 and 7000 per kg. As for many other medicinal plant species that are used domestically the purchase, resale and transportation of this species is not regarded with suspicion or treated as illegal. Thus, the imposition of levies and bribes is thought to be limited to a small levy that is applied generically to transported goods. This species is generally transported along with a range of other medicinal plants and agricultural products rather than on its own. This mode of transportation also makes it very difficult to estimate volumes.

Dey Khla

Scientific Name: *Gardenia angkorensis* Pitard Family: Rubiaceae

Khmer Name(s): Dey Khla

Conservation Status: This species is a “near endemic” being found in the open forests of Cambodia and Lao PDR. It is not listed in the CITES Appendices or IUCN Red List. This species was ranked by the *National Priority Tree Species Workshop* as being in the top ten endangered tree species in Cambodia (CTSP 2000). Commercial exploitation of this species is illegal in Cambodia.

Distribution and Abundance: *Gardenia angkorensis* is a fairly common shrub of the open forests of Cambodia and Lao PDR. Within Cambodia it is particularly found in the north-central and north-west of the country where it is highly sought after. In recent years this species has become rarer due to commercial exploitation and stocks have reportedly been depleted in some areas of north-western Cambodia near O Smach on the Thai border. Meanrith commune in Kampong Thom province is considered to be one of the better areas for this species because of favourable habitat; however, even here, larger shrubs are becoming rarer and collection is increasingly targeting smaller plants.

Use and Production: The stems and leaves of this species are traditionally used as elements in diuretic preparations. The chemical constituents of this species remain undocumented at present. In Cambodia this medicinal species is threatened by the commercial harvest of its attractive wood, which has a heavy density and pale appearance resembling ivory. This wood is exported to Thailand where it is processed and used in the manufacturing of jewellery, buttons, and other products.

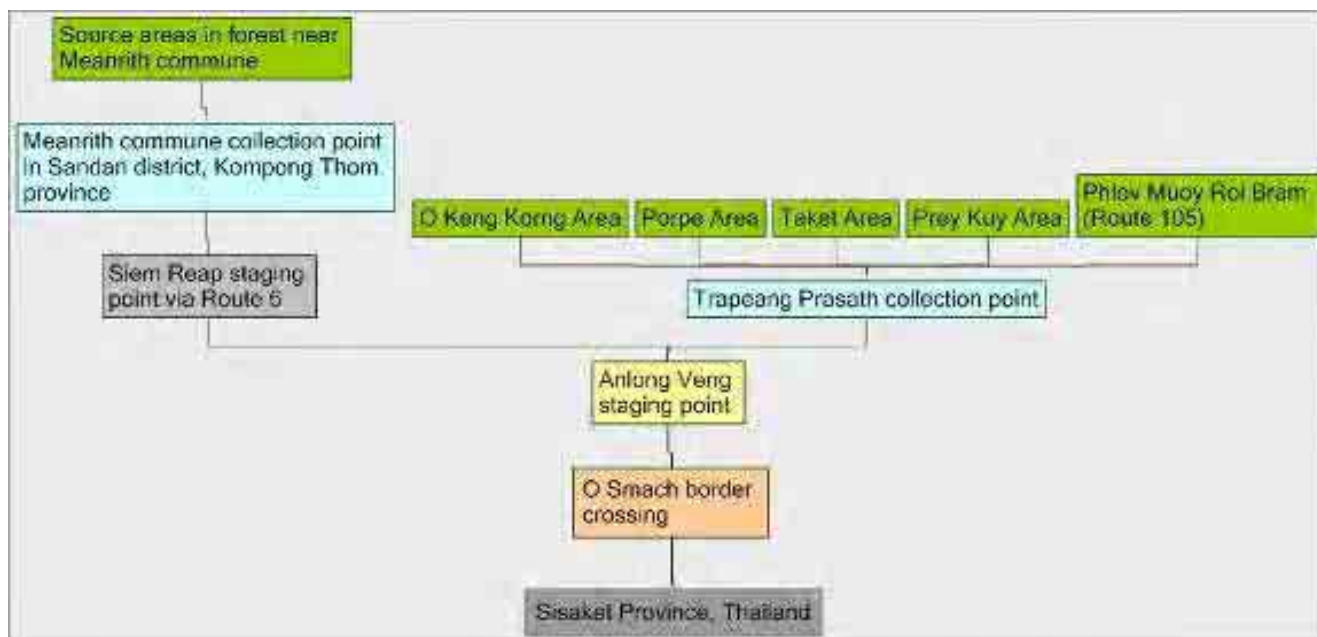
Focal Area: Meanrith commune, Sandan district, Kompong Thom province.

Description of Trade Chain: Thai businessmen ask local villagers, military and police to collect the wood. The trunks and branches, normally 40 to 80 cm in length and four to 20 cm wide, are then collected for transport in small cars. The wood is taken to Siem Reap via route 6, then to Anlong Veng. Dey Khla is also harvested from Samroang, Trapeang Prasath and Anlong Veng districts of Oddar Meanchey province where the most important area for collection is in the O Keng Korng, Porpe, Taket and Prey Kouy areas; and along Plov Mouy Roi Bram (Route 105).

Normally, the wood is transported from Anlong Veng and Trapeang Prasath communes for storage in O Smach prior to export to Sisaket province in Thailand via the O Smach border crossing. (see Figure 8)

Figure 8

Description of Market Chain for Dey Khla



Source: TRAFFIC Survey Data

Prices, Volumes and Levys: The middlemen pay local collectors in Meanrith commune THB10 to 15 per kg for the wood. The wood is tied into bundles and transported by car to the O Smach border crossing where it is sold to Thai buyers for THB30 per kg. Each car may carry as much as 300 to 500 kg of wood valued at THB9000 to 15 000 (USD225 to 375) per trip. Details of levies and bribes for facilitating this trade are unknown.

Interviews upon Collection, Use, Trade and Legislation

Most of the information on the collection and use of medicinal plants pertains to trade in specific products and is integrated into the market chains documented above. These interviews do point to a number of areas as key sources for a range of medicinal plants for trade. These are areas around Kirirom and Phnom Aural in Kampong Chhnang and Kampong Speu provinces, as well as areas around Phnom Samkos and Phnom Tumpor in the far west. In addition, Phnom Bokor in Kampot, Phnom Kulen in Siem Reap, and possibly areas in Oddar Meanchey also appear to be important areas for collection.

Transport

Transport arrangements for medicinal plants vary considerably according to the products, volume of trade and final destination. The following all concern transportation of medicinal plants from Kampong Speu and Kampong Chhnang and represent different scales in trade.

Generally speaking the middlemen (suppliers) sell their medicinal plants to the shops in Phnom Penh at prices ranging from KHR500 to 5000 per kg. All medicinal plants are placed into 70-kg sacks.

One medicinal plant supplier to the Phnom Penh markets hires a minivan to transport medicinal plants from Kampong Speu to Phnom Penh by minivans. This car also transports other goods—from Kampong Speu’s Boriseth to other medicinal plants. The supplier pays KHR3000 for



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Boat landing in Stung Treng PC

the transportation fee for each of the 70-kg sacks irrespective of the popularity or value of the medicine. The car drops the sacks outside the shops at O Russey Market. While most sacks are sold to these shops, the supplier pays a further KHR700 for transport to shops at Serey Pheap Market by cyclo.

One large supplier to the Phnom Penh markets comes from Kampong Chnang. He hires a particular Korean truck from the province to transport 30 to 40 sacks to Phnom Penh three to four times a month. He pays KHR2500 per 70-kg sack and has the car driven directly to each shop that ordered the medicinal plants from him. In total, he pays about KHR75 000 to 100 000 (roughly USD20 to USD25) per trip for transport.

Medicinal plant products are also transported from Kirirom, Kampong Speu province and other areas associated with the eastern Cardamom mountains to Viet Nam. These products may be transported as dry woodchips, leaf material or whole organs. For example, *Moem Thnam Chin* tubers are transported whole from source areas to Chhrey Thom in Kandal province where they are then taken by boat to Viet Nam. This trade appears to be highly centralized and is undertaken by two groups rather than hundreds of independent traders. These groups operate the trade as a full-time, large business operation and transport medicinal plants on an almost daily basis.

Medicinal plants are also exported to Thailand, where they are reportedly used by the provincial Thai residents; volumes involved are not known. While it is clear that these exports do take place through Poipet, it is not yet clear if they are also exported through other border crossings.

Legislation and Regulatory Arrangements

No major regulations were promulgated since 2004 and some sources appeared unaware of the Sub-decree on the *Import, Export and Commerce of Traditional Medicine in the Public Sector* referred on p12. Of some significance, however, is that the Department of Customs and Excise is currently updating its risk management list of prohibited exports and imports. A range of other government agencies has also been asked to submit lists of commodities that they wish to see upon this list. Effective implementation of the export or import of commodities requires inter-agency agreements that will facilitate the role of Customs officials to act at the border on behalf of other agencies. It is reported that an agreement with the Ministry of Agriculture, Forestry and Fisheries is currently under way. Training of customs officials is required to ensure that they have the capabilities required for implementing these tasks. AusAID is currently supporting this.

In addition, the Ministry of Agriculture, Forestry and Fisheries issued a letter of request (File No. 154 dated 6th October, 2005) for the Chief of the Forestry Administration to take action against the production of Mreah Prov (Annex III). This letter was issued in support of issues raised by the Ministry of Interior that extracts from Mreah Prov and Vohr Romiet were being used as a source for Safrole, a compound used in the production of illicit drugs. While the commercial collection and production of Vohr Romeit and Mreah Prov is illegal in Cambodia it is unclear whether there is any agreement with Viet Nam regarding the illegality of importing the extracts. This appears not to be the case for Vohr Romeit imported from Lao PDR where an agreement was established between Lao PDR and Viet Nam in August 2002 specifying goods of Lao origin eligible for be import into Viet Nam. This is facilitated by Joint Circular No. 54/2003/TTLT-BTC-BTM of June 3, 2003 *Guiding the Reduction of Import Tax on Goods of Lao Origin* between Viet Nam's Minister of Finance and Minister for Trade, dated June 3, 2002.

This circular lists goods of Lao origin eligible for a 50% reduction of import tax when being imported into Viet Nam under annual treaties or agreements between the two countries' governments (Annex IV) or according to the Trade Ministry's notice on the basis of the volumes already agreed upon with the Lao Ministry of Trade. It includes provisions for the specific quantities and values of imported goods of Lao origin eligible for the 50% import tax reduction each year.

Promulgated together with this circular is a 2003 list of goods of Lao origin eligible for a 50% import tax reduction when imported into Viet Nam and conditions for enjoying the 50% import tax reduction. Also included are the requirements for a *Certificate of Origin* and written certification that products are covered by the tax preferential program. This certification is issued by either the Trade Ministry, the Trade Bureaus, or Trade Services of Vientiane city and Saysomboun special zone of Lao PDR. It is unclear if a similar circular for 2006 has been issued and whether Vohr Romeit is still included as an eligible product.

Regulatory instruments discussed but not yet promulgated, that would have a direct impact upon the legal status of medicinal plant species or populations include:

- Legislation to ensure a fully legal basis for the protection and management of Cambodia's protected areas.
- Ministerial decree (*Prakas*) determining the criteria for categorising species and outlining corresponding levels of protection.

CONCLUSIONS

Overall Diversity and Origins

This study confirms that a large number of Cambodia's plant species contribute to an extensive traditional pharmacopoeia. The documentation of 824 plants¹ identified to the species level from a limited number of sources supports the contention that the total number of medicinal plants in Cambodia may well exceed 1000 species, as there may still be geographic gaps in the record in spite of the comprehensive nature of available documentation. Even so, as many as 15% to 20% of the total medicinal plant pharmacopoeia may have been introduced to Cambodia.

Roughly 70% to 75% of the 824 species documented here are native to Cambodia. They comprise between 25% and 36% of Cambodia's known flora². A significant portion of these are endemic or near-endemics (nine point eight per cent) a further seven point five per cent appear to be endemic to Cambodia, Lao PDR and Viet Nam; and eight point six per cent appear to be endemic to the wider Indochinese Peninsula. At least 23% of the 824 species discussed here have been introduced from either other Asian countries or widely dispersed countries around the tropical and sub-tropical regions of globe.

The data also indicates that the number of introduced species that have become self-propagating is relatively limited, and therefore cultivation provides Cambodians with a significant portion of their traditional medicines. This includes 80% (152 species) of introduced species as well as five per cent (19 species) of those with broad distributions across the tropical world. In contrast only 12% (23 species) of the introduced species described here have become widely naturalized. It remains unclear how many of the 53 species lacking distributional data are introduced, although eight are cultivated and one is naturalized.

This pharmacopoeia consists of a wide variety of life forms. The 581 native medicinal plants documented here primarily consist of trees (30.1%), shrubs and sub-shrubs (19.9%), lianas (11.1%) and herbs (18.2%), while other life forms account for the remaining four per cent. Collectively these native plants constitute an important component of both the total flora and the structure of plant communities.

In contrast, introduced species consist primarily of herbs (45.52%), shrubs and sub-shrubs (34.09%). Trees (13.1%), and lianas (four point seven per cent). Bamboo constitutes a relatively minor component of introduced medicinal plants.

¹ This extensive database is not included in this document as it is too large to append.

² To date 2308 species have been described in Cambodia's flora however it is unclear as to whether this number includes introduced species; whether some of the species that lack distributional data are also introduced.

Principal Habitats of Medicinal Plants

Cambodia's native medicinal plants are widely distributed across a range of major habitats including dense, secondary and open forests, other more open areas, and a range of narrow habitats.

Medicinal plant species are not randomly distributed in the landscape. The majority (55.9%) of Cambodia's native medicinal plants, including 49 species confined to narrow habitats, are relatively restricted in terms of their ecological amplitude. This also includes the large majority (70.9%) of all species associated with dense forest while a further 19% are associated with secondary forests. Open forests are similar in this respect with 67.5% of species confined to open forests and six point one per cent associated with secondary forests. Secondary forests feature a lower percentage of species that are confined to this forest type (51.7%) but also share 30% with dense forests and five point one per cent with open forests.

Vulnerabilities of Species

Up to 50% of the native medicinal plants (14% of the known flora) could conceivably be under threat in the longer term. These are species that exhibit a significant level of endemism, relatively narrow ecological amplitude and/or are dense forest species that are likely to have suffered depletion because of extensive modification of the forest canopy by logging operations over the last decade or so.

Those that may be threatened in the medium term (Priority Group I) include 80 species, or 14% of the native species regarded here. Many species on this list are apparently already threatened by the overall demand upon them. In addition, many other species have become rare in certain areas including a number of species from priority group 2. It is likely that these may also be considered threatened in the medium term. Species in priority groups 3 and 4 may be vulnerable in the long term though this will need to be clarified through research.

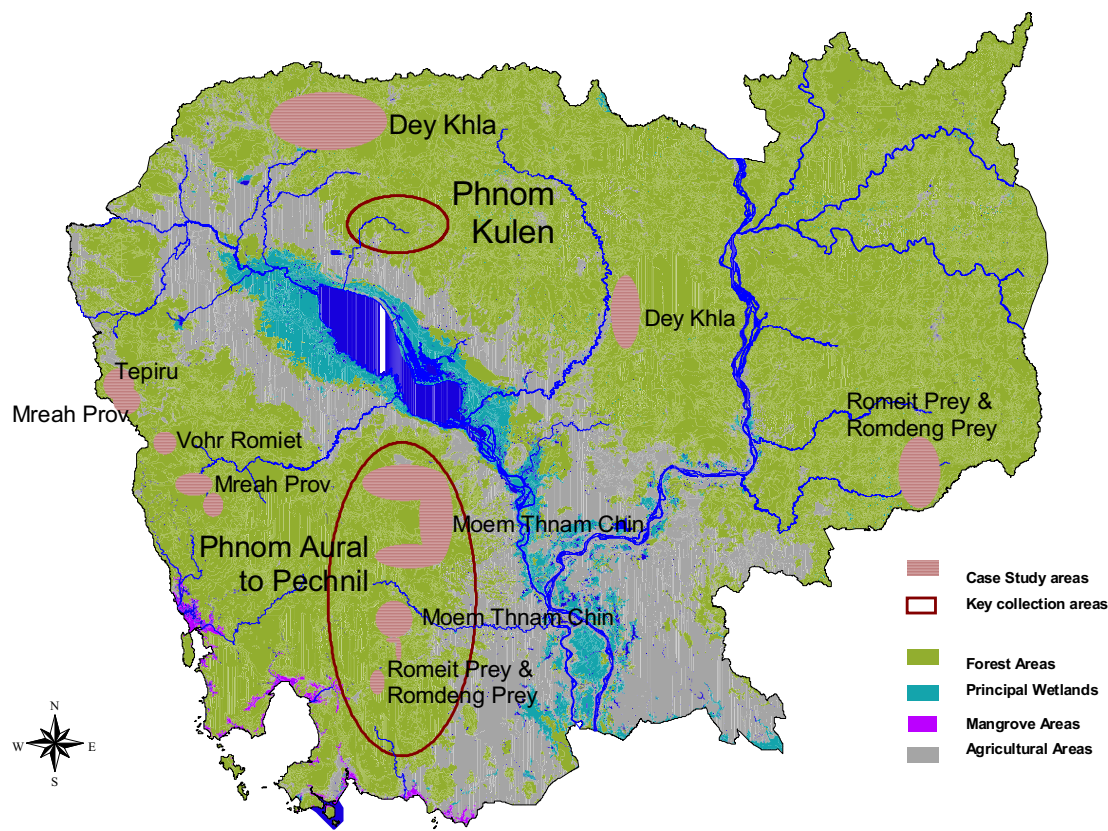
Mreah Prov *Dysoxylum lourieri* appears to be threatened in the short-term and requires urgent effective protection while enforcement efforts for Vohr Romiet *Coscinium usitatum*, and probably Dey Kla *Gardenia angkorensis*, should be strengthened.

Key Medicinal Plant Collection Areas

The current studies indicate a number of key areas for medicinal plant collection. These are areas at or contiguous with: Kirirom, Phnom Aural, Phnom Bokor, Phnom Samkos, Phnom Kulen, and Phnom Tumpor. These areas tend to be support dense evergreen forests or both dense and open forests. Areas associated with Kirirom, Phnom Aural and Phnom Bokor appear to have particular importance because of their closer proximity to Phnom Penh.

Figure 9

Key collection areas and case study areas



Source: David Ashwell

General Trade Scenario

There is a substantial trade of domestically derived medicinal plants in Cambodia that responds to both a larger domestic demand and a significant international one. While this study does not seek to document the total volume and value of this trade, it appears to be very substantial. The overall trade scenario includes products of widely varying value including low cost ingredients for local/domestic traditional medicines, moderately priced products that may be traded for medicine or other reasons (eg. Dey Kla), and high value illegal products that are traded internationally.

Trade in illegally derived products of Vohr Romeit and Mreah Prov still continues despite their legal status, a range of law enforcement efforts and the extensive damage that these populations appear to have endured through overexploitation. This trade is secretive but remains highly organized. It also remains unclear if the trade scenario for Dey Kla, which does not pass through Phnom Penh, is a common one. This species may not be representative of a wide range of medicinal plants, however, as it is targeted for specific non-medicinal use by the Thai garment industry.

It is apparent that large volumes of a large number of species are traded from natural habitats for use in both the domestic and international markets on a regular basis. Areas relatively close to Phnom Penh that include extensive dense forests are targeted for much of this collection. This trade also appears to be highly centralised with wholesalers based in Phnom Penh, who are likely to be amongst the largest stakeholders. These wholesalers also appear to constitute the hub of the overall domestic trade. They receive raw materials from middlemen, sometimes act directly as retailers, distribute products to other retailers and re-export them back to provincial areas.

This arrangement appears to have developed in part from provincial based retailer beliefs that the trade is more reliable and cheaper. Because plants are becoming rarer in the favoured collecting areas, collectors are forced to travel further, resulting in higher prices. This in turn creates a more closed business, as people try to protect their knowledge of collection areas and subsequently leads to more intense negotiation with collectors. Purchasing from a wholesaler shifts this burden to the wholesaler and middlemen who are more able to cope with it.

In addition, they are well positioned to supply medicinal plants for export to Thailand and Viet Nam. This was not documented during this study, however, due to limitations in time and information availability; nor have the operations exporting these traditional medicines been linked to the export of the commercial products derived illegally from Vohr Romeit and Mreah Prov.

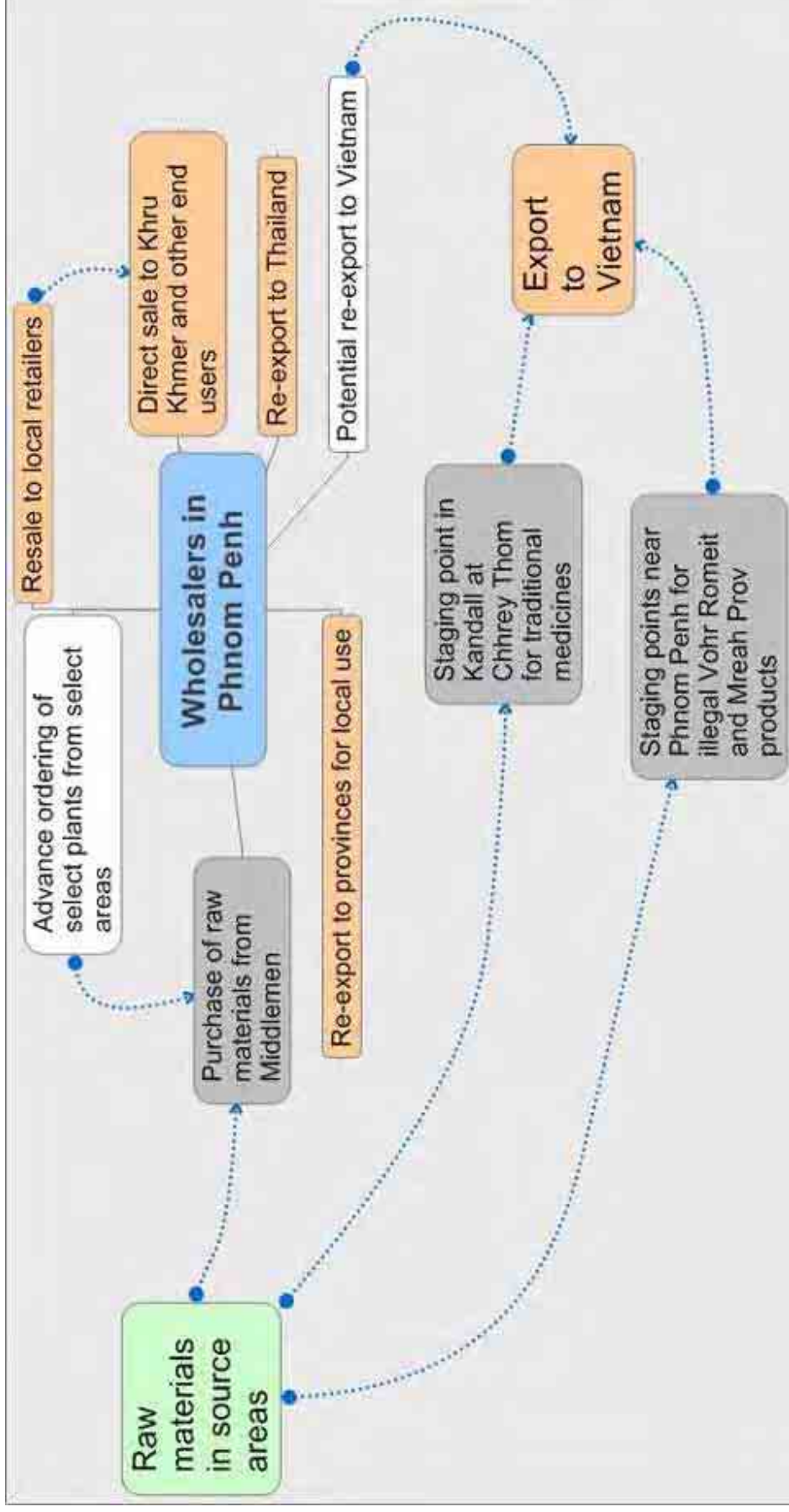
Regulatory Framework

No regulatory instruments of particular relevance to medicinal plants appear to have been promulgated since 2004 (see p. 56 for details on national regulations). While there are provisions in the Forestry Law that could enable more effective protection, these need to be supported by other instruments that categorise plant species in terms of threat and proscribe protection measures.

Nevertheless, it is clear that existing protection measure have had some impact upon reducing the collection of certain species in areas supported by law enforcement activities. It is unclear how other regulatory instruments (i.e. export and import taxes,) support the effective implementation of efforts to prevent the collection and trade of these products.

The regulatory framework for protecting medicinal plants could be greatly enhanced if the draft legislation on protected areas were to be passed.

Figure 10
General Trade Scenario



Source: TRAFFIC Data

DISCUSSION

The conservation significance of Cambodia's medicinal plants rests upon two major considerations: 1) the biological significance of the individual species; and 2) the socio-economic importance of the whole pharmacopoeia. Consequently Cambodia's diverse assemblage of medicinal plants is subject to extensive demand facilitated by a range of trading arrangements.

Much of the trade appears to be centralized in Phnom Penh though some international trade bypasses the capital. Wholesalers of medicinal plants based in Phnom Penh appear to be key stakeholders who act in a range of capacities, in a highly organized sector. This is not only in terms of buying and reselling large quantities of plant materials but also in terms of re-exporting (distributing) them to provincial TM shops. Presently, there is no evidence that a single group controls this trade though it is conceivable that the number of people acting in coordinating roles could be relatively small.

Hence, these wholesalers are well placed to act as both coordinators for the medicinal plant trade and participants in the international trade of medicinal plants. Yet, while it is not yet clear how well developed this potential for coordinating the trade is, traders do respond to requests from provincially-based "distributors" to supply substantial quantities of material; no doubt this requires middlemen to seek out sources of particular species. It is apparent that the organization of the trade in this manner is, at least in some instances, partly a response to the increasing rareness of many species in areas that have been the focus of collecting in the past.

These wholesalers are also well placed to participate in the international trade of medicinal plants. Although this has not yet been confirmed, it seems likely that they are involved in the export of medicinal plants to Thailand from Poipet. The direct trade route to Viet Nam and the direct trade of Dey Klla to Thailand also demonstrates the extent to which trade is demand driven. It is expected that middlemen will facilitate trade in the most direct and financially profitable manner available to them.

However, these wholesalers have not yet been linked to the illegal trade of Vohr Romeit and Mreah Prov which also appears to be coordinated from Phnom Penh.

Irrespective of the legality of medicinal plant trade there is a great deal of secrecy, consequently making it difficult to obtain accurate indications of the volumes involved. Evidence of a bustling trade is evident, however, in the large demand for traditional medicine in both urban and rural areas, the existence of over 90 traditional medicine shops in Phnom Penh, and the use of trucks as well as taxis for transport. An extensive and rapidly improving national road system is expected to have also facilitated access to many areas in recent years.

Additionally, while the overall volume is expected to be very large, methods used to quantify it are unlikely to provide accurate results. This stems from the degree of secrecy involved, the varied forms of transport (cars, taxis, trucks, boats) used in the trade, and the potentially large number of people and vehicles involved in transport arrangements.

Other gaps in our understanding of the overall trade scenario concern the amount of border crossings used for international trade, the volumes of trade through these areas and the final destinations of the plant products. While it is clear that Phnom Aural, Kirirom and other areas in Kampong Chhnang and Kampong Speu are centres for medicinal plant collection, many other dense forest areas appear also to be focal areas for collection, e.g. Bokor and Phnom Kulen. There are also many gaps in our knowledge regarding the source areas for many individual species and their status. While it is clear that collection is making many species rare in certain areas, anecdotal reports indicate that these same species may still be present in other areas.

The relative importance of introduced species in trade is also not well understood. The fact that the majority of these are cultivated suggests that they are widely available to the local population and that trade may not be important. However, it is not clear as to how introduced species and the 138 species associated with open habitats are distributed in the country.

Cultivation of local species appears to be very limited, including only one near-endemic species (*Asparagus cochinchinensis*). Of the 27 species that are widespread in the tropical world and cultivated in Cambodia, 21 are either herbs or shrubs that are probably very easy to grow and only one is a tree. The extensive pharmacopoeia of native plants that has been easily accessible to Cambodians appears to have discouraged investment in domestication of native species.

The total demand for the use and trade of native plants is placing an increasing level of threat to these resources. While some reports of the rareness or loss of species may pertain to limited areas rather than the national as a whole, there are clear indications that many species are becoming harder to get. This is indicated by the apparent centralization of trade in recent years, the practice of ordering plants from certain areas, and the switch by some provincially-based retailers from using a local supply to ordering plants from Phnom Penh based wholesalers. It is to be expected that the collection of medicinal plants will become increasingly coordinated and targeted upon both a wide range of species and localities as preferred species become harder to obtain.

This increasing rarity of plants is not restricted to certain taxa or lifeforms but includes perennial herbs, subshrubs and shrubs as well as large trees. Examples documented in this study include Moem Thnam Chin and Dey Kla as well as Vohr Romiet and Mreah Prov. This increasing rareness is associated with destructive collection techniques.

It may be expected that this will pose a threat to the continued trade of many species in time. While approximately 100 species are of primary concern, as many as 300 species may be threatened if the trade continues to grow and becomes more effective through increased levels of centralization and coordination. This could have a tremendous impact. Not only would such a development undermine an important and relatively affordable component of Cambodia's public health system, it could also contribute to the ecological impoverishment of many forest areas through the systematic extraction of these species in an unsustainable manner.

The potential for this decline is not currently mitigated by national legislation. This is in part due to the lack of passage of regulatory instruments such as: a law on Cambodia's protected areas, including many of the aforementioned source areas; a sub-decree on the categorization of threatened species along with prescriptions for protective action; and inter-agency agreements pertaining to trade and transport. Capacity issues as well as financial constraints also undermine effective action.

Nevertheless there are indications that the existing regulatory framework together with law enforcement is having some impacts. The illegal status conferred upon Vohr Romiet does appear to have reduced the incidence of its trade. Law enforcement has also halted the exploitation of this species in some areas of the Cardamom Range. On the other hand, status of this species has declined in south-western Cambodia. While the situation with Mreah Prov is similar, the effectiveness of law enforcement appears less clear. It may be that efforts to stop the exploitation of this species by the Ministry of Agriculture, Forestry and Fisheries and its Forestry Administration (see Appendix 8) are having an impact while the practice is continuing in protected areas under the Ministry of Environment's jurisdiction.

RECOMMENDATIONS

The following recommendations concern actions that aim to address unsustainable trade in medicinal plants and derived products. In reality, they are best considered as a sub-set of actions that would best be undertaken within the framework of a national conservation strategy for medicinal plants such as those that Lao PDR, Thailand and Viet Nam have already developed and, at least in part, implemented.

If this approach is adopted, it should be done in collaboration with other conservation and development partners, thereby allowing TRAFFIC to focus upon its core trade related mission and skills. Alternatively, TRAFFIC may consider focusing upon developing a sub-set of these activities for immediate action. While this may be a tempting consideration, it is important to note that further research and clarification of the conservation significance and social-economic importance of Cambodia's medicinal plant heritage remains central to any sustainable path of action. These considerations are presented below with the context of a national working group and a national conservation strategy for medicinal plants.

Finally, a National Strategy for the Conservation and Sustainable use of Medicinal Plants should be developed through the raising of national and public awareness, the establishment of a national working group, and the convening of a regional workshop as described below.

Regulatory Framework

Cambodia's regulatory framework should be strengthened to promote measures that enable, facilitate and ensure the conservation and sustainable use of Cambodia's medicinal plants. Central to this is the addition of further species to the CITES list at the earliest possible occasion.

The following nominations to the CITES list should be made at or before the next *Conference of Parties*:

- *Dysoxylum lourieri* (Mreah Prov Phnom) should be listed upon Appendix I as a near-endemic large tree species that is heavily exploited in a manner that completely destroys the tree and greatly reduces the likelihood that the species can reproduce and recover.
- *Gardenia ankorensis* (Dey Khla) should be listed upon Appendix II as a near-endemic shrub species that is heavily exploited in a manner that destroys much of the plant and greatly reduces the reproductive and regenerative capacity of populations.
- *Cinnamomum cambodianum* (Tepiru) should be listed upon Appendix II as an endemic tree species that is heavily exploited in a manner that completely destroys the tree and greatly reduces or eliminates the reproductive and regenerative capacity of populations.
- *Coscinium usitatum* (Vohr Romiet) should be listed upon Appendix III as this woody liana heavily exploited in a manner that greatly reduces or eliminates the reproductive and regenerative capacity of populations.

While listing in CITES Appendix III can be undertaken immediately under a sovereign decision by Cambodia, nominations for species to be added to Appendices I and II can only be done at the *Conference of the Parties to CITES*. The Royal Government of Cambodia should be assisted in the required preparations for, and participation in, the 15th *Conference of the Parties to CITES (CITES CoP15)*, which will be hosted by Qatar. This should include:

- Mentoring of at least one staff member of the national scientific and management authority that will attend CITES CoP15 as part of Cambodia's delegation.
- Preparation of national regulatory instruments that strengthen the conservation and sustainable use of these species and demonstrate Cambodia's commitment to their conservation. These instruments may consist of either sub-decrees or inter-ministerial Prakas³ provided that they embody the required measures and constitute adequate commitment upon behalf of government.

³ A *Prakas* is a ministerial level decree that may be issued by a single ministry, or jointly by two or more ministries. These may be issued independently of existing legislation although many new laws do specify that *Prakas* upon particular issues should be developed.

The Royal Government should also proceed with the development of inter-agency agreements between the customs department and the Ministry of Agriculture, Fisheries and Forestry at the earliest possible convenience. This will enable customs officials to act on behalf of the Ministry of Agriculture, Fisheries and Forestry to undertake enforcement activities at the border. This will require support for training for custom officials. TRAFFIC may consider seeking financial support from AusAID or other donors to enable them to provide this training.

The Royal Government should also develop the categories and list of threatened plant species in line with the requirements stipulated in the Forestry Law. These categories should be based upon the international and national conservation significance of the plants as well as knowledge of the level of threat and the requirements of existing regulations. Once the categories have been developed the priority groups proposed here should provide a starting point for assessing which species should be listed.

In addition, the passage of the draft protected area law should be undertaken swiftly and in a manner that does not facilitate compromise of its ability to achieve the conservation of Cambodia's biological diversity. This will strengthen regulation of resource extraction from protected areas and ensure that this supports the objectives of the protected area system. It will also help the Ministry of Environment to stop the production of Mreah Prov and Vohr Romeit in areas under their jurisdiction thereby complementing efforts by the Ministry of Agriculture, Forestry and Fisheries and its Forestry Administration to stop their production in areas under their jurisdiction.

Furthermore, the regulatory framework governing export of the extracts from *Coscinium usitatum* should be clarified if trade in these products is facilitated by inter-governmental agreements such as that which exists between Lao PDR and Viet Nam. This should be complemented by clarification of the alleged role this species has in the production of illicit drugs – an allegation that has developed almost mythological status in Cambodia. This clarification will require concerted investigation into the market chain within Viet Nam, and possibly China, in order to establish the true end-use of these extracts.

National and Public Awareness Raising

Awareness raising should to be undertaken for the benefit of both national decision makers as well as for the general public. This should be addressed through the development of:

- A country status report describing the diversity, distribution, abundance and conservation significance of Cambodia's medicinal plants along with an account of traditional use, incidence and impacts of trade, potential for market development and income generation.
- A draft *National Strategy for the Conservation and Sustainable Use of Medicinal Plants* should be developed as a basis for consultation with government, other national stakeholders and members of the international community.
- Publications for raising public awareness of the cultural and utilitarian values of traditional medicines from particular areas of Cambodia that may be regarded as iconic. These areas are Kirirom, Phnom Aural, Phnom Bokor and Phnom Kulen. An attractive poster and calendar illustrating some of the key species should also be developed, based upon this work, in the form of botanical paintings in watercolour for distribution to both government officials and the public.

National Working Group

A multi-disciplinary National Working Group on the Conservation and Sustainable Use of Medicinal Plants should be established to oversee the development and implementation of the National Strategy for the Conservation and Sustainable use of Medicinal Plants and address emerging issues concerning:

- Benefits of conserving medicinal plants and the effectiveness of strategies, actions and implementation arrangement.
- Monitoring of the conservation status, domestic use and international trade of medicinal plants.
- Strengthening of law enforcement measures through addressing gaps in the regulatory framework and improving inter-agency collaboration.
- Measures for strengthening inter-agency cooperation in the conservation and sustainable use of medicinal plants including law enforcement.
- Cambodia's participation in international conventions and international co-operation in regulating trade in medicinal plants, particularly in relation to CITES, the Association of Southeast Asian Nations (ASEAN) Regional Action Plan on Trade in Wild Fauna and Flora, and the ASEAN Wildlife Enforcement Network (ASEAN - WEN) and as well as bilateral arrangements.
- Development and refinement of *in-situ* and *ex-situ* production systems for medicinal plants including the identification of alternatives to the harvest of species endangered in the wild.
- Access rights of local communities and their participation in the development and implementation of sustainable use strategies including the role of bio-prospecting and the protection of individual populations of interest.
- Continued research/monitoring upon the diversity, conservation status and production and processing of medicinal plants and derived products within Cambodia.

The group's membership should consist of relevant agencies and institutions including national and international academics and university researchers, the Center for Traditional Medicine, the Association of Traditional Cambodian Healers, representatives of the wholesalers and retailers as well as officials from the Customs Department, Ministry of Finance, Forestry Administration, Department of Agronomy, the Ministry of Health, and the Ministry of Environment.

Serious consideration should be given to placing this working group within the framework of the *National Biodiversity Committee* that is mandated to facilitate interagency coordination relating to the conservation and sustainable use of Cambodia's biological and ecological diversity.

Regional Workshop

A two or three day regional workshop should be undertaken to share regional experience, refine and adopt the country status report, and provide consultation upon the draft *National Strategy for the Conservation and Sustainable use of Medicinal Plants*. This workshop should include sessions on:

- Diversity and conservation status of medicinal plants within countries within the region.
- Benefits of conserving medicinal plants and the effectiveness of strategies and measures in participating countries.
- Identification and implementation of monitoring the conservation status, domestic use and international trade of medicinal plants.
- Role of international conventions and international co-operation in regulating trade in medicinal plants.

- Development and refinement of *in-situ* and *ex-situ* production systems for medicinal plants including assessment of the utility and effectiveness of alternative non-threatened species or products.
- Measures for strengthening inter-agency cooperation in the conservation and sustainable use of medicinal plants including closer cooperation between law enforcement agencies.
- Access rights of local communities and their participation in the development and implementation of sustainable use strategies including the role of bio-prospecting and the protection of individual populations of interest.

Participation in the workshop should include a selection of participants from Cambodian institutions that will either be members of the *National Working Group on the Conservation and Sustainable Use of Medicinal Plants*, or from those institutions that are likely to be called upon in implementing a national strategy. At a minimum these will include officials from ministries dealing with commerce, culture, finance, interior and rural development as well as those directly involved in natural resource management and agricultural development. Representatives of other countries within the region that have had appropriate experience in the development and implementation of their respective national strategies or some aspect thereof should be invited to present and provide feedback. These should include Lao PDR, Malaysia and Viet Nam but possibly also China and India.

Facilitation of this workshop should be done either by TRAFFIC or by TRAFFIC in partnership with IUCN and/or WWF and the collaboration of a bilateral or multi-lateral donor. It should include members of the *CITES Plants Committee* from the Asian Region, IUCN's *Medicinal Plant Specialist Group* and ASEAN-WEN representatives as both facilitators and presenters.

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APPENDIX 1

ANIMAL PRODUCTS PRICES AT TRADITIONAL MEDICINE RETAIL OUTLETS IN CAMBODIA

Animal	Part	Price per part in USD	Location
Bear	gallbladders	30 - 500	Phnom Kulen
Bear	gallbladder	3.75	Poipet
Bear	gallbladders	300 - 500	Kompong Speu
Bear	gallbladder	50 - 300	Pursat
Bear	skin	3.75 / piece	Pursat
Bear	claw	1.25	Ratanakiri
Bear	canine	40 - 60	Ratanakiri
Elephant	ivory	4.00 / piece	Poipet
Elephant	hair	0.75 / hair	Ratanakiri
Cobra	gallbladder	15.00	Poipet
Southern Serow	bone	2.50	Pursat
Red Jungle Fowl	foot	0.75	Pursat
Loris	whole	0.85	Pursat
Loris	whole	3.00	Preah Vihear
Loris	whole	6.25	Stung Treng
Loris	whole	5.00	Ratanakiri
Flying Squirrel	whole	0.85	Pursat
Flying Squirrel	whole	5.00	Ratanakiri
Tiger	bone	6.25 / kg	Pursat
Tiger	canines	120 / tooth	Ratanakiri
Porcupine	stomach	1.25 / piece	Kompong Speu
Porcupine	stomach	3.75	Preah Vihear
Porcupine	stomach	3.75	Stung Treng
Porcupine	stomach	6.25	Ratanakiri
Porcupine	teeth	0.50 / tooth	Preah Vihear
Porcupine	jaw	0.25	Ratanakiri
Mouse Deer	jaw	0.50	Preah Vihear
Starfish	whole	0.75	Kratie
Horseshoe Crab	shell	0.75	Kratie
Mouse Deer	whole	2.50	Stung Treng
Otter	skin	1.25 / piece	Ratankiri
Hog Badger	fat	3.75 / half litre	Ratanakiri
Python	gallbladder	3.75	Ratanakiri

Prices are correct as of August 2004

APPENDIX 2

SURVEY OF PHARMACIES AND TRADITIONAL MEDICINE RETAIL OUTLETS IN PHNOM PENH: SUMMARY OF RESULTS

Type of Shop	Number visited	Number of shops currently seen with patented medicines allegedly containing CITES listed species
Western pharmacies	4	2
Open-fronted pharmacies	5	1
TCM shops	19	19
TVM shops	4	0 ⁴
TKM shops	6	0 ⁵

Product sold	Possible Ingredients	Number of outlets seen in	Code in identification guide ⁶	Price (August 2005)	Quantity seen for sale
Western and Open-fronted Pharmacies					
Shexiang Zhitong Tiegao plasters	Musk	2 Western, 1 open-fronted pharmacies	1.4.F	< 20 cents each	> 50
TCM Shops					
HuGuSheXiang plasters	Tiger bone, musk	19	1.1.A	< 25 cents each	< 10 in each shop
TianWangShe Xiang plasters	Musk, Leopard bone	19	1.9.H		< 10
Shuang Loong Yuen ⁷	Tiger bone	TCM	2.20.G		
Medicine for rheumatism ⁸	“ contains 20% Tiger bone” (retailer translated the writing)	1	Not in guide	\$2 each	
Tiger bone wine ⁹	Retailer said that animal ingredients were not listed on the label as that made such products difficult to import.	1	Not in guide	Small bottle \$17, large bottle \$28	
Condense Seal Pills	Seahorse, cistanche ¹⁰	10	2.13.H	\$2 per bottle	< 10 in each shop
Lin Chee Tan (pills)	Chinese characters say Shexiang	10	Not in guide	\$1 per bottle	< 10 bottles in each shop
Shexiang Ren Shen ¹¹ for rheumatism and backache	Musk 5%, orchid (gastrodia), 10%, Ginseng 10%, Deer horn 10%,	1	Not in guide	\$2.50 per bottle	6-7 bottles of pills
Product name only in Chinese characters (pills)	Tiger bone	1	2.14.D	less than \$5	
Hu Ku Padon	contains 20% Tiger bone	2	2.24.F	\$2	< 10 pkts

⁴ One TVM shop also often sold *HuGuSheXiang* and *TianWangSheXiang* plasters (1.1.A, 1.9.H) which, according to the guide, contain musk, Tiger bone and Leopard bone, but is currently out of stock. The shop imports these products from Viet Nam.

⁵ None of the TKM shops had any patented products allegedly containing CITES listed species *currently* for sale. However, one TKM shop often sold *HuGuSheXiang* and *TianWangSheXiang* plasters (1.1.A, 1.9.H).

⁶ Cameron *et al.*, 2004

⁷ No indication of Tiger bone. Says on the packet that it contains seahorse and sea dragon

⁸ Small boxes of pills. No picture, only Chinese writing.

⁹ imported from China

¹⁰ in list of ingredients says it also contains seal penis

¹¹ Retailer said it was better quality and more effective than Lin Chee Tan.

Product sold	Possible Ingredients	Number of outlets seen in	Code in identification guide ⁶	Price (August 2005)	Quantity seen for sale
Wan (pills)	(according to retailer)				
Pi Fu Bing Antipyretic Pills	Pangolin	2	2.13.D		> 10 in each shop
Bak Foong Pills	Gastrodia	1	2.10.H	just over \$2.	3-4 packets.
Hutou pai plaster.	musk	1	Not in guide	500 riel each ¹²	< 50
Shexiang Zhuanggugao plasters		5	not the ones in guide	500 riel each	
Golden Coin Tortoise Antipyretic Pills ¹³	Pangolin and Tortoise shell	1	2.14.B	< USD 5	> 10
Poison Kai Yeung Pills	Long-nosed Pit Viper listed in ingredients (also Pangolin pictured on packet)	1	Not in guide		
Dragon Life Sexual Capsule	Musk, Tiger penis	1	2.10.	USD 2.50	3-4 box,
Sen Way Chew Chan Wan		1	2.10.E	USD 2.50.	3 boxes
Armadillo Antipyretic Pills	Pangolin	5	2.13.D	USD 2	4-5 bottles in each shop
Yan Shen Jai Jao Wan	Pangolin scales, Tiger bone, Gastrodia, Tortoise shell	1	2.26.C	USD3.50	4-5 bottles
XiangShaYang Wei Wan	Saussurea	1	2.30.D		
Surn Suie Phone Sub Wan	Tiger bone (Cobra <i>Naja naja</i> snake gall)	1	2.15.A		3-4 bottles
Wei-Tai 999 Capsule	Saussurea	1	2.3.E		12 bottles
TVM					
Two TVM stalls were found in an exhibition that advertised Chopharco pharmaceutical products for import into Cambodia. Some products, such as <i>An Hai Cau Bo Than</i> (Seal Tonic Pills) and <i>Van Tho Tinh Ginseng Drug</i> (containing five per cent antler) may contain animal derivatives. According to the stall owners, the majority of the Vietnamese community in Phnom Penh visit a clinic on Monivong Boulevard which specialises in TVM.					

Prices are correct as of August 2004.

¹² 500 riel is approximately USD 0.13.

¹³ packets in shop had same name, different picture

APPENDIX 3

A MINIMUM LIST OF ANIMAL SPECIES ALLEGEDLY USED IN TRADITIONAL MEDICINE THAT ARE WILD CAUGHT IN CAMBODIA

Mammals	Birds	Reptiles and Amphibians	Marine
Slow Loris <i>Nycticebus coucang</i> (all parts)	Lesser Coucal	Softshell Turtle sp. (carapace, plastron)	Seahorse sp.
Pygmy Loris <i>Nycticebus pygmaeus</i> (all parts)	Greater Coucal	Asian Box Turtle <i>Cuora amboinensis</i> (carapace, plastron)	Starfish sp.
Otter sp. (tail, skin)	Red Junglefowl <i>Gallus gallus</i> (foot)	Tortoise sp. (carapace, plastron)	Horseshoe crab sp.
Sambar <i>Cervus unicolor</i>	Purple Swamphen <i>Porphyrio porphyrio</i> (foot)	Python sp. (all parts).	Pipefish sp.
Southern Serow <i>Naemorhedus sumatraensis</i> (bone, skin, horn)		Krait sp.	
Red Muntjac <i>Muntiacus muntjac</i> (hooves)		Cobra sp. (gallbladder)	
Lesser Oriental Chevrotain <i>Tragulus javanicus</i> (jaw)		Tockay Gekko <i>Gecko gekko</i>	
Eld's Deer <i>Cervus eldii</i>		Monitor Lizard sp.	
Bear sp. (skin, gallbladder)		Siamese Crocodile <i>Crocodylus siamensis</i>	
Hog Badger <i>Arctonyx collaris</i> (fat)		Toad sp.	
Porcupine sp. (stomach, teeth, jaw)		Frog sp.	
Flying-fox sp.		Turtle sp.	

Mammals	Birds	Reptiles and Amphibians	Marine
Tiger <i>Panthera tigris</i> (teeth)			
Elephant <i>Elephas maximus</i> (hair)			
Sunda Pangolin <i>Manis javanica</i> (scales)			
Leopard <i>Panthera pardus</i>			
Burmese Hare <i>Lepus peguensis</i>			
Silvered Langur <i>Semnopithecus cristatus</i>			
Monkey sp.			
Mekong River Irrawaddy Dolphin <i>Orcaella brevirostris</i> (bones, flesh, teeth)			
Dugong <i>Dugong dugon</i> (tusks, bone, oil, meat, hair, flippers)			
Gaur <i>Bos gaurus</i> (horn)			
flying squirrel (probably <i>Petaurista</i>)			

Sources: Heng Kimchhay, Wildlife Protection Officer, pers comm., August 2004, Huon Chhum, *kru khmer*, pers comm., July 2004.

APPENDIX 4

WILDLIFE SPECIMENS CONFISCATED BY FA-WILDAID WPMU (JULY 2001 – AUGUST 2004)

Species names and identifications have not been verified by the author and are transcribed directly from data provided by WildAid Cambodia.

Species	Bone		Dead		Gall bladder		Head		Horn		Shell		Live		Meat		Skin		Teeth		Other	
	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)
REPTILES																						
King Cobra														44	108.5							
Monocellate Cobra													9									
Cobra spp.			1										72	7.1								
Burmese Python	1	2.70	5	7	54								219	13	1	21	98	15				32 (no unit given), 81.5kg fat
Reticulated Python													9									17kg fat
Puff-faced Watersnake													84	249.25			105					
Rat Snake spp			1										157	273.2	6							
Watersnake spp.			1	0.35									115	385.25								
Snake spp.				0.2									2	30.5								0.3kg scales
Bengal Monitor			9	2									158	10.5	8.9							
Water Monitor			1										65		1	1						
Gecko spp.			24											85								
Big-headed Turtle													5									
Mangrove Terrapin													41									
Asian Box Turtle			2										17		16							
Indochinese Box Turtle													1									
Giant Asian Pond Turtle													193									
Yellow-headed Temple Turtle													101									
Malayan Snail-eating Turtle			42										129		33							
Elongated Tortoise													45	8								
Black Asian Giant Tortoise			589										30		22							
Asiatic Softshell Turtle													7									
Wattle-necked Softshell Turtle													6									
Tortoise spp.			22										372	1941.5	1104	174	107	17				95 eggs
Turtle spp.			2					5					10	12.5	192	1	44.6					
Crocodile spp.													1									

Species	Bone		Dead		Gall bladder		Head		Horn		Shell		Live		Meat		Skin		Teeth	Other	
	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)			
MAMMALS																					
Chinese Pangolin		0.50																			
Sunda Pangolin			4										94	42.1		20.6	1	0.1		2 blood (no unit given), 2.5kg scales	
Sunda Colugo (Flying Squirrel)			6																		
Flying-Fox													88								
Large Flying-fox													25								
Pygmy Loris			63																		
Slow Loris			54										34								
Gibbon spp.													2							7 hands	
Long tailed Macaque			1				1						306								
Pig-tailed Macaque													11								
Pileated Gibbon													7								
Silvered Langur													1								
Asiatic Jackal	1												1				4				
Dhole													1								
Asiatic Black Bear													3								
Sun Bear	5	2.30	1										14	0.2			11		2	8 claws, 1 skull, 3 carcasses, 4 paws	
Hog Badger	1															2	2			8 claws, 0.5kg fat, 1 lung	
Large-toothed Ferret Badger													1								
Hairy-nosed Otter													1				1				
Smooth-coated Otter			2										4				7			4 tails	
Civet spp.			1										47	1	2	10.9					
Common Palm Civet													5								
Small-toothed Palm Civet													1								
Binturong													5								
Java Mongoose													4			1					
Clouded Leopard																	3				
Asian Golden Cat																					
Fishing Cat		12											1	1			8	0.1			
Leopard		3.60															3				
Leopard Cat													12								
Marbled Cat													2								
Tiger																				1	11kg fat

Species	Bone		Dead		Gall bladder		Head		Horn		Shell		Live		Meat		Skin		Teeth	Other
	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)		
Asian Elephant		9					1						4				12		3	0.5 trunk, 1 tail
Wild Boar (Wild Pig)				9.7									5		3	3545.9		2	25	77 tusks
Lesser Mouse Deer						3							28		2	16.5				3 legs
Greater Oriental Chevrotain			2						18	4.3			3				1			
Eld's Deer									5	14.3			3				6	12.5		
Sambar		3.5				3							3							
Hog Deer																1.2				
Red Muntjac		0.30	3			40							8	2	333.6	23			2	54 hooves, 4 stomachs, 59 legs
Gaur					1	2	7						1				1			14 jaws
Banteng						5										1.5				
Southern Serow		18.40			1	1	41						3				4	0.4		1 skull
Indian Giant Flying Squirrel						3														
Asiatic Brush-tailed Porcupine			1										1			7.5				
Porcupine spp.			4		45	1							9			25.2			27	2kg quills, 132 stomachs, 26 'scales'
Siamese Hare																3.5				
Rabbit spp.			2										3			11.2				
Beger's pig																	1	0.8		
BIRDS																				
Blue-breasted Quail													15							
Chinese Francolin													4							
Green Peafowl													6							2 'tails'
Germain's Peacock Pheasant			14										2							
Quail (Rain Quail)			101	7									61			3.9				
Red Junglefowl													13							7 feet
Siamese Fireback																				30 feet
Lesser Whistling-Duck			5	15									200	4	2.5					
Barred Button Quail			196										15		7.8					
Small Button Quail													33							
Brown Hornbill													2							
Great Hornbill							12													
Pied Kingfisher			1																	
Blue-tailed Bee-eater													4							
Coucal spp.			12																	

Species	Bone		Dead		Gall bladder		Head		Horn		Shell		Live		Meat		Skin		Teeth	Other
	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)		
Lesser Coucal			39										3							
Blossom-headed Parakeet													1034							
Grey-headed Parakeet													5							
Parakeet spp.													45							
Red-breasted Parakeet													56							
Asian Palm Swift			30																	
Barn Owl													6							
Brown Fish Owl									4											
Owl spp.													5							
Spot-bellied Eagle Owl													2							
Hodgson's Frogmouth			1										17							
Savanna Nightjar													1							
Dove spp.			180	12									1815	354	21.9					
Red collared Dove													11							
Spotted Dove													343							
Thick-billed Green Pigeon			33																	
Bengal Florican													1							
Sarus Crane			2										2							
Masked Finfoot			23										3		1.3					
Baillon's Crake			46																	
Common Moorhen			11																	
White-breasted Waterhen			3	32										21	5.9					
Black-shouldered Kite			2																	
Crested Serpent Eagle													5							
Great-headed Fish Eagle													7							
Osprey													2							
Rufous-winged Buzzard													5							
Great Cormorant																22.5				
Black-crowned Night Heron			13										2							
Chinese Pond Heron			49										27		1.1					
Egret spp.			1										9							
Heron spp.													6							
Little Egret			8																	

Species	Bone		Dead		Gall bladder		Head		Horn		Shell		Live		Meat		Skin		Teeth	Other
	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)	N	W(kg)		
Pond Heron spp.			88										139							
Yellow Bittern			61										15							
Spot-billed Pelican			1										17							
Asian Openbill															3					12 'jaws'
Greater Adjutant													7							
Lesser Adjutant			3										12	1						
Stork (Staw-necked)													2							
Stork spp.			155	20									142	22						
Woolly-necked Stork													4							
Large-billed Crow			1										1	1						
Oriental Magpie Robin													2							
Black-collared Starling			1										1							
Common Myna			7										58							
Hill Myna			1						4				43							
Barn Swallow			5										175							
Striated Bulbul			6																	
Brown Prinia			1736										6							
Oriental Reed Warbler													14							
Eurasian Tree Sparrow													110							
Scaly-breasted Munia																				
Little Grebe			1																	
Purple Swamp Hen			20	20									3			4				
White-vented Mynah													51							

Source: WildAid Cambodia

APPENDIX 5

MEDICINAL PLANTS OF CAMBODIA DATABASE DEVELOPMENT

The first step in the research behind this report involved the preparation of a credible list of medicinal plant species along with matching data upon their origins, principal habitats, life form, relative abundance and international conservation significance as described in the CITES Appendices and the *IUCN Red List of Plants* (1992). A number of concerns and constraints to the development of a useful database based upon accurate data were identified. These include the current lack of a main source of documented botanical information and the limited, albeit increasing, capacities in related botanical and pharmacological fields.

Specific concerns include:

- While the individual accounts of Cambodia's medicinal plants mentioned below commonly concern from two hundred to more than 550 species no verified list of all of Cambodia's medicinal plants currently exists. It is thought that there may be something in the order of 1000 medicinal plant species in Cambodia (Dr Hieng Punley, Director of National Center of Traditional medicine, Ministry of Health, *pers. comm*).
- It is possible that some of the existing documents are derived from studies that are limited geographically. For example, Marie Martin's work upon the ethnobotany of Cambodia did focus upon the south-western part of the country although it also included some work from other parts of the country such as Siem Reap (Marie Martin *pers. comm.* 1993).
- There is limited financial and technical support for rigorous clarification of the taxonomy of medicinal plants. This is of particular significance as a number of the more credible documents described below are based upon work undertaken in the 1960s and some of their taxonomy is outdated. The names of many species have been formally changed in accordance with the rules of international botanical nomenclature. The number of people working in this field is very limited as are the levels of technical and logistical support they receive.
- Concerns about the compatibility of information upon various aspects of interest that are extracted from differing sources arise as different source documents sometimes use disparate taxonomies. For example, while one author may use a particular name for a taxon other authors may list the same name as a synonym. Approximately 150 names used by authors cited in this study as plants names are regarded as synonyms by one or more of the other authors cited.
- Differing sources do not necessarily classify data in a standardised manner; including data upon the origins, principal habitats, life form and use. There are also substantial differences in how individual authors present scientific names. These frequently pertain to the use of different authorities for the same plant name, and sometimes concern the use of different spelling.
- Some data remains difficult to obtain. Comment upon the relative significance of Cambodia's medicinal plants is limited as a full list of Cambodia's flora and its endemic species appears not to have been published, although Dy Phon (1982) states that 2,308 species, including 214 endemic species, have been described. It is unclear as to how many of the non-endemic species are introduced.
- Information upon the chemical constituents of medicinal plants is very limited in most documentation with the exception of Kham (2004).

Published accounts that focus upon Cambodia's medicinal plants commenced with Petelot's four-volume account of medicinal plants and their uses in Cambodia, Viet Nam and Laos in the 1950's (Petelot 1952, 1953, 1954a and 1954b). These include 442 species used in Cambodia. Prior to the onset of war in the 1970's these contributions were complemented by:

- A contribution to the study of Cambodia's medicinal plants concerning 445 species (Douc 1966).
- An introduction to the ethnobotany of Cambodia including 230 medicinal species (Martin 1971).
- An account of the ethnobotany of Ratanakiri including 18 medicinal species (Matras and Martin 1972).
- A doctorate thesis upon traditional medicine and pharmacy in Cambodia concerning 83 species (Hahn 1978).

Subsequent to the war a number of varied initiatives have taken place. These include the publication of two major books concerning useful plants including medicinal plants in Cambodia by Dy Phon (2001) detailing 568 species; and upon the use and chemistry of Cambodia's 515 medicinal plant species by Kham (2004). During this period there have been a number of other initiatives that relate to medicinal plants. These include a number of detailed studies concerning the use of non-timber forest products and/or medicinal plants by select communities or within selection areas (eg. David 2006, Schmidt 2006). There is also a wide array of village interview data concerning the use of NTFP as well as other health sector related assessments such as that undertaken by KHANA upon the role of traditional healers in HIV/AIDS care and prevention in Cambodia (KHANA 2001).

In addition, the Ministry of Health's *Centre for Traditional Medicine* chairs an inter-agency working group that is currently preparing a book upon medicinal plants in Cambodia (Dr Hieng Punley, Director of National Center of Traditional medicine, Ministry of Health, pers. comm.).

A database recording the diversity and conservation significance of Cambodia's medicinal plants was developed using Microsoft Excel. Data was derived from the key published accounts by Petelot (1952, 1953, 1954a and 1954b), Douc (1966), Martin (1971), Matras and Martin (1972), Hahn (1978), Dy Phon (2001) and Kham (2004). These accounts were selected because:

- They are either formally published or were the result of doctorate studies.
- Each constituted historical contributions to the study of Cambodia's medicinal plants.
- Each demonstrated knowledge and diligence of plant taxonomy rather than reliance upon Cambodian plant names.

In contrast, many of the community-based assessments are based upon interview data. This approach is fraught with problems relating to reliability of much of this data stemming from its anecdotal nature, variations in local knowledge and use of local plant names, and the generally limited botanical knowledge of the investigators concerned. Two apparent exceptions to this trend are reports by GERES (in prep.) and Schmidt (in prep.). These documents focus upon coastal areas and Mondolkiri respectively.

The database was developed by combining data from the different publications following standardization of data for each attribute. This was first done for the "names-in use" and synonyms presented in these documents. Standardizing the taxonomy of the species described in all of the documentation used was key to establishing the true number of species concerned, and to enable data from different sources to be compared and combined as relevant. For each other attribute (origin, habitat etc.) all of the classes used in the different publications were aggregated then classified into a broader set of categories that were used for analysis and comparative purposes.

The taxonomy of these plants was standardized by the development of a 'Table of Equivalence' of their nomenclature (not included in this report) through the following multi-step process:

- All 'names-in use' and synonyms presented in these sources, including references to the described authorities, were entered into Excel database. Where sources considered a wide range of plant uses (Dy Phon 2001, Martin 1971, and Matras and Martin 1972) taxa with non-medicinal uses were also included.
- The resulting 1,218 combinations were then cross-tabulated with each of the sources they are detailed in.
- The synonyms used by each author were added in additional columns.

- Taxa that could reasonably be regarded as equivalent taxa (irrespective of whether they are strictly to be considered as basionyms or synonyms) were then identified by cross-referencing the names that were used by each author, along with all of the synonyms provided by them, on a record-by-record basis.
- Generally, speaking this equivalence was easy to identify. When identification of equivalent names was problematic reference was made to the International Plant Name Index (www.ipni.org) or other relevant taxonomic literature (eg. Smitinand *et.al.* 1980).
- A provisional name was then identified. Names that were used in more recent sources were given preference over those described in earlier sources. No attempt was made to ensure that this provisional name had “priority” in accordance with the International Rules of Botanical Nomenclature due to time constraints and the difficulty of this for such a large number of taxa. The International Plant Name Index (IPNI) identifies those scientific names for plants that have been legitimately published. Although IPNI does include some data upon the status of some of these names, whether it is a basionym or a synonym, it does not provide information upon which name currently has priority.

Data pertaining to the origin/level of endemism, life form, habitats, relative abundance and IUCN Red List Status of these species were entered into the database from the various sources. In general, most data was obtained from Dy Phon’s ‘dictionary’ of plants used in Cambodia (Dy Phon, 2001), which provides a wealth of data upon these attributes. Where there were some differences in the array of classes used by authors they were standardized by aggregating and classifying them into a broader set of categories that were used for analysis and comparative purposes. The resulting categories are:

Origin and Endemism

E+ = Endemic species or "near endemic" species from Cambodia and contiguous parts of Laos, Thailand or Viet Nam.

IF = Former French Indochina (Cambodia, Laos and Viet Nam).

IF+ = Former French Indochina along with one other country.

IP = Indochinese Peninsula incorporating Cambodia, Laos, Myanmar, Thailand, Viet Nam and contiguous parts of southern China.

IP + = Indochinese Peninsula plus one or two other countries.

WS Asia = Widespread in Asia.

OWT = Old World Tropics including parts of Africa, and Asia and/or Australia.

PT = Pan Tropical.

Cam + ? = Native to Cambodia and possibly elsewhere.

Relative Abundance

R = Rare

FR = Fairly rare

FC = Fairly common

C = Common

VC = Very common

Timber Classes

L = Luxury timbers

1 = Premier class timbers

2 = Second class timbers

3 = Third class timbers

APPENDIX 6

PRINCIPLE HABITATS AND DISTRIBUTION PATTERNS OF CAMBODIA'S MEDICINAL PLANT SPECIES

Table A: Principle Habitats and Distribution Patterns for species associated with narrow habitats, dense and semi-dense forest.

ORIGIN	Narrow Habitats	Dense Forests		Semi-dense Forests	Dense & Open Forests
		Dense Forest Only	Dense & Semi-dense Forest		
Endemic and "Near-Endemic"	5	23	2	3	1
French Indochina	4	8	1	1	1
French Indochina and one other country		7	3	1	
Indochinese Peninsula	4	11		1	2
Indochinese Peninsula and possibly further afield	1	12	3		3
Cambodia & possibly further afield		6		1	
Old World Tropics	9	7			
Pantropical	9	2			
Widespread in Asia	17	52	2	2	5
Unknown Origins					
Introduced		1			1
Grand Total	49	129	8	9	13

Sources: Petelot (1952, 1953, 1954a and 1954b), Douc (1966), Martin (1971), Matras and Martin (1972), Hahn (1978), Dy Phon (2001) and Kham (2004)

Table B: Principle Habitats and Distribution Patterns for species associated with open forests.

ORIGIN	Open Forests			
	Open Forest Only	Open & Semi-dense Forest	Open Forest & Open Areas	Open Forest & Narrow Habitats
Endemic and "Near-Endemic"	6			
French Indochina	7	1	1	1
French Indochina and one other country	5			
Indochinese Peninsula	11	1		
Indochinese Peninsula and possibly further afield	7			
Cambodia & possibly further afield				
Old World Tropics	6			3
Pantropical	1			
Widespread in Asia	33	1	6	3
Unknown Origins				
Introduced	1			
Grand Total	77	3	7	7

Sources: Petelot (1952, 1953, 1954a and 1954b), Douc (1966), Martin (1971), Matras and Martin (1972), Hahn (1978), Dy Phon (2001) and Kham (2004)

Table C: Principle Habitats and Distribution Patterns for species associated with open forests.

ORIGIN	Secondary Forests					
	Secondary forest only	Secondary & dense forests	Secondary & semi-dense forest	Secondary & open forests	Secondary forest & narrow habitats	Secondary forest & open areas
Endemic and "Near-Endemic"	2	5	1	1		
French Indochina	8	3			2	1
French Indochina and one other country	4	2			1	
Indochinese Peninsula	7	3			1	
Indochinese Peninsula and possibly further afield	5	4	1	1		
Cambodia & possibly further afield	1					
Old World Tropics	9	2				1
Pantropical						
Widespread in Asia	26	17	1	5	4	1
Unknown Origins						
Introduced			1			
Grand Total	62	36	4	7	8	3

Sources: Petelot (1952, 1953, 1954a and 1954b), Douc (1966), Martin (1971), Matras and Martin (1972), Hahn (1978), Dy Phon (2001) and Kham (2004)

Table D: Principle Habitats and Distribution Patterns for species associated with other areas.

ORIGIN	Other Areas			
	open areas	waste lands	wet areas	wide spread
Endemic and "Near-Endemic"	7			
French Indochina	2	1	1	
French Indochina and one other country	1		1	
Indochinese Peninsula	3	1	3	
Indochinese Peninsula and possibly further afield	1		1	
Cambodia & possibly further afield		1		
Old World Tropics	8	1	4	3
Pantropical	13	4	5	4
Widespread in Asia	36	6	15	6
Unknown Origins				1
Introduced	1	4	4	
Grand Total	72	18	34	14

Sources: Petelot (1952, 1953, 1954a and 1954b), Douc (1966), Martin (1971), Matras and Martin (1972), Hahn (1978), Dy Phon (2001) and Kham (2004)

APPENDIX 7

ASSESSMENT ON THE VULNERABILITY OF MEDICINAL PLANT SPECIES IN CAMBODIA

Assessment of vulnerability was conducted by allocating each species to one of four priority groups reflecting potential levels of threat. The groups were identified by characterizing species by the level of endemism, their principal habitat requirements and – in the case of trees and large woody vines - their relative abundance as described by Dy Phon and Rollet (1999).

Species that were restricted to ‘narrow habitats’ were also considered to be of conservation concern. Similarly, species confined primarily to dense and semi-dense forests were integrated into this classification because they also demonstrate a low degree of ecological amplitude in a landscape that has been greatly degraded in recent decades by timber collection and fire respectively. These data were integrated into the above-mentioned database along with that upon their international conservation significance as listed in the CITES Appendices and the IUCN Red List; as well as their ranking upon Cambodia’s list of timber classes of trees (CTSP 2001).

Data concerning the origin/endemism of the medicinal plant species were cross-tabulated with their principal habitat requirements. Note that the IUCN Red Lists combines critically endangered, endangered and vulnerable categories as threatened species in contrast to those that are either of lower risk or ‘data deficient’.

1. Priority Group I: All species that are either;
 - a. Endemic to Cambodia or ‘near endemics’. and/or
 - b. Limited to narrow habitats within the Indochinese Peninsula,
 - c. CITES listed,
 - d. Listed as threatened on the IUCN Red List,
 - e. Described by Dy Phon and Rollet (1999) as being ‘rare’ in Cambodia.
 - f. Listed as a luxury timber species in Cambodia and/or are
 - g. Listed as timbers of premier quality in Cambodia that are not common or very common.
2. Priority Group 2: All additional species that are either;
 - a. Endemic to the former ‘French Indochina’ and/or
 - b. Listed as being of lower risk or data deficient on the IUCN Red List,
 - c. Limited to dense forest or semi-dense forest within the Indochinese Peninsula, and/or are
 - d. Described by Dy Phon and Rollet (1999) as being ‘fairly rare’ in Cambodia.
 - e. Listed as a timbers of premier quality in Cambodia that are considered common or very common, and/or are
 - f. Listed as timbers of secondary quality in Cambodia.
3. Priority Group 3: All additional species that are either;
 - a. Endemic to the broader Indochinese Peninsula, or are largely limited to the former ‘French Indochina’ but that also occur in one other country, and/or
 - b. Listed as timbers of tertiary quality in Cambodia and/or
 - c. Limited to narrow habitats and distributed beyond the boundaries of the Indochinese Peninsula.
4. Priority Group 4: All additional species those are limited to dense forests and distributed beyond the boundaries of the Indochinese Peninsula.

Anecdotal information upon the apparent rareness was also gathered as a routine aspect of the interview process. Information gathered during interviews in the first report ‘A Preliminary Investigation into the Use and Trade of Wild Plants and Animals in Traditional Medicine Systems in Cambodia’ was also used to assist in determining vulnerability.

SPECIES COMPOSITION OF PRIORITY GROUPS 1, 2 ,3 AND 4.

Priority Group 1 Species

Provisional Name	Timber Classes	Lifeform	Origin & Endemicity	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Azelia xylocarpa</i> (Kurz) Craib	L	tree	IP	dense forests	AR	EN A1cd	
<i>Ailanthus triphysa</i> Alston		tree	E+	dense & secondary for			
<i>Albizia lebbeck</i> (L.) Benth.	L	tree	OWT	open forests			
<i>Amomum krervanh</i> Pierre ex Gagnep		giant herb	E+	dense forests			
<i>Amomum villosum</i> Lour.		giant herb	E+	dense forests			
<i>Ampelocissus arachnoidea</i> Planch.		shrub – climber	E+	open forests			
<i>Anacolosa clarkei</i> Pierre		shrub	E+	open areas			
<i>Antidesma cochinchinensis</i> Gagnep.		shrub	IF	narrow habitats			
<i>Aquilaria crassna</i> Pierre	3	tree	E+	dense forests	R	CR A1cd	II
<i>Ardisia smaragdina</i> Pit		sub-shrub	E+	dense forests	FC		
<i>Atalantia citroides</i> Pierre ex Guillaumin		shrub	E+	secondary forests	FR		
<i>Bauhinia bracteata</i> (Benth.) Baker		liana	IP	narrow habitats	FR		
<i>Bauhinia curtisii</i> Prain		liana - woody	IP	narrow habitats			
<i>Bridelia cambodiana</i> Gagnep.		liana - woody	E+	open areas			
<i>Buchanania siamensis</i> Miq.		shrub/small tree	IP	narrow habitats			
<i>Caesalpinia godefroyana</i> Kuntze		small tree	E+	narrow habitats			
<i>Calamus palustris</i> Griff.		liana - palm	E+	semi-dense forests	FC		
<i>Calamus rudentum</i> Roxb.		liana - palm	E+	dense forests			
<i>Calamus salicifolius</i> Becc.		liana - palm	E+	open areas	C		
<i>Cassia garrettiana</i> Craib	L	small tree	IP	open forests	FC		
<i>Cassia siamensis</i> Lam.	L	tree	WS Asia	secondary forests	R		
<i>Cinnamomum cambodianum</i> Lecomte		tree	E+	dense forests	FR		
<i>Combretum latifolium</i> Blume		liana - woody	IF	narrow habitats			
<i>Curcuma sparganifolia</i> Gagnep.		herb	E+	open forests			

Provisional Name	Timber Classes	Lifeform	Origin & Endemicity	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Cycas rumphii</i> Miq.		small tree	IF	narrow habitats			II
<i>Cyclea peltata</i> (DC.) Hook. and Thwaites		liana	E+	dense & secondary forests			
<i>Dasydaschalon lomentaceum</i> Finet et Gagnep.	L	shrub	WS Asia	secondary forests & narrow habitat			
<i>Dialium cochinchinense</i> Pierre	I	tree	IP	dense & open forests	FC	LR/nt	
<i>Diospyros ehretoides</i> Wall. ex G.Don		tree	E+	open & secondary forests	FC		
<i>Diospyros pilosanthera</i> Blanco var. <i>helferi</i> (C.B. Clarke) Bakh.	L	tree	IP +	dense & semi-dense forests	C		
<i>Dipterocarpus alatus</i> Roxb. ex G. Don	2	large tree	IP +	dense forests	VC	EN A1cd+2cd B1+2c	
<i>Dysoxylum loureiri</i> Pierre	L	tree	E+	dense forests	FR		
<i>Elaeocarpus hygrophilus</i> Kurz		tree	IF	narrow habitats	FC		
<i>Entada reticulata</i> Gagnep		shrub - climbing	E+	dense & open forests			
<i>Erythrophleum teysmannii</i> (Kurz) Craib		tree	E+	dense forests			
<i>Fagraea fragrans</i> Roxb.	L	tree	IF +	dense & secondary forests	FR		
<i>Ficus langbianensis</i> Gagnep.		shrub	E+	semi-dense forests			
<i>Ficus variolosa</i> Lind. ex Benth.		shrub	E+	semi-dense forests	FC		
<i>Garcinia hanburyi</i> Hook. f.		tree	E+	dense & secondary forests	FC		
<i>Garcinia oliveri</i> Pierre		tree	E+	dense forests	FC		
<i>Garuga pierrei</i> Guillaumin		shrub	E+	dense forests			
<i>Guioa cambodiana</i> Pierre		shrub/small tree	E+	dense & secondary forests			
<i>Helicteres elliptica</i> Tardieu		shrub	E+	open forests			

Provisional Name	Timber Classes	Lifeform	Origin & Endemicity	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Helixanthera longispicata</i> (Lecomte) Danser		parasite	E+	dense forests			
<i>Hibiscus sagittifolius</i> Kurz		herb	E+	open areas			
<i>Holarrhena curtisii</i> King & Gamble		shrub	E+	open forests	TC		
<i>Hopea odorata</i> Roxb.	1	tree	IP +	dense forests	FC	VU A1cd+2cd	
<i>Hydnocarpus anhelminthica</i> Pierre		tree	E+	dense forests	FC		
<i>Insia bijuga</i> (Colebr.) Kuntze	1	tree	WS Asia	narrow habitats	FR/FC	VU A1cd	
<i>Ixora laotica</i> (Pit.) Pit.		shrub	E+	open areas			
<i>Kmeria duperreana</i> (Pierre) Dandy		tree	E+	dense & semi-dense forests			II
<i>Lasianthus kamputensis</i> Pierre ex Pit.		shrub	E+	dense forests			
<i>Maerua micronata</i> F.N. Williams		shrub	E+	open areas	FC		
<i>Melaleuca cajeputi</i> Powell	3	tree	WS Asia	narrow habitats	TC		
<i>Oldenlandia fraterna</i> Pierre ex Pit.		herb	E+	dense forests			
<i>Oldenlandia praecox</i> Pierre ex Pit.		herb	E+	narrow habitats			
<i>Oldenlandia rosmarinifolia</i> Pit.		herb	E+	dense forests			
<i>Oncosperma tigliarium</i> (Jack) Ridl.		palm tree	E+	dense forests	C		
<i>Ophiopogon pierrei</i> Rodriguez		herb	E+	dense forests			
<i>Pandanus capusii</i> Martelli		shrub	E+	narrow habitats			
<i>Pantadenia adenanthera</i> Gagnep.		shrub	E+	secondary & semi-dense forests			
<i>Pinanga cochinchinensis</i> Blume		palm tree	E+	narrow habitats			
<i>Polyathia thorelii</i> Benth. and Hook.		small tree	E+	dense forests			
<i>Pterocarpus indicus</i> Willd.		tree	WS Asia	dense forests		VU A1d	
<i>Pterocarpus macrocarpus</i> Kurz	L	tree	IP	open forests	FC		
<i>Shorea guiso</i> (Blanco) Blume	2	tree	E+	dense & semi-dense forests	FC/FR		
<i>Shorea roxburghiana</i> G. Don		tree	WS Asia	open forests	FC	EN A1cd	

Provisional Name	Timber Classes	Lifeform	Origin & Endemicity	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Shorea siamensis</i> Miq.	1	tree	IP	open forests	FC		
<i>Spathoglottis eburnea</i> Gagnep.		herb	E+	open forests			
<i>Stephania rotunda</i> Lour.		liana	IP	narrow habitats			
<i>Sterculia hypochra</i> Pierre		tree	E+	secondary forests			
<i>Swintonia pierrei</i> Hance	3	tree	E+	dense forests	VC		
<i>Tarenna quocense</i> Pierre ex Pit.		shrub	E+	dense forests			
<i>Tarenna vanpruckii</i> Craib		shrub	E+	dense forests			
<i>Terminalia bialata</i> (Roxb.) Steud.		tree	E+	open forests	FC		
<i>Thyrsanthera suborbicularis</i> Pierre ex Gagnep.		shrub - climbing	E+	open areas			
<i>Tournefortia montana</i> Lour.		shrub - climbing	E+	dense & secondary forests			
<i>Trigonostemon quocensis</i> Gagnep.		shrub	E+	narrow habitats			
<i>Walsura elata</i> Pierre		tree	E+	dense forests			

Origin and Endemicity	Relative Abundance	Timber Classes
E+ = Endemic or "near endemic"	R = Rare	L = Luxury timbers
IF = Former French Indochina (Cambodia, Laos and Vietnam)	FR = Fairly rare	1 = Premier class timbers
IP = Indochinese Peninsula (Cambodia, Laos, Myanmar, Thailand, Vietnam & Sth. China)	FC = Fairly common	2 = Second class timbers
IP + = Indochinese Peninsula plus one or two other countries	C = Common	3 = Third class timbers
WS Asia = Widespread in Asia	VC = Very common	

Cam + ? = Native to Cambodia and possibly elsewhere

Priority Group 2 Species

Provisional Name	Timber Class	Lifeform	Origin	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Acacia pinnata</i> (L.) Willd. subsp. <i>kerrii</i> I.C. Nielsen		tree - climbing	IF	dense & open forests			
<i>Adenantha pavonina</i> L. var. <i>microsperma</i> (Teijsm. Binn.) I.C. Nielsen		small tree	IF +	dense forests	FR		
<i>Aglaia odorata</i> Lour.		small tree	IP +	dense & open forests	FR	LR/nt	
<i>Aglaonema tenuipes</i> Engl.		herb	IF	dense forests			
<i>Alyxia pisiiformis</i> Pierre		shrub	IF	secondary forests			
<i>Anneslea fragrans</i> Wall.		tree	WS Asia	semi-dense forests	FR		
<i>Annona reticulata</i> L.		shrub	IF	open forests			
<i>Antidesma acidum</i> Retz.		shrub	IF	secondary forests	C		
<i>Aporosa filicifolia</i> Bail.		shrub	IF	open forests	FC		
<i>Artabotrys intermedius</i> Hassk.		shrub	IF	waste lands			
<i>Baccaurea ramiflora</i> Lour.		tree	WS Asia	dense forests	FR		
<i>Baeckea frutescens</i> L.		sub-shrub	WS Asia	open & open areas	FR		
<i>Bolbitis copelandii</i> Ching		fern	IP	dense forests			
<i>Butea superba</i> Roxb.		liana - woody	WS Asia	open forests	FR		
<i>Calamus viminalis</i> Willd.		liana - palm	IF	semi-dense forests	FC		
<i>Casearia greviaefolia</i> Vent.		shrub	WS Asia	narrow habitats	FR		
<i>Cassia fistula</i> L.		tree	WS Asia	open forests	FR		
<i>Cassia javanica</i> L.		tree	WS Asia	open forests	FR		
<i>Cenolophon oxymitrum</i> Holtum		herb	IP	dense forests			
<i>Cephalanthus angustifolius</i> Lour.		shrub	IF	open & semi-dense forests			
<i>Cinnamomum iners</i> Reinw. ex Blume		shrub	WS Asia	dense forests	FR		
<i>Clitoria hanceana</i> Hemsl. var. <i>laureola</i> Gagnep.		shrub	IF	open forests			
<i>Corypha umbraculifera</i> L.		palm tree	IP	semi-dense forests	FC		

Provisional Name	Timber Class	Lifeform	Origin	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Cratogeomys formosum</i> (Jack) Dyer subsp. <i>prunifolium</i> Kurz	3	shrub	WS Asia	open forests	VC	LR/1c	
<i>Crotalaria juncea</i> L.		sub-shrub	IF	cultivated			
<i>Dacrydium elatum</i> (Roxb.) Wall. ex Hook.	2	large tree	WS Asia	dense forests	VC	LR/1c	
<i>Dalbergia entadoides</i> Pierre ex Gagnep.		liana	IP	wet areas	FR	DD	
<i>Dialium cochinchinense</i> Pierre		tree	IP	dense & open forests	FC	LR/nt	
<i>Didymosperma caudatum</i> Wendl. et Drude		palm	IP	dense forests			
<i>Dillenia hookeri</i> Pierre		shrub	IF	open forests	VC		
<i>Dioscorea hispida</i> Dennst.		liana	WS Asia	dense forests	FR		
<i>Diospyros decandra</i> Lour.		shrub/tree	IP	dense forests	FC		
<i>Diospyros malabarica</i> (Desr.) Kostel.		tree	IF +	dense & semi-dense forests	FR		
<i>Dipterocarpus intricatus</i> Dyer	2	tree	IP	open forests	VC	LR/1c	
<i>Dipterocarpus obtusifolius</i> Teysm. ex Miq.	2	tree	WS Asia	open forests	VC	LR/1c	
<i>Dipterocarpus tuberculatus</i> Roxb.	2	tree	IP +	open forests	VC	LR/1c	
<i>Dischidia acuminata</i> Cost.		liana	IF	open forestss & narrow habitat			
<i>Dracaena cambodiana</i> (Gagnep.) Merr. and Chun		shrub	IF	dense forests	FC		
<i>Elaeocarpus lanceifolius</i> Roxb.		tree	IF	secondary forests/narrow habitat			
<i>Euonymus cochinchinensis</i> Pierre		shrub	IF	dense & secondary forests	C		
<i>Fagraea fragrans</i> Roxb.		tree	IF +	dense & secondary forests	FR		

Provisional Name	Timber Class	Lifeform	Origin	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Fagraea racemosa</i> Jack. ex Wall.		shrub/small tree	OWT	dense forests	FR		
<i>Ficus glomerata</i> Roxb.		tree	IF	secondary forests			
<i>Ficus racemosa</i> L.		tree	IF	secondary forests			
<i>Garcinia ferrea</i> Pierre	3	tree	IF	dense forests	FC		
<i>Garcinia gracilis</i> Pierre		small tree	IF	secondary forests			
<i>Garcinia harmandii</i> Pierre		tree	IF	dense & secondary forests	FC		
<i>Garcinia lanessanii</i> Pierre		tree	IF	dense & secondary forests	FC		
<i>Garcinia vilersiana</i> Pierre		tree	IP	dense forests	FC		
<i>Gardenia angkorensis</i> Pit.		shrub	IF	Open forests	FC		
<i>Gardenia cambodiana</i> Pit.		shrub	IP	secondary forests	FR		
<i>Globba cambodgensis</i> Gagnep.		herb	IF	dense forests			
<i>Goniothalamus repevensis</i> Pierre ex Finet and Gagnep.		shrub	IF	secondary forests	FC		
<i>Grewia asiatica</i> L.		shrub	WS Asia	dense & secondary forests	FR		
<i>Grewia urenaefolia</i> (Pierre) Gagnep.		shrub	IF	secondary & open areas	FR		
<i>Haldina cordifolia</i> (Roxb.) Risdale	2	tree	WS Asia	dense forests	FC		
<i>Holarrhena pubescens</i> (Bich. Ham.) Wall. ex G. Don		shrub/small tree	WS Asia	open forests	C	LR/1c	
<i>Homonioia riparia</i> Lour.		shrub	WS Asia	narrow habitats	FR		
<i>Ichnocarpus oxypetalus</i> Pit.		shrub - climbing	IF	open forests			
<i>Ilex wallichii</i> Hook. f.		shrub/small tree	IP	dense forests			
<i>Indigofera tinctoria</i> L.		sub-shrub	IF	open & open areas			
<i>Irvingia malayana</i> Oliv. ex Benn.		tree	WS Asia	open forests	VC	LR/1c	

Provisional Name	Timber Class	Lifeform	Origin	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Ixora nigricans</i> R.Br.		shrub	WS Asia	dense forests	FR		
<i>Knema globularia</i> (Lam.) Warb.	3	shrub	IP	dense & secondary forests		LR/1c	
<i>Lasianthus hoensis</i> Pierre ex Pit.		shrub	IF	dense forests			
<i>Leea indica</i> (Burm. f.) Merr.		shrub	IF +	dense forests	FR		
<i>Lycopodiella cernua</i> (L.) Franco and Vasc.		herb	IF	wet areas			
<i>Lygodium conforme</i> C. Chr.		liana - fern	IF	open areas			
<i>Machilus odoratissima</i> Nees		tree	WS Asia	secondary forests	FR		
<i>Maclura cochinchinensis</i> (Lour.) Corner		shrub	IF	secondary forests/narrow habitat	VC		
<i>Mangifera duperreana</i> Pierre		tree	IF	dense forests	FC		
<i>Mesua ferrea</i> L.	1	tree	WS Asia	dense forests	C		
<i>Millingtonia hortensis</i> L. f.		tree	WS Asia	cultivated	FR		
<i>Mitrella mesnyi</i> (Pierre) Ban		shrub	IF	secondary forests	C		
<i>Morinda tomentosa</i> Roth		shrub/small tree	WS Asia	open & open areas	FR		
<i>Murraya paniculata</i> (L.) Jack		shrub	WS Asia	dense forests	FR		
<i>Pandanus humilis</i> Lour.		shrub	IF	secondary forests			
<i>Peltophorum dasyrrhachis</i> (Miq.) Kurz, var. <i>dasyrrhachis</i>	1	tree	IP +	dense & secondary forests	C		
<i>Peltophorum pterocarpa</i> (DC.) Backer ex K. Heyne	1	tree	OWT	open forestss & narrow habitat			
<i>Pinanga duperreana</i> Pierre ex Becc.		palm tree	IF	dense & semi-dense forests	C		
<i>Pinus merkusii</i> Jungh and de Vries	2	tree	WS Asia	open forests	VC		
<i>Polygonum odoratum</i> Lour.		herb	IF	open areas			
<i>Rauwenhoffia siamensis</i> Scheff.		shrub - climbing	IF	dense forests			
<i>Scaphium macropodium</i> (Miq.) Beumee		large tree	?	?	FC	LR/1c	

Provisional Name	Timber Class	Lifeform	Origin	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Shorea obtusa</i> Wall. ex Blume	1	tree	IP	open forests	VC	LR/1c	
<i>Sindora siamensis</i> Teysman ex. Miquel	1	tree	IP +	open & secondary forests	C	LR/1c	
<i>Sophora tomentosa</i> L.		shrub	WS Asia	narrow habitats	FR		
<i>Sphenodesme pentandra</i> Jack		shrub - climbing	WS Asia	narrow habitats	FR		
<i>Stemona tuberosa</i> Lour.		herb	IF	dense forests			
<i>Sterculia populifolia</i> Roxb.		tree	WS Asia	dense & secondary forests	FR		
<i>Stereospermum colais</i> (Dillwyn) Mabb.	1	tree	WS Asia	dense & open forests			
<i>Streptocaulon juvenas</i> (Lour.) Merr.		liana - woody	IP	dense forests	FR		
<i>Strychnos nux-blanda</i> A.W. Hill		shrub/small tree	IP	open forests	FR		
<i>Tephrosia purpurea</i> (L.) Pers.		herb	IF	open forests			
<i>Terminalia alata</i> F. Heyne ex Roth	1	tree	IF +	open forests	VC		
<i>Terminalia bellirica</i> (Gaertn.) Roxb.		shrub/tree	WS Asia	semi-dense forests	FR		
<i>Tetrameles nudiflora</i> R. Br.	3	tree	WS Asia	secondary forests/narrow habitat	FR		
<i>Toona surenii</i> (Blume) Merr.	2	tree	WS Asia	dense forests	FC		
<i>Willughbeia edulis</i> Roxb.		liana - woody	IP	dense forests	FC		
<i>Xanthophyllum excelsum</i> Blume		tree	IP	dense forests	FC/FR		
<i>Xylia xylocarpa</i> (Roxb.) Taub.	1	tree	IP	open forests	C		

Origin and Endemicity

E+ = Endemic or "near endemic"

IF = Former French Indochina (Cambodia, Laos and Vietnam)

IP = Indochinese Peninsula (Cambodia, Laos, Myanmar, Thailand, Vietnam & Sth. China)

IP + = Indochinese Peninsula plus one or two other countries

WS Asia = Widespread in Asia. Cam + ? = Native to

Cambodia and possibly elsewhere

Relative Abundance

R = Rare

FR = Fairly rare

FC = Fairly common

C = Common

VC = Very common

Timber Classes

L = Luxury timbers

1 = Premier class timbers

2 = Second class timbers

3 = Third class timbers

Priority Group 3 Species

Provisional Name	Timber Class	Lifeform	Origin	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Acorus calamus</i> L.		herb	WS Asia	narrow habitats		-	-
<i>Adenosma indianum</i> (Lour.) Merr.		herb	IF +	secondary forests		-	-
<i>Albizia lebbekoides</i> (DC.) Benth.		tree	IF +	secondary forests & narrow habitat		-	-
<i>Allophylus serrulatus</i> Radlk.		sub-shrub	WS Asia	narrow habitats	FC	-	-
<i>Alternanthera sessilis</i> R. Br.		herb	IF +	wet areas		-	-
<i>Ammannia baccifera</i> L.		herb	IP	wet areas		-	-
<i>Ampelocissus martinii</i> Planch.		shrub - climbing	IP	open areas		-	-
<i>Areca triandra</i> Roxb.		palm tree	WS Asia	narrow habitats	C	-	-
<i>Avicennia officinalis</i> L.		shrub	PT	narrow habitats	C	-	-
<i>Barringtonia acutangula</i> (L.) Gaertn.		tree	WS Asia	narrow habitats	FC	-	-
<i>Barringtonia asiatica</i> (L.) Kurz		tree	PT	narrow habitats		-	-
<i>Bruguiera gymnorhiza</i> (L.) Savigny		tree	PT	narrow habitats	C	-	-
<i>Buchanania reticulata</i> Hance		shrub	IP	open forests	FC	-	-
<i>Caesalpinia major</i> (Medik.) Dandy and Exell		liana - woody	PT	narrow habitats		-	-
<i>Calophyllum inophyllum</i> L.		tree	PT	narrow habitats	FC	-	-
<i>Cananga latifolia</i> (Hook.f. et Thoms.) Finet et Gagnep.		tree	IF +	semi-dense forests	FC	-	-
<i>Capparis flavicans</i> Kurz		shrub	IP	secondary forests		-	-
<i>Careya arborea</i> Roxb.	3	tree	WS Asia	open forests	C	-	-
<i>Carissa cochinchinensis</i> Pierre ex Pit.		shrub	IP	open forests		-	-
<i>Cassia garrettiana</i> Craib		small tree	IP	open forests	FC	-	-
<i>Cerbera odollam</i> Gaertn.		shrub/tree	OWT	narrow habitats	R	-	-
<i>Chloranthus erectus</i> (Buch.-Ham.) Verd.		shrub	IF +	dense forests		-	-
<i>Cinnamomum</i> aff. <i>albiflorum</i> Nees		tree	IP +	narrow habitats		-	-
<i>Combretum quadrangulare</i> Kurz		shrub	IP	secondary forests	VC	-	-

Provisional Name	Timber Class	Lifeform	Origin	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Croton caudatus</i> Griseb.		shrub	WS Asia	narrow habitats	VC	-	-
<i>Cyanotis axillaris</i> Roem. and Schult.		herb	OWT	narrow habitats		-	-
<i>Dalbergia horrida</i> (Dennst.) var. <i>glabrescens</i> (Prain) Thoth. and K.K.N. Nair		liana	IF +	open areas		-	-
<i>Decaschistia parviflora</i> Kurz		sub-shrub	IP	waste lands		-	-
<i>Dendrolobium lanceolatum</i> Schindl. ex Gagnep.		shrub	IF +	open forests		-	-
<i>Dendrolobium triangulare</i> (Retz.) Schindl.		shrub - climbing	OWT	narrow habitats		-	-
<i>Desmodium flexuosum</i> Wall. ex Benth.		Sub-shrub	IP	open forests		-	-
<i>Desmodium stigulosum</i> Schindl.		sub-shrub	IP	open forests		-	-
<i>Dillenia indica</i> L.		tree	IF +	dense & semi-dense forests		-	-
<i>Dillenia obovata</i> (Blume) Hoogland		tree	IF +	open forests		-	-
<i>Dillenia ovata</i> Wall. ex Hook. f. et Thoms.		tree	IF +	open forests	FC	-	-
<i>Dioscorea brevipetiolata</i> Prain and Burkill		liana	IP	dense & open forests		-	-
<i>Diospyros castanea</i> (Craib) Fletcher		tree	IP	open & semi-dense forests	FC	-	-
<i>Drynaria fortunei</i> (Mett.) J. Sm.		epiphyte	PT	narrow habitats		-	-
<i>Feroniella lucida</i> (Scheff.) Swingle		small tree	IF +	dense & secondary forests	FC	-	-
<i>Fibraurea tinctoria</i> Lour.		liana	IF +	dense forests	FC	-	-
<i>Flagellaria indica</i> L.		liana	OWT	narrow habitats		-	-
<i>Glochidion lanceolarium</i> (Roxb.) Voigt		shrub	IF +	open forests		-	-
<i>Gluta lacifera</i> (Pierre) Ding Hou		tree	IP	open forests	FC	-	-
<i>Grewia hirsuta</i> Vahl		shrub	IF +	secondary forests	C	-	-
<i>Hydnocarpus kurzii</i> (King) Warb.		shrub/tree	IF +	dense forests	FC	-	-

Provisional Name	Timber Class	Lifeform	Origin	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Ichnocarpus frutescens</i> (L.) R. Br.		shrub - climbing	WS Asia	narrow habitats	FC	-	-
<i>Ipomoea pes-caprae</i> (L.) R.Br.		herb	PT	narrow habitats		-	-
<i>Ixora cuneifolia</i> Roxb. var <i>varians</i> Pit.		shrub	IF +	dense forests		-	-
<i>Jasminium funale</i> Decne		shrub - climbing	IF +	secondary forests	FC	-	-
<i>Knoxia valerianoides</i> Thorel ex Pit.		herb	IF +	dense forests		-	-
<i>Licuala spinosa</i> Wurm.		palm tree	WS Asia	narrow habitats	FC	-	-
<i>Linnophila repens</i> (Benth.) Benth.		herb	IP	wet areas		-	-
<i>Lumnitzera littorea</i> (Jack) Voigt		tree	OWT	narrow habitats	FC	-	-
<i>Mallotus philippinensis</i> (Lam.) Muell. Arg.		shrub - climbing	WS Asia	narrow habitats		-	-
<i>Melaleuca cajuputi</i> Powell		tree	WS Asia	narrow habitats	VC	-	-
<i>Melastoma saigonense</i> (Kuntze) Merr.		shrub	IP	open areas	VC	-	-
<i>Pandanus tectorius</i> Sol. ex Parkinson		tree	OWT	narrow habitats		-	-
<i>Parinari anamensis</i> Hance	3	tree	IP	dense forests	VC	-	-
<i>Phoenix humilis</i> Royle		palm tree	IP	open forests	C	-	-
<i>Pouzolzia zeylanica</i> (L.) Benn.		herb	WS Asia	narrow habitats		-	-
<i>Pterocarpus macrocarpus</i> Kurz		tree	IP	open forests	FC	-	-
<i>Rauwolfia verticillata</i> (Lour.) Baill.		shrub - climbing	IF +	dense & semi-dense forests		-	-
<i>Rhizophora mucronata</i> Poir.		tree	PT	narrow habitats	VC	-	-
<i>Sandoricum koetjape</i> (Burm. f.) Merr.	3	tree	IP +	dense forests	FC	-	-
<i>Scurrula parasitica</i> (L.)		parasite	IF +	secondary forests		-	-
<i>Semecarpus cochinchinensis</i> Engl.		tree	IP	dense & secondary forests	C	-	-
<i>Shorea henryana</i> Pierre		large tree	IP	?		-	-
<i>Solanum album</i> Lour.		sub-shrub	IP	open areas		-	-
<i>Sonneratia caseolaris</i> (L. f.) Engl.		small tree	OWT	narrow habitats	FC	-	-

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<i>Spirolobium cambodianum</i> Baill.		sub-shrub	IP	dense & secondary forests		-	-
<i>Stenochlaena palustris</i> (Burm. f.) Bedd.		liana - climbing	OWT	narrow habitats		-	-
<i>Syzygium zeylanicum</i> (L.) DC.		small tree	WS Asia	narrow habitats	C	-	-
<i>Terminalia alata</i> F. Heyne ex Roth		tree	IF +	open forests	VC	-	-
<i>Terminalia chebula</i> Retz.	3	tree	WS Asia	open forests	C	-	-
<i>Tetracera scandens</i> (L.) Merr.		shrub - climbing	IP	secondary forests & narrow habitat		-	-
<i>Tiliacora triandra</i> (Roxb.) Diels		sub-shrub - climbing	IP	?		-	-
<i>Ventilago harmadiana</i> Pierre		shrub - climbing	IP	secondary forests		-	-
<i>Wrightia religiosa</i> (Teijsm. And Binn.) Benth.		shrub	IP	secondary forests	FC	-	-
<i>Xantolis cambodiana</i> (Pierre ex Dubard) P.Royen		small tree	IP	secondary forests		-	-
<i>Xylia xylocarpa</i> (Roxb.) Taub.		tree	IP	open forests	C	-	-
<i>Xylocarpus moluccensis</i> (Lam.) Roem.		shrub	WS Asia	narrow habitats	FC	-	-
<i>Zizyphus cambodiana</i> Pierre		shrub	IP	secondary forests	VC	-	-

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Priority Group 4 Species

Provisional Name	Timber Class	Lifeform	Origin	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Aidia chantonea</i> Tirveng.	-	shrub/tree	OWT	dense forests			
<i>Aporosa doica</i> Mull. Arg.	-	shrub	WS Asia	dense forests			
<i>Ardisia rigida</i> Kurz	-	sub-shrub	WS Asia	dense forests			
<i>Artabotrys hexapetalus</i> (L.f.) Bhandari	-	sub-shrub - climbing	WS Asia	dense forests			
<i>Bauhinia bassacensis</i> Pierre ex Gagnep. var. <i>bassacensis</i>	-	liana	WS Asia	dense forests	C		
<i>Callicarpa cana</i> L.	-	shrub	WS Asia	dense forests			
<i>Calycopteris floribunda</i> (Roxb.) Lam.	-	liana	WS Asia	dense forests	C		
<i>Canarium album</i> (Lour.) Rausch.	-	tree	WS Asia	dense forests	FC		
<i>Caryota urens</i> L.	-	palm tree	WS Asia	dense forests			
<i>Chasalia curviflora</i> Thwaites	-	shrub	WS Asia	dense forests			
<i>Cinnamomum</i> aff. <i>javanicum</i> Blume	-	tree	WS Asia	dense forests			
<i>Cinnamomum tetragonum</i> A. Chev.	-	tree	WS Asia	dense forests			
<i>Costus speciosus</i> (D. Koenig) Smith	-	herb	WS Asia	dense forests			
<i>Daphne composita</i> (L.f.) Gilg	-	shrub	WS Asia	dense forests			
<i>Derris elliptica</i> (Sweet) Benth.	-	liana - woody	WS Asia	dense forests	FC		
<i>Dianella ensifolia</i> DC.	-	herb	OWT	dense forests			
<i>Dichroa febrifuga</i> Lour.	-	shrub	WS Asia	dense forests			
<i>Ellipanthus tomentosus</i> Kurz	-	shrub/small tree	IP +	dense forests			
<i>Eurycoma longifolia</i> Jack	-	shrub	WS Asia	dense forests	FC		
<i>Euthemis leucocarpa</i> Jack	-	shrub	Cam + ?	dense forests			
<i>Excoecaria agallocha</i> L.	-	small tree	WS Asia	dense forests	FC		
<i>Fagerlindia fasciculata</i> (Roxb.) Tirveng	-	shrub	WS Asia	dense forests			
<i>Gymnema reticulata</i> (Moon) Alston	-	liana	WS Asia	dense forests			
<i>Harrisonia perforata</i> (Blanco) Merr.	-	shrub	WS Asia	dense forests	FC		
<i>Heritiera littoralis</i> Aiton	-	tree	OWT	dense forests	FC		

Provisional Name	Timber Class	Lifeform	Origin	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Ixora chinensis</i> Lour.	-	shrub	WS Asia	dense forests			
<i>Ixora coccinea</i> L.	-	shrub	WS Asia	dense forests			
<i>Ixora diversifolia</i> Wall. ex Hook. var <i>flexilis</i> Pit.	-	shrub	IP +	dense forests			
<i>Ixora flavescens</i> Pierre var <i>cambodiana</i> Pit.	-	shrub	WS Asia	dense forests			
<i>Jasminum anastomosans</i> Wall.	-	shrub - climbing	IP +	dense forests			
<i>Lyonia ovalifolia</i> (Wall.) Drude	-	shrub	WS Asia	dense forests			
<i>Mallotus paniculatus</i> (Lam.) Muell. Arg	-	shrub/small tree	WS Asia	dense forests			
<i>Microtropis discolor</i> (Wall) Wall.	-	shrub	WS Asia	dense forests			
<i>Mitragyna parvifolia</i> (Roxb.) Korth.	-	tree	Cam + ?	dense forests			
<i>Mussaenda frondosa</i> L.	-	shrub	WS Asia	dense forests			
<i>Myxopyrum smilacifolium</i> Blume	-	liana	WS Asia	dense forests			
<i>Oldenlandia umbellata</i> L.	-	herb	WS Asia	dense forests			
<i>Oleandra neritiformis</i> Cav.	-	fern	WS Asia	dense forests			
<i>Parameria loevigata</i> (Juss.) Moldenke	-	liana - woody	WS Asia	dense forests			
<i>Parkia sumatrana</i> Miq.	-	tree	IP +	dense forests	FC		
<i>Piper retrofractum</i> Vahl.	-	shrub - climbing	IP +	dense forests			
<i>Prismatomeris tetrandra</i> (Roxb.) Schum.	-	shrub	WS Asia	dense forests	FC		
<i>Psychotria adenophylla</i> Wall.	-	shrub	WS Asia	dense forests			
<i>Psychotria reevesii</i> Wall. ex Rob.	-	shrub	WS Asia	dense forests			
<i>Quisqualis conferta</i> (Jack) Exell	-	shrub - climbing	IP +	dense forests			
<i>Rourea mimosoides</i> (Vahl) Planchon	-	liana	IP +	dense forests			
<i>Sambucus hookeri</i> Rehder	-	shrub	WS Asia	dense forests			

Provisional Name	Timber Class	Lifeform	Origin	Principal Habitat	Relative Abundance	IUCN Red List Status	CITES Appendix Status
<i>Scaphium affine</i> Ridley	-	large tree	Cam + ?	dense forests			
<i>Schima crenata</i> Korth.	-	tree	PT	dense forests			
<i>Schima wallichii</i> (DC.) Korth	-	tree	PT	dense forests	VC		
<i>Schleichera oleosa</i> (Lour.) Oken	-	tree	WS Asia	dense forests	C		
<i>Scurrula ferruginea</i> (Roxb.) Danser	-	parasite	IP +	dense forests			
<i>Smilax glabra</i> Wall. ex Roxb.	-	liana	WS Asia	dense forests	FC		
<i>Stephania hernandifolia</i> (Will.) Walp.	-	herb	OWT	dense forests			
<i>Strophanthus candatus</i> (L.) Kurz	-	shrub - climbing	WS Asia	dense forests			
<i>Syzygium cumini</i> (L.) Skeels	-	tree	OWT	dense forests	FC		
<i>Tarenna attenuata</i> Pit.	-	shrub	WS Asia	dense forests			
<i>Terminalia nigrovullosa</i> Pierre in Lanessan	-	tree	WS Asia	dense forests			
<i>Terminalia triptera</i> Stapf	-	tree	WS Asia	dense forests	C		
<i>Vitex glabrata</i> R. Br.	-	tree	OWT	dense forests	FC		
<i>Walsura villosa</i> Wall. ex Hiern	-	tree	IP +	dense forests	FC		
<i>Xanthium strumarium</i> L.	-	herb	Cam + ?	dense forests			
<i>Zingiber purpureum</i> Roscoe	-	herb	WS Asia	dense forests			

Origin and Endemicity

E+ = Endemic or "near endemic"

IF = Former French Indochina (Cambodia, Laos and Vietnam)

IP = Indochinese Peninsula (Cambodia, Laos, Myanmar, Thailand, Vietnam & Sth. China)

IP + = Indochinese Peninsula plus one or two other countries

WS Asia = Widespread in Asia

Cam + ? = Native to Cambodia and possibly elsewhere

Relative Abundance

R = Rare

FR = Fairly rare

FC = Fairly common

C = Common

VC = Very common

Timber Classes

L = Luxury timbers

1 = Premier class timbers

2 = Second class timbers

3 = Third class timbers

APPENDIX 8

LETTER OF REQUEST FOR STOPPING MREAH PROV PRODUCTION

Kingdom of Cambodia
Religion King Nation

Ministry of Agriculture, Forestry and Fisheries
File N0. 154 Phnom Penh: October 6th, 2005

Director General of Ministry of Agriculture, Forestry and Fisheries
would like to advise to
His Excellency Chief of Forestry Administration

Subject: Request to take action on stopping Marah Preu production, which is a source, provides Safrole substance for drug production.

Reference: Report of participation meeting on Drug Inspection in year 2005 of Legal Department of Ministry of Agriculture, Forestry and Fisheries # 328 dated 14 September 2005.

-Signature of His Excellency Minister of Ministry of Agriculture, Forestry and Fisheries dated 22 September 2005.

As above subject and reference, I would like to inform your Excellency that based on spirit of a meeting on Drug Inspection in year 2005 at Ministry of Interior it has raised that Cambodia has imported several types of chemical substance in which the import of acid sulfuric is higher. Acid sulfuric is used to produce Marah Preu oil that contents Safrole substance is important chemical substance for drug production and also being used for yellow vine production.

As above mentioned and request, Ministry of Agriculture, Forestry and Fisheries decided Chief of Forestry Administration to inform all levels of FA to take action effectively on stopping yellow vine production and especially Marah Preu trees that provide Safrole substance for drug production.

Please your Excellency Chief of Forestry Administration takes action to implement the above mentioned.

Seal and Signature

Kum Saron

CC:

- The National Authority of Anti Drug Combating
"To be advised"
- Building of Inspectorate
- Legal Department of Ministry of Agriculture, Forestry and Fisheries

"For information"

-Archive and Documentation

(Unofficial translated by WildAid)

APPENDIX 9

NOTICE FOR REDUCTION OF IMPORT TAX

The following joint circular incorporating a list of the quantities and goods of Lao origin eligible for import tax reductions when imported to Vietnam in 2003 was downloaded from the internet. *Vohr Romeit* is listed as Vang Dang under section III Forest Products.

JOINT CIRCULAR No. 54/2003/TTLT-BTC-BTM OF JUNE 3, 2003 GUIDING THE REDUCTION OF IMPORT TAX ON GOODS OF LAO ORIGIN SPECIFIED IN THE AUGUST 13, 2002 VIENTIANE AGREEMENT BETWEEN THE GOVERNMENT OF THE SOCIALIST REPUBLIC OF VIETNAM AND THE GOVERNMENT OF THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

Pursuant to the Vientiane Agreement signed on August 13, 2002 between the Government of the Socialist Republic of Vietnam and the Government of the Lao People's Democratic Republic on creation of favorable conditions for people, transport means and goods to travel across the border of the two countries, and promotion of development of trade and investment cooperation between Vietnam and Lao;

The Ministry of Finance and the Ministry of Trade hereby jointly guide the 50% tax reduction for goods of Lao origin imported into Vietnam as follows:

I. SCOPE OF APPLICATION:

A. Goods made in the Lao People's Democratic Republic and imported into Vietnam shall enjoy the import tax rate equal to 50% of the preferential one specified in the Preferential Import Tariff, if they satisfy the following conditions:

1. Being those on the List of goods items of Lao origin eligible for the 50% reduction of preferential import tax when being imported into Vietnam under annual treaties or agreements between the two countries' governments.

The specific quantities and values of imported goods of Lao origin, which are eligible for 50% import tax reduction each year, shall be based on the List of goods of Lao origin eligible of 50% preferential import tax reduction when being imported into Vietnam under the treaty or agreement between the two countries' governments in that year or according to the Trade Ministry's notice on the basis of the volumes already agreed upon with the Lao Ministry of Trade.

Promulgated together with this Circular is the List of goods items of Lao origin eligible for 50% (fifty per cent) import tax reduction when being imported into Vietnam in 2003.

In cases where a goods item concurrently satisfies the conditions for enjoying 50% import tax reduction and those for enjoying a CEPT preferential tax rate, the lower tax rate of these two tax rates shall apply.

2. Having a certificate of origin (C/O) issued by the Trade Ministry or the Trade Bureaus or Trade Services of Vientiane city and Saysomboun special zone of Laos.

3. Obtaining a written certification that they are covered by the tax preferential program under the agreement between the two governments, issued by the Trade Ministry or Trade Services of Vientiane city and Saysomboun special zone of Laos.

4. Being imported into Vietnam through border gates officially opened along the Vietnam-Laos border.

B. Procedures for producing and checking certificates of origin (C/O):

Enterprises that import Lao goods, which are on the List of goods items eligible for 50% import tax reduction, promulgated together with this Circular, and wish to enjoy the import tax reduction preference, shall have to produce to the customs offices the original certificates of origin of the goods together with the prescribed import document sets upon carrying out the import procedures.

In cases where enterprises have not yet obtained C/O for production upon carrying out the import procedures, the customs offices shall apply the ordinary tax rates or CEPT preferential tax rates (if the conditions therefor are fully met) and accept the delayed C/O production within 30 days counting from the date of submitting the customs declarations. After submitting C/O, enterprises shall be considered for reimbursement of overpaid tax amount (the difference between the paid tax amount calculated at the ordinary tax rate or CEPT preferential tax rate and that calculated at 50%-reduced preferential import tax rate specified in the Import Tariff).

Importing enterprises shall be held responsible before law for the legality and validity of the already submitted C/O. If any C/O fraudulence is detected, the concerned importing enterprise(s) shall be handled according to the current law provisions.

When having any doubt about the truthfulness and accuracy of certificates of origin, the customs offices may request the concerned enterprises to supply written evidences. The time limit for enterprises to supply additional documents shall be 30 days after the C/O is submitted. Pending the re-inspection result, the 50% tax rate reduction for the concerned goods lots shall temporarily not be given, and the ordinary tax rates or CEPT preferential tax rates (if the conditions therefor are fully met) shall be applied. And at the same time, the procedures for goods release shall continue to be carried out if such goods items are not banned or restricted from import and there is no doubt about false declarations of goods. In cases where the goods owners have sufficient documents to prove the Lao origin of their goods, the overpaid tax amount shall be considered and reimbursed (the difference between the already paid tax amount calculated at the ordinary tax rate or CEPT preferential tax rate and that calculated at 50%-reduced preferential import tax rate specified in the Import Tariff).

II. OTHER REGULATIONS

1. The tax calculation prices for calculation of 50% preferential import tariff reduction for goods of Lao origin imported into Vietnam are determined to be the actually paid prices inscribed in foreign trade contracts signed between the two countries' companies, provided that such foreign trade contracts fully satisfy the conditions prescribed in Section I, Part III of the Finance Ministry's Circular No. 08/2002/TT-BTC of January 23, 2002 guiding the application of import tax calculation prices under foreign trade contracts. For foreign trade contracts failing to fully meet the conditions for tax calculation according to contractual prices, the prices for calculating 50% tax reduction shall be the minimum prices promulgated by the Finance Ministry.

2. The tax calculation bases, tax collection and payment regime, accounting of tax amounts, report on tax collection and payment results, import tax reduction, tax reimbursement, tax arrears collection and handling of violations shall comply with the provisions of the Law on Export Tax and Import Tax and the current guiding documents.

III. ORGANIZATION OF IMPLEMENTATION

Once every three months (by the 15th day of the following month at the latest) and annually (by February 15th of the following year at the latest), the General Department of Customs shall sum up and report the volumes and value (calculated at the import tax calculation prices) of import goods subject to this Circular to the Trade Ministry and the Finance Ministry. In cases where it detects that the Lao side issues written certifications for goods in excess of the volume already agreed upon, the Trade Ministry shall work together with the Lao Trade Ministry in devising appropriate remedial measures.

This Circular takes effect 15 days after its publication in the Official Gazette and applies to the import goods declarations registered with the customs offices as from January 9, 2003 (the effective date of the 2003 Treaty on economic, cultural, scientific and technical cooperation between the Government of the Socialist Republic of Vietnam and the Government of the Lao People's Democratic Republic).

Those cases of importing goods of Lao origin, entitled to the 50% import tax reduction, with their import declarations registered with the customs offices as from January 9, 2003 to the effective date of this Circular, shall be eligible for the import tax reimbursement. The import tax amount to be reimbursed shall be the difference between the tax amount already paid by enterprises and the import tax amount already reduced by 50% under this Circular's guidance. Enterprises shall contact the Customs Departments of the localities where they import goods for carrying out the procedures for tax reimbursement. A dossier of application for tax reimbursement comprises:

- + A written request for reimbursement of already paid import tax;
- + Import goods customs declaration with customs liquidation;
- + Foreign trade contract, foreign trade purchase and sale invoices;
- + Documents evidencing that import goods are of Lao origin according to the guidance in this Circular.

This Circular replaces Joint Circular No. 75/2001/TTLT-BTC-BTM-TCHQ of September 24, 2001 of the Finance Ministry, the Trade Ministry and the Customs General Department guiding the reduction of import tax on goods of Lao origin specified in the Agreement between the Government of the Socialist Republic of Vietnam and the Government of the Lao People's Democratic Republic (the 1999 Cua Lo Agreement) on creation of favorable conditions for people, transport means and goods to travel across the common borders of the two countries.

Any problems arising in the course of implementation should be promptly reported by the concerned units to the Finance Ministry and the Trade Ministry for study, timely guidance and supplements.

For the Minister of Finance
Vice Minister
TRUONG CHI TRUNG

For the Minister of Trade
Vice Minister
PHAN THE RUE

THE LIST AND QUANTITIES OF GOODS OF LAO ORIGIN ELIGIBLE FOR THE 50% PREFERENTIAL IMPORT TAX REDUCTION WHEN BEING IMPORTED INTO VIETNAM IN 2003

(According to Appendix No. 3 to the 2003 Treaty on Economic, Cultural, Scientific and Technical Cooperation between the Government of the Socialist Republic of Vietnam and the Government of the Lao People's Democratic Republic, signed on January 9, 2003)

Promulgated together with Joint Circular No. 54/2003/TTLT-BTC-BTM of June 3, 2003 of the Finance Ministry and the Trade Ministry

No	Names of goods	Headings under the Import Tariff	Calculation units	Quantities
I	Wood and wood products			
1	Flooring planks	4418	m2	210,000
2	Household wood furniture made of	4414, 4419, 9401, 9403	m3	1,000
3	Plywood	4412	ton	100,000
4	Finished and semi-finished products	4407	m3	150,000
II	Assorted minerals			
1	Plaster	2520	ton	125,000
2	Tin	2609	ton	1,000
III	Forest products			
1	<i>Chai pha</i>	1301	ton	2,500
2	<i>Vang dang</i> (<i>coscinium usitatum</i>) pierre)	1211	ton	10,000
3	Orang-outang fruit	0813	ton	50
4	Fruit for making jelly	0813	ton	1,500
5	<i>Amomum longiligulare</i>	0908	ton	300
6	Job's tears	1211	ton	5,000
IV	Farm and husbandry products			
1	Sticky rice, long-grain rice	1006	ton	20,000
2	Sesame	1207	ton	1,000
V	Processing-industry products			
1	Jip-lai blanket	6301	unit	50,000
2	Jip-lai fan	8414	unit	100,000
3	Electric rice cooker	8516	unit	100,000

TRAFFIC, the wildlife trade monitoring network, works to ensure that trade in wild plants and animals is not a threat to the conservation of nature. It has offices covering most parts of the world and works in close co-operation with the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

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