

The origin and diffusion of betel chewing: a synthesis of evidence from South Asia, Southeast Asia and beyond

THOMAS J. ZUMBROICH*

Keywords

betel chewing – *A. catechu* L. – *Piper betle* L. – lime – biogeography – archaeobotany – historical linguistics – *āyurveda* – Austronesian – South Asia – Southeast Asia – Pacific Islands

Abstract

The preparation of a betel quid generally involves the combination of slaked lime with two plant products: the seed of *Areca catechu* L. ('areca nut') and the leaf of *Piper betle* L. ('betel leaf'). This paper aims to provide a comprehensive perspective on how the habit of betel chewing originated and was diffused across Southeast Asia, South Asia and the Pacific Islands before the common era. The limited biogeographical data available on the two plant species are consistent with a restricted natural distribution which was followed by a wide dispersal by human agency. A critical review of past archaeobotanical reports from South India to Papua New Guinea challenges some of the earliest dates claimed for betel chewing. By synthesizing evidence from the disciplines of archaeology, historical linguistics and textual analysis on the plants and the material culture of betel chewing, a picture emerges that is far more complex than had previously been suggested. Currently no single model of dispersal, such as the migration of Austronesian speakers, fully

* 2409 Arpdale Street, Austin, TX 78704-3818, U.S.A., zumbroich@yahoo.com.

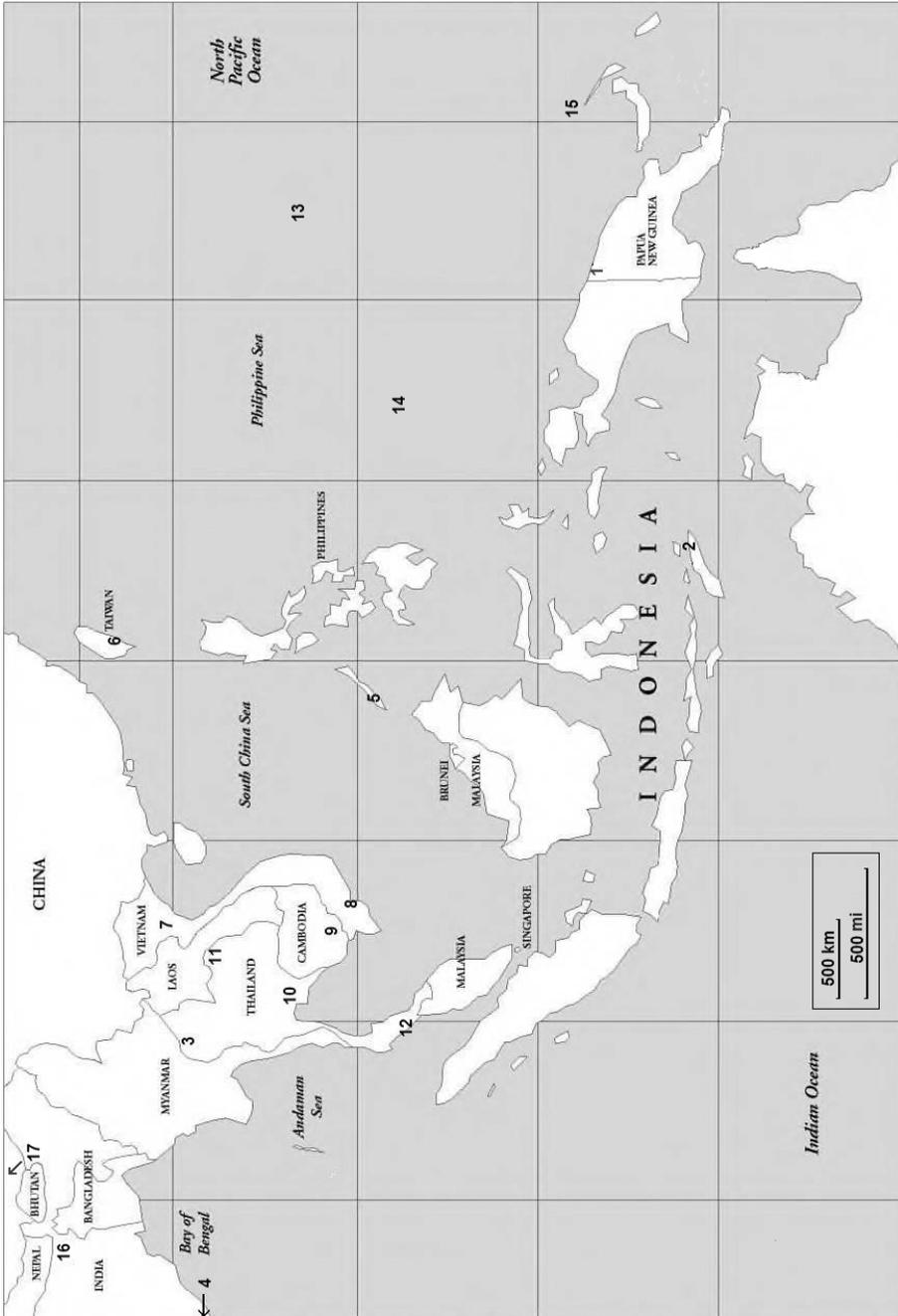


Figure 1: Map of the most important sites mentioned in the text (in order of appearance): 1. Dongan, Sepik-Ramu basin; 2. Uai Bobo and Bui Ceri Uato caves, northern East Timor; 3. Spirit Cave, Mae Hong Son province; 4. Watgal, Raichur district, Karnataka (off the map); 5. Duyong Cave, Palawan island; 6. Beinan, near modern day Taitung City; 7. Nui Nap, Thanh Hoa province; 8. Giong Ca Vo, Ho Chi Minh City province; 9. Angkor Borei, Takeo province; 10. Khok Phanom Di, Chon Buri province; 11. Ban Chiang, Udon Thani province; 12. Trang, Trang province; 13. Guam, Western Marianas; 14. Palau; 15. St. Matthias Islands, Bismarck Archipelago; 16. Pāṭaliputra, modern day Patna, Bihar; 17. Niya, modern day Minfeng, southwestern Xinjian Uyghur Autonomous Region in northwest China (off the map).

explains the transmission of *A. catechu* L. and *P. betle* L. across Asia. However, a number of biological and cultural factors can be identified that have facilitated the dynamic expansion of betel chewing across a wide geographic area up to the present.

1. Introduction

1.1. In his seminal work on the natural history of Southeast Asia, Rumphius¹ portrays betel chewing as a proof of human ingenuity: No less than three components, each one unpleasant when tasted by itself, have to be combined to complete the widely enjoyed betel quid.² Practically unknown in the western hemisphere until the first Portuguese and Dutch reports about India in the sixteenth century, betel chewing has since been recognized with alcohol, tobacco and caffeine amongst the most prevalent addictive habits in the world.³ It has been estimated that at the beginning of the twentyfirst century, worldwide as many as 600

¹ Georg Eberhard Rumpf, 1627/1628-1702.

² From his posthumously published work, Rumphius (1741): I, 32. For earlier general accounts of betel chewing, see v. Bibra (1855); Lewin (1889); Hartwich (1911). More recent summaries are Rooney (1993); Donkin (1999): 186-192; Gupta and Warnakulasuria (2002); Strickland (2002); Rättsch and Müller-Ebeling (2003): 128-133; Reichart and Philipsen (2005). No comprehensive academic monograph is available on the topic.

³ Some of the discussion, to what degree betel chewing is addictive or harmful, has been coloured by colonial and post-colonial attitudes towards the habit and attempts to restrict it. See, e.g. Burton-Bradley (1979).

million were regularly chewing betel.⁴ Its geographical area of use has historically been centered on South Asia and Southeast Asia, with a reach from Madagascar and the fringes of East Africa (e.g. Tanzania) to the Western Pacific as far as the Solomon Islands. But the geographical distribution of betel chewing has always been dynamic,⁵ e.g. more recently expanding through migratory movements of Asian populations into Europe or beginning to retreat from traditional betel chewing countries like Vietnam.⁶

1.2. Betel chewing releases a complex set of biologically active components into the blood stream which result in diverse physiological and psychosomatic responses. Betel chewers experience a sense of well-being, heightened alertness, a warm body sensation, improved digestion and increased stamina. This wide range of effects has been validated by an understanding of some of the underlying mechanisms.⁷ Beyond the individual biological responses, the betel quid carries deeply symbolic connotations and has long played a role in the social fabric of many Asian cultures. Its significance in different circumstances of private and public life centers around the theme of facilitating and structuring relationships.⁸ These aspects have previously been explored in varying depths from an ethnographic⁹ and literary perspective.¹⁰

1.3. The ‘great antiquity’ of the betel habit is explicitly stressed in many accounts,¹¹ and claims to its origin some millenia ago have been made, e.g. for India, Thailand or Vietnam. However, the actual treatments of its prehistoric roots and subsequent diffusion have mostly been sketchy, often relying on few data when presenting a narrative. The goal of this paper is to begin developing a broad-based account of the origins and

⁴ Gupta and Warnakulasuriya (2002): 79, while other authors present significantly different estimates.

⁵ For maps of betel chewing areas, see Brownrigg (1992): 13; Rooney (1993): xii; Donkin (1999): 187, map 13. Such maps do not reflect the dynamic changes in the distribution of betel chewers over time.

⁶ See, e.g. Nguyễn (2006): 514-515; Reichart and Nguyễn (2008).

⁷ Chu (2001): 230-231; Boucher and Mannan (2002): 104; Chu (2002):111.

⁸ This statement necessarily oversimplifies its complex patterns of utilization since, as Sherratt (2007): 14, points out, ‘there can be no simple equation between particular acts of consumption and a single ideology or set of meaning’.

⁹ For the most significant contributions, see Ellen (1991); Conklin (2007).

¹⁰ E.g. various articles in Gode (1960a): I; see also Stöhr (1981); Rooney (1993).

¹¹ From de Candolle (1886): 428, to Southworth (2005): 211.

early spread of betel chewing with a focus on the period before the common era.

After laying a foundation of botanical and biogeographical data for the plant species utilized, this enquiry will proceed to evaluate previous archaeobotanical reports. To trace the components of the betel quid across Asia, it turns out one must primarily rely on non-plant proxies in the archaeological record (such as dental remains and betel use paraphernalia) as well as linguistic reconstructions and loan word patterns. Textual material of ethnohistorical relevance, which is available sufficiently early only from China and India, can provide further evidence. A narrative of the prehistory of betel chewing provides insights into the earliest exchanges of non-subsistence cultigens across Asia and, ultimately, sheds light onto cultural aspects of its use in societies of the wider region.

2. Ingredients of the betel quid

2.1. The ingredient common to almost all masticatory mixtures referred to as 'betel chew' is the fruit of *Areca catechu* L. In case this palm is difficult to obtain, the seeds of other wild growing palm species such as, e.g. *Pinanga dicksonii* Blume in South India or *Areca macrocalyx* Zipp. ex Blume on the Moluccas and New Guinea, can be substituted as an inferior choice.¹² The fruit of the 'areca nut palm' turns a yellow to scarlet colour as it ripens and then consists of a thick fibrous pericarp, the so-called husk, that encloses the seed, commonly, yet incorrectly called a nut.¹³ This seed which is primarily made up of reddish brown endosperm with dark waxy lines is masticated after dehusking and slicing. Depending on local preference, the fruit is harvested at different stages of maturity, and the seed chewed in preparations that vary from fresh, dried, boiled to fermented.¹⁴ Exceptional chewing practices of note, but unknown antiquity occur in modern Taiwan where fresh, very unripe fruit is included in the betel quid *without* dehusking¹⁵ and in the southern Chi-

¹² See Lewin (1889): 23-25, for a comprehensive list.

¹³ Bavappa et al. (1982): 33-34. The name 'betel nut palm' is doubly a misnomer. We prefer 'areca nut palm', since the designation 'areca palm' is reserved for *Chrysalidocarpus lutescens* H. Wendland (= *Dypsis lutescens* (H.Wendl.) Beentje & J. Dransf.), see Dransfield and Uhl (1987): 347.

¹⁴ Jayalakshmi and Mathew (1982): 225-240.

¹⁵ Wang et al. (1997): 1185.

nese province of Hunan where *only* the husk is chewed without betel leaf or lime.¹⁶ All parts of *A. catechu* L., but in particular the endosperm contain as biologically active components four related pyridine alkaloids¹⁷ and a wide range of phenolic compounds.¹⁸ Besides their use as a stimulant the areca nut and other parts of the palm are traditionally used in a variety of medicinal applications, most importantly for intestinal ailments and as a vermifuge.¹⁹

A. catechu L. is part of a genus of forty-eight species of understory palms and thrives in humid tropical forests at low to medium elevations. Unlike some other members of its genus, *A. catechu* L. is quite adaptable. It readily self-seeds and is tolerant of open conditions.²⁰ As is the case with other cultigens, including a number of palms such as the coconut (*Cocos nucifera* L.), peach palm (*Bactris gasipaes* Kunth) or sugar palm (*Arenga pinnata* (Wurmb.) Merril), the origin of *A. catechu* L. is unclear. While a better understanding of the phylogeny of the Malesian palm subtribe Arecinae is emerging,²¹ a molecular phylogenetical analysis for the genus *Areca* is currently not available. Other *Areca* species are widespread from India along the Sunda shelf crossing Wallace's line to Papua New Guinea. Speculations on the center of origin for *A. catechu* L. have ranged from the Andamans to Western Malaysia and Java to the Philippines.²² Amongst the various hypotheses, the one with relatively the strongest support is Beccari's, who argued that *A. catechu* L. speciated in the Philippines. There he not only discovered the greatest mor-

¹⁶ Zhang et al. (2008).

¹⁷ The German pharmacist Jahns (1891) was the first to isolate from areca nuts and name the alkaloids arecoline, arecaidine, guvacoline and guvacine (Sanskrit *guvāka* = '*A. catechu* L.'). Wang et al. (1997) demonstrated the significant differences in the alkaloid spectrum between different parts of the plant and during different stages of fruit development.

¹⁸ Condensed tannins, hydrolyzable tannins, non-tannin flavans, simple phenolics; Wang and Lee (1996); Wang et al. (1997).

¹⁹ E.g., Burkill (1935): I, 226-228; Perry (1980): 302; for Indian medicine, see Meulenbeld (1999-2002).

²⁰ Beccari (1919): 305; Murthy and Pillai (1982): 13-17; Uhl and Dransfield (1987): 414-416; Brotonegoro et al. (2000): 52-53.

²¹ Loo et al. (2006).

²² De Candolle (1886): 428: 'The country [of origin] is not proved'; Burkill (1935): I, 223: 'undoubtedly Malaysian in origin'; Raghavan and Baruha (1958): 317: 'species originated in Malaya'; Balakrishnan and Nair (1979); Bavappa et al. (1982): 2-3; Brotonegoro et al. (2001): 51.

phological diversity for *A. catechu* L., but also a number of closely allied endemic species.²³

Equally a subject of discussion is the full extent of the areca nut palm's geographical distribution *before* human intervention. It was recently claimed that its range included the island of Guam in Western Micronesia based on a very small number of pollen from geological core samples with radiocarbon dates prior to the presumed human occupation of the island.²⁴ Given the lack of corroborating evidence, this claim cannot readily be accepted.²⁵ Whether Taiwan was within its natural range, is equally doubtful due to the island's location at the extreme northern edge of the current distribution of the genus and the lack of other *Areca* species. However, it is generally agreed that towards its western limit in Asia *A. catechu* L. was introduced by humans to India.

By comparison, *Areca triandra* Roxb. ex Buch.-Ham. ('wild Areca palm'), whose seeds are chewed as a substitute for those of *A. catechu* L., is naturally widely distributed from India to Indochina, Thailand, Peninsular Malaysia and the Indo-Malaysian archipelago. Specimens of the 'wild Areca palm', as its name indicates, can be found throughout its range in primary forests.²⁶ As trees typically show little phenotypic distinction between domesticated and wild growing populations and retain their ability to thrive uncultivatedly after natural or human induced dispersal,²⁷ the identification of truly wild growing tree specimens is challenging. Consequently, reports of *seemingly* 'wild' growing *Areca catechu* L. palms in different locales have always turned out to be unconvincing due to a high likelihood of human interference from nearby habitations, native trails and so on.²⁸ Based on the lack of unequivocally natural stands of *A. catechu* L. in closed forests *anywhere* in its current range,²⁹ one may hypothesize that it had a rather restricted natural distribution followed by a wide dispersal by human agency.

²³ E.g., *A. ipot* Becc., *A. camarinensis* Becc.; Beccari (1919): 301, 308-310.

²⁴ Athens and Ward (1999a): 129, table 11; 151; Athens et al. (2004): 24, table 1. Athens and Ward (1995), is quoted as evidence for *A. catechu* L., but shows no data on it. A possible explanation of these results for Guam is a confusion with pollen of *Pinanga insignis* Becc. that is native to Guam.

²⁵ Others do, e.g. Fitzpatrick et al. (2003): 60.

²⁶ Sosef (2000): 123.

²⁷ Fairbairn (2005): 490.

²⁸ See Beccari (1919): 305, for a specific example.

²⁹ Explicitly stated by Corner (1966): 282.

2.2. Slaked lime (calcium hydroxide, $\text{Ca}(\text{OH})_2$) is the second essential ingredient of the betel chew. Its addition increases the intraoral alkalinity which in turn reduces the astringency of the tannins of areca nut, releases its alkaloids, especially arecoline, and aids the overall freshening effect on the mouth.³⁰ Hence, lime makes the betel quid both more palatable and physiologically effective. Quicklime (Calciumoxide, CaO) is traditionally prepared in coastal areas by heating the shells of marine molluscs or coral to high temperature. Freshwater shellfish or terrestrial molluscs and, rarely, pearls are alternative raw materials.³¹ If actual limestone is available, such as, e.g. in Thailand or Vietnam, it is preferred by connoisseurs for its superior taste.³² At some point before consumption the quicklime is slaked by adding a sufficient amount to water so that a thick paste results. Frequently, coloured and aromatic plant products, such as catechu (heartwood extract from *Acacia catechu* (L. f.) Willd.) or turmeric (root of *Curcuma longa* L.), are added to the lime resulting in an improved flavour, while a specific colour is sometimes considered auspicious for a certain occasion.³³ The lime is then smeared onto a leaf of *Piper betle* L., the third essential component of the betel quid.

2.3. Many members of the complex genus *Piper* L. with over a thousand species contain volatile aromatic oils,³⁴ and their leaves are used for a variety of medicinal or culinary purposes.³⁵ *Piper betle* L. ('betel pepper') is a climbing plant typically propagated asexually from stem cuttings rather than from seeds.³⁶ The leaves of *P. betle* L. have a relative high content of phenolic compounds which not only taste refreshingly but also exert a range of pharmacological activities.³⁷ The broad heart shape of the leaf makes it ideally suited for assembling areca nut and lime paste on its surface and to be folded into a 'betel quid'. If need be,

³⁰ Nieschulz and Schmersahl (1968); Wang et al. (2001).

³¹ Illustrated by Chinnery (1922): 24; also see Stöhr (1981): 553; Brownrigg (1992): 20.

³² Xuan Hien Nguyễn (2008): pers. communication.

³³ Chu (2001): 230; Wang (2001): 1980; Nguyễn (2006): 508; Xuan Hien Nguyễn (2008): pers. communication.

³⁴ Utami and Jansen (1999): 184-185.

³⁵ Burkill (1935): II, 1736-1754; Perry (1980): 312-313.

³⁶ Balasubrahmanyam (1990); Balasubrahmanyam et al. (1994); Teo and Banka (2000): 102-104.

³⁷ E.g., hydroxychavicol, eugenol, methyl eugenol, isoeugenol, flavone, quercetin; Chu (2001); Guha (2006): 90-91.

the leaves of other *Piper* species are substituted in betel chewing,³⁸ but *P. betle* L. is the only one that has been domesticated specifically for use with mastication.³⁹ Primarily in the Moluccas and Papua New Guinea the young inflorescences of *P. betle* L. are preferred to the leaves.⁴⁰ After taking a small piece of areca nut into the mouth, a fruit spear is dipped into lime and the part to which the lime has adhered is bitten off. Rumphius accordingly distinguished *Sirii folium* ‘betel leaf plant’⁴¹ and *Siriboa* ‘betel fruit plant’ (< Malay *sirih buah*),⁴² though this distinction is no longer maintained at the species level.⁴³

The traditional view on the origin of *P. betle* L. has been that its native range was centered around Java, where allegedly wild plants had been found.⁴⁴ Contemporary reviews have added little to this picture.⁴⁵ However, already Rumphius (1627-1702) explicitly stated that to his knowledge the plant is nowhere to be found in the wild, but exclusively under cultivation:

‘The betel leaf grows in all of East India and Old India, on the Islands as well as in Quantung, the southernmost province of China, yet nowhere by itself in the forests, but always in gardens.’⁴⁶

The absence of wild *P. betle* L. plants from Java has been confirmed more recently.⁴⁷ By comparison, some similar species like *P. caninum* Blume are widely distributed across Malesia and beyond New Guinea.⁴⁸

³⁸ Lewin (1889): 25-26.

³⁹ Burkill (1935): II, 1738-1740.

⁴⁰ Rumphius (1742): V, 341; Jacobs (1971): 57; Ellen (1991):106.

⁴¹ Rumphius (1742): V, 336-340.

⁴² Rumphius (1742): V, 340-342.

⁴³ *Siriboa* = *P. siriboa* L. = *P. betle* L. var. *siriboa* (L.) C. DC.; de Wit (1959): 397; Jansen (2002).

⁴⁴ Crawford (1869): 89, mistakenly quotes Rumphius’s authority; Drury (1873): 129, ‘The plant has been found wild in Java which is probably its native country’; Watt (1889-1896): VI, pt. 2, 248, ‘a native of Java’; Burkill (1935): II, 1738: ‘apparently a native of central and eastern Malaysia’.

⁴⁵ E.g., Teo and Banka (2000): 103; Guha (2006): 87.

⁴⁶ ‘...nullibi sponte in silvis, sed ubique in hortis.’ Rumphius (1742): V, 337.

⁴⁷ Chibber (1912): 357, writes ‘Mr. J. C. Konigsberger, Director of the Botanical Gardens, Buitenzorg [Java], informs me by letter that this species has not yet been found in the wild state in any part of Java, and adds that is is, however, growing wild in Celebes and, probably, also in the Moluccas.’ There is no independent confirmation of the latter observations which appear to be second-hand.

⁴⁸ Jansen (1999): 261.

Other closely related species are known from locations of the mainland such as Vietnam or South China.⁴⁹ In conclusion, we have found little support for the orthodox view that *P. betle* L. originated in or around Java, and its natural distribution in island Southeast Asia or the mainland remains uncharted. However, the apparent lack of verifiable collections of *P. betle* L. from the wild that are phenotypically differentiated from known cultivars, raises again the possibility of an initially restricted distribution from where the domesticated plant was spread.

In light of the biogeographical data presented, one cannot assume that the natural range of areca nut and betel pepper overlapped originally. It is therefore possible that either plant product was used as a masticatory (or otherwise) *without* the other for an unknown length of time and the presence of areca nut plus lime need not necessarily imply the use of betel leaf.⁵⁰

3. Archaeobotanical record

3.1. For the origins of the betel habit and arboriculture of the areca nut palm in Southeast Asia and beyond, surprisingly early dates as far back as 13000 B.P. have been presented.⁵¹ Those claims are based on archaeobotanical evidence reported over the last forty years from sites in New Guinea to southern India.

Probably the most spectacular find had been the remains of the fibrous husk of a fruit, identified as *A. catechu* L., which was discovered at Dongan on the Sepik coastline of northern New Guinea [1 in Fig. 1]. Its radiocarbon date of 5800 B.P. based on associated wood charcoal challenged conventional chronologies of the dispersal of tree-crops from South-east Asia to New Guinea.⁵² However, recent radiocarbon dating of the actual husk proved it to be a modern contaminant which, despite its excellent preservation status, was not identifiable to the species level.⁵³

Excavations in caves in eastern Timor [2] were reported to have yielded different remains of *Areca* sp. and seeds of *Piper* sp. in the layers

⁴⁹ Jaramillo and Manos (2001): 712, Fig. 3.

⁵⁰ As appears to be assumed frequently, e.g. by Fitzpatrick et al. (2003): 61; Bellwood (2004): 29.

⁵¹ E.g., recently Latinis (2000): 52; Fitzpatrick et al. (2003): 59; Blench (2004): 34, 43.

⁵² Swadling et al. (1991): 102-103, 111; Swadling (1996): 51; Spriggs (1998): 56-60; Denham (2004): 614.

⁵³ Fairbairn and Swadling (2005): 378-379; Fairbairn (2005): 492.

dated before 3000 B.C.E., representing 'the two ingredients of betel chewing'.⁵⁴ However, a later publication shows the identification of *Areca* sp. seeds merely as 'possible' or 'fair', and only so in layers dated 2500 B.P. or more recent, which contradicts the earlier report.⁵⁵ A recent reassessment of the archaeobotanical evidence from these caves no longer mentions *A. catechu* L., but curiously notes '*Piper betel* [sic!] ... occurring in some of the deepest excavated layers'.⁵⁶ In our view, the data shed little light, if any, on betel chewing in Timor before the common era.

Similarly equivocal is the earliest evidence from the South-East Asian mainland. During excavations of the Spirit Cave in northwestern Thailand [3] at levels corresponding to about 9000 to 7600 B.P. uncarbonized and carbonized fruit fragments were identified as belonging to *Areca* sp. Taking into account five uncarbonized *Piper* sp. seeds from that same time horizon the conclusion was drawn that betel chewing could have been part of the repertoire of the Hoabinhian culture.⁵⁷ Gorman also raised the issue of possible domesticity of the presumed areca nut palms at Spirit Cave. Not only must questions be raised about the antiquity of the uncharred botanical remains,⁵⁸ but given the uncertainty about the actual species of the remnants, it would be difficult to infer betel chewing, let alone cultivation of *A. catechu* L. from these findings.⁵⁹

Finally, there is a find from Karnataka in southern India [4] that has found its way into the secondary literature.⁶⁰ At the neolithic site of Watgal with occupation from about 2700 B.C.E. two carbonized *A. catechu* L. seeds were reported in the most basal layer.⁶¹ It was published without further documentation or detailed botanical examination and can therefore, pending future confirmation, be viewed as questionable.⁶²

⁵⁴ Glover (1979): 18-19; Bellwood (1997): 186-187. The *basal* date of these sites is around 13000 B.P. which explains the incorrect early dates for betel chewing found in the literature.

⁵⁵ *Areca* sp. remnants in Horizon VII at Bui Ceri Uato, 0 – 2500 B.P., Uai Bobo 1, 700 – 1000 B.P., cited in Glover (1986): 97, 132, 229-230. See similar criticism in Fairbairn and Swadling (2005): 381.

⁵⁶ Oliveira (2006): 94.

⁵⁷ Gorman (1963); Gorman (1971); Yen (1977): 570-572; Glover (1979): 11-17.

⁵⁸ Fairbairn and Swadling (2005): 381.

⁵⁹ For further criticism of Gorman's archaeobotanical identifications, see Harlan and de Wet (1973): 52.

⁶⁰ E.g., Bellwood (2005): 93; Southworth (2005): 246.

⁶¹ Deavaraj et al. (1995): 61; Fuller (2002): 253.

⁶² Dorian Fuller (2004): pers. communication.

3.2. For the period discussed, the archaeobotanical record supporting betel chewing remains, at best, poor for a number of reasons. Archaeologically based models of distribution and exchange are typically based on inventories of non-organic artefacts, such as ceramics, beads or metal objects. In contrast, botanical findings from archaeological contexts are often less well documented and identified than accompanying remains. An exception are the numerous enquiries into the development of agriculture that focus on plants fulfilling subsistence needs.⁶³ However, their bias towards cereals and tubers has resulted in comparatively short shrift being given to ‘minor crops’⁶⁴ or plants used primarily in a social context as are the main constituents of the betel quid.

More specifically, taking into account closely related species in the *Areca* genus, e.g. *A. triandra* Roxb. Ex Buch.-Ham. broadly occurring across Southeast Asia, or the presence of other local palm species, a positive identification of *A. catechu* L. is essential to specifically imply its utilization in betel chewing and its arboriculture around human habitations. But taphonomic issues complicate the identification of *A. catechu* L. Phytoliths cannot be adduced for differentiation from other palms nor is there a hard husk to be preserved. Charring will only preserve the seeds which, however, are prone to collapse after carbonization.⁶⁵ Even more challenging is *Piper betle* L. for which identification has been based on the presence of *Piper* sp. seeds.⁶⁶ However, in the vast genus *Piper* for which leaves and seeds have numerous known medicinal and culinary uses in indigenous societies,⁶⁷ no conclusions on betel chewing can be drawn from isolated *Piper* sp. seeds in archaeological contexts.

4. Island South-East Asia

4.1. Dental remains from archaeological contexts are important indicators of life style and diet of prehistoric populations.⁶⁸ Reddish-brown, so-called ‘betel stains’ on dentitions have been adduced as evidence for the use of the areca nut with lime if other dietary components⁶⁹ or post-

⁶³ E.g., Bellwood (2005).

⁶⁴ Noted by Blench (2004): 31; Fuller (2007): 431-432.

⁶⁵ Andrew Fairbairn (2008): pers. communication.

⁶⁶ Yen (1977): 572; Glover (1979): 18.

⁶⁷ Burkill (1935): 1736-1754.

⁶⁸ Reviewed in Oxenham and Tayles (2002); Douglas and Pietrusewsky (2007).

⁶⁹ E.g., berries, see Pietrusewsky and Toomay Douglas (2002): 76.

mortem conditions⁷⁰ were unlikely causes. Confounding this type of evidence is a practice called ‘teeth blackening’ that involves the purposeful staining of the visible surfaces of previously etched permanent teeth with a variety of agents. Teeth dyeing can be performed for aesthetic reasons and as a rite of passage, such as puberty or marriage. The custom is documented ethnohistorically in many betel chewing cultures of South-east Asia and the Pacific Islands.⁷¹ Therefore, depending on the type of stain observed on teeth, different causes have been implied. Relatively indiscriminant discolouration is thought to be caused by *incidental* staining from casually chewing a mixture of areca nut with lime, whereas staining focussed on the facial aspect of anterior teeth might be due to *deliberate* staining.⁷²

The oldest evidence from dentitions comes from a burial site in the Duyong Cave on Palawan island in the southern Philippines [5] that contained skeletal remains with visible stains on teeth compatible with those observed after betel chewing. The skeletons were accompanied by six *Anadara* shells that appeared to be lime containers as one was still filled with lime. This burial pit was dated to about 2660 B.C.E. (4630 B.P. +/- 250) with evidence pointing to the occupation of the cave by an indigenous community of hunter-gatherers at least one thousand years prior. Stained teeth and containers for lime were also found in other caves in the area corroborating the suggestion that betel chewing was practiced.⁷³ Other evidence for the Philippines dates from the considerably later Metal Age (first millennium C.E.). Teeth from a burial site on the island of Bohol (Central Visayas region of the Philippines) were found to have the characteristic reddish stain associated with betel chewing.⁷⁴

At the expansive neolithic site of Beinan on the East Coast of Taiwan [6] numerous skeletal remains in the over fifteen hundred excavated burial sites had dentitions with stained teeth. This was adduced as evidence that betel chewing was practised amongst the inhabitants of Beinan around 1500 to 800 B.C.E. A more detailed description of dentitions

⁷⁰ E.g., soil contact, see Hocart and Fankhauser (1996): 284.

⁷¹ Bailit (1968): 348, Linh (1998).

⁷² Oxenham et al. (2002): 912.

⁷³ Fox (1970): 60-65; Bellwood (1997): 221-222; Barretto-Tesoro (2003): 304. No further testing was performed on any of the dentitions.

⁷⁴ Yankowski (2005): 101.

from archaeological sites in Taiwan for which betel chewing has been claimed might allow to refine this chronology in the future.⁷⁵

4.2. To integrate these isolated pieces of material evidence into a broader framework, historical linguistics provides correlative arguments. By applying the comparative method to attested languages, words of hypothetical ‘proto-languages’ can be reconstructed as abstract forms.⁷⁶ Based on the relationships of forms within a language tree and loan pattern between language families, inferences about material culture and chronology become possible.⁷⁷ However, successful reconstructions remain hypothetical forms that may require reinterpretation, e.g., in the case of a plant name, if they are in conflict with known biogeographical data.⁷⁸ By the same token there are other potential reasons to explain the lack of a reconstructible term for a cultigen short of its actual absence in the reconstructed ‘proto-culture’.

With these caveats in mind, lexical data from the Austronesian phylum provide support for the prehistoric presence of some aspects of the betel habit in the Philippines’ region. According to a widely accepted hypothesis, the homeland of Austronesian speaking migrants was Taiwan from where colonizing proceeded southward.⁷⁹ In the northernmost islands of the Philippines, the Batanes, the establishment of Neolithic cultures that are linked to Taiwan have been archaeologically dated to between 4500 and 4000 B.P.⁸⁰ The Proto-Austronesian form **buaq* is reflected in the meaning ‘fruit’ throughout the *whole* Austronesian language tree, i.e. in Formosan *and* Malayo-Polynesian languages. However, only from the Batanes Islands in the northernmost Philippines through Sulawesi and the Lesser Sunda to the Solomon Islands, reflexes of **buaq* (or a very similar Proto-Malayo-Polynesian form) are also

⁷⁵ Radiocarbon dates for the Beinan culture have clustered between 5300 B.P. and 2300 B.P. We are following Bellwood’s suggestion for the chronology. Lien (1991): 343-345; Bellwood (1997): 217. Much of the work on Taiwanese sites has been published in relatively inaccessible excavation reports.

⁷⁶ Conventionally marked by a star (*). For all linguistic material we have retained the spelling of the source, except for Chinese forms which are romanized according to the Pinyin system.

⁷⁷ Southworth (2005): 2-35; Mahdi (1998).

⁷⁸ For examples, see Blench (2004): 32.

⁷⁹ For recent reviews see Pawley (2002); Adelaar (2005). For a criticism of this model, see, e.g. Oppenheimer (2006).

⁸⁰ Bellwood and Dizon (2005): 27.

found with the meaning ‘areca nut’.⁸¹ This would imply that only from the arrival of the settlers in the Philippines, areca nut came to be considered the ‘fruit *par excellence*’ attesting to the emerging importance of its use in these Austronesian speaking societies.⁸²

The reconstruction **qápur* ‘lime’ as it is employed with areca nuts, but also for other purposes, is reflected in a Formosan language and can thus be assigned to the Proto-Austronesian level.⁸³ It is possible to make the argument that Austronesian speakers were already familiar with the areca nut in Taiwan before reaching the Philippines. Certainly betel chewing is deeply rooted amongst some Taiwanese indigenous groups, like the Amis or Puyuma.⁸⁴ A possible explanation for the absence of the meaning ‘areca nut’ for **buaq* in Proto-Austronesian can be based on an earlier, but different Proto-Austronesian form **Sawiki* ‘areca nut’ that existed in Formosan languages, but was subsequently lost.⁸⁵ However, there is no other evidence to support the latter hypothesis, and biogeographical arguments do not favour Taiwan as a center for the diffusion of *A. catechu* L.

The available linguistic data referencing ‘betel pepper’ are more complex and difficult to interpret than those for ‘areca nut’ and ‘lime’. There is no broadly supported reconstruction for an etymon at the Proto-Austronesian or Proto-Malayo-Polynesian level.⁸⁶ In fact, the greater linguistic diversity of indigenous terms for betel pepper across the Indo-Malaysian archipelago has frequently been adduced to argue for its longer use there than elsewhere.⁸⁷

4.3. It appears that the chewing of areca nut with lime was incorporated into the cultural repertoire of Austronesian speakers in the Philippines more than 4000 years ago. The question of how long indigenous groups of the region had used it previously cannot be answered with any accuracy on the basis of the scarce archaeological evidence available. As

⁸¹ Wolff (1994): 515; Blust (1995): 473; Zorc and Ross (1995): I, 1152; Mahdi (1998): 406-407.

⁸² Wolff (1994): 515.

⁸³ Blust (1976): 21-22, table 1; Zorc (1994): 565.

⁸⁴ E.g., see Chen (1968): 73-74.

⁸⁵ Blust (1995): 473; Robert Blust (2004): pers. communication.

⁸⁶ Zorc and Ross (1995): I, 1152; Lichtenberk (1998): 344-345; Mahdi (1998): 404-405.

⁸⁷ Crawford (1869): 89; Reid (1985): 529; Strickland (2002): 85. This broad-brush argument appears of questionable value in determining the home of *P. betle*. L.

areca nuts accompanied the migration of Austronesian speakers further into the Indo-Malaysian archipelago, the areca nut palm could have been dispersed into these regions. The interaction between pre-Austronesian indigenes and Austronesian speaking migrants⁸⁸ would therefore, depending on the region, have involved the diffusion of areca nut between the two populations in either direction. Where and at what point betel pepper was added to complete a betel quid remains undocumented.

5. Mainland South-East Asia

5.1. In Vietnam a rich tradition of folktales about betel chewing has been preserved across different ethnic groups. The folktale, *Tân lang truyện*, ‘The Story of Tan [and] Lang’ or ‘The Story of the Areca Palm Tree’, is the most widely known among the ethnic Viet.⁸⁹ This tale about the origin of the betel quid has been integrated into the legendary dynastic histories of the eighteen Hung Kings which, according to one chronology, ruled northern Vietnam between 2879 and 258 B.C.E.⁹⁰ Around 2000 B.C.E. a romantic tragedy involving the love of a young woman for one of twin brothers is said to have transformed the two brothers into the first areca nut tree and a limestone. These were subsequently both encircled by the mourning woman which had turned into a vine of betel pepper. Upon hearing about these events the ruler, King Hung-Vuong IV, decreed that forthwith the combination of areca nut, lime and betel leaf be chewed in his kingdom as a symbol of filial and conjugal affection.⁹¹ This contextualization gave betel as an important part of the Vietnamese cultural inventory an ancient origin and a mythological, quasi-historical etiology.

⁸⁸ Bulbeck (2006): 398, 408-409, documents such exchange for the To Ala’ of the Lamong Highland, South Sulawesi. However, the introduction of areca nut to the To Ala’ by Bugis can only be inferred for the early historic period.

⁸⁹ Nguyễn and Reichart (2008): 26.

⁹⁰ This chronology with a precise beginning in the early third millennium B.C.E. in order to predate the mythical emperors of China, was codified in a text from the fifteenth century; Taylor (1983): 309; Wheatley (1983): 366. In an apparent anachronism, the form *tân lang* ‘areca palm’ is a partial loan from Chinese of a much later date than the time period in which the story has been set, see note 132.

⁹¹ We are retelling a version of the story according to Lebrun (1950): 166-167; Gode (1960b): I, 165-167. Nguyễn (2006): 510-512, analyzes different types of the tale and presents a translation of the oldest extant manuscript version from 1695.

5.2. Irrespective of the specific time depth implied by this version of the legend, evidence for the earliest use of areca nut in mainland Southeast Asia in fact points to two different cultural complexes with different linguistic affiliations in Vietnam. One of them is the Dong Son culture centered on the Red River delta in northern Vietnam. It reached its classical phase around the middle of the last millennium B.C.E. with the manufacturing of elaborately decorated (so-called Heger I) bronze drums which over time became widely distributed via the exchange networks of the Indo-Malaysian archipelago.⁹²

Dentitions ranging in age from 3000 to 1700 B.P. from a Dong Son site in Nui Nap [7] have been subjected to further analyses.⁹³ Three quarters of the assessed individuals displayed some dark-reddish stains on their teeth. One maxillary incisor dated 2400 to 2000 B.P. was examined with scanning electron microscopy which showed changes in surface morphology consistent with deliberate etching. Mass spectrometrical analysis of the actual stain material on the same tooth showed some identical mass fragments between the stain and areca nut extract, but no alkaloids specific to *A. catechu* L. were detectable in the stain.⁹⁴ This study tentatively supports that areca nut was known to the inhabitants of Nui Nap and was used in the context of teeth dyeing (after a process of etching) and hence probably was also chewed casually.⁹⁵ Betel chewing in *pre*-Dong Son Metal cultures of North Vietnam (Phung Nguyen and Dong Dau cultures), with dates as early as the first half of the second millennium B.C.E., has been proposed but the validity of these claims cannot be assessed for lack of documentation.⁹⁶

There are other indications for the cultural importance of betel chewing in the early Metal age of northern Vietnam. Amongst the most ornately decorated Dong Son bronze objects are *tho*, wide-mouthed flared

⁹² Bellwood (1997): 269-271, 277-279; Higham (2004): 57-59.

⁹³ Oxenham et al. (2002). The great majority of remains were from the common era. No specific information was provided on the two oldest individuals dated to 3000 to 2500 B.P.

⁹⁴ Methodological issues, in particular the lack of controls, make the data as presented difficult to interpret

⁹⁵ The documented use of areca nut for teeth dyeing has always been found to be associated with betel chewing as well.

⁹⁶ Nguyễn (2006): 500, notes these findings, including blackened teeth and areca nut remains, though the sources are either unpublished or possibly published in inaccessible Vietnamese excavation reports. See Glover and Bellwood (2004): 205-208, for a bibliography.

vessels, thought to be spittoons.⁹⁷ If we correctly associate these bronze spittoons with betel chewing, their inclusion as sumptuous grave goods of the Dong Son elite is a sign that emerging social hierarchies⁹⁸ are reflected in the material culture associated with the betel habit.

The most explicit association of the native inhabitants of the Red River Delta with betel chewing comes from the exploration of early Chinese texts. Based on information gathered in the course of the Chinese attack of northern Vietnam during the Qin dynasty (221 to 207 B.C.E.) the people of the kingdom of Van-Lang were known to habitually chew betel and to exchange areca nut and betel leaf as part of wedding rituals. Chinese sources noticed their black teeth and assumed they were a natural consequence of betel chewing.⁹⁹ The society described here for the period of the Hung kings and the Dong Son archaeological context was likely of Mon-Khmer linguistic affiliation.¹⁰⁰ This can be based on the linguistic analysis of some of the terms closely associated with the dynasty of Hung kings and the association that Viet and other languages later attested in the area have with the Mon-Khmer family.¹⁰¹

In 111 B.C.E. the Han empire's conquest of the region 'South of the mountains' (*Ling-nan*) absorbed the areas of roughly Northern Vietnam as well as Guangdong and Guangxi provinces formally into the Han empire.¹⁰² Subsequently emperor Han Wudi had rare plants representative of southern surroundings imported to the imperial *Fu Li* (Lychee) palace of his capital Chang'an. Included in this predictably unsuccessful attempt

⁹⁷ Higham (1996): 113, Fig. 4.23c, shows a *tho* from Viet Khe in the Red River Delta, 500 to 300 B.C.E. Huyen (2004): 200, identifies these vessels as spittoons.

⁹⁸ Higham (1996): 327-328.

⁹⁹ '*L'habitude de chiquer le bétel était déjà répandue, ainsi que celle se noircir les dents, que les Chinois considéraient comme un effet naturel de l'usage du bétel.*' Maspéro (1918): 10. The precise source of these descriptions is not entirely clear from Maspéro's references, but appears to be the *Ho Han Shu*, History of the Later Han Dynasty (25 to 220 C.E.). Maspéro is misquoted on 'tooth blackening' by Coedès (1966): 41; Hickey (1982): 60; Oxenham et al. (2002): 910.

¹⁰⁰ Mon-Khmer together with the Munda languages found in India form the Austroasiatic family, one of the primary linguistic substrates of mainland Southeast Asia; Blench (1999): 67; Fuller (2007): 416.

¹⁰¹ Taylor (1983): 8; Higham (1996): 109. The overall interpretation of historic events presented here reflects a Vietnamese (as opposed to a Chinese) perspective.

¹⁰² Taylor (1983). Higham (1996): 108-109.

to create an exotic 'lychee garden' were over a hundred areca nut palms.¹⁰³

The northeasterly continuation of the Vietnamese coast towards the mouth of the Zhujiang River (today's Hongkong) and the island of Hainan¹⁰⁴ have a climate suited for the cultivation of the areca nut palm and betel pepper, but we have no information when these plants were first cultivated there. Trade contacts along this whole coastline intensified from the middle of the first millennium B.C.E. and would have sooner or later introduced betel chewing further northeast.¹⁰⁵

5.3. The other Vietnamese archaeological complex which can be associated with betel chewing is the Sa Huynh culture. It is known for its jar burials with characteristic earrings as grave goods.¹⁰⁶ Coming from Island Southeast Asia, possibly Borneo, sometime between 1000 to 500 B.C.E. Austronesian speakers are thought to have settled the coastline of South-central Vietnam, ultimately developing a series of kingdoms known as Champa during the first millennium C.E.¹⁰⁷ With great likelihood the arrival of Austronesian speakers would have soon initiated contact with Mon-Khmer speakers.¹⁰⁸ The original settlers are often associated with the Sa Huynh culture in coastal Vietnam, though the time-depth and reach of the Sa Huynh culture and its precise association with Austronesian speaking settlers is subject to discussion.¹⁰⁹

At Giong Ca Vo, the southernmost site associated with the Sa Huynh culture on the estuary of the Dong Nai river [8], dentitions were found to have what appeared to be areca nut staining. Their approximate date was 2500 B.P.¹¹⁰ Other material evidence confirms the presence of areca nut palms in the wider region before the common era. The most tangible piece, even though not reported in much detail, comes from the archaeological site of Phu Chanh that is located along a tributary of the Dong

¹⁰³ Li (1979): 113-114; Needham et al. (1986): 453, based on quotes from the *San Fu Huang Tu*, Illustrated Description of the Three Cities of the Metropolitan Area, of the late third century C.E.

¹⁰⁴ Schafer (1970): 45-46.

¹⁰⁵ Higham (2004): 58-59; Southworth (2004): 212-213. Anderson (2007) discusses Hainan, though is overall unreliable on historical and linguistic details.

¹⁰⁶ Higham (1996): 304-308; Bellwood (1997): 275-279.

¹⁰⁷ Thurgood (1999): 15-23; Higham (2004): 60; Southworth (2004): 209-213.

¹⁰⁸ Bellwood (1997): 271-275; Thurgood (1999): 17-19.

¹⁰⁹ Glover et al. (1996): 166.; O'Connor (2006): 77, point out the possibility of an inception of the Sa Huynh culture as early as 4000 B.P.

¹¹⁰ Oxenham et al. (2002): 914, with no further details.

Nai river and about 50 miles northwest of Giong Ca Vo. Inside a Heger I drum, as part of an assembly thought to be a rare example of a drum burial, an areca nut was discovered together with, amongst other items, a mirror from the late Western Han period (202 B.C.E. to 9 C.E.).¹¹¹ Besides providing firmly datable evidence for the presence of areca nut (assuming the identification is correct), this finding also highlights the cultural importance of areca nut, as it was included as a grave good together with other imported high value items. In relative proximity, at Angkor Borei in southern Cambodia [9] the majority of dental remains from a pre-Angkorian burial site showed evidence of incidental tooth staining thought to be derived from chewing betel. The date for this early historic site falls between 200 B.C.E. and 400 C.E.¹¹²

From the Chinese perspective, the areca nut palm was firmly associated with *Linyi*, southern Vietnam or Champa. The *Linyi Ji* (Records of the Champa Kingdom) which was probably in parts authored by Dongfang Shuo around 100 B.C.E.¹¹³ contains the following description of the ubiquitous groves of areca nut palms:

‘Everywhere the areca trees form forests of thousands and ten thousands of plants, dense, vigorous, without branches, ... Every family possesses several hundred trees, which seem as high as clouds, with the fruiting branches like cords hanging down.’¹¹⁴

The corresponding passage from Ji Han’s *Nanfang Cao Mu Zhuang* (Plants of the Southern Region, traditionally dated to 304 C.E.)¹¹⁵ lists the three ingredients of the betel quid. It also adds more details about the social significance of the areca nut:

‘It grows in *Linyi*, where the people consider it valuable. Visiting relatives and guests of the family must first be presented with this. If by chance the presentation is overlooked or forgotten, it will induce enmity.’¹¹⁶

¹¹¹ Yamagata et al. (2001): 103.

¹¹² Pietrusewsky and Ikehara-Quebral (2006): 89.

¹¹³ Though remodelled well into the fifth century C.E., Needham et al. (1986): 445-446.

¹¹⁴ Needham et al. (1986): 446, translating Arousseau (1914): 15-16.

¹¹⁵ Li (1979): 8-13; Needham et al. (1986): 447-451.

¹¹⁶ Li (1979): 111.

Well beyond the Tang dynasty (618 to 906 C.E.) much of the coastline of Vietnam maintained its reputation as a producer of areca nuts which reportedly even found their way into alcoholic beverages.¹¹⁷

5.4. Complicating the linguistic analysis of betel chewing terminology in mainland Southeast Asia is the relatively greater scarcity of lexical data from the language families involved compared to Austronesian languages.¹¹⁸ For the Chamic speaking settlers in coastal Vietnam and their descendants, direct contact with Mon-Khmer speakers for over two thousand years has also resulted in extensive mutual borrowings but at least one term associated with betel chewing shows a continuity between Proto-Austronesian and Chamic. The Acehnese¹¹⁹ form *gapu* ‘lime in betel quid’ was transmitted from its Proto-Austronesian root through Proto-Chamic to Acehnese.¹²⁰ For the Proto-Chamic reconstruction **pina:ŋ* ‘areca palm, areca nut’ cognate forms are widely distributed within the Western Malayo-Polynesian language group (e.g. *pinay* in Malay, Javanese and the languages of Kalimantan)¹²¹ suggesting a common ancestry in Proto-Malayo-Chamic **pinay*. This evidence supports that Austronesian speakers reaching Vietnam were already familiar with areca nut and lime as were their Austronesian speaking ancestors.

A broadly attested etymon **ml[əw]* has been reconstructed for Proto-Mon-Khmer,¹²² and based on its reflexes we can assign as its gloss ‘betel leaf’.¹²³ A similarly well documented Proto-Mon-Khmer reconstruction referencing ‘areca nut’ has not been described. By some estimates Proto-Mon-Khmer broke up into subgroups some time before 3000 B.C.E.,¹²⁴

¹¹⁷ E.g., Schafer (1963): 141, 142; Schafer (1967): 72, 175.

¹¹⁸ Another general limitation in the use of lexical and reconstructed linguistic data for the terminology of betel chewing is the occasionally observed lack of differentiation between ‘betel’ – ‘betel leaf’ - ‘betel quid’ and ‘lime’ - ‘lime in betel quid’ - ‘betel quid’.

¹¹⁹ Future Acehnese speakers migrated to northern Sumatra after the decline of the Cham empire in Vietnam, hence Acehnese is a Chamic language; Thurgood (1999): 23.

¹²⁰ Thurgood (1999): 354; Graham Thurgood (2008): pers. communication.

¹²¹ Mahdi (1998): 405; Thurgood (1999): 300.

¹²² Shorto (2006): 478, #1860. Mahdi (1994): 477; Mahdi (1998): 404-405, has **blu[?]*.

¹²³ As opposed to ‘betel quid’ which would imply the use of areca nut and lime as well. See data in Mahdi (1998): 404; Sidwell and Jacq (2003): 151. In Aslian languages of Peninsular Malaysia the form *blök* ‘areca nut’ (!) can be found (Skeat and Blagden (1916): II, 515, #125), though its genetic relationship to related forms in other Mon-Khmer languages is uncertain; Shorto (2006): 478, see also Blench (2006): 3-4.

¹²⁴ Pejros and Shnirelman (1998): 380; Higham (2002): 225-226; Blench (2006): 3.

and this would imply a remarkable time-depth for a knowledge of the betel leaf. However, one must stress the uncertainty about the phyletic structure of the Mon-Khmer family and, in particular, any dates assigned to its evolution.

Equally unresolved is the relation of the Proto-Mon-Khmer **ml[əw]* to attested Austronesian forms referencing ‘betel leaf’. The suggestion that this ‘culture-word’ was borrowed from an Austronesian reconstruction **buyuq* can be rejected on phonological grounds alone.¹²⁵ Conversely, multiple loans of a reflex of **ml[əw]* into Austronesian languages as far as Western Micronesia starting at a ‘very early date’ have been proposed,¹²⁶ though would require a significant revision of the known pattern of contact between the populations involved. There is, however, agreement that it was the source of later loans into the Daic languages Thai and Shan of Thailand.¹²⁷ The Proto-Mon-Khmer reconstruction **sla?* ‘leaf’¹²⁸ is reflected in some Mon-Khmer languages as ‘leaf *par excellence* = betel leaf’¹²⁹, yet in others, like Old Khmer *slā*, metonymically referencing ‘areca palm’.¹³⁰ A reflex of proto-Mon-Khmer **sla?* was also the source of Proto-Chamic **sula* with the meaning ‘leaf/betel leaf’.¹³¹

The etymology of the Chinese terms for betel chewing ingredients substantiates their introduction from ‘South of the mountains’. A reflex of Proto-Malayo-Chamic **pinan* was likely borrowed from Chamic speakers (or conceivably Malayic speakers on one of the islands) to become Chinese *bin lang* ‘areca nut’.¹³² This phonetic transcription, literally meaning ‘honoured guest’, was accomplished with the characters *bin*

¹²⁵ Robert Blust (2008): pers. communication.

¹²⁶ Mahdi (1994): 477; Mahdi (1998): 404-405.

¹²⁷ Pzyluski (1929): 16; Diffloth (1984): 88; Mahdi (1998) 404; Shorto (2006): 478.

¹²⁸ In all documented Munda languages cognate forms of likely a common Austroasiatic root are attested (e.g. Kharia *ula?* ‘leaf’), though they never reference ‘betel leaf’. Instead the terminology for betel ingredients in Munda languages reflects loans from Indo-Aryan languages, e.g. Kharia *pān* ‘betel leaf’ (< **parṇá*; Turner (1966): 446, #7918), *supari* ‘betel nut’ (< **suppāra*; Turner (1966): 778, # 13482). See Bodding (1929-1936); Donegan and Stampe (2008). Consequently, linguistic arguments would indicate that betel chewing reached Munda speaking tribes relatively late by way of contact with Indo-Aryan speakers.

¹²⁹ Compare **buaq* ‘fruit/areca nut’ in Malayo-Polynesian languages.

¹³⁰ Shorto (2006): 119, #230.

¹³¹ Thurgood (1999): 331; Graham Thurgood (2008): pers. communication.

¹³² It is found in Sino-Vietnamese as *binh lang* or *tân lang* ‘areca’; Davidson (1975): 604. See also note 90.

‘guest’¹³³ and *lang* ‘Sir’¹³⁴ while the addition of the wood radical *mu* to both *bin* and *lang* indicated its association with a tree.¹³⁵ The synonym *bin men yao jian* used in the *Nanfang Cao Mu Zhuang* translates as ‘guest [at the] door medicinal sweetmeat’.¹³⁶ In both cases the primary reference is to areca nut as a symbol of hospitality.

The early Han term *ju jiang* (*ju* berry sauce)¹³⁷ initially referred to the product of *P. nigrum* L. and only after the fifth century C.E. it also references by mistaken identification *P. betle*. L.¹³⁸ Of an earlier date is *fu liu* (with a number of variations)¹³⁹ ‘betel leaf’ which is attested in the *Nanfang Cao Mu Zhuang*. It appears to be a phonetic transcription from a Mon-Khmer language.¹⁴⁰

5.5. The evidence to address the prehistory of betel chewing further west in mainland Southeast Asia primarily consists of dentitions. On the coast of the Gulf of Siam the cemetery of Khok Phanom Di [10] belonged to a hunter-gatherer community from about 2000 to 1500 B.C.E. Based on the ample dental remains there was no indication that during any phase of the occupation areca nut was chewed.¹⁴¹ The extensive skeletal series of Ban Chiang in northeast Thailand [11] stretching from about 2100 B.C.E. to 200 C.E. documents the difficulty of interpreting tooth stains in this population transitioning to wet rice agriculture. Even though there was some staining of teeth at Ban Chiang, it was not the tell-tale dark red-brown typically accompanying betel chewing. Other indicators, such as greater tooth wear and greater than expected calculus (mineralized plaque) formation that significantly increased during the later phases of the occupation, could have been caused by a newly acquired cultural activity such as betel chewing. However, a change in diet like greater intake of protein or carbohydrates are equally likely causes

¹³³ Giles (1912): 1123, # 9247.

¹³⁴ Giles (1912): 854, # 6779.

¹³⁵ *bin lang shu* ‘areca nut tree’ in the *Linyi Ji*; Needham et al. (1986): 445; explained by Imbault-Huart (1894): 817-818; Mayr (1983): 276; see also Bretschneider (1895): 430.

¹³⁶ Li (1979): 111.

¹³⁷ Watson (1991): II, 291-292, attesting *ju jiang* in 135 B.C.E. Needham et al. (1986): 384, incorrectly identify betel pepper in this passage.

¹³⁸ Li (1979): 46-53, discusses in detail the conflation surrounding *ju jiang*. See also Dalby (2000b): 74-75.

¹³⁹ Imbault-Huart (1894): 313.

¹⁴⁰ Mahdi (1998): 406.

¹⁴¹ Tayles (1999): 277; Highham (2004): 44- 46.

for increased calculus.¹⁴² The dental remains from the mortuary series of Non Nok Tha, located about 70 miles southwest of Ban Chiang and dated to about 3000 to 500 B.C.E. showed no sign of betel chewing except a high frequency of dental calculus.¹⁴³ Equally inconclusive is the evidence from the skeletal series of nearby Non Pa Kluay of roughly the late second millennium B.C.E. where only a small percentage of teeth had 'betel stains'.¹⁴⁴

In a palynological study of three archaeologically relevant sites across Thailand only the core samples from a lake near Trang in Southern Peninsular Thailand [12] indicated a presence of the areca nut palm. There were merely traces of *Areca sp.* pollen for the time period between 6600 to 4000 B.P., but after 1500 B.P. there was an indication that *A. catechu* L. had been cultivated systematically with additional evidence for the presence of *Piper sp.*¹⁴⁵ To summarize, no site from Thailand has provided conclusive evidence for betel chewing before the common era as of yet. Unless this reflects gaps in the record or taphonomic issues, it would indicate a relatively late diffusion of the betel chewing habit into this region which runs contrary to what is commonly believed.¹⁴⁶

5.6. Based on linguistic evidence alone it appears that on the eastern rim of the Southeast Asian mainland betel pepper was known very early, and long before we have any evidence for the presence of the areca nut. If correct, this implies that either the natural distribution of *P. betle* L. included this part of the mainland or that an earlier transfer by humans occurred. The Austronesian speaking settlers ancestral to the Chamic people arriving early in the first millennium B.C.E. seem to have brought with them a notion of the use of the areca nut, but linguistic loan patterns do *not* suggest that Mon-Khmer speaker owed their knowledge of betel chewing to those Austronesian speakers. Material remains indicate that by the middle of the first millennium B.C.E. betel chewing was practised from the Mekong Valley along the coastline of Vietnam to the Red River Delta from where it diffused into South China. Its further westerly

¹⁴² Pietrusewsky and Toomay Douglas (2002): 59, 76; Toomay Douglas and Pietrusewsky (2007): 311-314.

¹⁴³ Toomay Douglas and Pietrusewsky (2007): 311.

¹⁴⁴ Pietrusewsky (1988): 5.

¹⁴⁵ Maloney (1999): 136; White et al. (2004): 115; 116, fig. 3; dating based on uncalibrated radiocarbon data.

¹⁴⁶ E.g. Rooney (1992): 20.

movement deeper into mainland Southeast Asia might have occurred closer to the common era based on the limited evidence at hand.

6. Pacific Islands

6.1. For Western Micronesia, historical accounts from the time of first European contact described that on the Mariana Islands [13]¹⁴⁷ indigenous Chamorro ‘continuously’ chewed a betel quid¹⁴⁸ and that the women commonly stained their visible teeth black. Detailed chemical analysis of a tooth of a female from the Latte period (1000 to 1521 C.E.) presumed to have been ‘blackened’ proved that the brown residue indeed contained areca nut alkaloids, though the authors’ other conclusion that on the Marianas ‘women did not chew areca nut on a regular basis’ is clearly wrong.¹⁴⁹ Further evidence from the Marianas dated to the pre-Latte (first millennium) to Latte periods, including staining as well as patterns of dental pathology, indicates that betel chewing was widely practised.¹⁵⁰ On Guam, the southernmost of the Mariana Islands, archaeological findings of shell containers filled with slaked lime point in the same direction.¹⁵¹ An even earlier, well-documented date is provided by the investigation of 3000 year old burial sites at Chelechol ra Orrak on the island of Palau [14] where reddish stains on teeth, and, so it is presumed, the use of betel, were very common amongst adults.¹⁵² Whether the observed concentration of stains on antemolar teeth was primarily due to deliberate staining or betel chewing cannot be resolved based on the evidence presented.¹⁵³ The early use of areca nut appears to be supported by microfossil pollen records for Palau that indicate a presence of *A. catechu*

¹⁴⁷ The Northern Mariana Islands together with Guam to the south constitute the Mariana Islands.

¹⁴⁸ Lévesque (1993): 465.

¹⁴⁹ Hocart and Fankhauser (1996): 284-285.

¹⁵⁰ See the well documented study by Leigh (1929), but also Hanson and Butler (1997): 280; Pietrusewsky et al. (1997): 331.

¹⁵¹ Carucci and Mitchell (1990): 47.

¹⁵² Fitzpatrick (2003): 60-61; Fitzpatrick et al. (2003): 722.

¹⁵³ This view presented differs from that of the authors of the study who believe to have proven betel chewing.

L. at roughly compatible dates, though no concomitant evidence for the presence of a *Piper* species was found.¹⁵⁴

Reflexes of Proto-Austronesian **buaq* ‘areca nut’ in Chamorro and Palauan confirm the notion that the areca nut palm was introduced to the Marianas and Palau with the settlement by Austronesian speakers from the Philippines and/or eastern Indonesia.¹⁵⁵ The areca nut tradition would therefore date to about 1500 B.C.E. in the Marianas and 1000 B.C.E. for Palau,¹⁵⁶ though earlier dates for the occupation by Austronesian speakers have been proposed.¹⁵⁷ The linguistic data for ‘betel pepper’ on the other hand have been subject to divergent interpretations and, given the lack of other evidence, the date of its introduction in Western Micronesia remains unresolved.¹⁵⁸

There is a scarcity of findings from Melanesia except for untested dental staining reported from the St. Matthias (Mussau) Islands of the Bismarck archipelago [15] with a date of 1600 to 500 B.C.E.¹⁵⁹ These dental remains are connected with the earliest sites of the distinctive ‘Lapita cultural complex’ for which the use of lime as infill material for pottery has been noted as one of its innovations.¹⁶⁰ A broad set of lexical items related to betel chewing, such as for ingredients and implements, have been reconstructed to Proto-Oceanic, an Austronesian subgroup whose homeland is sought in the Bismarck Archipelago.¹⁶¹ If we tentatively accept the connection between the Lapita culture and the Oceanic language group,¹⁶² the conclusion would be that Austronesian speaking settlers introduced betel chewing and maybe with it the use of lime in decorating pottery to the Bismarck islands. After about 1500 B.C.E. betel chewing spread from there as part of the Lapita diaspora across the Southwest Pacific into the Solomon Islands and the Santa Cruz area.

¹⁵⁴ Athens and Ward (1999b): 170. In a study from Guam there was actually a *decrease* in the *Piper* sp. signal synchronous with the appearance of *A. catechu* L. pollen; Athens and Ward (1999a): 146.

¹⁵⁵ Chamorro and Palauan do not belong to the Oceanic subgroup of the Austronesian language family, but are unclassified members of the Malayo-Polynesian subgroup; Pawley (2002): 255.

¹⁵⁶ Lichtenberk (1998): 353; Pawley (2002): 256.

¹⁵⁷ Athens and Ward (2004): 26-27.

¹⁵⁸ Lichtenberk (1998): 345; Mahdi (1998): 404-405.

¹⁵⁹ Kirch et al. (1989): 73.

¹⁶⁰ Kirch (1987): 172; Lichtenberk (1998): 352-353.

¹⁶¹ Tryon (1994): 486; Lichtenberk (1998): 343-351.

¹⁶² Pawley (2002): 259.

6.2. On the Pacific Islands, betel chewing is only one of the two addictive habits based on a *Piper* species. The other is kava, a psychoactive drink prepared from the root and basal stem of *Piper methysticum* G. Forster.¹⁶³ The discussion about the relationship between betel chewing and kava consumption in the Pacific region was initiated when different migration patterns for so-called ‘kava-people’, followed by a wave of ‘betel-people’ were postulated.¹⁶⁴ This theory has since been disproven.¹⁶⁵ Cytogenetic analysis of cultivars of *P. methysticum* G. Forster has pinpointed the origin of kava in northern Vanuatu and mapped its easterly diffusion across the Pacific islands.¹⁶⁶ Comparable data to help trace the movements of *P. betle* L., which has received far less attention in the Oceanic area than kava, have unfortunately not been produced. A plausible hypothesis is that with the domestication of *P. methysticum* G. Forster in northern Vanuatu kava drinking replaced betel chewing in the subsequent migrations of Austronesian speakers further into Polynesia. In effect this helped to create the complementary pattern of betel chewing and kava drinking observed in the Pacific Islands.¹⁶⁷

7. South Asia

7.1. On the Indian subcontinent significant archaeological evidence to trace the introduction of betel chewing is absent, and lexical data as well as textual material become the most important resources to address the origins of betel chewing. Dravidian speakers are likely to have been a dominant force in the development of the Neolithic of the southern Indian peninsula, the so-called Southern Neolithic, from about the middle of the third millennium B.C.E. In the Dravidian language family, three major subgroupings are distinguished: North, Central and South Dravidian with the latter represented by the well-recorded literary languages of Telugu, Tamil, Malayalam and Kannada amongst less documented languages.¹⁶⁸ A term for the areca nut **aṭ-ay-kkāy* can be reconstructed with

¹⁶³ Onwueme (2000): 106; Rättsch and Müller-Ebeling (2003): 395-397.

¹⁶⁴ Codrington (1891): 1-2; Rivers (1914): II, 252-255; Seyfarth (1981): 560.

¹⁶⁵ Lebot et al. (1992): 51-56.

¹⁶⁶ Refuting the updated version of Rivers’s argument in Brunton (1989): 83-87.

¹⁶⁷ Lichtenberk (1998): 354-357.

¹⁶⁸ Southworth (2005): 48-51; Fuller (2007): 413-415.

strong support to Proto-South Dravidian.¹⁶⁹ The evidence for a reconstruction of a separate form **pōka* ‘areca nut/palm’ to the higher level and hence older Proto-Dravidian¹⁷⁰ is comparatively weak. Besides the South Dravidian Tamil, Malayalam, Tulu, Telugu and Kuwi, a reflex is attested in only one Central Dravidian language, Kolami, in the general meaning ‘betel’, possibly as a result of later borrowing from Telegu.¹⁷¹ The etymon **vett-ilai* ‘betel leaf’ securely reconstructs to a subgroup of Proto-South Dravidian,¹⁷² but if we accept the existence of a Telugu cognate *betré/betlé* ‘betel leaf’,¹⁷³ **vett-ilai* can be reconstructed to Proto-South Dravidian as well.¹⁷⁴

In summary, linguistic analysis confirms that neither areca nut nor betel leaf were native to southern India. They were probably introduced in the time period before the breakup of Proto-South Dravidian which is estimated to have occurred around 1500 B.C.E.¹⁷⁵ Two other tree crops adopted in India from Southeast Asia, *Cocos nucifera* L. and *Santalum album* L. (sandalwood), are also reconstructable to Proto-South Dravidian. For sandalwood charcoal evidence dates its presence in South India to 1400 to 1300 B.C.E., i.e. the latest phase of the Southern Neolithic.¹⁷⁶ Thus the betel ingredients may have been part of a larger influx of new plant species from the Indonesian archipelago sometime around the middle of second millennium B.C.E. The use of sandalwood and the practice of betel chewing are examples of significant changes in aesthetic ideals,

¹⁶⁹ Burrow and Emeneau (1984): 11, #88; Southworth (2005): 211; Fuller (2007): 427. Krishnamurty (2003): 9, reconstructs to Proto-Dravidian and considers the areca nut palm a native species, but based on biogeographical arguments and specific criticism in Fuller (2007): 421, this can be rejected. A reflex of **at-ay-kkāy* through Portuguese was the source of English ‘areca’; Furtado (1960).

¹⁷⁰ Southworth (2005): 83, based on Burrow and Emeneau (1984): 361, #4048. In the same volume Southworth (2005): 222, also presents a slightly different reconstruction **pōkku*. Krishnamurty (2003): 9, has **pānk-*.

¹⁷¹ Southworth (2005): 237, points out the high likelihood of borrowing in particular from Telugu into Central Dravidian languages.

¹⁷² According to Southworth (2005): 50, 211; based on Burrow and Emeneau (1984): 502, #5515, it reconstructs to the subgroup Proto-South Dravidian 1. A reflex of **vett-ilai* through Portuguese was the source of English ‘betel’.

¹⁷³ Crawford (1869): 89.

¹⁷⁴ Aiyar (1931) discusses possible Austroasiatic roots of the Dravidian form with no firm conclusion.

¹⁷⁵ Southworth (2005): 327.

¹⁷⁶ Fuller (2007): 426-427.

medicine and ritual practice that accompanied the transformation of Southern Neolithic society in response to outside contact.¹⁷⁷

7.2. Turning to the linguistic history of betel chewing terminology in Indo-Aryan languages, the most widely represented language family in South Asia,¹⁷⁸ the Old-Indo-Aryan form *pūga* ‘areca nut’ is thought to be derived from the Dravidian **pānkk*.¹⁷⁹ The form *tāmbūla* ‘betel leaf’ on the other hand appears to be a loan from an Austroasiatic source reflecting **ml[əw]* (or **bl[əw]*),¹⁸⁰ even though the initial *tām-* remains so far unexplained.¹⁸¹ In support of the Austroasiatic origin of *tāmbūla* one can also adduce Indo-Aryan **bār* ‘betel’ that is reflected in Sanskrit and Bengali, e.g. in *bāruī* ‘caste of the betel leaf growers’.¹⁸² On phonological grounds it has been argued that *tāmbūla* reached Sanskrit by way of one of the Munda languages spoken by hill tribes in Eastern and parts of Central India,¹⁸³ but in light of the absence of any cognate Munda forms,¹⁸⁴ a Mon-Khmer language must be considered the most likely source.

7.3. While these linguistic data point towards the source of the introduction of betel chewing among Indo-Aryan speakers, other questions can be addressed through textual references. The deep literary tradition of the Indo-Aryan languages stretches back beyond the middle of the second millennium B.C.E. and allows us to explore when and where betel chewing first became a noteworthy practice.

¹⁷⁷ Boivin et al. (in press).

¹⁷⁸ See, e.g., Southworth (2005): 40-42.

¹⁷⁹ Burrow (1947): 386; Turner (1966): 471, #8313; Mayrhofer (1998): III, 332.

¹⁸⁰ Przulski (1929): 15-19; Kuiper (1938): 305; Turner (1966): 329, #5776; Mayrhofer (1998): 242.

¹⁸¹ Przulski (1929): 17, notes the prefix *ta-* that precedes the names of plants in some Mon-Khmer languages, though it is not detectable in any of the known reflexes of **ml[əw]*.

¹⁸² Przulski (1929): 18; Turner (1966): 520, #9213; Penzer (1927): 270-275, for various reflexes of **bār* in Bengali.

¹⁸³ Kuiper (1948a): 70-71; Kuiper (1948b): 383. A local, ‘Indic’ origin as suggested by Mahdi (1998): 405, seems equally unlikely.

¹⁸⁴ See note 128.

7.3.1. Despite claims to the contrary,¹⁸⁵ none of the works of the Vedic period which ended around 700 B.C.E. contain any convincing references to the betel habit. Such references are also absent from the later and rather encyclopedic epic *Mahābhārata*. Only in a single edition of a subrecension of the *Rāmāyaṇa* is the term *tāmbūlika* ‘betel seller’ present,¹⁸⁶ but this variant reading is of a relatively late date.¹⁸⁷ In its archetypal form the *Rāmāyaṇa* reflects the time period between 750 and 500 B.C.E. before the rise of Buddhism and the imperial dynasty of Magadha in their capital Pāṭaliputra [16].¹⁸⁸ Notions of southern peninsular India or Sri Lanka are vague in the epos¹⁸⁹ which might explain why betel chewing is omitted in any descriptions of southern scenes or characters. We may also speculate that at the time of the composition of the *Rāmāyaṇa* betel chewing had not made its way to the Ganges watershed where some of the events in the older parts of the epic take place, even though it is impossible to attach any specific date to this hypothesis.

7.3.2. The Sri Lankan Chronicles *Dipavaṃsa* (Chronicle of the Island, after third century C.E.)¹⁹⁰ and *Mahāvāṃsa* (Great Chronicle, ca. fifth century C.E.)¹⁹¹ provide the first textual evidence on betel ingredients in northern India. These chronicles make reference to Ashoka of Pāṭaliputra since he sent the first Buddhist missionaries to the island. The following passage of the *Dipavaṃsa* details the legendary events surrounding Ashoka’s consecration around 270 B.C.E.:¹⁹²

¹⁸⁵ See Bhat and Rao (1962): 14; McDonell and Keith (1967); Agrawala (1977) for unconvincing arguments.

¹⁸⁶ Turner (1966): 329, # 5776.

¹⁸⁷ It appears as a variant of *prāvārika* ‘maker of upper garments’ in *Rāmāyaṇa* 2.90.23 of Gorresio’s (1843-1858) edition of the Bengal sub-recension of the northern recension of the *Rāmāyaṇa*; Goldman (1986); Robert Goldman (2008): personal communication. For the material culture represented in the *Rāmāyaṇa* see, e.g. Guruge (1960); Vyas (1967).

¹⁸⁸ Goldman (1984): I, 14-23.

¹⁸⁹ Goldman (1984): I, 27-28.

¹⁹⁰ Law (1959).

¹⁹¹ Turnour (1909); Geiger (1960); Guruge (1989); Bullis (2001). See Guruge (1989): 175-192, for a detailed discussion of the Chronicles’ textual history.

¹⁹² Guruge (1989): 162.

‘At that time the gods always brought the celestial tooth-sticks¹⁹³ and the betel leaves,¹⁹⁴ fragrant, grown on the mountain, soft, glossy, sweet, full of juice and pleasing ... [and] the celestial sugar-cane, a quantity of areca nut¹⁹⁵ and a yellow cloth.’¹⁹⁶

This description is echoed by another one, set four years after Ashoka’s coronation on the occasion of his conversion to Buddhism when he is said to have distributed large amounts of ‘tooth-sticks and betel leaves’¹⁹⁷ to the monastic community. These passages, mainly intended to illustrate Ashoka’s wealth and generosity, imply that a supply of the ingredients of the betel quid was available in Pāṭaliputra at the time.

For Sri Lanka, too, the *Mahāvamsa*,¹⁹⁸ which chronicles events on the island beginning with the legendary arrival of the Indo-Aryan prince Vijaya on the day of the demise of the Buddha,¹⁹⁹ provides the first reference to betel chewing.²⁰⁰ During the construction of the *Mahāthūpa* (Great Stupa) in Anurādhapura, king Duṭṭhagāmaṇī rewarded the work-

¹⁹³ *dantakaṭṭha*.

¹⁹⁴ *nāgalatā*.

¹⁹⁵ *pūga*.

¹⁹⁶ *Dipavamsa* 6.4, 6.10. Law (1959): 170, renders *nāgalatādanthakaṭṭha* as ‘tooth-stick of the *nāga*-creeper’ and, according to Rhys Davids and Stede (1921-1925): 349, 580, *nāga* in this composite stands for ‘ironwood tree’ (*Mesua ferrea* L.). This large, buttressed tree with tasteless and inodiferous wood, evidently does not fit the description here. The correct identification for Pāli *nāgalatā* is *Piper betle* L., compare Sanskrit *naḡalatā* ‘betel vine’ (*nāga* ‘snake’ since the betel leaf resembles the hood of the cobra, *latā* ‘creeper’) and Sinhalese *nāgalatā*, *nagā* ‘betel’ (Clough (1892): 282-283). Since the stem of *P. betle* L. was not used as a tooth-stick, the term can be divided into two items ‘betel (leaves) and tooth-sticks’. Guruge (1989): 510, 749, suggests the same solution for the corresponding passage *Mahāvamsa* 5.25, in which areca nut is not mentioned.

¹⁹⁷ *Mahāvamsa* 5.75., Guruge (1989): 513, 753, *nāgalatādanthakaṭṭha*.

¹⁹⁸ Different references from the *Mahāvamsa* that Lewin (1880): 8, gives for the earliest accounts of betel chewing have been frequently quoted, e.g. Hartwich (1911): 586, Burton-Bradley (1979): 481; Rooney (1983): 14. However, the story of a gift of betel leaves by a princess to her lover as part of the legend of Paṇḍukābhaya ‘from around the year 504 B.C.E’, in reference to *Mahāvamsa* 9.16. cannot be considered authentic for either date or details of the event (Compare the translations by Turnour (1909): 37 and Geiger (1964): 66). Lewin also relates an episode from Duṭṭhagāmaṇī fight against the Tamils ‘in 161 B.C.E.’, during which his enemies noticed Duṭṭhagāmaṇī’s ‘blood-red’, betel-stained lips and spread the rumour that he was wounded. We have been unable to find the source of this story.

¹⁹⁹ Depending on the tradition 544/543 B.C.E. or, more likely, around 485 B.C.E.; Guruge (1989): 277-280.

²⁰⁰ See Carpentier (1977) for a general review of betel chewing in Sri Lanka.

ers not just with money, clothing, food and drink, fragrant flowers and sugar, but also with *mukhavāsakapañcaka*, the five perfumes for the mouth.²⁰¹ These are explained in a commentary as betel with additional aromatic ingredients such as camphor.²⁰² If this event in the middle of the second century B.C.E. is indeed relayed authentically,²⁰³ it constitutes the earliest reference anywhere to betel chewing in conjunction with other flavourants.

7.3.3. In northern India areca nut and betel leaf were integrated into the emerging medical system of *āyurveda* as far back as transmitted sources reach. The older layer of the *Carakasamhitā* from around the first century C.E.²⁰⁴ describes a betel quid without lime, but with a number of added aromatics to be used as part of *mātrāshītīya*, the daily regimen for well-being:

‘One desiring clarity, taste and good smell should keep in his mouth the fruits of nutmeg,²⁰⁵ musk seed,²⁰⁶ areca nut,²⁰⁷ cubeb,²⁰⁸ small-cardamom²⁰⁹ and clove,²¹⁰ fresh betel leaf²¹¹ and exudate of camphor²¹².’²¹³

By the beginning of the common era, regular chewing of a betel quid was apparently recognized as integral part of oral hygiene, and this notion stretched as far as Kashmir, the putative region of origin of the

²⁰¹ *Mahāvamsa* 30.18-19; Geiger (1958): 235; Guruge (1989): 932.

²⁰² The commentary is the *tikā* of the eighth or ninth century C.E.; Guruge (1989): 298-304. See Penzer (1924-1928): VIII, 246-248, for some introductory remarks on the ‘five aromatics’. We avoid the term ‘spices’ with its culinary connotation in lieu of ‘aromatics’.

²⁰³ Geiger (1960): XXII, considers this a time period for which the *Mahāvamsa* is generally historically reliable.

²⁰⁴ For a discussion of the date, see Meulenbeld (1999): IA, 105-115.

²⁰⁵ *jātīphala*, *Myristica fragrans* Houtt., Abdul Kareem (1997): 97.

²⁰⁶ *kaṭuka*, *Abelmoschus moscatus* Medicus; Abdul Kareem (1997): 1.

²⁰⁷ *pūga*.

²⁰⁸ *kakkola*, *Piper cubeba* L.f.; Abdul Kareem (1997): 109.

²⁰⁹ *sūksmailā*, *Elettaria cardamomum* (L.) Maton var. *cardamomum*; Abdul Kareem (1997): 58.

²¹⁰ *lavaṅga*, *Syzygium aromaticum* (L.) Merr. et Perry; Abdul Kareem (1997): 133.

²¹¹ *tāmbūla*.

²¹² *karpūra*, derived from different sources, see Donkin (1999).

²¹³ *Carakasamhitā*, *Sūtrasthāna* 5.76cd-77; translation after Sharma (1981): I, 39. See also Meulenbeld (1999): IA, 13-14.

Carakasamhitā.²¹⁴ The somewhat later *Suśrutasaṃhitā*²¹⁵ enumerates in detail the properties and actions of areca nut and betel leaf in the terminology of *āyurveda*,²¹⁶ thus developing a theoretical basis for specific health benefits of frequent chewing of betel:

‘Chewing betel leaves with powder of camphor, nutmeg, cubeb, clove, musk seed, lime and areca nut [...] mitigates excess salivation, is good for the heart, and cures diseases of the throat; it is beneficial soon after getting up from sleep, partaking meals, bathing and vomiting.’²¹⁷

In summary, by constructing a medicinal rationale for frequent betel chewing these early medical works added an important dimension to the enduring adoption of the habit in India. The incorporation of aromatic plant products into the betel quid can be documented after the beginning of the common era across South Asia. Whether this practice actually originated in South Asia is unresolved but its absence in other areas like Vietnam is of note.²¹⁸ Some of the flavourants utilized, like nutmeg and clove had to be imported from as far away as the Moluccas, and a connection between increasingly aromatized betel quids and the emerging trade in aromatics seems probable.

7.4. Betel chewing in northern India can be dated to some time after 500 B.C.E., i.e. around a millennium later than linguistic data suggest for South India. By this time local trade networks across the Indian subcontinent²¹⁹ and long-distance trade within the ‘Bay of Bengal interaction sphere’²²⁰ were active and must have brought Indo-Aryan speakers increasingly in contact with different betel chewing populations. This could explain why the earliest documented Indo-Aryan reference to are-

²¹⁴ Jan Meulenbeld (2004): pers. communication, on the geographical origin of the *Carakasamhitā*.

²¹⁵ See Meulenbeld (1999); IA, 333-352, on the date.

²¹⁶ *Suśrutasaṃhitā*, *Sūtrasthāna* 46.201, 279-280; Murthy (2000): I, 224, 235. Discussed by Strickland (2000): 89-91.

²¹⁷ *Suśrutasaṃhitā*, *Cikitsāsthāna* 24.21-23; translation after Murthy (2000): III, 224; Meulenbeld (1999): IA, 276. See also *Suśrutasaṃhitā*, *Sūtrasthāna* 46.495; Murthy (2000): I, 448.

²¹⁸ For an early third century C.E. example from South India, see *Maturaikkañci* 436-438; Cheliah (1962): 253. On Vietnam, see Nguyễn (2006): 501.

²¹⁹ Smith (2002).

²²⁰ Gupta (2005).

ca nut was derived from a Dravidian source whereas the term for betel leaf is related to forms from Mon-Khmer languages of mainland South-east Asia. Betel chewing is documented in the early Buddhist culture of Sri Lanka in the last centuries before the common era. This might significantly underestimate the arrival of areca nut and betel pepper on the island if the betel quid reached South India via Sri Lanka.

8. Beyond South Asia

At the beginning of the common era Buddhist culture expanded north into Central Asia, and with it travelled apparently a demand for betel ingredients. The Kharoṣṭhī documents of the third century C.E. discovered in Niya in Chinese Turkestan [17]²²¹ give glimpses of life along the southern branch of the emerging Silk Road. From two of these tablets we learn that *drim̐pura* ‘betel’ had been ‘sent’.²²² In a climate more suited for growing pomegranates,²²³ neither betel leaves nor areca nuts could be produced locally. But the presence of black pepper, small cardamon and cinnamon bark²²⁴ confirms that imports from as far as South India reached this remote location north of the Tibetan plateau.

The further northwesterly path of *tāmbūl* into Persia²²⁵ followed the increasingly frequented trade routes from India either overland or by sea. Ibn Baṭṭūṭa (ca. 1330) described plants of *P. betle* L. in Dhofar on the southern coast of the Arabian peninsula (today’s Oman)²²⁶ at a time when the chewing of *qāt* (*Catha edulis* Forssk.) had probably not yet been introduced to the region from Ethiopia.²²⁷ It is unknown when betel chewing made its entrance to the coastal regions of Northeast Africa,²²⁸ but quite certainly it approached the occidental fringes of its expansion

²²¹ These documents, dated 235 to 325 C.E. were discovered by Sir Aurel Stein. They are written in a Prakrit and named for the Kharoṣṭhī script used.

²²² Burrow (1940): 16, # 77; 144, #721. See also Agrawala (1970): 280; Atwood (1991).

²²³ Burrow (1940): 129, #612 and *passim*.

²²⁴ Burrow (1940): 141, #702: *marica*, *suṣmala*, *tvaca*; the latter not identified by Burrows.

²²⁵ Steingass (1957): 277.

²²⁶ Ibn Baṭṭūṭa (1929): 114.

²²⁷ For the history of *qāt*, see Weir (1980): 71-76 and the excellent review by Varisco (2007). The relationship between betel and *qāt* chewing in this region is unexplored.

²²⁸ Ibn Baṭṭūṭa (1929): 111.

with Austronesian speakers as they migrated from Borneo to Madagascar sometime around the seventh century C.E.²²⁹

Archaeological evidence²³⁰ and references to *yavanas*, Graeco-Roman merchants, in early Tamil poetry²³¹ indicate the presence of foreigners as part of a trading colony, e.g. in Arikamedu, on the East Coast of southern peninsular India by about the second century B.C.E. Although these merchants must have witnessed betel chewing, the classical world of the Mediterranean, which was otherwise so open to the consumption of exotic pleasures, took no note of the habit or at least left no detectable mention of it.²³² It would take another fifteen hundred years till Marco Polo (ca. 1295) described the use of *tembul* in India for the first time to a European audience.²³³

9. Discussion

9.1. Reconstructing the prehistory of betel chewing presents a significant challenge since the betel quid combines products from two now widely distributed plants with the relatively ubiquitous inorganic lime. To develop a comprehensive synthesis of the diffusion of betel chewing across Asia, we have sought to mesh complimentary evidence from different disciplines. However, the lack of well-provenanced archaeobotanical findings in conjunction with limited biogeographical data presents a significant obstacle to a better understanding of the origins of the betel quid. For other domesticated plants, such as the edible banana in the genus *Musa*, DNA-based phylogenetic studies have greatly contributed to the understanding of their dispersal.²³⁴ Such biomolecular work is under way for the relatively confined genus *Areca*²³⁵ and promises to improve our understanding of its biogeography in the foreseeable future. The complexity of the pantropical genus *Piper* will present a more formidable obstacle to rapid advances in its biogeography.

²²⁹ This theory is based on linguistic affinities between Maanyan spoken in South Borneo and Malagasy. See Rasoloson and Rubino (2005): 456.

²³⁰ Begley (1983); Begley (1991); Coningham (2002).

²³¹ De Romanis (1997): 116-117; Karttunen (1997): 316.

²³² Betel leaf is *not* the equivalent of *malobathrum*, see Karttunen (1997): 157-160; Dalby (2000a): 198-199; Schoff (2001): 216.

²³³ Marco Polo (1938): I, 413.

²³⁴ Kennedy (2008).

²³⁵ Charlie Heatubun, Bogor (Indonesia) and Royal Botanic Gardens, Kew.

9.2. Betel staining of dentitions has been adduced as a means of identifying and contextually dating prehistoric populations of areca nut chewers. Yet, the exact source of archaeologically identified so-called ‘betel stains’ has eluded proof in all but one study where areca nut alkaloids were directly shown to be present in the residue removed from stained teeth.²³⁶ Since the parameters determining the patterns of stains caused by casual betel chewing and, more importantly, their taphonomy are insufficiently understood,²³⁷ assessing further markers correlated with betel chewing, such as calculus formation and attrition of teeth, is bound to produce more convincing results.²³⁸ Another issue is the conflation between the effects of betel chewing versus deliberate dyeing of dentitions in ethnohistorical descriptions that apparently began with the Han dynasty’s account of the inhabitants of the Red River Delta.²³⁹ Deliberate teeth blackening is a custom shared by many cultures, betel chewing or not, and usually does *not* involve areca nut as the main colourant.²⁴⁰ The two staining patterns will overlap when betel chewers had their teeth blackened in adolescence and continue to chew betel throughout their lives.²⁴¹ As the relationship between these two cultural practices becomes better understood from a historical and anthropological perspective, arguments about betel chewing that are based on dental remains might require reevaluation. Insights into the origins of teeth blackening would also shine light onto the evolution of aesthetical concepts in the respective cultural contexts. For example, teeth dyeing is largely absent from the Indian subcontinent as opposed to many betel chewing cultures further east.²⁴² This is reflected in Tamil and Sanskrit poetry which frequently praise beautiful white teeth in a culture of betel chewers.²⁴³

9.3. The usage of identical plant species for the betel quid across all betel chewing cultures is most parsimoniously explained with a diffusionist argument, i.e. the spread of the *complete* betel quid from a single

²³⁶ Hocart and Fankhauser (1996): 281.

²³⁷ See Leigh (1929): 267; Gowda (1951): 184, Reichart et al. (2006) for data underlining this issue.

²³⁸ See, e.g. Reichart et al. (2006).

²³⁹ See above and Maspéro (1918): 10

²⁴⁰ See, e.g. Huard (1951): 201.

²⁴¹ Leigh’s data (1929): 273 illustrate this point.

²⁴² Bailit (1968): 348.

²⁴³ E.g. in the Tamil epic *Maṇimekhalai* (ca. second century C.E.) canto 3, 6; Daniélou (1989): 11, 27.

region. As the deliberate mastication of the seed of *A. catechu* L. initiated the evolution of the betel quid, this choice of palm species, one may hypothesize, reflected a strategy to maximize the ingestion of its alkaloids.²⁴⁴ The allied ingredient lime is used in a broad range of other applications in indigenous cultures, e.g. as body and face decoration, as bleach for hair or as a pigment.²⁴⁵ Any serendipitous ingestion of lime with areca nut would have created an enhanced sensory impression on the chewer, because lime amplifies the physiological effects of the areca nut and reduces its astringency while at the same time turning the saliva bright red.²⁴⁶ The functional combination of an alkaloid containing plant with lime in a plant quid is not unique to betel chewing. It was developed a number of times with different plants in geographically disparate cultures, e.g. with coca (*Erythroxylon* spp.) in South America, with pituri (*Duboisia hopwoodii* (F. Muell.) F. Muell.) in Australia and with tobacco (*Nicotiana* spp.) as well as other species in the Americas.²⁴⁷

To explain the addition of the betel leaf, it has been proposed that a natural association of areca nut palm and betel pepper ‘prompted experiments by man’.²⁴⁸ But when seventh century Sanskrit story-teller Bāṇabhaṭṭa had ‘betel-nut trees entwined by creepers of betel’ in the forests of Central India,²⁴⁹ he did not describe a natural plant community. Rather, it either reflected a metaphoric nexus or, quite literally, already the practice of cultivating betel vine on supports of areca nut palms as documented later from various regions.²⁵⁰ The shape of *P. betel* L. leaves, their taste and content of physiologically active components make them a preferred choice over closely related species.²⁵¹ The common use of the leaves of *P. betel* L. contrasts with the geographically limited employment of its inflorescence to scoop up lime. Galvão’s ‘História das Molucas’ of about 1544 notes that the locals preferred the ‘ear’ (inflorescence) over the ‘Javanese leaf’.²⁵² There is no indication that the use of

²⁴⁴ No data are available on the alkaloid content of closely related palm species or known substitutes to shed light on this hypothesis.

²⁴⁵ Stone (1876): 44, 57; Lichtenberk (1998): 337, 352-353.

²⁴⁶ Responsible for the colouring are non-tannin phenolics, i.e. flavans, like catechin and epicatechin; Bavappa et al. (1982): 241.

²⁴⁷ McLeod (1930): 574; Dixon (1933): 150; Miner (1939); Rättsch and Müller-Ebeling (2003): 175, 190.

²⁴⁸ Donkin (1999): 186.

²⁴⁹ Verse 39 of Bāṇabhaṭṭa’s *Kādambarī*; Ridding (1974): 16; Layne (1991): 20.

²⁵⁰ See, e.g. Volkens (1902): 437; Balasubrahmanyam et al. (1994): 37.

²⁵¹ Ellen (1991): 100-101; Conklin (2007): 269-270, for other *Piper* sp. leaves used.

²⁵² Jacobs (1971): 57.

the flower stalk preceded the preparation of an actual quid, and more likely this practice represents a later regional specialization.

9.4. Given the gaps in the evidence, a cohesive narrative of the spread of betel chewing across Asia remains beyond reach, but a number of salient points emerge. There seem to be no specific data to corroborate the often voiced view that betel chewing originated in Malaysia or Java which lie centrally in the overall geographical area of betel use. ‘Austronesianists’ see it as established that from the Proto-Malayo-Polynesian phase in the northern Philippines about 4000 years ago betel chewing ingredients accompanied Austronesian speakers on their migrations,²⁵³ and at least as far as areca nut plus lime are concerned, the evidence supports this notion. Should future research find the home of the areca nut palm elsewhere in the Indo-Malaysian archipelago, its pre-Austronesian transmission eastward to the Philippines will require elucidation. The northerly expansion of betel chewing from the Philippines into Taiwan, if this was the sequence of events, is readily explained by documented continued trade contacts for several millennia after the initial southward move of Austronesian speakers.²⁵⁴

Very tenuously dated linguistic evidence indicates a knowledge of betel pepper on the Southeast Asian mainland amongst Mon-Khmer speakers before Austronesian speaker familiar with betel chewing made contact with the Vietnamese coastline around the beginning of the first millennium B.C.E. Much further east betel pepper must have been available to Austronesian speakers by about 1500 B.C.E to accompany their migration across the Pacific. Such widespread distribution of betel pepper across South East Asia by the second millennium B.C.E cannot easily be explained within the orthodox framework of the Austronesian migration alone.

During the second millennium B.C.E., betel chewing was introduced into southern peninsular India together with or somewhat after other tree species of Southeast Asian origin. Long-range Indian Ocean exchange networks whose products reached as far as the neolithic groups of the south Deccan plateau were apparently functioning earlier than is usually stressed for this region.²⁵⁵ The role of Sri Lanka as an initial point of connection between the eastern archipelago and the Indian subcontinent

²⁵³ E.g., Bellwood (2004): 29.

²⁵⁴ Hung et al. (2007): 19746.

²⁵⁵ E.g. by Glover (1996); Gupta (2002): 5.

is unclear at this point. For North India betel chewing can only be documented after 500 B.C.E. when contacts with different trade partners already familiar with betel chewing were in place.

The pre-Austronesian domestication of betel pepper and arboriculture of the areca nut palm cannot yet be conclusively demonstrated. However, the movement of numerous plants across Island South-East Asia, independent of and sometimes *against* the direction of the Austronesian expansion has been noted before.²⁵⁶ As new models of maritime migration and colonization in the Indo-Pacific region become available,²⁵⁷ the understanding of the movement of *A. catechu* L. and *P. betle* L. across Asia is bound to improve.

9.5. The remarkably ‘success’ of the betel quid over such a wide geographic area raises the question whether underlying factors can be identified. One can address this issue on different levels, namely that of hominid evolution, the specific botanical properties of *A. catechu* L. and *P. betle* L., the physiological effects of betel chewing and, finally, the cultural practices associated with the custom.

9.5.1. In an attempt to understand the significance of psychotropic substance use from prehistoric to modern times, an evolutionary model has been put forward.²⁵⁸ This perspective asserts an *adaptive* human propensity for the use of plant-derived secondary metabolites such as those from areca nut, *qāt*, coca and tobacco, acting as neurotoxins. Indeed, there are significant parallels between the employment of these different stimulants in humans, extending to the terms of delivery via the buccal mucosa and the pharmacological mechanisms of action as well as detoxification. However, if human substance seeking (‘pharmacophagy’) did evolve to provide pharmacological benefits to our hominid ancestors, exposure to such phytochemicals needed to have occurred broadly and on an evolutionary time scale. At least for the plants noted above the attested time-depth of usage is too limited to support such a model.²⁵⁹ Rather than being a *specific* evolutionary adaptation of our hominid an-

²⁵⁶ Mahdi (1998): 405; Blench (2004): 46; Kennedy (2008): 76.

²⁵⁷ See Anderson and O’Connor (2008), for a recent brief review.

²⁵⁸ Sullivan and Hager (2002), recently updated in Sullivan et al. (2008).

²⁵⁹ Sullivan and Hager (2002): 399, appear to overstate the time depth of known use for stimulants, e.g. *qāt*, for the sake of their argument. Sullivan et al. (2008) consider it plausible that the combination of plants with lime was consumed as early as 100000 years ago.

cestors, the commonalities in substance use for now appear to represent a exploitation of independently evolved biological mechanisms.

9.5.2. Some aspects of the botany of *A. catechu* L. and *P. betle* L. can help account for the dynamic expansion of betel chewing across Asia and the Pacific Islands. Since these two plants are adaptable and readily propagated, a local supply of the ingredients was accomplished in many subtropical and tropical locations within limits of sufficiently high temperatures and rainfall. A cluster of areca nut palms became a typical sight in the home and village gardens of betel chewing communities.²⁶⁰ This contrasts with other desirable plant products of the eastern archipelago, like nutmeg (*Myristica fragrans* Houtt.) and clove (*Syzygium aromaticum* (L.) Merr. et Perry) whose demanding requirements have always limited the dispersal of the actual plants. The ability to preserve, transport and trade areca nut and, to a lesser degree, betel leaf over long distances differs, e.g. from the highly perishable *qāt* leaf that must be consumed within two days of picking for full flavour and efficacy.²⁶¹ In the case of betel chewing this has allowed its expansion into areas unsuitable for growing the ingredients, e.g. from coastal or low-lying regions to montane areas,²⁶² and the shipment from places of high production to those of high demand.²⁶³

9.5.3. Similarly, the physiological responses betel chewing evokes could have been of importance in its diffusion. The ability of areca nut to suppress appetite²⁶⁴ and to combat fatigue has remained an incentive to this date to take a supply on long-distance travel as is shown by current use amongst the Nuaulu of South-central Ceram (Maluku).²⁶⁵ This practise could have played a particular role for the dispersal via trans-oceanic

²⁶⁰ So in an early third century C.E. description of a morning scene in the town of Maturai (present day Madurai) capital of the southern Indian Pāṇḍiya kingdom: ‘The sweep the sand-strewn courtyards where the bees and beetles hum, and green arecanuts fall.’ *Maturaikañci*, 753-754; Cheliah (1962): 269.

²⁶¹ Weir (1980): 28.

²⁶² E.g., Pommaret (2003), documents the expansion of betel chewing from India into Butan in the 19th century.

²⁶³ Coningham (2002): 104, gives an example of areca nut cargo found in a 1659 shipwreck headed from Sri Lanka to the Indian mainland. Borooah (2000): 381, illustrates for Northeast India how improved modes of transportation for betel leaf have expanded its usage.

²⁶⁴ Strickland et al. (2003).

²⁶⁵ Ellen (1991): 109.

voyages in the Indo-Malaysian archipelago and across the Pacific. An early recognition of the pharmacological qualities of *A. catechu* L. and *P. betle* L. is also demonstrated independently by their integration into the corpus of *āyurveda* in North India.

9.5.4. Very little is known about how betel chewing was integrated into cultural practices by its earliest users, but some general themes can be derived from ethnohistorical sources.²⁶⁶ The availability and straightforward preparation of a basic betel quid from the raw ingredients allowed access beyond an elite or those with expert knowledge in contrast to, e.g. the difficult to obtain and process *pitchuri* of Australian aborigines. Nor was betel chewing typically subject to ritual rationing as is the case with *kava*.²⁶⁷ Betel is most often consumed informally and, even though it is an essential part of many rituals, is not their sole focus. Chewing a *simple* betel quid thus became primarily an inclusive activity across social, religious, age or gender barriers rather than an instrument of differentiation. However, depending on the exact manner and circumstances in which a betel quid is presented, it also has the potential to be a medium of establishing rather than crossing barriers.²⁶⁸ Similarly, many aspects of the wider material culture of betel chewing emphasize social stratification as reflected in the addition of expensive aromatic ingredient to the quid,²⁶⁹ the presentation of prestigious paraphernalia sets²⁷⁰ or the development of special skills in rolling a betel quid.²⁷¹ Thus, the nuanced use of the betel quid and its complex material culture provided a sophisticated tool of social interaction in the diverse cultures which adopted the custom.

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²⁶⁶ For a general discussion of this aspect of stimulants, see, e.g. Sherratt (2007).

²⁶⁷ Rudgley (1994): 154, 163-164.

²⁶⁸ See, e.g. Upadhyaya (1964): 216; Brownrigg (1992): 26; Conklin (2007): 293-294.

²⁶⁹ Concisely reviewed by Brownrigg (1992): 21.

²⁷⁰ Brownrigg (1992): 36-132; Rooney (1993): 40-65.

²⁷¹ Nguyễn (2006): 504.

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