

ABSTRACT

CALLIS, KRISTINE LEE. The History of Plant Use in Laos: Analysis of European Accounts of Plant Use for Primarily Religious and Medicinal Purposes. (Under the direction of Robert Beckmann.)

A Review of manuscripts written by European explorers and colonists affords the opportunity to develop a clearer understanding both of types of plants employed and their significance in religion and medicine during the 16th to 19th centuries. This paper is a distillation of accounts by thirteen European explorers, written between 1545 until 1861, about Laos and the Lao people in Siam. All of the references to plants and plant use have been extracted for an analysis of which plants European explorers viewed being used traditionally in Laos during this time period and information on how these plants were used and collected. Many of the plants described in the texts were medicinal in nature and some have been examined for modern pharmaceutical use. These pharmaceutical studies have substantiated the effectiveness of historical medicinal plant use. The texts also describe plants that were used in religious ceremonies and that continue to play an important role in Lao culture. Future comparative analysis of these early records with modern day observations of plant use should prove productive in formulating assessments of Traditional Environmental Knowledge loss and the impact of this loss on daily life. Understanding the plants that are important to native Lao in the past can lead to better methods of conservation in the future.

**The History of Plant Use in Laos: Analysis of European Accounts of Plant Use for
Primarily Religious and Medicinal Purposes**

by

Kristine L. Callis

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BIOGRAPHY

Kristine Callis got her Bachelor of Science, as well as a Master of Science from North Carolina State University in Botany. Her focus is ethnobotany and she studies both botany and anthropology. She is passionate about following the changes in traditional environmental knowledge in Laos, PDR. She would one day like to become a professor of ethnobotany and guide other students to understand the important role plants play in our lives. In her spare time, she enjoys swing and salsa dancing.

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Chapter 1: Introduction

Laos is a landlocked country with a tropical to sub-tropical climate. The flora comprises elements of three principal plant formations: Evergreen Mountain Forest, Evergreen Lowland Forests and Deciduous forests. With an estimated population of 5.2 million people representing a wide range of ethnically diverse people,¹ there is an average of 47 people per square mile: “the Lao population though low, consists of an extraordinary variety of ethnic groups whose diversity and, in some cases isolation, has made the realization of true cultural and political unity in Laos difficult.”² The Lao people are divided into three regional groups, the Lum or valley people, who make up the ethnic majority in Laos, the Soung or mid-slope dwelling people, and the Theung or mountain or highland people. In turn, these regional groups are subdivided into ethnic groups whose respective numbers are hard to estimate. Members of many of these groups migrated hundreds of years ago from surrounding countries such as China and Thailand.

Despite both its importance as a political entity in Southeast Asia and its rich history, American academics have conducted little research in Laos. Most of the research on the People’s Democratic Republic of Laos (Laos, PDR), has been conducted by French academics, whose writings have been virtually ignored by Americans. Western traditions have had little influence on the traditions of Laos. For example, the animist religion, *phii*, has experienced little change in hundreds of years, despite its repression in the 1970s and 1980s by the Lao government. Ngaosrivathana emphasizes the importance of European accounts of the Lao:

Early European sources are valuable for the study of Lao history because they provide unique descriptions of marketable natural resources of the interior of South-East Asia, the export-import trade in which the Lao were engaged, the political relations between the

¹ USDS 2002

² Mansfield, 24, 103

Lao and their neighbors and many aspects of Lao customs and everyday life. In this regard European records differ profoundly from the historical records maintained by the Lao themselves. The Lao annals tend to record only the major political and religious events, and pay attention almost exclusively to the concerns of the ruling elite.³

An international conference on Lao history held in 2002 focused on European's perspectives of Lao life. Several researchers presented works on European explorers in Laos. These papers, and other historical studies, were compiled in the book *Breaking New Ground in Lao History: essays on the Seventh to Twentieth Centuries*. These essays provided a chronological account that proved invaluable in my construction of a timeline of European writings about Laos^{note}: (see Appendix 1).

Brief History of Laos

From 1887 to 1945, France ruled the land known as Laos, the territories east of the Mekong being ceded in 1893 to France by the Siamese government, which had conquered the land between the late 17th to 18th centuries.⁴ The government-general of these territories was based in Hanoi and the territories were thought of as an extension of Vietnam. Not until an Anglo-French agreement in 1896, did Britain recognize the territories east of the Mekong as belonging to the French. The territories of Siam, however, were not incorporated into the French territories and Siam stayed independent.⁵ In 1904, the areas west of the Mekong, including Saiyaburi and Champasak, were given to France in a Franco-Siamese treaty. The French lost the territories east of the Mekong in 1940, and the areas west of the Mekong in 1941, in a treaty with

³Ngaosrivathana, 146

^{note}: I made these translations unless otherwise noted

⁴ Ngaosrivathana, 6

⁵ Ngaosrivathana, 7

Tokyo. It was not until 1945, that Laos declared independence, though true independence was not gained until 1953.

With the end of the ‘Silent War’ in Laos in the 1970s, the country closed its borders to outsiders. Accordingly, it became impossible for Western academics to conduct research inside Laos. Not until the late 1980s, did Laos resume discourse with other countries, this marked the initiation of negotiation for trade agreements with China and Thailand. The retirement of President Souphanouvong in March of 1991 triggered a wave of reform, which included the forming of a new constitution. In the years following, flood caused famine, leading the country to seek outside help. This forced contact with other nations in combination with the constitutional reform, found Laos beginning its change from a communist to a capitalist economic strategy. Nonetheless, formal research could not be started until the late 1990s, because of reluctance to allow Western academics into the country. The government of the People’s Republic of Laos today recruits Western investors, academics, and tourists effects that may lead to many social and economic changes. Laos is now a full member of the Association of South East Asian Nations. Although tight political control is in the hands of the communist party (PPRL), the country has, nevertheless, adopted a capitalist economic strategy and continues to welcome Western interests. The pace of internal change quickens and the importation of foreign goods expands. It is then increasingly important to document the dynamics of Laotian culture, ecology, and life, before the influx of exotic plants and foreign ideas diminishes its identity.

Europeans in Laos

The first European explorer to Laos was Marco Polo's Portuguese slave, Fernão Mendes Pinto, who was captured and then traveled through Southeast Asia with his Asian owners. In 1545, Pinto wrote an account of his travels that is partly incoherent and partly fictitious. Not until many decades later did historians recognize it as an account of travels through Southeast Asia, including Laos. It was not long after this account was written that Laos became a country known to Europeans:

Laos first came to the attention of Europe ... between the mid-1500s and the mid-1600s, when the major seafaring nations of Western Europe were exploring the potential for commercial gain in many parts of Asia. During this period, a few Portuguese, Spanish and Dutch traders and at least four Catholic priests ventured inland as far as Vientiane, to observe and gather information on the spot. By contrast, English, French, and other traders relied on accounts obtained at second hand from coastal peoples.⁶

Pinto was the first European explorer to visit Laos, traveling as the servant of Burmese merchants. His often-incomprehensible account of the voyage, with misnamed cities, led scholars to disregard his work until the 1980s, his work contributing little to the body of European knowledge of Laos. The next recorded European explorers of Laos were Diogo Veloso and Blas Ruiz de Hernan Gonzalez, who sailed around Southeast Asia in 1596. Although their principal activities centered in the Philippines, they did travel up the Mekong through Cambodia and into Laos. It was not until 1641, that the next explorer, the Dutch merchant Geebaerd van Wusthof, traveled to Laos on a trade mission. He kept an extensive journal of his travels, including lists of the goods bought and sold. Coincidentally, during Wusthof's visit to Vientiane, Jesuit missionaries appeared in Laos. Giovanni de Marini was a Jesuit missionary in Tonkin who wrote an account of a fellow missionary's visit to Laos in 1648. Commenting on the barbaric practices of the people and their religion, he dispassionately described Buddhism as a

⁶ Ngaosrivathana, 144

religious practice. The accounts of many explorers including those of Marini and Wisthoff, are in *The Universal History of 1799* (hereafter referred to as *Universal History*), the first encyclopedia to give a complete and coherent account of the then documented information about Laos. Prior to publication of this encyclopedia, written in English, accounts of Laos were only available in French, Portuguese and Italian. *Universal History*, a series of European accounts, elaborated ideas about the Lao. Few Europeans had direct contact with Laos prior to the arrival in Bangkok of Jean-Baptiste Pallegoix, a French missionary to Siam. While Pallegoix never traveled as far as the capital, he did record extensive interviews with Lao people in Bangkok and visited Lao villages on the border of the Mekong valley. Henri Mouhot explored Siam in 1864; his notes on Siam and Laos include frequent quotes from Pallegoix. Mouhot's exploration took him to parts of modern day Laos, and his family published his findings posthumously. For both a time line and brief description of the explorers, see Appendix 1. A more in-depth analysis and summary of their accounts is found in Chapter Two.

The Plants

The thirteen European accounts on Laos recorded, in sum, the uses of 33 medicinally or religiously significant plants, fourteen of which were previously unidentified either to genus or species with three yet remaining unidentified. I have separated the plants in separate chapters: Chapter Three includes clearly identified plants, whereas Chapter Four analyzes previously unidentified plants. The analysis of each plant includes a discussion of both the European explorers' description and any modern pharmaceutical studies. For a list of the plants, including both the scientific and common names, see Appendix 2.

Chapter 2: European Exploration of Laos

Introduction

European accounts offer a window on the culture and life in Laos, and also show the progression of Western knowledge about the Southeast Asian mainland. As herein described, these accounts were recorded during a 300-year period, beginning in the mid-16th Century. Typical of human ventures into uncharted realms, the respective explorers embodied and exercised the cultural bias of their native Europe. Accordingly, their accounts of indigenous cultural elements in Laos must be accepted and evaluated in this context. Although presentation of details of this European context seems unnecessary, it is important to emphasize two factors that likely weighed prominently as these men delved into the conduct of human life in this distant and largely unknown land.

One factor is ecclesiastical. Roman Catholicism permeated cultural and social institutions throughout Europe. It was the thread providing continuity of life. But the Western Schism saw the Church split in the late 14th and early 15th Centuries. Within less than another one hundred years Martin Luther, a German monk, nailed his proposals on the door of the Castle Church in Wittenberg. Then began a festering turmoil as the Church wrestled with increasing division. The camp of the continuing faithful found itself contending with a checkered throng of protesters in the throes of a Reformation and a Counter-Reformation. Christianity no longer was of one mind. Yet, most importantly, infusion of European culture by the Judeo-Christian tradition and ethos was unabated. Although now labeled Catholic and Protestant, Christian power was not diminished in its suffusion of the European world. And it was in this culture that perceptions of religion, society and their interface evolved in the minds of the soon-to-be explorers of Laos. In this distant precinct they would encounter and report of religious beliefs

and practices yet unknown to the European mind. Accordingly, the reader of their respective accounts must be attuned to potential insinuation of Western elements.

The second factor is imperial. During the 300-year period in which the few intrepid Europeans explored and wrote of Laos, denizens of Portugal, Spain, England and Holland loosed their rapacity in both the neighboring mainland and islands of Southeast Asia. Sea voyages had opened the door to a larger world -- a world to be explored, conquered, claimed and exploited. Commercial enterprise in the East Indies was affected by genius, guns and steel. Our few explorers of Laos could not escape the impacts of this commercial warfare, which both facilitated and impeded their travels. Again the reader must be attuned to the potential influence of national identity and imperial design in the minds of the respective writers as we now address their accounts.

Fernão Mendes Pinto

Scholars believe Fernão Mendes Pinto to be the first European to write about Laos.⁷

Pinto was one of nine Portuguese servant-slaves of Burmese merchants who journeyed from Pegu to Luang Prabang, Laos in 1545, a place he calls Calaminham. He did not write about his travels until after he returned to Europe, more than 25 years later. Due to the misinterpretation of many place names and the effects of time on his memory of people and places, these accounts were thought to be fictitious tales of a good storyteller. It was not until 1980 that scholars were able to trace Pinto's place names as Portuguese corruptions of Burmese names for places originally named in Thai and Lao.⁸ Pinto's account of other countries, such as Burma and China are intelligible and contributed significantly to European knowledge of South, East and

⁷ *ibid*, 95

⁸ *ibid*, 96

Southeast Asia. Since it was not known that Pinto visited Laos until the 1980s, this part of his work had no influence on the European knowledge. Even though it is now known where Pinto traveled, most of his stories and accounts of Laos are still incomprehensible and it is impossible to distinguish fact, fiction, opinion or fantasy. Therefore, I am not including any further analysis of Pinto's work in this research.

João de Barros

João de Barros was a Portuguese explorer who traveled to Southeast Asia in the 16th Century. He is credited as being the first person to use the term Lao ('Lau') when referring to the three kingdoms in the interior of the mainland,⁹ Jangama, Chancarai Changcaran and Lanca.¹⁰ During the time that Barros visited Southeast Asia, Laos was indeed split into three kingdoms:

The kingdom of Laos split into three separate kingdoms from the year 1707 A.D. The three kingdoms that emerged fell simultaneously under the domination of Siam in 1779 A.D. but continued to be ruled by monarchs of Lao descent. As for the kingdom of Vientiane which was the largest of them all the line of succession of its ruler..."¹¹

While this description of the country is both brief and devoid of any account of plant use, Barros does distinguish Laos from Siam in both location and language.

Ralph Fitch

While Ralph Fitch did travel extensively through the East Indies, he did not venture into the heart of Laos, yet he did observe the customs of the people of Siam and Chaing Mai. His

⁹ *ibid*, 103

¹⁰ Barros

¹¹ Viravong, 109

observations, made in 1591, are incorporated in the description of Laos in *Universal History*, including comments on polygamy and loose morals of Lao children.¹²

Fitch notes that the people of Siam eat “roots, herbs, leaves, dogs, cats, rats, serpents and snakes.”¹³ He neither offers detail of which roots, herbs and leaves are eaten, nor if these plant products are used in ways other than as food.

Like many later explorers, Fitch remarks on the importance of gum Benjamin, also widely called benzoin, referring to it as Benjamin or frankincense.¹⁴ This later designation may have initiated a mistaken identification of Benjamin as frankincense that was perpetuated in trade records. Frankincense, or *Boswellia sacra* Fleuck., is not found in Laos, but is native to Ethiopia, Somalia, Yemen, and Oman. Although not used in making frankincense, gum Benjamin, was once the largest plant export from Laos and today remains an important export¹⁵. To see more on benzoin, see page 36.

Diogo Veloso and Blas Ruiz de Hernan Gonzalez

Antonio de Morga, Lieutenant Governor of the Philippines in 1593, published in 1609, *Sucesos de Las Islas Filipinas*, a book based on letters and verbal accounts of European explorers of Southeast Asia. In this account, Morga describes voyages of the Portuguese explorer Diogo Veloso and the Spanish explorer Blas Ruiz de Hernan Gonzalez. Traveling together under the Spanish flag, Veloso was taken prisoner in 1594 when Thailand attacked Cambodia, and he remained in Siam before making his way to the Philippines.¹⁶ In a trip to Cambodia in 1596,

¹² Ngaosrivathana, 153-54

¹³ Fitch, 418

¹⁴ *ibid*

¹⁵ FAO

¹⁶ Ngaosrivathana, 110

Veloso and Gonzalez found that King Sattha I had been overthrown in a coup¹⁷ and that a senior Cambodian official had taken control of the throne.¹⁸ Veloso and Gonzalez then traveled briefly up the Mekong into Laos to Luang Prabang (a place they call Alanchan or Lan John) in search of the former king.¹⁹ Their goal was to bring the king back to Cambodia and reinstate him as ruler. Unfortunately they found that he had already passed away, the only remaining members of the ruling family being his mother and youngest son. Veloso and Gonzalez did bring the son back to Cambodia and reinstated him as ruler.²⁰

Morga includes a letter written by Gonzalez from Cambodia in July of 1598, in which his description of the circumstances of their trip and a cursory glimpse of the country. Throughout their account of the trip up the Mekong, Veloso and Gonzalez provide a meager descriptions of both the natural vegetation and plant use: “It contains mines of gold, silver, copper, iron, brass, and tin; and it also yields silk, benzoin, lac, brasil, wax, ivory and has rhinoceroses and many elephants and horses, larger than those found in China.”²¹ The 1971 editor of Morga’s manuscripts, J.S. Cummins, specifies that benzoin refers to gum Benjamin, which is an aromatic gum, and that brasil is an aloes wood.²² Several manuscripts on Laos, such as Wusthof and Marini, mention benzoin as an important tree whose sap was processed as a gum and which counted as a major export of Laos. Other explorers note that brasil, more commonly called Brasilwood or old aloe also was a prominent export. Brasil wood is *Caesalpinia sappan* and continues in use today. More information on these plants can be found on page 50.

¹⁷ Morga, 85

¹⁸ Ngaosrivathana, 110

¹⁹ Morga, 124

²⁰ *ibid*, 125

²¹ *ibid*

²² Ngaosrivathana, 111

Although Veloso and Gonzalez recorded little about either the vegetation or plant use in Laos, they were quite attentive to the natural history of the Philippines, providing detailed descriptions of the use of betel nut and other plants as medicines and poisons.²³

Geebaerd von Wusthof

Geebaerd von Wusthof was a Dutch merchant who traveled to Laos and Cambodia between 1641 and 1642. Reaching the land of “Louwen” on 20 July 1641,²⁴ the Dutch Trading Company sent Wusthof on an expedition to Laos requested by a group of Lao traders.²⁵ The Dutch company entertained two goals: first to unhinge the combined Portuguese and Spanish grip on Lao trade, second to gain direct access to the export goods brought into Cambodia from Laos. Wusthof kept a journal during the voyage, writing about the politics of Laos, the land and its customs, but principally about the goods that were found and traded. Being a commercial expedition, Wusthof’s accounts tend to be his trade negotiations with the Lao and the king of Laos.

Not surprisingly, in his account, Wusthof mentions gum *lac* 19 times and gum Benjamin 20 times, these being the two major commodities of trade.²⁶ He also notes opium trade, but there is no account of observed use by the Lao people. Non-commercial use or value of plants or plant products entered Wusthof’s journal, but his description of the environment around him is in simple terms. For example, he describes one of his trips only as “traveling in a dense forest”.²⁷ Wusthof does note a few plant uses, such as bamboo tied to the hands and feet to play a game involving combat:

²³ Morga, 258-260

²⁴ Wusthof (Dutch), 15

²⁵ Ngaosrivathana, 116

²⁶ Wusthof (French), 340-341

²⁷ *ibid*, 184

After a few moments, the looters engaged in combat, by punching the other in the face. Although it became sore, the second combatant was able to hit the fist back [in the face]. Afterwards, acrobatics were started with bamboo attached to the arms and feet... Subsequently, a Chinese game [was played] that involved disguises of tigers and other animals.²⁸

When Wusthof became ill, he declined Lao medicine and did not record what was offered. Similarly, Wusthof observed offerings at the local temples, but did not chronicle what was offered, apart from saying that candles were lit. He comments on the subject of religious beliefs, recording what he identifies as superstitions. For example, he says that if a tree or branch fell in the woods without the aid of wind, the Lao guides would stop their progression on the expedition.²⁹ Wusthof's mission to establish a trade network with the Lao failed, not because of the lack of plant materials or exports, but as a function of the rivalry between the Portuguese and Spanish traders and the Dutch.

Wusthof makes observations of Lao religious life, but does not compare this religion to Christianity. He describes the Buddhist temples as well as some of their rituals and practices. Unlike Marini, who was in Laos at approximately the same time, Wusthof is not occupied with the religious life of the Lao, nor does he compare the Lao and European belief systems. Wusthof's observations of Lao life seem anecdotal, his focus being the search for tradable goods. If his Christian upbringing in England influenced his view of Laos, he does not discuss it in his journal.

Giovanni Filippo de Marini

Although several of his fellow missionaries were active in Laos, Giovanni Filippo de Marini did not visit this country. The Jesuit mission at Tonkin, established in 1627, was charged

²⁸ *ibid*, 137

²⁹ *ibid*

with the conversion of the Lao people to Christianity. Most missionaries sent from Tonkin into Laos died enroute, and the efforts to set up missions in Laos failed. One missionary who succeeded in spending some time in Laos was Giovanni Maria Leria. Wusthof recorded his arrival in Vientiane in 1642, accompanied by fellow missionary Mateo Cebrian.³⁰ Although Leria was forced to leave in 1648, accounts of his travels, together with other, shorter accounts on Laos, gave Marini the information he used in his book *A New and Interesting Description of the Lao Kingdom*. John Riddle verified the translation of the original translation by Walter E.J. Tips and Claudio Bertuccio from Italian to English.

As noted previously, the Lao people highly prized benzoin in that it was the largest export commodity. Marini describes the source of benzoin as a tree growing very well in the mountains.³¹ The leaves are similar to those of a chestnut tree, but with flowers more like those of an orange.³² The fruit is fragrant approximately the size and shape of an acorn, but inedible, serving only as the source of seeds to produce more trees. So valuable were these seeds that the king prohibited sale of the fruit to foreigners.³³ In Marini's opinion, however, it would not matter if a foreigner bought the seeds since he did not believe the tree would grow well in any areas lacking the distinctive climatic features of Laos.³⁴

The climate in Laos proved favorable not only for the fragrant benzoin flowers, but similarly for flowers of many other species. Flowers were so abundant, according to Marini, that the Lao also produced quite a bit of honey.³⁵ Flowers also played an important role in religious

³⁰ *ibid*, 196

³¹ Marini, 5

³² *ibid*, 5

³³ *ibid*, 5-6

³⁴ *ibid*

³⁵ *ibid*, 6

practices, with people placing flowers, perfume and rice as offerings on ancestor altars.³⁶ Marini noted the verdure of the forests and countryside, also probably attributed to the warm and rainy climate of Laos. One of the trees precious to the Lao did not grow in the rich forests, but among the rocks in the Kingdom of Ava. This tree produced amber, a possible item in trade with the Kingdom's neighbors.³⁷

Marini briefly mentions poison and medicine in Laos, but never describes the source from which these compounds were made. He does relate an incident in which the Lao army put poison in a river when the enemy was on the other side.³⁸ So many of the enemy's soldiers and animals died that they had to retreat.³⁹ The line between poison and medicine is exceedingly fine; therefore, knowing which poison is used could also inform medical practices. Marini refers to the remedies as "medical plants," but, unfortunately, includes neither description of the plants nor any indication of their effectiveness⁴⁰. Included is an account of monks making perfumed waters, which were also considered medical:

During the greatest heat, these same mandarins bring the monks jars filled with orange flower perfume and medicinal waters accompanied by medicinal plants and perfumes so fine and so aromatic for their use when they take a bath, that never has Antonius in his thermal baths, nor Diocletius in his... experienced something as delightful, nor have they ever been served with so much honor civility.⁴¹

³⁶ *ibid*, 59

³⁷ *ibid*, 10

³⁸ *ibid*

³⁹ *ibid*

⁴⁰ *ibid*, 70

⁴¹ *ibid*

Marini further notes that in exchange for rice wine, monks give these medicinal waters to the ill.⁴² Rice wine seems to be quite important to the Lao. For example, Marini points out that one Lao superstition involves placing wine on the head of elephants to give them more courage:

After having first poured a drop of bile in wine [rice wine], they use it in a detestable and superstitious ceremony. They rub it into the head of an elephant assuming that – they are convinced that this is an incontestable truth- by this means they themselves become more daring and their elephants more courageous and stronger, and they believe they will be victorious in any kind of skirmish or battle.⁴³

This practice affords a glimpse of the key roles of rice wine in culture in Laos. Made from the principal crop plant, it is seen as giving strength and courage. The wine is also important to the monks in Laos. According to Marini, rice wine was one of the favorite offerings to the monks. He describes the wine as: “sweet wines they distill from the best rice the country produces.”⁴⁴

Marini also points out a curiosity pertaining to the religious manuscripts. Monks apparently wrote letters on palm leaves with an iron awl.⁴⁵ Pallegoix also refers to palm leaves as being the writing medium for religious manuscripts. This use of palm leaves will be discussed in greater detail later (see page 49).

Alexander Hamilton

Alexander Hamilton was a Scottish merchant captain who wrote about his travels from Africa to Japan. His accounts of the Malay Peninsula were published in 1727. Although he never visited Laos, he talked to the merchants in Cambodia to learn more about the interior. His description of Laos is embedded in his account of Cambodia. Scholars believe that his accounts

⁴² *ibid*, 59

⁴³ *ibid*, 14

⁴⁴ *ibid*, 71

⁴⁵ *ibid*, 74

about the wealth of Laos are “wild exaggerations.”⁴⁶ It is clear from his account that he overestimates the abundance of wealth in Laos:

The kingdom of Laos borders on Siam, Cambodia, Couchin-china and Tonquin. It produces gold, raw silk, and elephant’s teeth are so plentiful, that they stake their fields and gardens about with them, to keep out wild hogs and cattle from destroying their fruit and corn.⁴⁷

Hamilton also describes the people of Laos, saying they are pagans and that the women are “little inferior to Portuguese or Spanish ladies.”⁴⁸ Descriptions such as the example above, prevailed in the European perception of Laos, as evidenced by their later inclusion in *Universal History* (See page 18 for more details on *Universal History*).

Hamilton describes some plant use, frequently identifying one plant is Agala wood: “The Harbour is safe and the Country produces Rice, Timber for building, Tin Elephants, Elephants teeth and *Agala* wood.”⁴⁹ He says that Agala wood is found in the kingdom of Siam on the banks of the river Tanacerin and is also mentioned as being found in the Siamese city of Sangore.⁵⁰ Hamilton goes on to describe the country as “low and as fruitful as any Spot of Ground in the World, in Rice, Legumen, Fruit and Roots, Cattle wild and tame.”⁵¹

Engelbert Kaempfer

Trained in Germany as a botanist and medical physician, Kaempfer traveled around South, Southeast and East Asia in the late 1600s with the Dutch East-India Company. His accounts are compiled in the book *The History of Japan: Together with a Description of the*

⁴⁶ Ngaosrivathana, 113

⁴⁷ Hamilton, 204

⁴⁸ *ibid*

⁴⁹ *ibid*, 64

⁵⁰ *ibid*, 60, 160

⁵¹ *ibid*, 161

Kingdom of Siam. John Pinkerton later uses Kaempfer's description of Laos found in the first of three volumes, in his composition of views on Laos. While describing the regions of Siam, Kaempfer says that there is a place to the north, called Laos. He describes the kingdom:

Since I have mention'd Laos, it will not be improper to communicate to the Reader what account I had of this Kingdom, which is otherwise but little known, because of its being an Inland Country, and remote from the Sea.⁵²

He describes little plant use, although he does give a brief mention of the importance of Benzoin and Gum Lac. On the subject of religion, he merely mentions that it is similar to that of Siam, yet does describe the written religious texts: "They write upon leaves like the Peguans and Malabarians, and as the Siamites write their religious Books; but civil affairs are writ upon a sort of course paper with earthen pinns."⁵³

Kaempfer remarks on the important role plants play in Lao religion. He notes that: "The men cause their Legs to be painted from the ankle up to the knee with flowers and branches, like the Braspintados of the Siamites, as a mark of their Religion and Manhood."⁵⁴ That the native Lao to go to the extent of painting their bodies with pictures of plants for religious or coming-of-age ceremonies attests to the significance of these plants. Unfortunately, Kaempfer does not indicate which plants were painted on the body.

Jean-Baptiste Du Halde

The encyclopedia *Description géographique, historique chronologique, politique et physique de l'épire de la Chine et de la Tartarie chinoise, enrichée des cartes generales et particulières de ces pays, de la carte générale et des cartes particulières du Thibet et de la*

⁵² Kaempfer, 40

⁵³ *ibid*, 41

⁵⁴ *ibid*

Corée, was based on the respective accounts of 17 Jesuit missionaries to China. Published in 1735, Du Halde's collection of accounts describes a well-known trade route from China to Thailand, which winds through a place called Lahos. Some scholars believe this place is in Southern China, not the Kingdom of Laos.⁵⁵ However, after reviewing the work, I do believe this is northern Laos, an area that was once a part of China. This place was identified as Laos by Europeans and therefore, the account was included in *Universal History*. Du Halde describes medicinal plants traded between the Lahos and northeastern Thai and China. Even if the account only describes trade in Southern China and Thailand there is likely cross-over of their use into Laos and therefore it is useful to approach the medicinal plants in Du Halde's account as probably being used by people in northwestern Laos.

Although Du Halde was a Jesuit priest, he refers only to those plants that were either unknown to Europeans or that have importance in trade, but not plants used in a religious context. He does not address religious uses of plants, though he does examine medicinal plant use. The only mention of religion is the brief note that the people of Lahos have the same religion, customs and language as the people of Siam⁵⁶. This comparison probably contributed to the assumption that Lahos was the kingdom of Laos.

Du Halde mentions several medicinally important plants and refers to many of them by their local common names. Many of these plants had previously been unidentified and more discussion of these species will follow in an analysis of their use and their identification.

Universal History

Published in England in 1759, the encyclopedia called *The Modern Part of an Universal History*

⁵⁵ Ngaosrivathana, 95

⁵⁶ Du Halde, 105

offers English speakers a first glimpse into the world of Laos. An article on the impact of *Universal History* on European knowledge of Laos is included in the book *Breaking New Ground in Lao History: Essays of the Seventh to Twentieth Centuries* edited by Mayoury Ngaosrivathana, Kennon Breazeale, and Mayuri Ngaosivat. Therefore, I will keep this description brief.

The encyclopedia, *Universal History*, incorporates the various explorers' accounts of Southeast Asia including Marco Polo, Fernao Mendes Pinto, Antonio de Faria, Gaspar da Cruz, Ralph Fitch and William Eaton.⁵⁷ Most of the information on Laos comes from the account, mentioned earlier, by Giovanni de Marini. Many of the passages in *Universal History* are almost identical to passages in Marini's account of Laos. Unfortunately, despite being a published work (1669), the journal of Geebaerd von Wusthof and the descriptions within his account were not included in the encyclopedia.⁵⁸

Universal History, like many accounts on Laos, discusses the exports of Laos, but unlike other accounts it also discusses medicinal plants and ventures to name these plants. While elaborating on trade with China, the list of exports from Laos includes “[a] medical paste called zhadam; a sort of medical wood named ingo by the Portuguese, and maha ing by the Siamese; likewise opium; kotso, a kind of medical root so called; and white linen cloth.”⁵⁹ Many of these plants have never been identified in the literature (for more information on plant identification see page 38). Another principal medicine, according to the encyclopedia, is made from lakka, or kare. This is most likely gum *lac* or insect *lac*, which is a resin exuded by insects feeding on the sap of a tree.

⁵⁷ Ngaosrivathana, 153-154

⁵⁸ *ibid*, 155

⁵⁹ *ibid*, 182

Another frequently mentioned plant product is gum Benjamin, or benzoin, and, according to *Universal History*, benzoin is said to have medicinal properties, the fruit being “forbidden to sell to strangers” perhaps due to its extremely bad taste.⁶⁰ This account of benzoin derives from the description by Marini. *Universal History* addresses several exports from the Kingdom of Leng region. It notes that other than the medicinal plants, the Leng people also trade “cotton spun and unspun, tea, lack, japan, or brazil wood, and the medicinal root above-mentioned [tong-quey].”⁶¹ Here cotton is again identified as an export, though the account probably comes from the description of exports given by Marini. The same is true for the brazil wood. It is surprising that in this account teak is not mentioned as a wood traded by the Leng, since it was later to become the principal export.

Jerome Richard – 1778

Jerome Richard was a French secular priest who published a two-volume work on *The History of Tonquin* in 1778, which includes some informative descriptions of Laos. He notes that the people living in Tonquin are ethnically Lao. He obtains his information from a survey of European works on Laos similar to the encyclopedic description in *Universal History*. Also like *Universal History*, most of his information comes from the work of Marini. For the most part, the information he chooses to include may be accepted as reasonably accurate. Yet he does exaggerate, as when he claims the Lao soldiers live for a hundred years. Richard’s account was reprinted by John Pinkerton in 1818 in an effort to further advance the European understanding

⁶⁰ Ibid, 183

⁶¹ ibid, 183

of Laos. Richard's account of Laos includes natural products and natural sciences. While describing the environment in Laos, he states that the country is fertile and covered in forest:

The frontiers towards China, a part of Chochin-China and the kingdom of Laos are found by extensive mountains, mostly covered with immense forests: it seems that they would all be fertile if cultivated ... The woods are very beautiful; gold, silver, iron, yellow, red and black copper, which is much esteemed in the country, are found in them.⁶²

Richard was clearly impressed with the natural beauty of Laos and even says " Bountiful nature spreads her flores over the plains and valleys and even on the mountains"⁶³

While Richard may suggest that the land is not cultivated, he includes a description of the types of fruit grown by the Lao and how their fruits are used. For example, he explains that the Mulberry trees are grown less for their fruit and more for cultivating silk worms.⁶⁴ There are fruit trees that are grown just for their culinary delights, like lechae or *Litchi chinensis*, and Richard provides an extensive description of the fruit, including the local name and its importance to the political structure of the country:

The lèchae, which the inhabitants call bèjay, grows on a high tree, whose leaves are like the laurel: the fruit appears in grapes on the branches, and each grain takes the form of a heart, the size of a small hen's egg. When ripe it is of a crimson red: its shell is thin, rough and easily opens. The fight and taste are equally gratified by the excellence and beautify of this fruit: it does not keep more than forty days: it is ripe in April. About that time, the King's taste-officers put their seal on those trees, which promise the best bèjay, without enquireing whom they belong to, and the owners not only bust not touch them, but are obliged to attend to the preservation of those fruits reserved and marked for the court⁶⁵

Some of the fruits, such as durian, which Richard calls taca or mite, seem to induce illness when eaten in abundance. Richard warns, " If eaten to excess it causes a pestilential disorder which

⁶² Richard, 713

⁶³ *ibid*, 764

⁶⁴ *ibid*, 717

⁶⁵ *ibid*

the natives call morxi.”⁶⁶ Overeating is not the only cause of illness and Richard describes the various diseases experienced, or not, by the Lao:

The apoplexy, pleurisy, the plague, such as known in Europe, is never experienced in Tonquin. The most common diseases are fevers, dysenteries, yellow-jaundice, and the smallpox; ... Leporasy is said to be very common and the sufferers are quarantined to certain parts of the country. There is also something called “bad wind” which occurs when “the wind, or sudden impression of a cold air, charged with local exhalations, suddenly congeals the blood, and instantly kills many; other are only benumbed in some of their limbs; most often the mouth is deformed and turned as in a paralytic stroke.”⁶⁷

Even though the Lao are not afflicted by many of the diseases known to Europe, Richard was harshly critical of the medical care in Laos:

Although their medical men are numerous, they cannot be said to possess much ability, and are ignorant of the construction of the human frame, for they never even dream of anatomy. They however gather some information from Chinese books, in which they learn to prepare drugs, herbs and roots ... The chief and most difficult operation in most diseases is fire: the manner they apply it deserves notice. They use the leaf of a tree well dried, which they beat in a mortar, and afterwards slightly moisten with diluted Indian-ink; they divide it into pieces the size of a farthing, which they apply to different parts of the body; they then set fire to them with lighted paper.⁶⁸

Even so, Richard acknowledges that “medicinal herbs,” including opium, are important trade commodities, along with Benjamin and lacquer.

John Pinkerton

John Pinkerton was a renowned Scottish writer who, in 1802, edited *A General Collection of Voyages and Travels*. Included in this collection were accounts of Laos from descriptions and essays written by Du Halde, Richard and Kaempfer. These accounts are examined separately, by the respective author. While Pinkerton made no new contribution to the

⁶⁶ *ibid*

⁶⁷ Richard. 728

⁶⁸ *ibid*, 729

knowledge on Laos, he was important in pulling together accounts written after the publication of *Universal History*.

Karl Friedrich August Gutzlaff

Dr. Karl Gutzlaff, a German Protestant, published an article describing the natural vegetation of Laos with the Royal Geographical Society in London in 1849. Although he never visited Laos, he lived approximately three years in Bangkok, there being one of the first Protestant missionaries, using his training from the Netherlands Missionary Society. In this capacity, he helped to translate parts of the Bible into Lao as well as Thai. The information he obtained on Laos was gathered from contact with both ethnic Lao living in Thailand and Lao prisoners of war. His accounts of Laos describe the country as lush and fertile with “gigantic trees and luxuriant vegetation.”⁶⁹ He describes each region in terms of fertility of the soil and its utility in supporting the growth of both rice and forests, including the teak forests.⁷⁰ Apparently this is the first mention of teak as a specific wood important to the Lao.

Not unlike previous writers, Gutzlaff does address the importance of gum Benjamin and its use as a varnish: “The varnish-tree grows in perfection. The natives themselves understand the manufacture of beautiful lacquered ware, and export some to their neighbors.”⁷¹ Not surprisingly, he identifies gum benzoin as of an export of utmost importance.⁷² Gutzlaff includes other vegetation, stating that the Lao do not take care of their fruit trees and the vast habitat of

⁶⁹ Gutzlaff, 33

⁷⁰ *ibid*, 37, 39

⁷¹ *ibid*, 35

⁷² *ibid*, 39

the fan palm due to the cool elevated geography of the country.⁷³ Gutzlaff's account of Laos and its vegetation clearly is intended for an informed scientific community.

Jean-Baptist Pallegoix

Jean-Baptist Pallegoix arrived in Bangkok in 1830. Fascinated by the area, it was his mission to learn everything he could about the interior of the peninsula,⁷⁴ questioning Lao villagers, who would come to Bangkok to trade, about the customs, politics, and natural science of their homeland. He then traveled to the foothills of the Chao Phraya basin, to visit Lao villages,⁷⁵ and, although planning travel to the interior, he contracted malaria and could therefore not realize this dream.⁷⁶

Although Pallegoix stayed principally within the borders of Siam, this Kingdom incorporated many of the provinces of modern day Laos: in the East, “Muang Korat and several Lao Principalities”, and in the north “Xieng Mai, Laphun, Lakhon, Muang Phre, Muang Nam, Muuang Lom and Luang Phrabang.”⁷⁷ Pallegoix estimated the population of Siam to be one-sixth Lao, or roughly one million people.⁷⁸

Pallegoix provides extensive descriptions of plant products of Laos. He offers an in-depth description of the ritual attending betel nut consumption, remarking how it is unusual that Europeans are so poorly informed, given that the use of betel is spread through half the world.

⁷³ *ibid*, 35

⁷⁴ Ngaosrivathana, 105

⁷⁵ *ibid*, 135

⁷⁶ *ibid*

⁷⁷ Pallegoix, 1-2

⁷⁸ *ibid*, 2

The length and depth of his description, attests that Pallegoix found betel to be an important element of Lao life.

Pallegoix also describes plants that have medicinal uses, most of these plants are produce fruits also eaten as food. In addition to fruits, Pallegoix found also a few medical flowers. Although he only discusses one of these in particular, the mali flower, he does note that many other flowers were similarly used in medicine (For more information on mali, see page 59).⁷⁹ Other than medical plants, Pallegoix also describes several plants used in Buddhist ceremonies. A prominent example is the Indian poplar, known as makok, held sacred by Buddhists because it is the tree under which the Buddha, Somana Khodom, to attain “perfect sanctity and the dignity of the Buddha.”⁸⁰

Pallegoix provides an extensive study of the flora and the uses of numerous plants recording both mode of use and the results of such use. While Pallegoix did visit many villages on the border of Laos, unfortunately, his account lacks extensive first-hand experience living in the interior of Laos. Despite this important fault in Pallegoix’s research, he still produced the most extensive description of plant use in Laos before the 20th century.

Henri Mouhot

Although aware of both Pallegoix’s interest in and his account of Laos, Henri Mouhot could find no European explorer who actually traveled into the interior of the Mekong valley.⁸¹ He may have felt he was the first, in that he claims he was unable to find any written accounts of

⁷⁹ *ibid*, 72

⁸⁰ *ibid*, 71

⁸¹ Ngaosrivathana, 97

Europeans who were in Laos prior to his expedition.⁸² Unfortunately, Mouhot was unable to finish his work. He contracted malaria and died in Luang Phrabang in 1861,⁸³ his family in England then published his journal and notes.

Henri Mouhot maps Siam to include ten eastern provinces and five northern provinces, many of which are now considered part of Laos. The ten eastern provinces include Pheltsjaboun, Bua-Xum, Sara-Buri, Nooha-Buri, Nakhon-Najok, Patsjin, and Phanatsani-khom.⁸⁴ The five northern provinces, according to Mouhot, include Sangkalok, Phitsalok or Phitsanulok, Kumphang-Phet, Phixai and Taheng.⁸⁵ Like Pallegoix, Mouhot also estimates the population of Siam to comprise of one million Lao,⁸⁶ but it is unclear if this estimate is extracted from Pallegoix's notes or is Mouhot's own assumption.

Although Mouhot is said to be a naturalist and frequently quotes Pallegoix, he recorded very little about either the plants or their uses in Siam. What he does describe is the abundance of bamboo:

Vegetation is scanty and consists principally of bamboo, but it is rich and varied in those places where the detritus has formed a thicker surface of soil. The dense forests furnish gum and oil, which would be valuable for commerce if the indolent natives could be prevailed on to collect them.⁸⁷

He also notes the importance of bamboo in making houses.⁸⁸

Pallegoix previously mentioned many of the fruits also mentioned by Mouhot, including mango, mangusteen, pineapple and durian.⁸⁹ Unlike Pallegoix, Mouhot ascribes no medicinal

⁸² *ibid*

⁸³ *ibid*

⁸⁴ Mouhot, 59

⁸⁵ *ibid*

⁸⁶ *ibid*, 61

⁸⁷ Mouhot, 121

⁸⁸ *ibid*, 115

uses to these fruits, only cataloging them as found in Siam. Due to his untimely death, the account of Mouhot is incomplete and contains little information on uses of member of the flora in Laos.

Conclusions

The respective accounts of these explorers doubtless were influenced by their personal objectives, objectives formulated in the context of the Western civilization of their European homelands. In some instances, the author states his objectives; in other instances, these are surmised. Observations and comments about some of these are in order.

As we have noted, Veloso and Gonzalez spent no more than two weeks traveling in Laos. Of Portuguese and Spanish nationality, respectively, we are safe in assuming that their exploration incorporated some commercial interests. Portugal and Spain were, at that time, engaged in fierce competition for access to resources and export commodities. Although they do not articulate their motive, they invested most of their effort in the mission to reinstate the Cambodian King. So occupied, they recorded little about the uses of plants in Laos.

As an emissary of the Dutch East Indies Company, Geebaerd von Wusthof provided an account of plant usage that derived from his commercial interests in facilitating export trade with Laos. Not surprisingly, his emphasis focused on high-value commodities such as gum Benjamin and opium, and his negotiations with royal officials. National interests certainly would have influenced his assessment of the land and life of Laos. His observations about the practice of Buddhism are not couched in comparison with Christianity. If his Christian upbringing in England influenced his view of Laos, such is not evident in his journal.

⁸⁹ *ibid*, 165

A Jesuit missionary, Giovanni Marini predictably concentrates his writings on the religious practices. He gives an account of the uses of some plant-based medicines, but his descriptions focus more on plants placed on altars as offerings, commenting that such uses of plants are barbaric or sinful. Similarly he characterizes the Lao export of plant commodities such as benzoin as reflective of the inherent greed of these heathen people

The account of Laos found in *Universal History* is heavily influenced by the descriptions from Marini. This may explain the focus on the religious life in Laos and the expressions of bias that parallels the views of Marini.⁹⁰ Accordingly, it may be said that since the editors did not delete the religious bias of Marini, they probably respected his characterization of the Lao people as barbaric.⁹¹

Richard continues his diatribe in the description of marriage and the use of concubines, a practice also indulged by the European elite at the time of his writing:

‘The magistrates and ministers generally take but one wife; but that is less an effect of their moderation than of their avarice. They would wish it to be understood that too much occupied by their public duties, they cannot bestow the time on their pleasures which they consecrate to business: but the great number of their concubines makes amends for confining themselves to one wife.’⁹²

Scholars have said that Richard’s “study of Laos from the European texts and reports available to him reflects the intellectual trends of the age in which he lived”⁹³. Extending this observation, one might conclude that both Western and Christian bias, and ethnocentric mentality characterized most European explorers in the late 18th century.

⁹⁰ Ngaosrivathana, 131

⁹¹ *ibid*

⁹² Richard, 765

⁹³ Ngaosrivathana, 131

Pallegoix obtained most of his information secondhand. Yet he devoted great effort to accounts of plant usage, leaving an invaluable compendium of plant descriptions and their respective uses by the Lao. Unfortunately he employed nomenclature that was a mix of native names or their French interpretations. Consequently, it is often quite difficult to determine with exactitude the specific plant being considered.

Mouhot, despite being heavily influenced by Pallegoix and despite being a naturalist, seems to ignore the rich array of plant life in Laos and instead focuses on the geology and land formations of the country. Each of these explorers, with perhaps the exception of Pallegoix, was blinded to the richness of plant diversity and use in the Kingdom of Laos by personal goals. Mouhot's writing reveals little bias, possibly as a function of its later editing, compilation, and publication by other family members.

Of the fifteen explores accounts, or collection of explorers' works, about Laos, prior to the acquisition of the country by the French in the 18th century, only eleven contributed to the European knowledge of plants and plant use, see figure 1. The *Universal History* contributed no new knowledge but instead brought the previous accounts together to form a collective body of work on Laos, thus the encyclopedia is left out of figure 2. From figure 2 it is clear that Pallegoix contributed the most to the European knowledge of plants and plant use in Laos (39% of total), with Du Halde (13%) also contributing significantly.

Chapter 3: Plants Used in Laos

Common Names	Scientific Names	Family names
Areca	<i>Areca catechu</i>	<i>Palmacea</i>
Betel nut	<i>Areca catechu</i>	Palmacea
Durian	<i>Durio zibethinus</i>	Bombaceae
Gum Benjamin (Benzoin)	<i>Styrax benzoin</i>	Styraceae
Jackfruit (bread-tree)	<i>Artocarpus heterophylla</i>	Moraceae
Lac	Insect Lacquer	
Logan (Logan Litchi)	<i>Euphoria longan</i>	Euphorbiaceae
Mango	<i>Mangifera indica</i>	Anacardiaceae
Mangoustan	<i>Garcinia mangostana</i>	Clusiaceae/Guttiferae
Mulberry tree	<i>Morus spp.</i>	Moraceae
Nymphoea (Water Lilly)	<i>Nymphaea</i>	Nymphaeaceae
Opium	<i>Papaver somniferum</i>	Papaveraceae
Papaya	<i>Carica papaya</i>	Caricaceae
Sandalwood	<i>Santalum spicatum</i>	Santalaceae
Tamarind	<i>Tamarindus indica</i>	Caesalpinaceae

Table 1. The plants are listed in the same order they appear in the text.

European explorers were slow to note plant use, but those plants they did record were so culturally important they could not be overlooked. Therefore, even if a plant is only mentioned by one explorer, it must be assumed that its use was fairly widespread. Many of these plants were mentioned by multiple explorers and therefore, even if it did not have religious or medicinal significance, it is included due to the importance to Lao life.

Areca/Betel Nut

Betel nut, occasionally referred to in the manuscripts as *areca*, is *Areca catechu*. A tall palm that produces hard nuts, the fruit is cut up and chewed for its stimulant properties. An expert on vegetation in Laos, Vidal lists *Areca catechu* as a medicinal plant used by the Lao.⁹⁴ Pallegoix notes his surprise that Europeans have little knowledge of betel nut or its consumption,

⁹⁴ Vidal, 406

especially since its use is spread through half the world. The length and depth of Pallegoix's description attests to his belief that betel is an important part of Lao life. Although Pallegoix does not make a direct link between betel use and either religious practices or medical remedies, the importance implied in Pallegoix's description warrants betel being discussed here. He describes three main characteristics of the plant and its use:

The physical features of the betel and areca trees:

Betel is a climbing plant that looks like pepper, and is thus called piper-betel. It continually produces pretty heart-shaped, fleshy leaves with a pungent and aromatic flavor. Areca is a tree of the palm genus, as thick as a leg, straight, slender and with leaves only on the top, which reaches a height of 50-60 feet. It produces two or three huge clusters of 200-300 nuts, first green but when ripening reddish yellow. These nuts are full of acerbic and astringent meat.⁹⁵

Preparation for use:

Thus one takes two betel leaves on one of which one spreads out a thin layer of slaked lime reddened with turmeric with a spatula. One rolls them in such a way as to obtain the shape of a cigar and then cuts an areca nut into four pieces. One places a piece in one's mouth and chews it while biting pieces from the betel which one holds by the end. One rubs one's teeth with a pinch of smoking tobacco and chews that too... When the mouthful of areca has no more flavor, one washes the mouth and soon after this recommences the operation.⁹⁶

Effects on the body:

Soon the saliva becomes the color of blood; one experiences a slight drunkenness relaxing the head and lifting the spirit... The use of betel blackens the teeth (Which, besides, is considered attractive in the country) It corrects the bad odour of the mouth and when used in moderation contributes a lot to the conservation of the teeth just like it destroys them if the use is excessive or if one adopts the habit of putting to much lime.⁹⁷

Veloso and Gonzalez and Mouhot also mention use of betel nut and areca. Veloso and Gonzalez remark that betel nut consumption was quite widespread in the Philippines. As with

⁹⁵ Pallegoix, 64

⁹⁶ *ibid*

⁹⁷ *ibid*

Pallegoix, their surprise at the lack of European knowledge of betel nut leads the reader to conclude that betel nut use was extensive throughout Southeast Asia. The detailed description and lengthy commentary indicates the importance of the plant in Southeast Asian social life.⁹⁸ Mouhot comments on betel nut use in Laos and Siam and says the farmers in the south of Siam trade it in exchange for rice.⁹⁹

In modern times, betel nut is still an important part of Lao life. Tambiah, an anthropologist who studied life in a village in Northeast Thailand near the border with Laos, examines the types of offerings given to the ancestors:

Each householder's offering considered of a large basket or bowl containing one boiled chicken, sauce, rice in a small basket, pa wan (rice mixed with sugar) in a package, betel nut, tobacco, and locally made cigarettes.¹⁰⁰

According to Tambiah, betel nut is also an important offering to the village spirits, or *phii*, who protect the village and cause problems if neglected:

The first sequence, kuad khaw phii, is concerned with the 'invention' to the phii to leave the patient (choen phii org). For kuad, patient or his representative has to take to the cham certain standard offerings (kaj): two lumps of rice, flower, candle, betel nut and tobacco.¹⁰¹

According to Tambiah's description, the importance of betel nut to the Lao people seems to have changed little over the last few hundred years. Pallegoix and Mouhot recorded its importance as both a social and religious element in the 19th century and Tambiah refers to it as being used even in the 20st century. However, according to a study by Reichart *et al.*, performed in 2003, betel nut chewing has decreased in Thailand so significantly in the last several years that the rate of mouth, tongue and throat cancer decreased by 33% in males and 42% in females from

⁹⁸ Veloso.

⁹⁹ Mouhot, 156

¹⁰⁰ Tambiah, 270

¹⁰¹ Tambiah, 278

1988 to 1991. Many other studies have been done assessed both the health risks and benefits of betel nut.

In 1976, Arjungi reviews the use of betel nut in Asia, noting that it has an important place in Ayurveda and Chinese medicine. It is used in Ayurvedic medicine to treat headaches, fever and rheumatism, and in Chinese medicine treat infections. Instead of being beneficial, however, Arjungi found that betel nut contains the alkaloid arecoline, which has been shown to cause leukoplakia, an open sore in the mouth caused by irritation, when the compound is applied to the buccal mucosa of rats and mice.

Using resveratrol as a control, Lee *et al*, in 2003, examined the antioxidant activity of *A. catechu*. The extract manifested both high radical scavenging activity and inhibition of apoptosis of lung fibroblast cells in Chinese hamsters. Results furthermore note that betel nut had more antioxidant activity than resveratrol, which may mean it could prevent oxidative damage in cells.¹⁰²

In 2002, Vinoy *et al*. examined the correlation of betel nut and heart rate in lactating women. They studied lactating women who used betel nut three or more times daily and found that the women, on average, had a significantly lower heart rate than in uses with a lower daily intake. These observations notwithstanding, the researchers concluded that betel nut use does not affect the amount of energy used by the women in a 24-hour period if they were not using betel nut at that time.¹⁰³

Therefore, while betel nut may have some therapeutic properties, such as lowering the heart rate of lactating women or preventing oxidative damage in cells, it can cause health

¹⁰² Lee *et al*, 2003

¹⁰³ Vinoy *et al*, 2002

problems such as open sores in the mouth and could lead to cancer of the mouth and throat.

More studies are needed on the effects of betel nut, to determine both dose and circumstances that render the compound harmful or beneficial.

Durian

Du Halde notes that durian fruit is native to Siam and does not occur north of the kingdom¹⁰⁴, although it is found in Laos. The fruit is said by Pallegoix to smell like rotting flesh and taste like the food of angels.¹⁰⁵ Small spikes on the hard outer shell make it difficult to open, but the soft mesocarp is stringy inside and is sweet. Richard mentions that when durian, what he calls mite or taca, is eaten in excess it causes morxi, a pestilential disorder.¹⁰⁶ Unconfirmed rumors allege that the fruit is so addictive that users would sell their clothing to buy more durian, but there is no evidence supporting that either these rumors are true or that durian causes addiction.

Pallegoix also mentions durian as containing a very astringent shell, which is used to prevent and cure ('against') dysentery.¹⁰⁷ There are little to no published findings on the beneficial or therapeutic effects of durian.

Gourd

Focusing on the religious aspects of Lao culture, Marini recorded several origin myths of the Lao people. One of these myths is particularly interesting due to the importance given to a pumpkin (English translation). While the pumpkin is a new world food, similar squashes are found in Southeast Asia. In this myth, after man is created, he emerges from a pumpkin:

¹⁰⁴ Du Halde (French), 107

¹⁰⁵ Pallegoix, 67

¹⁰⁶ Richard. 717

¹⁰⁷ Pallegoix, 67

They believe that a buffalo, which was born as deformed an animal as one has ever seen, limping, badly built, timorous, extremely weak and extraordinarily skittish, had fallen from heaven into the sea and that it filled its imagination with so many different species that, without and intercourse, it conceived a monster and, a short time later, it conceived a pumpkin filled with white and black men who had been enclosed in it like so many chicks and who came out of it in the manner I have already described.¹⁰⁸

This myth could be viewed as humans being given birth to by plants and thus having inseparable ties with the plant kingdom. In *Universal History*, this myth is recounted slightly different than that of Marini's version, although it is obviously taken from Marini's account of the myth:

They tell us, that formerly a buffalo, one of the most deformed creatures which ever was seen, lame, ill-shaped, extremely fearful, weak and apt to start, fell from heaven into the sea; where by the mere strength of imagination, he conceived a monster and soon after brought forth a gourd full of white and black men.¹⁰⁹

The original Italian version uses the term "zucca" which translates as gourd, possibly calabash gourd, or *Lagenaria siceraria*. Therefore the fruit from which man was conceived is probably a gourd and possibly even the round calabash gourd, which is widespread throughout Southeast Asia.

The difference between these versions of the myth is the type of fruit from which man emerges. In the English version of Marini's account, man comes out of a pumpkin, while in the Italian version it is a gourd, possibly calabash. This difference probably has more to do with the translation of the story than in a discrepancy in the story itself.

A gourd also plays a role in traditional Lao music as attributed to Viravong, a Lao native, who wrote a history of Laos in the 1950s:

The people of Nong-Sae used a sort of fruit of the gourd family which they blow to produce sound and a bamboo-like sort of flute with four holes which they called Piu-

¹⁰⁸ Marini, 40

¹⁰⁹ Ngaosrivathana, 195

Sung. When they offer liquors to their guests, they set the glass on their flute and invite them to drink.¹¹⁰

This description of the gourd and its inclusion in the origin myth suggest that the hollow fruit played an important role in Lao life.

Gum Benjamin

As noted previously, Gum Benjamin, or benzoin, has been a main export commodity of Laos. Veloso and Gonzalez, Wusthof, Marini, Kaempfer, Fitch and Gultzlaff all mention that benzoin is a major product produced by the Lao.

The benzoin produced in Laos comes from *Styrax tonkinensis* and is known as “Siam benzoin”, as opposed to “Sumatra benzoin”. Sumatra benzoin comes from two different trees, *Styrax benzoin* and *Styrax paralleloneurum*.¹¹¹ Laos currently produces about fifty tons of benzoin annually.¹¹² Although Vietnam also produces benzoin for export, it is on a much smaller scale and the majority of the world’s Siam benzoin comes from Laos.¹¹³ The majority of the benzoin in Laos is produced in the northern mountainous regions, specifically in Luang Phrabang.¹¹⁴ The importance of benzoin production in Laos is reflected in the report of the United Nation’s Food and Agricultural Organization (FAO):

Benzoin appears in international trade in several forms. Most Siam benzoin exported from Lao PDR is in the form in which it is collected from the tree, after it has been cleaned and graded. It consists of hard, usually cream-coloured/pale orange pieces, which if broken reveal a milky white colour. The benzoin is quite pale in colour when freshly collected but darkens gradually during storage to a sandy-orange colour. During handling and transport from its collection to the point of export, larger pieces are inevitably broken down to smaller ones and a significant proportion of dust and siftings is produced. Some

¹¹⁰ Viravong, 22

¹¹¹ FAO

¹¹² *ibid*

¹¹³ *ibid*

¹¹⁴ *ibid*

benzoin which finds its way to Bangkok through Thai traders living near the border with Lao PDR, and which is used in the preparation of traditional medicines (but also occasionally exported), is formed in larger, dark brown lumps with a glassy appearance.¹¹⁵

A commodity of multiple uses, benzoin is found in incense, fragrance, and flavoring and in pharmaceuticals.¹¹⁶ There is evidence to suggest that benzoin may cause allergic reactions, as noted by James *et al* in 1984. In the study of nineteen cases of allergic contact dermatitis and found that the main cause of allergy was the presence of styrax gum.¹¹⁷ Although medicinal properties and any religious uses of benzoin were not detailed by the Europeans, the their extensive descriptions of the manufacture and commercial importance of benzoin warrant a closer look.

Jackfruit

The largest tree fruit in the world, jackfruit originated in the rainforest of India and early spread into Southeast Asia. Green outside and with a yellow pulp that smells like pineapple or banana, the fruit contains many seeds (100-500) that are viable for only a short period of time (3-4 days).

According to Pallegoix, jackfruit, or *Artocarpus heterophylla* has medicinal qualities, being quite laxative and healthy.¹¹⁸ He identifies one type of jackfruit as a medicinal and another type used to dye monks' clothing.¹¹⁹ He does not identify color, but since there has been little change in the Buddhist monk's wardrobe in hundreds of years, it may be assumed that the jackfruit imparted a rich yellowish-orange. The Buddha gave permission to the monks to use

¹¹⁵ Ibid

¹¹⁶ FAO

¹¹⁷ James *et al*, 1984

¹¹⁸ Pallegoix, 68

¹¹⁹ *ibid*

roots, boles, barks, leaves, flowers and fruits to dye their robes.¹²⁰ The monks would use jackfruit heartwood and jackfruit leaves to dye their robes. Despite its history of widespread use in Southeast Asia little effort has been made in investigation of possible therapeutic effects or medicinal qualities of jackfruit.

Lac

According to *Universal History*, a principal Lao medicine is made from *lakka*, *lac* or *kare*. Although *Universal History* claims this is a type of earth found around anthills, it is most likely a resin excreted from an insect. The insect taps into the phloem of the tree and the pressure from the phloem pushes the sap through the insect's body. The insect can assimilate some of it, and the rest is collected in a sap droplet at the tail end of the bug. Several explorers including Wusthof and Marini record production of gum *lac*. Veloso and Gonzales mention that *lac* is a significant product of in Laos, and Wusthof identifies it one of the most highly traded goods.¹²¹ Wusthof's frequent mention of gum *lac* suggests that it was an abundant and prominent commodity on the market.¹²²

Logan

According to Pallegoix, the "*logan litchi*" fruit, which the Siamese call *lam jai*, is used to soften the chest.¹²³ Vidal also lists *Euphoris longana* as a medicinal plant used by the Lao.¹²⁴ While this claim is not supported by investigation, in 2002, Huang and Wu assessed logan as an anti-inflammatory. Studying prostaglandin E(2) production in a macrophage cell line, they

¹²⁰ Horner.

¹²¹ Morga, 125

¹²² Wusthof, 340-341

¹²³ Pallegoix, 69

¹²⁴ Vidal, 406

found that *logan* had a dose-dependent effect in increasing both prostaglandin E(2) production and cyclooxygenases (COX-2) protein expression. Therefore, *logan* makes an effective anti-inflammatory *in vitro*.¹²⁵ These data suggest that further investigations may identify *logan* as the source of pharmaceuticals for effective heat mat of arthritis and related diseases.

Mango

Pallegoix notes the medicinal use of mango explaining that it purifies the blood and, when pickled in vinegar, whets the appetite and “advantageously replaces gherkins.”¹²⁶ Vidal lists *Mangifer indica*, mango, as a medicinal plant.¹²⁷

Several studies have examined the medicinal properties of Mango. In 2003, Sairam *et al* perused the claim that *Mangifer indica* is known for its anti-diarrhea properties. They examined the effect of mango extract on diarrhea, and on the growth of the bacteria *Streptococcus aureus*, *Proteus vulgaris*, *E. coli* and *Klebsiella spp*.¹²⁸ They reported that extracts of mango seeds, both aqueous (AMI) and methanolic (MMI), effective treatments for diarrhea, similar to that of standard anti-diarrhea treatments such as loperamide.¹²⁹ The AMI also significantly reduced growth of both *S. aureus* and *P. vulgaris*, although neither solution adversely impacted growth of either *E. coli* or *Klebsiella*.¹³⁰

Nkuo-Akenji *et al.*, in 2001, tested a mixture of papaya root, citrus leaves, citrus limon fruit and mango leaves on the growth of *Samonella spp*. They found that *S. paratyphi* was most

¹²⁵ Huang and Wu, 2002

¹²⁶ Pallegoix, 69

¹²⁷ Vidal, 406

¹²⁸ Sairam *et al*, 2003

¹²⁹ Sairam *et al*, 2003

¹³⁰ Sairam *et al*, 2003

sensitive, with *S. typhimurium* is the least sensitive.¹³¹

In the same year, Makare *et al.* investigated the antibacterial and antiviral properties of a mango bark extract in mice. They found that this extract both increased the production of humoral antibodies and delayed inflammation and hypersensitivity, suggesting that it may hold promise as an immunostimulant.¹³²

In the context of these recent investigations, it is reasonable to conclude that the use of mango, as described by Pallegoix, was an effective medicine in treating the ill, depending on the malady.

Mangoustan

Garcinia mangostana is known by many common names, including mangoustan, mangosteen, manggis, mangotanier, and mangostao. A tall tropical tree with leathery oval leaves, it produces an edible purplish red fruit combining one or two seeds. Mangoustan originated in the Sunda Islands and is native throughout Southeast Asia, apparently first domesticated in Thailand.¹³³ Du Halde describes a more limited range, noting that “mangoston” is not grown in Siam but is grown in Laos.¹³⁴

While neither Du Halde nor Pallegoix suggest that mangosteen has medicinal qualities, subsequent studies have focused on the promise of *Garcinia mangostana* in treatments of some cancers. Employing a crude methanolic extract, in 2004, Moongkarndi *et al.* found significant anti-proliferative activity, antioxidant activity and induced apoptosis in breast cancer cells.¹³⁵ In 2003, Matsumoto *et al.* found that the xanthenes of mangoesteen significantly inhibited the

¹³¹ Nkuo-Akenji *et al.*, 2001

¹³² Makare *et al.*, 2001

¹³³ Morton

¹³⁴ Du Halde (French), 107

¹³⁵ Moogkarndi *et al.*, 2004

effects on the growth rate of leukemia cells, with, alpha-mangostin both completely inhibiting growth and inducing cell apoptosis.¹³⁶

Suksamrarn *et al.* investigate these xanthenes, in 2003, for potential treatment of tuberculosis. They found that both alpha- and beta-mangostins, as well as garcinone B, significantly inhibited *Mycobacterium tuberculosis*.¹³⁷

Mulberry Tree

Richard explains that the mulberry trees are grown less for their fruit than for cultivating silk worms.¹³⁸ Wusthof names silk as one of the major exports of the Lao, accordingly, it may be inferred that mulberry was important to Lao culture.

Mulberry, *Morus alba*, is a short tree (average height of 4 ft.) native to China and found throughout East and Southeast Asia. The Lao historian, Viravong, explains that mulberry is significant in three quite different contexts: it is used to grow silk worms, to make bows for hunting, and women use it as a source for hair oil. The growth habit of the mulberry is such that it yields a natural shape for a bow:

At Muong Veng-Chiang to the west, there was a certain variety of mulberry trees which grew on rocks, the stem of this tree is curved in such a natural way that one needed only to cut it and make a perfect bow out of it without much additional work. This kind of bow was called Neng-kong.¹³⁹

Europeans provide little mention of hunting as a means of acquiring food, but the bows may have also been used in times of war.

Viravong describes the use of mulberry oil by women of high social standing:

¹³⁶ Matsumoto *et al.*, 2003

¹³⁷ Suksamrarn *et al.*, 2003

¹³⁸ *ibid.*, 717

¹³⁹ Viravong, 20

The Lao women of Nong-Sae do not use make-up or painted brows. They used only hair oil, which was extracted from a certain kind of mulberry tree. The women of high standing and family wore silk skirts, their hair in braids hanging on the sides and rolling them up to the level of the ears showing pearl or other precious stones earrings.¹⁴⁰

Echoing Richard's account, Viravong describes the use of mulberry in raising silk worms:

The terrain of the Nong-Sae kingdom in the vicinity of the Li-Kin (Kiri) mountain in the west was infested with Malaria; green vegetation vanished in winter and life was unpleasant. But from Kuk-Ching-Tchow to Tin-Si, the land was more cultivable. The people of the area grew mulberry trees and raised silkworms and produced beautiful silk fabrics for their own use. The people of Tai-Woh and Ki-Lin did not do so well in producing silk but used instead the fibers of a certain kind of fruit known as Poh-Loh-Su.¹⁴¹

The identity of this Poh-Loh-Su is unknown and Viravong adds in a footnote:

It cannot be known for sure which was the Poh-Loh-Su tree, but it has been said that they grew wild in the province of Nam-Hoi in the vicinity of Kwang-Tung. Later, people tried to grow them in the temple grounds. In the time of Rajawong-Liang, between 1045-1100 B.C., a certain mandarin named Tat-Kai from the city of Sai-Wick tried to grow it domestically and was successfully followed by others.¹⁴²

Nymphaea (Flowers)

The water lily or Nymphaea is the most valued flower in the country. It is the offering to both the monks and the Buddha,¹⁴³ according to Pallegoix, the flower was also used decoratively for festivals.¹⁴⁴ While Richard claims that Nymphaea is the second most important flower in Laos, he says that the first is: "The flower they most value, is a kind of caper, white or red, of an excellent perfume and lasts a fortnight after it is gathered. Women of quality use them to ornament their dresses"¹⁴⁵ This flower may be jasmine, but may also be another form of water

¹⁴⁰ Viravong, 21

¹⁴¹ Viravong, 20

¹⁴² Viravong, 20

¹⁴³ Pallegoix, 74

¹⁴⁴ ibid

¹⁴⁵ Richard, 718

lily. While the description does not lead to an identification of the particular flower, it is clear that flowers, such as water lily, hold an important and special place in Lao culture and religion. Nymphaea is still an important flower in Buddhist ceremonies.

Opium

European explorers record that opium was both used medicinally and traded by the Lao. Wusthof notes the opium trade and the occurrence of the plant extract on the market, but he does not mention either intoxication or medicinal use.¹⁴⁶ The *Universal History* attests to the medicinal use of opium,¹⁴⁷ and Du Halde records its trade with the Siamese for medicinal purposes¹⁴⁸.

Opium has a long medical history that is outside the scope of this paper Joseph Westermeyer documents opium use in Laos in his book *Poppies, Pipes, and People: Opium and its Use in Laos*. Used as a painkiller, cough suppressant, anesthesia and overall cure-all for hundreds of years opium is well known by both Europeans and Americans.

Papaya

Pallegoix recounts that when papaya fruit is eaten whole, the prickly seeds are “good against worms.”¹⁴⁹ This plant use is of particular interest because papaya, *Carica papaya*, is a New World fruit native to the tropics of Central and South America and Spanish explorers encountered papaya in 1526, subsequently transporting it to Europe. Although now a pan tropical tree, it is not known when papaya entered Laos. Certainly papaya had integrated in Lao

¹⁴⁶ Wusthof, 160

¹⁴⁷ Ngaosrivathana, 182

¹⁴⁸ Du Halde (French), 108

¹⁴⁹ Ngaosrivathana, 70

culture by the time of Pallegoix's visit in 1836. The many investigations of the medicinal properties of papaya have not assessed the effectiveness of papaya seeds in removing worms.

Several studies have looked at *Carica papaya*'s fertility inhibiting ability. In 1982, Farnsworth and Waller examined the effects of plants reported to inhibit sperm, including *C. papaya*. They found that a low oral dose of sun dried papaya seeds, ground up and suspended in water, gave a 40% decrease in the fertilization rate of male rats.¹⁵⁰ They predicted that this sperm inhibition would increase at higher doses.¹⁵¹ Later in the same year, Tiwari *et al.* looked at the effectiveness of *C. papaya* as a female contraceptive in Assam, India and found that papaya, when combined with *Ferula narthex* resin caused abortion.¹⁵² In 2002 a new fertility study involving papaya was conducted by Kusemiju *et al.*, who looked at the effectiveness of *C. papaya* as a male contraceptive.¹⁵³ Examining the reproductive organs of male rats administered a high dose of papaya bark extract over four weeks showed significant change in the histology of the testis and semen.¹⁵⁴ The higher the does of papaya, the less forward motility was seen in the sperm, as well as a decrease in the sperm count and viability of the sperm.¹⁵⁵ In other words, Kusemiju *et al.* concluded that papaya wood extract causes a complete loss of fertility in male rats and would be an effective male contraceptive, at least in animals.¹⁵⁶

Starley *et al.* examined the role of papaya as a burn treatment in Africa, in 1999, where it is used as a major component for burn dressings at hospitals.¹⁵⁷ The fruit pulp is applied daily in

¹⁵⁰ Farnsworth and Waller, 1982

¹⁵¹ Farnsworth and Waller, 1982

¹⁵² Tiwari ¹⁵², 1982

¹⁵³ Kusemiju *et al.*, 2002

¹⁵⁴ *ibid*

¹⁵⁵ *ibid*

¹⁵⁶ *ibid*

¹⁵⁷ Starley *et al.*, 1999

thick layers to the burn area and appears effective at dislodging necrotic tissue and preventing infection.¹⁵⁸ It also appears to prepare the wound for a possible skin graft.¹⁵⁹ Starley *et al.* believe that the active ingredients in papaya that contributes to its success at treating burns are the enzymes chymopapain and papain.¹⁶⁰ *C. papaya* also exhibits antimicrobial activity that could contribute to the treatment and healing of the burn.¹⁶¹ Nkuo-Akenji *et al.* found, in 2001, that a formula typically used in Cameroon to treat typhoid fever that consisted of *Cymbogon citrates* leaves, *Carica papaya* leaves and *Zea mays* silk was an effective microbial compound against *Salmonella spp.* - with a minimum inhibitory range of 0.02 to 0.06 mg/ml.¹⁶² Therefore, this combination is probably an effective treatment for Typhoid fever.

Bhat and Surolia examined anti-malarial drugs typically used in India, including *C. papaya* in 2001. The ground up rind of papaya showed significant anti-malarial activity. The results were so promising that Bhat and Surolia suggest papaya may have a commercial pharmaceutical use.¹⁶³

Sandalwood

Santalum album or Sandalwood was used in Laos as incense and, according to Du Halde was traded with the Merchants from “Tai yai” or the “Pmap hang” from the west.¹⁶⁴ Du Halde describes two types of sandalwood, red and yellow, although he does not indicate the differences

¹⁵⁸ *ibid*

¹⁵⁹ *ibid*

¹⁶⁰ *ibid*

¹⁶¹ *ibid*

¹⁶² Nkuo-Akenji *et al.*, 2001

¹⁶³ Bhat and Surolia, 2001

¹⁶⁴ Du Halde (French), 107

between the two.¹⁶⁵ The use of sandalwood in incense is significant to the Buddhist religion, where the sandalwood incense is burned to help aid in meditation.

While Du Halde does not indicate a medicinal use for sandalwood, it seems to have a nutritional quality that leaves fatty acids in the liver. Liu and Longmore fed rats a sandalwood seed oil enriched diet to determine the effects on tissues and the metabolism of ximenynic acid, a fatty acid that comprises approximately 30% of sandalwood's fatty acids. They found that the liver and adipose tissues contained a significant amount of ximenynic fatty acid, although the brain did not.

Tamarind

The last fruit that Pallegoix claims has medicinal properties is tamarind, which “combined with sugar, it furnishes excellent jams that are very useful for the ill.”¹⁶⁶ A similar mixture is used in tamarind candy has been reported to result in elevated levels of lead and even lead poisoning in children in California between 1999 and 2000.¹⁶⁷ Nevertheless, tamarind has medicinal qualities such as treating diabetes and decreasing inflammation.

Rimbau *et al.* used ethanol and chloroform extracts of *Tamarindus indica* topically on mice, in 1999, to test the anti-inflammatory effects of tamarind. Tamarind showed little effect at decreasing inflammation, although it did lower inflammation in at least one trial case.

In 2004, Mairi *et al.* studied the potential of *Tamarindus indica* as a treatment for diabetes mellitus. They found that tamarind had some anti-diabetic activity in that it reduced the level of blood sugar in diabetic rats. However, the treatment elevated glycogen levels in the liver and

¹⁶⁵ *ibid*

¹⁶⁶ Pallegoix, 74

¹⁶⁷ Childhood lead poisoning report from 1999-2000

skeletal muscles.

Clearly tamarind had important medicinal properties. From Pallegoix's description, it was used as a cure-all treatment, and from the medicinal studies of tamarind it may have broad therapeutic treatments.

Conclusions

Many plants were appropriately identified and recorded by the European explorers to Laos. While the effectiveness of many of the recorded uses have not been substantiated by modern research, the fact that many of these plant have been shown to have medicinal qualities gives credit to their use by the Lao. Research should be started on plants that have a history of medicinal use in Laos but have been virtually ignored by pharmaceutical research, such as durian and jackfruit. Those plants that are recorded as important religious components, such as sandalwood, should be studied ethnobotanically to find out if there has been any change in their use and to provide a better record of the ritual and preparation surrounding the use of the plant. In conclusion, the examination of these plants in the literature provides a foundation for future research.

Chapter 4: Plant Identification

Common Names	Scientific Names	Family name
Agala wood	Unknown	
Bai-lan	<i>Corypha Umbraculifera</i>	Areaceae
Brasil wood	<i>Caesalpinia sappan</i>	Caesalpinioideae
Cotso	Unknown	
Eaglewood	<i>Aquilaria agallocha</i>	Thymelaeaceae
Fadam	<i>Melochia umbellata</i>	Sterculiaceae
Kloi	<i>Manihot esculenta</i>	Euphorbiaceae
Maha ing/Ingo	<i>Macaranga denticulate</i>	Euphorbiaceae
Makok	<i>Ficus religiosa</i>	Moraceae
Mali	<i>Jasminum officinale</i>	Oleaceae
Meng Lak	<i>Sterculia scaphigera</i>	Sterculiaceae
Samphan	<i>Caesalpinia sappan</i>	Caesalpinioideae
Sirij Pinangh	<i>Piper betel</i>	Piperaceae
Tong Kouei/Cot houa boua	<i>Angelica sinensis</i>	Umbelliferae
Venejang	Unknown	

Table 2. List of plants referred to by explorers by their local name. Many have been identified to family, genus and species.

Many plants that are listed in historical manuscripts are, at best, ambiguously identified. Explorers in Laos often used local names to identify plants; frequently they used Western interpretations of local words for plant names. Applying linguistic techniques, botanical descriptions, and taxonomic guidelines, some of these plants can be identified to the respective species, while others can be classified only to family or genus. Dr. Jenny Xaing, a systematics researcher of Chinese origin and faculty member of the Department of Botany at North Carolina State University aided in verification of several plant identifications..

Agala wood

Hamilton is the only explorer to refer to the tree he calls Agala: “ The Harbour is safe and the Country produces Rice, Timber for building, Tin Elephants, Elephants teeth and *Agala* wood.”¹⁶⁸ Clearly Hamilton believes this wood to be a commodity produced by the Lao and possibly used in trade; however Wusthof does not record Agala in his trade records. Hamilton elaborates his description of Agala wood when commenting on its native habitat in the kingdom of Siam both on the banks of the river Tanacerin and in the Siam city of Sangore.¹⁶⁹ There is no known tree with a common name of “agala” in either English or Lao and accordingly this tree remains unidentified.

Bai-lan

Pallegoix refers to several plants used in Buddhist religious ceremonies. For example, the leaves of a palm called lan are used as paper, in the writing of religious books.¹⁷⁰ Pallegoix says that once the letters have been drawn on the leaves, the writer pours ink over it and the letters appear.¹⁷¹ Marini also mentioned the use of palms for letters and religious manuscripts,¹⁷² observing that an iron piece was used to scratch letters into the leaf. Marini’s description parallels that of Pallegoix, suggesting that this was a widespread practice among monks in Laos. Research has reported that *bai-lan*, or what Pallegoix calls lan, is *Corypha umbraculifera*, thus accurately identifying the palm species used in the Buddhist texts. This tall palm has large fan-like leaves that are made into fans and umbrellas used in religious processions in Sri Lanka and

¹⁶⁸ *ibid*, 64

¹⁶⁹ *ibid*, 60 and 160

¹⁷⁰ Ngaosrivathana, 66

¹⁷¹ *ibid*

¹⁷² Marini, 74

India. The leaves are cut into strips to be used as writing paper and the strips are strung together on a round loop of string¹⁷³.

Brasil Wood

While exploring the New World, explorers found what the locals called brasil wood, a plant that subsequently gave its name to the country of Brazil. When explorers in Southeast Asia speak of brasil wood, however, they are referring to *Caesalpinia sappan*. Brasil wood was mentioned in the *Universal History*, and by Veloso and Gonzalez, and Wusthof and Du Halde. Wusthof refers to the plant as “samphan”, a common local Lao name.¹⁷⁴ Du Halde reports that brasil wood is traded between the people of Mohang leng and their neighbors¹⁷⁵.

Abundant published literature in the medical community treats the therapeutic efficacy of *C. sappan*. Beack *et al.* showed, in 2000, moderate to significant anticonvulsant activity.¹⁷⁶ In their examination of 96 medicinal Vietnamese plants, in 2004, Nguyem *et al* found that the wood had antioxidative (due to the presence of phenolic compounds), anti-inflammatory, hepatoprotective, cytotoxic and hypoglycemic properties.¹⁷⁷ The phenolic compounds provide not only antioxidative activity, but also contribute to inhibition of xanthine oxidase (XO), thus making an effective treatment for gout¹⁷⁸. In 2003, Badami *et al* reported that sappan heartwood had significant antioxidant activity, especially in the liver and kidney.¹⁷⁹

¹⁷³ Private Correspondence, Kit Amarathithada

¹⁷⁴ Wusthof (French)

¹⁷⁵ Du Halde (French), 107

¹⁷⁶ Beack *et al*, 2000

¹⁷⁷ Nguyem *et al*, 2004

¹⁷⁸ *ibid*

¹⁷⁹ Bandami *et al*, 2003

In their study of the homoisoflavonoids in *C. sappan*, Niranja *et al* found antifungal activity.¹⁸⁰ In 2004, Kim *et al* reported positive results in inhibiting the ability of methicillin-resistant *Staphylococcus aureus* to grow and invade the human mucosal fibroblasts.¹⁸¹ Hu *et al*, in 2003, investigated the vasorelaxant activity of *C. sappan* on both rats and human cells,¹⁸² noting that although the vasorelaxant activity can be blocked, the extract appears effective at opening vessel passages.¹⁸³ In 2002, in a study of the efficacy of plant extracts as anti-inflammatories or chemotherapeutic agents, Hong *et al* found that *C. sappan* yielded moderate inhibition of iNOS.¹⁸⁴ They suggested *sappan* may prove useful as an anti-inflammatory agent and as a new therapeutic agent.¹⁸⁵

In 1997, Choi *et al* assessed the potential of *C. sappan* to alter the immune response in mice by manipulating the function of T cells.¹⁸⁶ They found that *sappan* extract caused dysfunction of T-cells, leading to an altered immune response.¹⁸⁷

Shih *et al* showed that *sappan* extract remarkably lowered sperm motility in human males, in 1990.¹⁸⁸ Although the effect is concentration-dependent, results support that *sappan* may prove to be an acceptable oral male contraceptive.¹⁸⁹

Although the early European explorers could not have anticipated these diverse pharmaceutical potentials, these studies suggest a spectrum of effective medicinal properties of

¹⁸⁰ Niranja *et al*,

¹⁸¹ Kim *et al*, 2004

¹⁸² Hu *et al*, 2003

¹⁸³ *ibid*

¹⁸⁴ Hong *et al*, 2002

¹⁸⁵ *ibid*

¹⁸⁶ Choi *et al*, 1997

¹⁸⁷ *ibid*

¹⁸⁸ Shih *et al*, 1990

¹⁸⁹ *ibid*

C. sappan. It is noteworthy that they reported its indigenous medical uses in their respective works.

Cotso

Cotso is a medicinal plant which, according to *Universal History* was traded between Laos and its neighbors, together with commodities such as opium. These texts describe *cotso*, or “kotso”, as “a kind of medical root so called.”¹⁹⁰ *The Universal History* probably acquired such information from Du Halde, who also mentions the trade of a medical root he calls *cotso*.¹⁹¹ Absent more precise descriptions, the identity of the plant remains obscure. An inventory of local Thai, Lao and Chinese revealed nothing approaching either “cotso” or other close phonetic interpretations.

Eaglewood

Du Halde notes that eaglewood is an acceptable means for payment of taxes.¹⁹² The English translation of Pinto’s work, translated by Rebecca D. Catz in 1989, recounts his observed use of this plant. Verification in the original Portuguese, manuscripts cannot be made since he does not mention eaglewood in his original work. Eaglewood is a rarely used common name for *Aquilaria agallocha*. Although Du Halde does not address medicinal properties of Eaglewood, it is used in medicine in Laos. In a modern research study, Kim *et al* found that an aqueous extract of *A. agallocha* stems, in an aqueous extract, inhibits the histamine response, thus effectively treating immediate hypersensitivity reactions (allergies) in rats.

¹⁹⁰ Ngaosrivathana, 182

¹⁹¹ Du Halde (French), 108

¹⁹² Mouhot, 142

Fadam

Melochia umbellata is recognized as a fast-growing tree species native to India. Several reports identify and describe a paste prepared from this plant. Du Halde describes a “physical paste,” called “fadam” in the original French and “sadam” in the English translation¹⁹³, noting this paste in the trade between northern Laos and China. *The Universal History* states that the Lao prepared a “medical paste called zhadam,”¹⁹⁴ the original Lao probably being *fadam*, which is *M. umbellata*. Although identified as the source of this medicinal paste, *M. umbellata* does not appear to have been studied for its pharmaceutical potential. For example, Pubmed has no record of *Melochia umbellata* in any research study.

Kloi

As previously mentioned, Pallegoix describes many fruits used for their medicinal properties. One of these is a type of potato the locals call *kloi*,¹⁹⁵ of which Pallegoix observes that its most remarkable features are its ‘extreme whiteness’ and that it is very poisonous.¹⁹⁶ Owing to its toxicity, the people cut the *kloi* into slices and soak these in water before letting them dry in the sun. Once dry, according to Pallegoix, these slices can be eaten.¹⁹⁷

Given this description, *kloi* is probably *Manihot esculenta*, better known as cassava. Cassava contains the most starch per dry weight of any food. As with potato, cassava root is peeled and cooked; eaten raw, the root is toxic because of the high concentrations of cyanogenic

¹⁹³ Du Halde (French), 108

¹⁹⁴ Ngaosrivathana, 182

¹⁹⁵ Pallegoix, 65

¹⁹⁶ *ibid*

¹⁹⁷ *ibid*

glucosides. Lescot, a French botanist who collected plant samples in Laos, described *Manihot esculenta* as used during childbirth, observing that it gives strength to both mother and child.¹⁹⁸

Poilane, another botanist who collected plants in Laos, says that the sepals are drunk in a glass of water.¹⁹⁹

Maha ing/Ingo

Du Halde mentions that the Chinese imported from the Lao a “medicinal wood called Ingo by the Portuguese and ‘Maha ing’ by the Siamese” and Ingo by the Portuguese.²⁰⁰ This observation is later recounted in *Universal History*, suggest that maha ing is possibly *Macaranga denticulate* due to its linguistic similarity to the Malaysian name “mahang”²⁰¹. *M. denticulate* is a small tree of early successional status, with large pendant leaves in the shape of elephant ears. Although native to Asia and found in Laos, there is no known medicinal use for this plant.

Makok

Buddhists hold as sacred an Indian poplar known as makok. It is so venerated because it is the tree under which the Buddha, Somana Khodom, sat to attain “perfect sanctity and the dignity of the Buddha.”²⁰² This tree ascribed to the Buddha is *Ficus religiosa*; cuttings of the original tree are planted in front of monasteries and temples throughout the Buddhist world.

While Pallegoix does not indicate medicinal use, only religious significance, a study by Mousa *et al*, in 1994, assessed *F. religiosa* for bioactivity.²⁰³ They found that an extract was

¹⁹⁸ Paris Herbarium

¹⁹⁹ Paris Herbarium

²⁰⁰ Du Halde (French), 108

²⁰¹ Engel and Phummai, 85

²⁰² Pallegoix, 71

²⁰³ Mousa *et al*, 1994

toxic to brine shrimp, and that the fruit of the plant demonstrated possible antitumor activity.²⁰⁴ Although, the ficus extract had no antifungal activity, it did show significant antibacterial activity.²⁰⁵ The conclusions of Mousa *et al* are that this ficus probably aids in the relief of both respiratory disorders and certain skin diseases, which are traditional uses for *F. religiosa*.²⁰⁶

Mali

In addition to his study of fruits, Pallegoix also found that a few flowers had medicinal properties. Although he discusses only one of these, the *mali* flower, he notes that many other flowers were also used in medicine.²⁰⁷ According to Pallegoix, *mali* is the second most valued flower in Siam,²⁰⁸ being made into perfume potions administered to the ill.²⁰⁹ *Mali* is the Thai name for *Jasminum officinale* or jasmine, a climbing vine that produces fragrant white flowers. Originating in East Asia, and now common throughout the world, little work has yet been done to examine medicinal properties of this species.

Meng Lak

Pallegoix state that: “a species of great basil called Meng Lak also produces a small grain a pinch of which, placed in a glass of water, swells, fills the entire glass and forms a very pleasant and refreshing emulsion”²¹⁰ Meng Lak is the Lao name for *Shorea robusta*; however, this plant is not known to have any medicinal properties nor is it known to be added to water to

²⁰⁴ *ibid*

²⁰⁵ *ibid*

²⁰⁶ *ibid*

²⁰⁷ Pallegoix, 72

²⁰⁸ *ibid*

²⁰⁹ *ibid*, 75

²¹⁰ Pallegoix, 65

drink. The description of Meng Lak expanding in water, matches the qualities of *Sterculia scaphigera*. Therefore it is possible that Pallegoix misnamed the plant.

Sirij Pinangh

Wusthof notes that the wood from the Sirij Pinangh tree, or Sirih Pinang in French, is used to make boxes given as presents, seemingly presented to the ill.²¹¹ Although Wusthof does not directly state that Sirij Pinangh is given to the ill, the gift box is given in context with an account of medicine and illness in Laos.²¹² Sirih Pinang is the Malaysian name for *Piper betel*. *P. betel* is not be confused with betel nut (*Areca catechu*). The leaves of the *P. betel* are wrapped around betel nut to form a neat edible package. The leaves also seem to have a stimulating effect. Harmful effects attributed to *P. betel* include an increase of blood flow, inhibition of blood clotting and possible carcinogenic properties. Extracts of the leaves showed significant capacity for inducing vasorelaxation in a study by Runnie *et al*, performed in 2004. In a study by Lin *et al*, in 2003, extracts of *P. betel* demonstrated carcinogenetic potential when applied directly to JB6 cells for 30 days. In 2002, Jeng *et al* found that betel leaf inhibited blood clotting and that it scavenges free radicals and inhibits xanthine oxidase.

In examining the effects of chemical constituents of betel leaf on sperm motility, Tewari, Chaturvedi and Dixit, in 1970, fed 10 rats a mixture of betel leaf and gum acacia. They found that 20% of the rats fed betel gave birth whereas 90% of the control rats gave birth. Similarly, the litter size of the betel leaf group was significantly lower than that of the control. Subsequent experiments on rats led the group to conclude that chemical constituents of betel leaf have significant antifertility properties.

²¹¹ Wusthof (French), 144-146

²¹² *ibid*

Tong Kouei / Cot houa boua

Another description of medicinal plants in *Universal History* is of plants used in the north of Laos, in the kingdom of Leng: “There is found here a medical root, called tong-quey by the Chinese, and by the Siamese kot-wha-bwa.”²¹³ This description likely comes from Du Halde who writes about a medicinal root called *Tong kouei* or *Cot houa boua* in the original French version and *Tong couei*, with no Thai name in the English version.²¹⁴ Du Halde continues *Cot houa boua* is a medical root traded between the ‘Mohang leng’ and their neighbors.²¹⁵ *Tong-quey* is the Chinese name of *Angelica sinensis*, a plant used in Chinese medicine for thousands of years. Many studies have assessed the efficacy of *A. sinensis* as a medical agent, all reporting positive therapeutic effects of the herb as it is used traditionally. For example, one of the most common uses of *A. sinensis* is to treat gynecological diseases. In 2004, Cheng *et al* found that an extract of an extract of *A. sinensis* significantly lowered the capacity of vaginal cancer cells to reproduce.²¹⁶ Mapping effects on mitotic division of these cancer cells, they identified the interruption of mitosis in the G1/S phase.²¹⁷ Therefore, they concluded that *A. sinensis* has anticancer properties that need to be tested *in vitro*.²¹⁸

Also in 2004, Wang *et al* studied the antifibrotic properties of *A. sinensis* in rats with nephritic syndrome.²¹⁹ They found that the herb significantly lowered both the rate of

²¹³ Ngaosrivathana, 183

²¹⁴ Du Halde (French), 106 and (English), 103

²¹⁵ Du Halde (French), 107

²¹⁶ Cheng *et al*, 2004

²¹⁷ *ibid*

²¹⁸ *ibid*

²¹⁹ Wang *et al*, 2004

deterioration of renal function and damage to the liver.²²⁰ These findings suggest that *A. sinensis* may be effective in treating damage induced by nephrosis.²²¹

Traditional Chinese medicine also uses *A. sinensis* root to treat vitiligo, the disorder that causes the loss of pigment in patches of skin.²²² In 1996, Raman *et al* found that *A. sinensis* root extract inhibited the growth of vitiligo cells in culture, thus possibly inhibiting its spread in the body.²²³

Both the accounts of Du Halde and modern research studies confirm that *Cot houa boua*, or *A. sinensis*, is a powerful medicine found in China and the north of Laos.

Chinese medicine has incorporated *A. sinensis* for over 2000 years. In 2003, Zhao *et al* used molecular genetics to identify true *A. sinensis* roots, as opposed to roots of other *Angelica* species.²²⁴ They found that *A. sinensis* had much higher levels of ferulic acid and Z-ligustilide, suggesting these differences may help both to fingerprint *A. sinensis* and ensure quality control.²²⁵

Venejang

Du Halde describes a tree he calls *venejang* in French and which in English translation is known as “vende jang”.²²⁶ *The Universal History* calls the tree Vendez-hang.²²⁷ Despite these changes in spelling, the description is the same:

²²⁰ *ibid*

²²¹ *ibid*

²²² Raman *et al*, 1996

²²³ *ibid*

²²⁴ Zhao *et al*, 2003

²²⁵ *ibid*

²²⁶ Du Halde (French), 106

²²⁷ Ngaosrivathana, 183

“There is also found here a Physical Root, which the Chinese call Tong couei [Covei?], and a kind of Tree called Vende jang, which bears Flowers as thick as one’s Finger, yielding a very delicious Smell; when these Flowers open they are of several Colours, as red, yellow, white, and black, and when the Fruit comes to Perfection it is of the Shape of a Duck. There are in this Country a great Number of these Trees, especially where the dew falls most.”²²⁸

This detailed description notwithstanding, the tree remains unidentified taxonomically.

Conclusions

Although various of the plants discussed above still lack precise taxonomic identification, proper scientific classification will enhance description of plant use in Laos hundreds of years ago. Through linguistic analyses of Chinese, Thai, Lao, French and English, many of the descriptive names used by the explorers may be deciphered. Other plants were identified through the physical description of either the plant itself, characteristics of the plant or uses of the plant depicted by the European explorers.

²²⁸ Du Halde (English), 103

Chapter 5: Conclusions and Future Research

Conclusion

Unfortunately most of the writings of Laos, made by the Lao people, did not survive the humid weather to reveal what life was like before the Europeans discovered the country. The writings from the Lao that did survive recorded state and religious politics, but do not provide any information on natural history or plant use. Therefore a study of the European accounts of Laos provides a rare perspective on the use of plants by the Lao people.

As mentioned in the conclusion of chapter one, Pallegoix recorded the most plant use in Laos. He not only made careful observations of which plants were important but also how they were used. Earlier explorers did not pay particular attention to the natural history and plant use of Laos and many of the writing on Laos were made from Europeans who had not visited the country. Even so, the plants recorded in the early writings on Laos provide a foundation for future research on how plant use has changed in Laos over time.

The European records a total of thirty plants as being important to the Lao, principally for religious and medicinal uses. As evident in figure 3, many of these plants were only recorded once in the literature, even so, their presence is important to understanding the role of plant use in Lao life. Although a few of these plants are used for things other than religion or medicine, such as gum Benjamin, their importance to the life of the Lao is so significant that they were included in this study. Several of the plants were noted by their common or local name and therefore could not be easily identified. Through a use of linguistics, systematics and taxonomy, I was able to identify the genus and species name of many of these plants. A few plants, however, remain unidentified, despite detailed descriptions.

Comparing the list of plants that were important to the Lao people several hundred years ago to plants that are important today, a study can be conducted into how plant use has changed in Laos over time. Therefore this study on the European view of plant use is only the beginning of a larger study on how traditional environmental knowledge has changed in Laos.

Future Research

The relationship between deforestation, plant habitat and plant use by indigenous people may lead to the development of observable parameters that can predict the impact of environmental change on human-plant interactions. Predictions of how deforestation, loss of habitat, shift in plant use, and subsequent loss of indigenous environmental knowledge determine how much natural and man-made disasters lead to more environmental degradation. I propose to study this system, by examining a specific case study, and find which factors trigger this feedback loop. My main hypothesis is that due to deforestation in northern Laos there has been a change in availability of plant habitats, which has led to a shift in medicinal plant use. Furthermore, I hypothesize that there is a decrease in availability of medicinal plants typically found in primary growth forests due to the decrease or elimination of these types of forests from deforestation. Also, I expect to find a positive correlation between availability of secondary growth medicinal plants and the deforestation rate.

Background on research: The Southeast Asian peninsula has the highest rate of deforestation of the entire world's tropical regions²²⁹. According to the United Nations Food and Agricultural Organization (UNFAO), in 1997 the average rate of deforestation in continental Southeast Asia was 1.6% annually. When compared to the annual deforestation rate of 0.38% in

²²⁹ European Commission Joint Research Center

Latin America, it becomes clear that the deforestation in Southeast Asia is a key problem²³⁰. It is not certain, however, what impact deforestation has on the relationship between plants and humans.

The World Health Organization estimates that 75-80% of people around the world use plant based medicines to treat illness²³¹. It is estimated that 74% of plant-based medicines produced by pharmaceutical companies came from the study of medicinal plant use by native people²³². With the publication of articles and books, such as those of Mark Plotkin in the 1990s, popularizing the study of medicinal plant use by indigenous people, the rainforests of South America became an expansive field site for ethnobotanists. Ethnobotanical work has also been done in Southeast Asia, including Indonesia, Thailand, Papua New Guinea, and the Philippines²³³. However, little work has been done on medicinal plant use in the People's Democratic Republic of Laos.

Research Location: I plan on conducting my research over an 8-12 month stay in Laos. I will collect data on deforestation and medicinal plant habitat, as well as catalogue the species of plants used in medicine by the local people to understand which species are medicinally important. I will then determine if plant use of specific species have increased or decreased and by how much. I can then correlate deforestation, loss or gain of plant communities and habitat and the shift of the use of medicinal plant species to determine how much impact deforestation has had on medicinal plant use. By observing the changes in interactions within the local

²³⁰ European Commission Joint Research Center

²³¹ World Health Organization

²³² Eisner

²³³ Crumley

environmental system, I can determine general parameters for predicting the impact of environmental change on the human use of plants.

Due to a high rate of deforestation and the continued use of plants in local medicine, Laos makes an ideal research site. In recent years, the rate of deforestation has significantly increased in Laos, putting four locations within Laos on the European Commission's list of the top 15 deforestation hotspots. Even so, it is estimated that 53.9% of Laos is still covered by forests²³⁴. This forest cover is in contrast to that of Thailand where only 22.8% of the country still has forest cover⁴. In Thailand, this deforestation has led to a devastating loss of indigenous knowledge on plant use and the environment²³⁵. While Laos continues to undergo extensive deforestation, there is still enough forest cover to support the continued use of medicinal plants and thus the opportunity to study a shift in the use of these plants.

The research would focus on a certain ethnic group, possibly from the Lao Theung or Lao Seung groups, in the northeast region of Laos. This region is ideal because some of the data already collected on past medicinal plant use come from historical trade records of transactions between the people of northern Laos and China. Conducting research in this area also limits the impact of outside factors, other than deforestation, such as influence from developed countries or increase in western style health care, since anthropologists have observed that little has changed in this region over hundreds of years²³⁶. I will also use two research sites, an experimental site and a control site. The potential exists to use an experimental research site inside one of the European Commission's deforestation hotspots. Another site may be selected as a control, with

²³⁴ Gilmour *et al*

²³⁵ Crumley

²³⁶ Ireson-Doolittle *et al*

the same ethnic group, in an area of little deforestation in order to determine how much change in medicinal plant use is due to deforestation.

Owing to the potential of Laos as an ideal research site, I attended an intensive language program this past summer at the University of Wisconsin, Madison, to learn the Lao language. Combined with my language skills in French, I hope to be able to communicate with people in both Laos and Thailand, and to find out first-hand which plants are important for medicinal use.

Research methods: To examine how deforestation impacts medicinal plant habitat, availability and subsequently use, I will first analyze local forest cover using GIS and ground analysis for vegetation mapping. While satellite mapping exists from both the European Commission and the UN FAO, a local area map of vegetation cover will offer a clearer picture of small-scale deforestation and ground cover vegetation. The data of local forest cover can also be annotated by interviews with older members of the community, whose knowledge of the area spans several decades. I can then use both the local and satellite maps to determine how much forest cover has been lost and where.

To select which species to analyze, I will determine which medicinal plants are important. I have already started this work for medicinal plants in Laos by reviewing manuscripts written by European explorers to Southeast Asia. This literature review affords the opportunity to develop a clearer perception and understanding of types of plants employed and their significance in medicine. I have compiled a list of 27 plants used historically in Laos and have categorized these plants into vegetation found in primary growth forests, secondary growth forests, open fields (savannas or shrub land) and exotics. By using these categories I can determine if deforestation has decreased or increased the abundance in certain species due to the loss or gain of habitat and therefore caused a shift in medicinal plant use. To find out which

plants are currently being used in Laos by native people, I will need to spend several months observing medicinal plant use in an experimental village and a control village.

By comparing current observations to historical records, I can examine how plant use has changed over decades and even over centuries. By correlating where deforestation occurs with changes in plant use, I can determine how deforestation has impacted the distribution and abundance of culturally important plant species. I am currently developing ways to quantify the change in plant use of medicinal plant species. This quantified change can then be graphed with deforestation to determine if a decrease in forest cover increases or decreases the habitat of specific plants and changes the types of plants people use. These findings can help determine how environmental changes, due to deforestation, natural disaster or climate change, can impact plant habitat and the response of plant and human interactions.

Conclusions: Knowledge of how deforestation impacts culturally important plants, such as medicinal plants, can aid in understanding the relationship within biological systems and the impact of environmental change on human interactions with plants. This kind of research is extremely important and pressing, both to salvage the knowledge of specific species and plant use in Laos, and for understanding the broader effects of deforestation while there is still the potential for restoration.

Figures

Figure 1: The number of plants that each explorer notes as having primarily religious or medicinal purposes. Clearly Pallegoix catalogued more of these plants than any other European explorer.

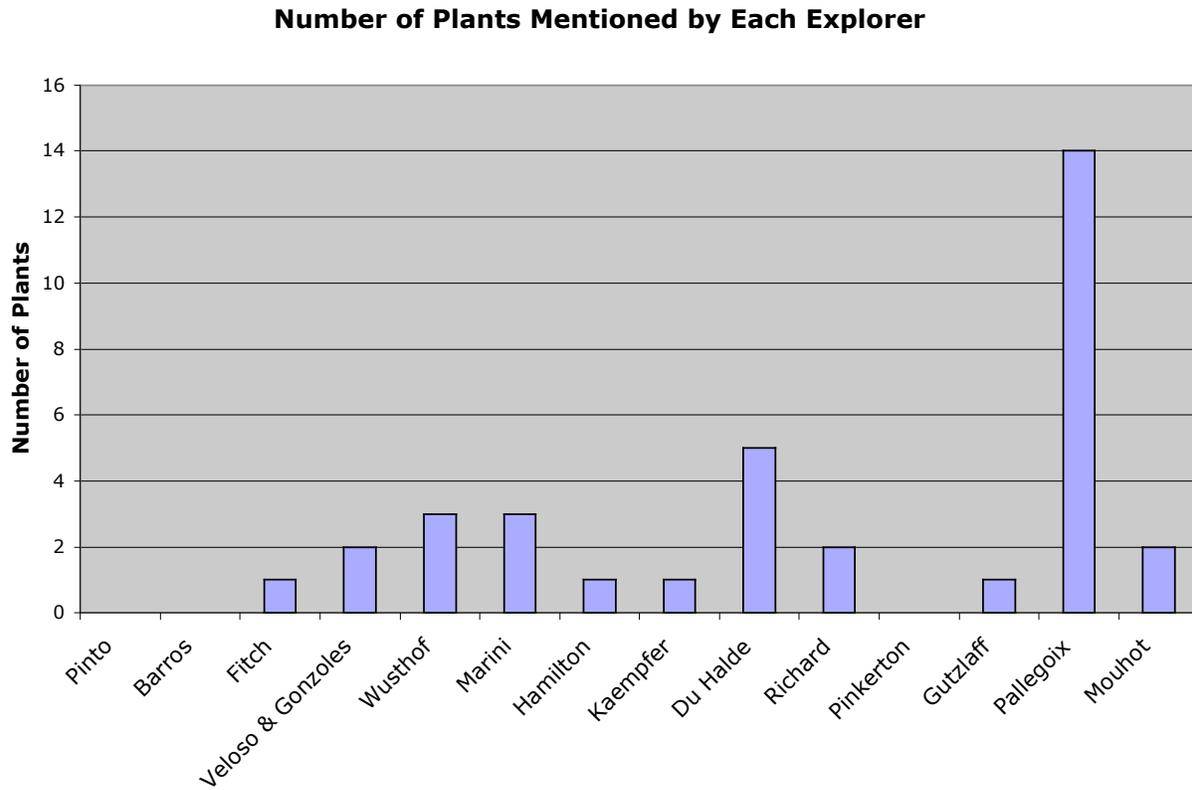


Figure 2: Percentage of the number of plants each explorer described out of the total number of plants recorded (42 total plant descriptions).

Percent Contribution of Explorers to Knowledge of Lao Plant Use

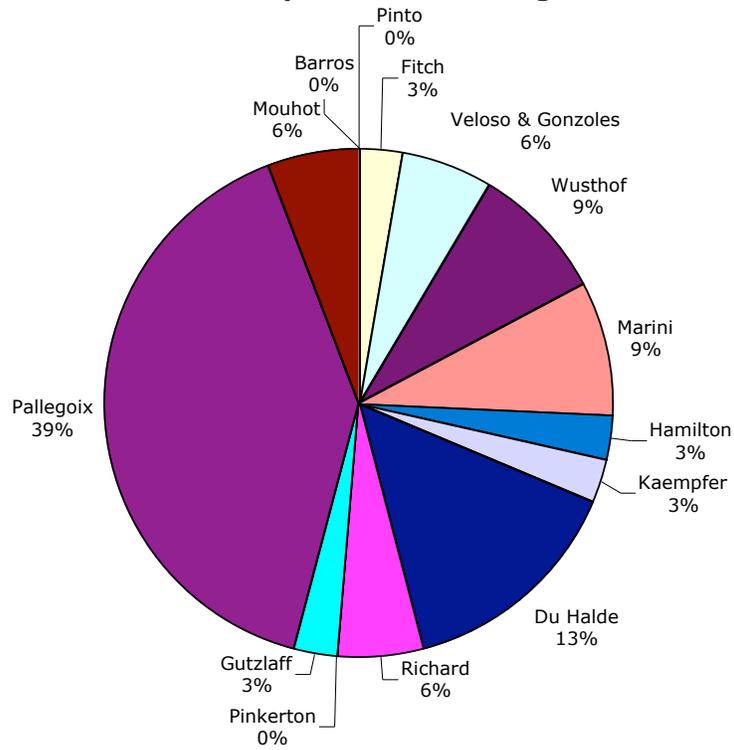
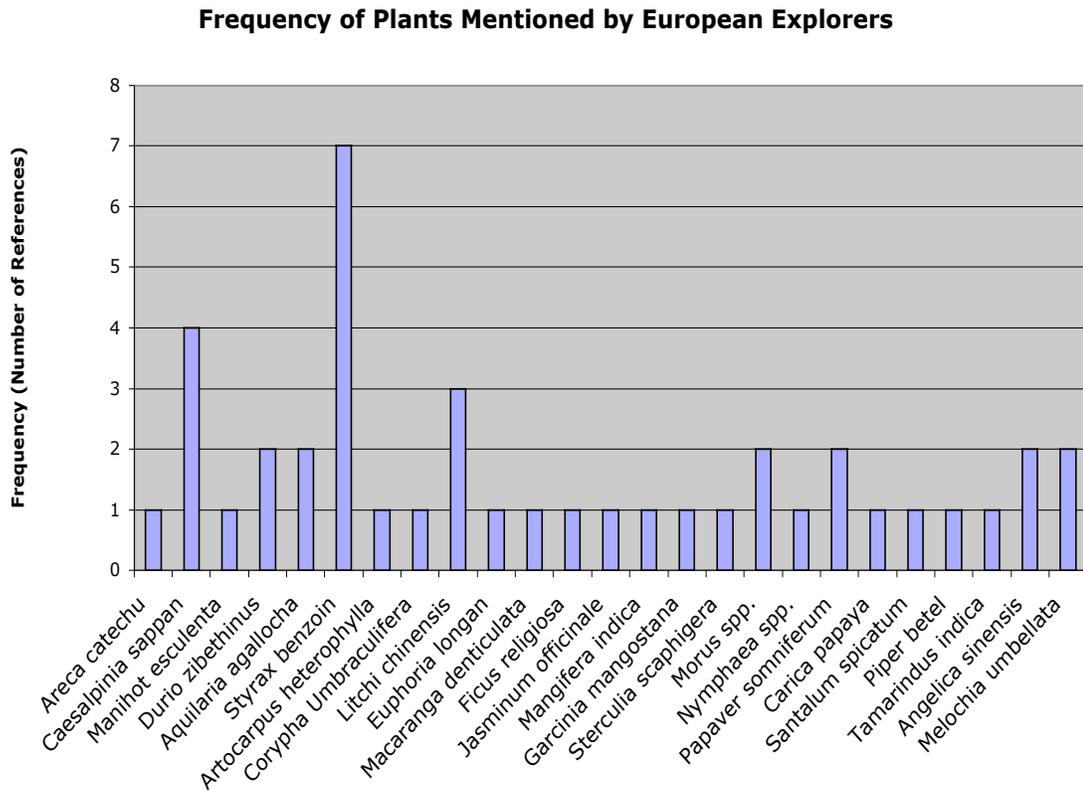


Figure 3: A list of all the plants noted by the European explorers as having significance in religion or medicine and how many times their use was recorded.



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APPENDICES

Appendix 1 – Timeline

Published accounts from European Explorers: A Timeline

- 1) Fernão Mendes Pinto – 1545
Slave, Portuguese, partly fictions account
- 2) João de Barros – 1563
Portuguese explorer, first used the term “Lau” and first to distinguish Laos from Siam
- 3) Ralph Fitch – 1591
English, Traveled the East Indies and met Lao people in Siam
- 4) Diogo Veloso and Blas Ruiz de Hernán Gonzoles – 1596
Portuguese and Spanish explorers, visited Vientiane and Mekong
- 5) Geebaerd van Wusthof – 1641
Dutch trader traveled the Mekong up to Vientiane
- 6) Giovanni Maria Leria (Giovanni Filippo de Marini) – 1642-1648
Italian Jesuit missionary
- 7) Alexander Hamilton 1688-1732
Scottish Merchant who traveled from Africa to Japan
- 8) Engelbert Kaempfer – 1690
German botanist who sailed with the Dutch East-India Company
- 9) Reverend Jean-Baptiste Du Halde – 1735
French geographer, wrote on general history of China and ‘Lahos’
- 10) The *Universal History*: Kingdome of Laos – 1759
Compilation of European knowledge of Laos
- 11) Jerome Richard – 1778
French Secular priest who did a study of Laos which included some Natural History
- 12) John Pinkerton – 1802
Scottish writer who compiled an account of Laos based on Du Halde and Kaempfer
- 13) Karl Friedrich Gutzlaff – 1828
German Protestant missionary who published an article on the Lao (1849), though he never visited Laos
- 14) Jean-Baptiste Pallegoix – 1830
Missionary to Bangkok, wrote extensively on Laos
- 15) Henri Mouhot - 1861
Upper Mekong and Luang Prabang. Died in Laos of Malaria

Appendix 2: Table 3 - Plant Names (Common and Scientific)

Common name	Scientific Name	Family name
Agala wood	<i>unkown</i>	unknown
Areca	<i>Areca catechu</i>	Palmacea
Betel nut	<i>Areca catechu</i>	Palmacea
Brasilwood (brasil wood)	<i>Caesalpinia sappan</i>	Caesalpinioideae
Cassava (Kloi)	<i>Manihot esculenta</i>	Euphorbiaceae
Durian	<i>Durio zibethinus</i>	Bombaceae
Eaglewood (old aloe)	<i>Aquilaria agallocha</i>	Thymelaeaceae
Gum Benjamin (Benzoin)	<i>Styrax benzoin</i>	Styraceae
Jackfruit (bread-tree)	<i>Artocarpus heterophylla</i>	Moraceae
Kotso (Cotso)	<i>unkown</i>	unknown
Lan Palm (bai-lan)	<i>Corypha Umbraculifera</i>	Arecaceae
Lèchae (bèjay)	<i>Litchi chinensis</i>	Sapindaceae
Logan (Logan Litchi)	<i>Euphoria longan</i>	Euphorbiaceae
Maha ing/Ingo (Mahang)	<i>Macaranga denticulata</i>	Euphorbiaceae
Makok (Buddha fig)	<i>Ficus religiosa</i>	Moraceae
Mali	<i>Jasminum officinale</i>	Oleaceae
Mango	<i>Mangifera indica</i>	Anacardiaceae
Mangoustan	<i>Garcinia mangostana</i>	Clusiaceae/Guttiferae
Meng Lak	<i>Sterculia scaphigera</i>	Sterculiaceae
Mulberry tree	<i>Morus spp.</i>	Moraceae
Nymphoea (Water Lilly)	<i>Nymphaea spp.</i>	Nymphaeaceae
Opium	<i>Papaver somniferum</i>	Papaveraceae
Papaya	<i>Carica papaya</i>	Caricaceae
Poh-Loh-Su	<i>unknown</i>	unknown
Rosewood	<i>Pterocarpus indicus</i>	Fabacea
Samphan	<i>Caesalpinia sappan</i>	Caesalpinioideae
Sandalwood	<i>Santalum spicatum</i>	Santalaceae
Sirij Pinangh	<i>Piper betel</i>	Piperaceae
Tamarind	<i>Tamarindus indica</i>	Caesalpiniaceae
Tong Kouei, Cot houa boua	<i>Angelica sinensis</i>	Umbelliferae
Vendez-hang (Venejang)	<i>unknown</i>	unknown
Zhadam (Fadam)	<i>Melochia umbellata</i>	Sterculiaceae

Appendix 3- Table 4 - Plants and Explorer

Common name	Explorer	Page
Agala wood	Hamilton	
Areca	Pallegoix, Muhot	
Betel nut	Pallegoix	
Brasilwood (brasil wood)	UH, V&G	
Cassava (Kloi)	Pallegoix	65
Durian	Pallegoix	
Eaglewood (old aloe)	Muhot	P-420
Gum Benjamin (Benzoin)	UH, Marini, Wusthoff, V&G, Fitch, Kaempfer, Gutzlaff	177-UH
Jackfruit (bread-tree)	Pallegoix	
Kotso (Cotso)	UH, Du Halde	182
Lan Palm (bai-lan)	Pallegoix, Kaempfer	66
Lèchae (bèjay)	Richard	
Logan (Logan Litchi)	Pallegoix	69
Maha ing/Ingo (Mahang)	UH	182
Makok (Buddha fig)	Pallegoix	71
Mali	Pallegoix	75
Mango	Pallegoix	
Mangoustan	Du Halde	107
Meng Lak	Pallegoix	65
Mulberry tree	Viravong, Richard	
Nymphoea (Water Lilly)	Pallegoix	74
Opium	UH, Richard	184
Papaya	Pallegoix	
Poh-Loh-Su	Viravong	20
Rosewood	Pinto	
Samphan	Wusthof	
Sandalwood	Du Halde	
Sirij Pinangh	Wusthof	
Tamarind	Pallegoix, Pinto	
Tong Kouei, Cot houa boua	UH, Du Halde	183
Vendez-hang (Venejang)	UH	183
Zhadam (Fadam)	UH, Du Halde	182

Appendix 4: Table 5 – Origin of Plants

Common Names	Origin
Agala wood	unknown
Areca	Asia
Betel nut	Asia
Brasilwood (brasil wood)	Asia & America
Cassava (Kloi)	S. America
Durian	Asia
Eaglewood (old aloe)	Asia
Gum Benjamin (Benzoin)	Asia
Jackfruit (bread-tree)	Asia
Kotso (Cotso)	unknown
Lan Palm (bai-lan)	Asia
Lèchae (bèjay)	Africa
Logan (Logan Litchi)	Asia
Maha ing/Ingo (Mahang)	Asia
Makok (Buddha fig)	Asia
Mali	Asia
Mango	Asia
Mangoustan	Southeast Asia
Meng Lak	Asia
Mulberry tree	Asia
Nymphoea (Water Lilly)	Asia
Opium	SW Asia
Papaya	South America
Poh-Loh-Su	unknown
Rosewood	Southeast Asia
Samphan	Asia & America
Sandalwood	Australia
Sirij Pinangh	Asia
Tamarind	Tropical Africa
Tong Kouei, Cot houa boua	Asia
Vendez-hang (Venejang)	unknown
Zhadam (Fadam)	Asia