Anthropogenic Vegetation Contributions to Polynesia's Social Heritage: The Legacy of Candlenut Tree (*Aleurites moluccana*) Forests and Bamboo (*Schizostachyum glaucifolium*) Groves on the Island of Tahiti[1]

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Anthropogenic Vegetation Contributions to Polynesia's Social Heritage: The Legacy of Candlenut Tree (*Aleurites moluccana*) Forests and Bamboo (*Schizostachyum glaucifolium*) Groves on the Island of Tahiti. In the tropical oceanic islands of the Pacific, vegetation patterns and dynamics are the result of plant dispersal capacities, the physical characteristics of the islands' ecosystems, and natural disturbances. However, humans have profoundly modified native landscapes through habitat destruction and the introduction of animal and plant species. The candlenut tree *Aleurites moluccana* (Euphorbiaceae) and the Polynesian bamboo *Schizostachyum glaucifolium* (Poaceae), intentionally introduced as useful plants by the first Polynesian migrants at least 1,000 years ago, are now widely naturalized in the high volcanic islands of the Society archipelago (French Polynesia), but with an intriguing patchy distribution. The present study consists of a comparative analysis between the most recent existing vegetation map and the known archeological sites on the island of Tahiti. Thirty-nine bamboo groves and 30 candlenut forests were identified and located using GIS and a Digital Elevation Model. The results show that the dispersal and distribution patterns of these two plant taxa are related to the presence and location of ancient sites of Polynesian occupation. The bamboo groves can be used as a bio-indicator of the presence of potential archeological sites. Their currently restricted distribution might reflect habitat requirements and poor dispersal capacities. The candlenut tree and the Polynesian bamboo are relicts of ancient Polynesian society that have persisted and remain integrated in the modern landscape. They can therefore be viewed as introduced species of high cultural heritage value.

Forêts de bancouliers (*Aleurites moluccana*) et bambouseraies (*Schizostachyum glaucifolium*) sur Tahiti: Des formations entre héritages culturels polynésiens et dynamique naturelle de dispersion. Dans les îles tropicales du Pacifique, la distribution spatiale de la végétation résulte du pouvoir de dispersion des diaspores, des perturbations naturelles et des capacités d'accueil des milieux insulaires. Cependant, les sociétés polynésiennes ont profondément modifié les paysages végétaux. Introduits il y a plus de 1,000 ans par les premiers Polynésiens, le bancoulier *Aleurites moluccana* (Euphorbiaceae) et le bambou polynésien *Schizostachyum glaucifolium* (Poaceae) sont aujourd'hui naturalisés dans les Iles de la Société (Polynésie française) mais possèdent sur Tahiti une distribution spatiale originale. Aussi, cet article vise à comparer la répartition actuelle des forêts de bancouliers et des bambouseraies avec celle des vestiges archéologiques pré-européens. Trente-neuf bambouseraies et 30 forêts de bancouliers ont été répertoriées sur Tahiti et localisées sous Système d'Information Géographique et Modèle

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Numérique de Terrain. Les résultats montrent que la dispersion et la dynamique spatiale de ces taxons dans les vallées sont fortement hérités de la position topographique des anciens foyers de peuplements. Les bambouseraies peuvent être considérées comme des bio-indicateurs potentiels des sites archéologiques. Ce fait est notamment associé à la faible capacité de dispersion du bambou polynésien. Ainsi, au-delà des approches biogéographiques classiques, évacuant souvent l'héritage des sociétés au profit de facteurs écologiques jugés plus déterminants, nous proposons une autre grille de lecture des bambouseraies et des forêts de bancouliers sur Tahiti.

Key Words: Biogeography, Tahiti, archeological vestiges, seed dispersal, introduced plants, cultural heritage, traditional ethnobotanical knowledge.

Introduction

The vegetation composition, patterns, and dynamics that characterize the tropical islands of the Pacific are the result of plant dispersal capacities (according to the distance from the nearest continents), the physical characteristics of the islands' ecosystems (e.g., climate, soil, hydrology), and natural disturbances (e.g., cyclones, floods, landslides, volcanic activity, and fires). Plant composition and vegetation dynamics in the Pacific region are rarely interpreted in the landscape as contributing to the societal legacy of the past. Apart from habitat degradation (e.g., deforestation, human-induced fires) or the introduction of plant and animal species (Kirch 1982, 1984; Kirch and Khan 2007; Lepofsky et al. 1996), it is often difficult to recognize the traces of ancient societies in the modern-day vegetation. The Society Islands (French Polynesia) were colonized by the Polynesians ca 1,000–1,500 years ago (Conte 1995). Observations made by the first naturalists (e.g., Parkinson 1773) together with recent archeological investigations demonstrate that the coastal zones of these highly volcanic islands were not the only inhabited areas during the pre-European period; rather, the interiors of Tahitian valleys were also populated (Mu-Liepmann 1981; Orliac 1984). Archeological sites extending from the littoral plain to more than 800 m above sea level (a.s.l.), in the deepest parts of valleys, and on mid-elevation plateaus have been identified (Emory 1926; Garanger 1964, 1984; Orliac 1984). The same trends have been found on the high islands of the Marquesas (Conte and Maric 2007; Ottino 1985), the Austral (Bollt 2008; Kennett et al. 2006; Vérin 1969), and other Society islands, in particular in the valley of Opunohu on the island of Moorea (Green et al. 1967; Hamilton and Khan 2007; Kahn and Kirch 2004).

The first Polynesian voyagers, by introducing plant species to the newly discovered islands and then cultivating them (called "transported landscapes" according to Kirch 1984), profoundly transformed the pre-human landscapes. Due to the extensive botanical and ethnobotanical studies of Abbott and Shimazu (1985; Abbott 1992), Cox (1980, 1989, 1991, 1993), Banack and Cox (1988), Cuzent (1860), Guerin (1990), Henry (1928), Nadeaud (1864, 1873), and Pétard (1986), as well as those of anthropologists and archeologists (e.g., Green 1994; Kirch 1982, 1984, 1996, 2000; Lepofsky 2003), the high diversity of traditional uses of plants introduced by Polynesians, mainly for ritual, medicine, food, and timber, are well known. From Samoa and the Cook Islands to the remote archipelagoes of Hawaii, Pitcairn Islands and Rapa Nui (Easter Island), and French Polynesia, the current floras include many "relict" plant species transported during these early migrations (e.g., Abbott and Shimazu 1985; Barrau 1957, 1959, 1965a, b, 1967; Cox 1991; Kirch and Khan 2007). Thus, the different vegetation types of the islands of the "Polynesian Triangle" are also a reflection of Maohi cultural heritage. The breadfruit tree (*Artocarpus altilis* [Parkinson] Fosberg.), the Polynesian chestnut (*Inocarpus fagifer* [Parkinson] Fosberg.), the Malay apple (*Syzygium malaccense* [L.] Merr. & Perry.), and the Otahiete apple (*Spondias dulcis* [Solander] Forster.) are representative examples of trees native to the Indo-Malaysian region and introduced to the Polynesian islands by Polynesians (Florence et al. 2007; Whistler 1991).

About 87 plant species were brought to the Society Islands, including 38 cultivated plants and many accidentally-introduced weeds (Florence 2003). Some of these species have become naturalized, i.e., established in the wild without human intervention, including the candlenut tree

(*Aleurites moluccana* [L.] Willdenow) and the Polynesian bamboo (*Schizostachyum glaucifolium* [Ruprecht] Munro). The distribution and elevation ranges of candlenut forests are the result of either the ancient dispersal of these trees following their introduction in the littoral plain or pre-European, wider human occupation. The status of bamboo groves (*S. glaucifolium*) is likewise indefinite. These woody plants are considered by some to be naturally dispersed native species and by others to be aboriginal introductions on the islands of the Pacific, especially Fiji (Smith 1979), the Cook Islands (Kirch 1996), the Society Islands (Florence et al. 2007; Lepofsky 1994, 2003; Pétard 1986), and the Hawaiian Islands (Wagner et al. 1990, 1999; Webster 1992).

This paper explores the modern spatial distribution and the dynamics of bamboo groves and candlenut forests on the island of Tahiti (Society Islands) in relation to past Polynesian occupation. The main aims, using GIS tools, are to superimpose modern vegetation patterns with known archeological sites to determine if there is a relationship between the distribution of the two focus species and ancient Polynesian settlements.

Material and Methods

Study Site and Species

The tropical oceanic island of Tahiti, located between 17°29′50″ and 17°52′32″S, 149°07′40 to 149°36′48″W, is the largest island of the Society archipelago (French Polynesia), with a land surface of 1,045 km², and a highest summit at 2,241 m a.s.l. Its geological age varies between 300,000 years (on the "peninsula of Tahiti Iti") and one million years (on Tahiti Nui) (Brousse et al. 1985). Eight main vegetation formations are classically distinguished (Florence 1993; Meyer 2007; Meyer and Salvat 2009; Papy 1951–1954), extending from the littoral plains up to the summits: (1) coastal low vegetation on sandy and rocky beaches, (2) littoral and paralittoral forests, (3) wetlands (alluvial or littoral marshes, low- and high-elevation swamps and lakes), (4) low- to middle-elevation dry to semidry forests with an average annual rainfall less than 1,500 mm, (5) low- to middle-elevation moist or mesic forests between 1,500 and 3,000 mm of rainfall, (6) mid- to upper-elevation wet forests (including valley forests) above 3,000 mm, (7) high-elevation rainforests or cloud forests from 3,000 mm up to 8,500 mm/year, starting at ca 900 m a.s.l. on the leeward dry coast, and 300–400 m on the wet windward coast of Tahiti Nui and Tahiti Iti, and (8) a subalpine vegetation zone characterized by ericoid shrublands 1,800 m a.s.l.

Candlenut (*A. moluccana*) forests and bamboo thickets (*S. glaucifolium*) are mainly found in the mid-elevation wet forests between the coastal strand and 890 m a.s.l. Like many of the plants introduced by the earlier Polynesians, the candlenut is native to the Indo-Malay peninsula (Cuzent 1860; Nadeaud 1864). Archeological excavations led by Lepofsky (1994, 1996) on the island of Moorea (Society archipelago), near Tahiti, testify to the presence of *candlenut* from the beginning of the Polynesian colonization. This tree, called *ti'a'iri* or *tutu'i* by Tahitians, can reach a height of 17–20 m and a diameter of 1.5 m (Florence 1997; Wagner et al. 1990). It produces seeds called "walnut of candlenut". During the pre-European period, the walnut was threaded on wicks made of coconut palm and burned (Henry 1928) as a light source, while the wood of the tree was employed to build dugouts (Florence 1997). Candlenut tree bark is rich in tannin, and was used as a dye for clothing and hair (Pétard 1986), while the carbonized seeds were mixed in candlenut oil to form ink intended for traditional tattoos (Cuzent 1860). The tree also had numerous pharmacological applications (Grépin and Grépin 1984; Henry 1928; Pétard 1986).

The bamboo, or *'ofe*, reaches heights of 12–15 m and diameters of 6 cm at the bases of the culms (Smith 1979; Wagner et al. 1990). On Tahiti, Cuzent (1860), Papy (1951–1954), and then Pétard (1986) observed that it developed indifferently between 10 and 700 m a.s.l., a similar elevational limit to candlenut. It is "spread from the beach up to the summit of valleys" in Tahiti (Nadeaud 1864), it is "very plentiful until an 800 meter altitude . . . and completely disappears at 1,200 m" (Cuzent 1860). This tree is, "in the Society archipelago, very common everywhere on the high islands, in the more or less degraded forests, among Hibiscus, Neonauclea or Rhus, often dominating in the highest stratum, from the sea level where it is still planted . . . until 500 m, on slope or plateau forest" (Florence 1997).

Bamboo also had several uses in French Polynesia. Tahitians employed it to make fishing rods, fences, and bowls, and as construction material for the walls of their huts (Henry 1928) and the frames of their houses (Lavondes 1968).

Morrison (1935), Cook in Beaglehole (1967), and Ellis (1836) described diverse everyday objects made with *S. glaucifolium*. After the internal partitions of their stems were removed, bamboo stalks were used to transport water for irrigation (Henry 1928; Pétard 1986). Henry (1928) identified three varieties of *'ofe*: *'ofe para* (yellow bamboo), *'ofe tea* (green bamboo), and the *'ofe 'ura* (pink bamboo). The latter was formerly planted on sacred grounds and was split to make the knife with which the umbilical cord of the newborn was cut. All these traditional uses have been abandoned, however, and Tahitians do not use bamboos nowadays, except for minor activities (e.g., fishing poles, fish hoop nets).

Methods

Location, size, and elevation ranges of bamboo groves and candlenut forests in Tahiti are based on (1) the vegetation map of Tahiti (Florence 1993) published in the Atlas de la Polynésie française (Dupon 1993) by the Institut de Recherche pour le Développement (IRD) at the scale 1:150,000, and (2) Global Positioning System points (using a GPS Trimble GeoExplorer®) of bamboo groves and candlenut forests we collected in the field.

Location of archeological sites in Tahiti are based on maps produced by the Service de la Culture et du Patrimoine of the Government of French Polynesia (2004 updated version). These sites include stone platforms called *marae*, stone walls called *paepae*, cultivation terraces, and funerary caves.

We used a common Geographic Information System (GIS) method. The two maps of the vegetation and archeological sites were digitized with a 350 dpi resolution. We used the ER Mapper® (version 7.0) software to superimpose the two maps according to the Digital Elevation Model (DEM-SRTM 90 m digital elevation data) for Tahiti. This file was translated into a Raster format then imported using a Map Info Geographic Information System (GIS Mapinfo® Professional version 7, WGS 1984 projection) to obtain a final map (Fig. 1). Each bamboo grove and candlenut forest was converted into a Vector format in order to create polygons which show the location, shape, and surface area of bamboo and candlenut forests.

The archeological sites are represented on the GIS layer by a symbol. By superimposing the bamboo grove layer, the candlenut forests layer, and the archeological sites layer, we were able to measure their distances from each other. The distances of candlenut forests and bamboo groves (barycenter of the plant formations) to the closest archeological sites were measured in meters, with an error margin of about 15 m due to both map digitalization and geo-referencing. We conducted non-parametric tests (Spearman's rank correlation using XLStat® [version 2007.6] software) in order to assess the statistical significance of the relations between plant formations and archeological sites. Correlation tests were used for the 39 bamboo groves and 30 candlenut forests (elevation, area, distance from the nearest vestige).

Results

Number and Locations of Archeological Sites

A total of 345 archeological sites are currently inventoried on the map of the Service de la Culture et du Patrimoine (SCP 2004). They range from the littoral plain (5 m a.s.l.) to mid-elevation valleys (up to 892 m a.s.l.). This result demonstrates that Polynesian settlements were found both on the coastal areas and in the center of the island of Tahiti, sometimes in deep valley bottoms. However, archeological data is still incomplete (B. Mou, SCP, and E. Conte, University of French Polynesia, pers. comm. 2010) as many existing archeological sites might be unnoticed under the dense rainforest, and because of the lack of systematic archeological surveys and excavations. The rugged topography of the high volcanic island of Tahiti is also a strong constraint on archeological studies.

Number, Size, and Locations of Bamboo Groves

Relatively few bamboo groves are reported on the vegetation map (Florence 1993), and most of them are located on Tahiti Nui. This map was set up using aerial photographs (J. Florence, pers. comm.) and only the large and dense monotypic stands were taken into account. We counted a total of 39 groves, with a size ranging from 1.9 to 26.4 ha, and located between 61 and 705 m a.s.l. Principal Component Analysis (Fig. 2) shows an inverse correlation between the distance of the archeological vestiges and the bamboo groves surface (Spearman's test: $r^2 = -0.2181$; p- value = 0.0027). The largest bamboo groves occur near archeological sites, and 74.9% of the total area of

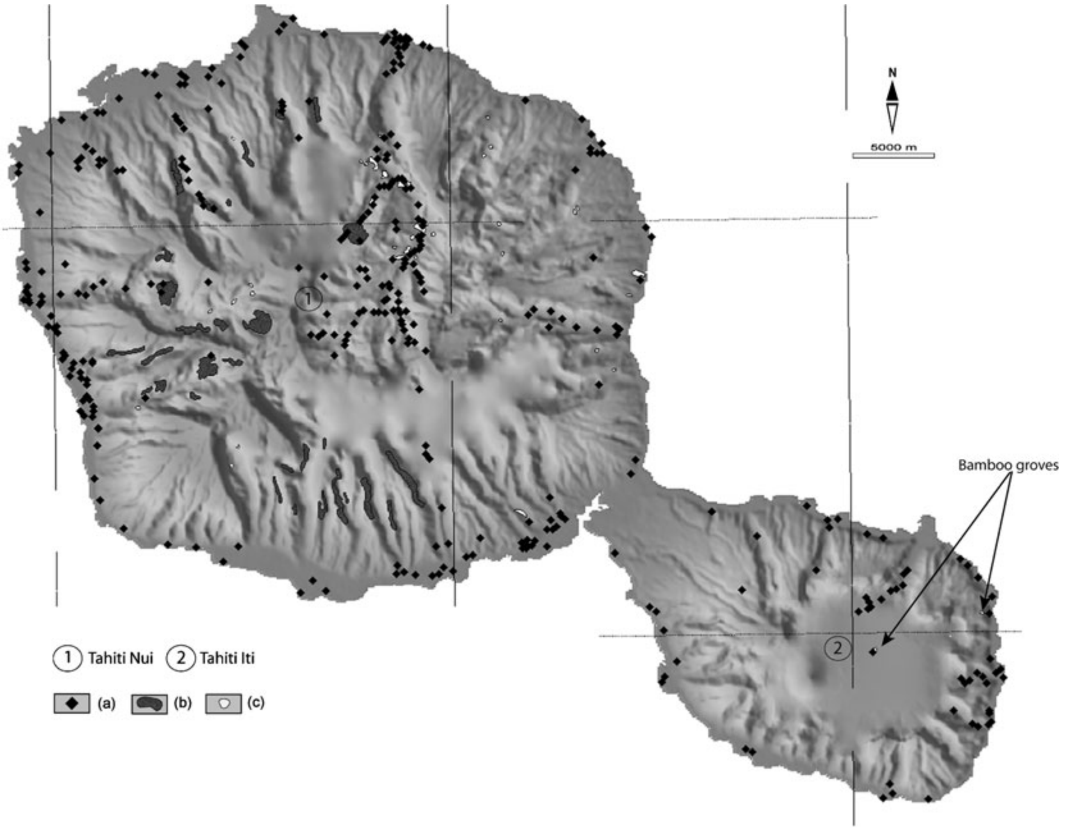

Fig. 1. Map of Tahiti showing the location of (**a**) the archeological sites, (**b**) the candlenut forests, and (**c**) the Polynesian bamboo groves.

bamboo groves in Tahiti are located less than 980 m from archeological sites (Table 1). This result strengthens the visual correlation between bamboo groves and archeological vestiges distributions (Fig. 1).

Number, Size, and Location of Candlenut Forests

We identified a total of 30 candlenut forests, ranging between 9 and 195.7 ha, and located between 114 and 890 m a.s.l. (Table 2). No significant correlation was observed regarding proximity to archeological sites (Spearman's test).

Discussion

Spatial Distribution and Dispersal of *Schizostachyum glaucifolium*

The most important bamboo groves are located closest to the archeological sites, suggesting the poor dispersal capacity of bamboo diaspores (e.g.

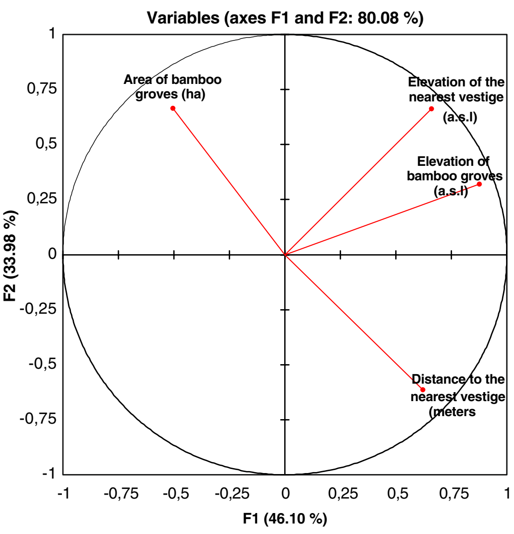

Fig. 2. Principal Component Analysis (PCA) shows a negative correlation between the area of bamboo groves and their distance to archeological sites (Spearman's test: $r^2 = -0.2181$; p- value = 0.0027. XLStat, Version 2007.6).

TABLE 1. CLASSES OF *SCHIZOSTACHYUM GLAUCIFOLIUM* BAMBOO GROVES BY ARCHEOLOGICAL SITES, AREAS, AND MEAN ELEVATIONS.

Classes	1	2	3	4	5	6
Distance to archeological sites (meters)	<980	<1,960	<2,940	<3,920	<4,900	>5,000
Number of bamboo groves	22	4	4	4	2	3
Mean elevation of archeological sites a.s.l. (meters)	202	74	628	258	154	413
Mean elevation of bamboo groves a.s.l. (meters)	241	141	460	369	374	609
Area of bamboo groves (hectares)	233.8	17.2	19.9	19.2	10.4	12.4
Percentage of the total area	74.9%	5.4%	6.3%	6.1%	3.3%	3.9%

seeds, rhizomes, stems) from their supposed sites of introduction. Indeed, bamboo groves have a reduced "mobility" and *S. glaucifolium* in particular possesses pachymorphe rhizomes (McClure 1966) from which young stems emerge. The bamboo spreads under caespitose clusters by suckers and shoots, with the groves growing and colonizing the best-exposed margins. This process seems particularly effective for bamboo groves located around 210 m a.s.l. (Table 1). The important boundary of bamboo groves belonging to that distance class probably reflects the abandonment of cultivated areas by the Polynesians as well as local abiotic conditions (e.g., rainfall, soil, topography).

Nevertheless, our results show that 13 bamboo groves are located far from the archeological vestiges, including ten between 1,960–4,900 m (distance classes 3 to 5) and three more than 5,000 m (distance class 6) (Table 1). A preliminary hypothesis is that movement of diaspores is directly related to the extent of floodwaters; hence the primary dispersal of this plant is hydrochory. Three bamboo groves, located at 198, 236, and 254 m a.s.l. in valleys near stream beds, could correspond to this dispersal mode. Indeed, *Schizostachyum glaucifolium* rhizomes do not penetrate deeply into the soil, instead developing a few centimeters to approximately one meter under the surface (pers. obs.), thus increasing the probability of being uprooted and transported downstream. In the Fiji Islands, this bamboo species is "moderately common along the banks of rivers and streams, in thickets on hillsides . . . from near sea level to more than 900 m" (Smith 1979).

However, some bamboo groves are located on the high banks of rivers, at the limits of the flood zone. The altitudes of the three remaining groves (578, 633, and 705 m a.s.l.) in the upstream portions of Temarua, Onohea, and Tahaute valleys (northeast of Tahiti Nui) make their dispersal by river hydrochory impossible. A second pathway of *S. glaucifolium* dispersal might be the production and dispersal of viable seeds. However, this bamboo species is often described as sterile in the Polynesian region (Christophersen 1935; Florence et al. 2007), as is the case for most of the other plants introduced and cultivated by Polynesians, such as the Ti plant *Cordyline fruticosa* (L.) Chevalier, the "tiare tahiti" *Gardenia taitensis* de Candolle, and taro *Alocasia esculenta* (L.) Schott.

However, Cusack (1999) demonstrated that *Schizostachyum* species are able to blossom, but with only a few stems in flower. In the Punaruu valley, located on the west coast of Tahiti Nui, flowering bamboos were rarely observed in the past (G. Tumahai, pers. comm.) nor recently (2009 pers. obs.), and no study in French

TABLE 2. CLASSES OF *ALEURITES MOLUCCANA* FORESTS BY ARCHEOLOGICAL SITES, AREAS, AND MEAN ELEVATIONS.

Classes	1	2	3	4	5	6
Distance to archeological sites (meters)	<767	<1,534	<2,301	<,068	<,835	<,610
Number of candlenut forests	7	4	6	7	4	2
Mean elevation of candlenut forests a.s.l. (meters)	575	492	522	494	431	615
Mean elevation of archeological sites a.s.l. (meters)	430	392	375	429	198	264
Area of candlenut forests (hectares)	268.3	353.6	246.3	340.5	202.1	114.5
Percentage of the total area	17.5%	23.1%	16.1%	22.3%	13.2%	7.5%

Polynesia has confirmed the germination of Polynesian bamboo seeds. Vegetative reproduction must therefore have been the exclusive method of dispersal, and the origin of these "remote" bamboo groves remains uncertain.

Alternatively, laterites and thick vegetation often cover the river terraces in Tahitian valleys, making the archeological sites difficult to find (E. Conte, pers. comm.). In this case, it is conceivable that bamboo groves of distances classes 3 to 6 testify to the burial of unlisted vestiges and their proximity to these groves. More archeological surveys and excavations would be needed, especially at close proximity to these bamboo groves.

The majority of bamboo groves are located in valleys within 1 km radius of an archeological vestige. These bamboo stands probably arose from the first bamboo plantations by the Polynesians, during human colonization of the valleys. Formerly, Brown (1931, p. 92) suggested the same mechanism to explain the distribution of bamboo in the Marquesas Islands: ". . . frequently found in all inhabited valleys of the Marquesas, from altitude of 10 to 500 meters. It does not occur in areas of indigenous vegetation, but on the sites of ancient native plantations, suggesting aboriginal introduction, the source of which remain uncertain." Today, these colonies still reflect the proximity of their original sites of introduction.

Schizostachyum glaucifolium is considered an aboriginal introduction in most of the Polynesian islands (e.g., Cook, http://cookislands.bishopmuseum.org/Default.asp; Hawaii, Abbott 1992, Wagner et al. 1990, 1999, Whistler 1991; Samoa, Christophersen 1935; Marquesas Islands, Brown 1931), but sometimes considered as native by other authors (Staples and Herbst 2005; Fiji, Smith 1979). Our results support the conclusion that *S. glaucifolium* is not an indigenous plant; rather it was probably introduced from the Indo-Malay peninsula to French Polynesia in the pre-European period. Only the fossil record and phylogeographic studies using molecular tools will answer the question of the status and origin of this species.

Dispersal, Spatial Distribution, and Shape of *Aleurites moluccana* Forests

The statistical results did not show a significant correlation between the location of archeological vestiges and candlenut forests. Unlike bamboo, candlenut trees rely on a sexual mode of reproduction. *Aleurites moluccana* is a monoecious tree whose drupaceous fruits contains a single seed (Florence 2004) that is spread by barochory and then propagates over longer distances by rolling downhill or by floating downstream. Seeds take 3–4 months to germinate, and propagated *A. moluccana* plants may take 3–4 years before producing fruit (Clarke and Thaman 1993; Elevitch and Manner 2006). Candlenut is nowadays a major component of low- and mid-elevation wet forests in Tahiti with the native trees *Hibiscus tiliaceus* L., *Rhus tahitensis* Guillemin, and *Neonauclea forsteri* (Seemann ex Haviland) Merrill (Florence 1993), and found in disturbed forests of the Australs, the Gambier, and the Marquesas islands, sometimes up to 1,000 m a.s.l (Florence 1997). Dense colonies are also observed in secondary forests of other Polynesian islands (Fosberg 1991; Whistler 1991). This tree is a pioneer species, adapted to high light levels for seed germination and seedling growth, and tolerating partial shade (Elevitch and Manner 2006 and pers. obs.).

We suggest that candlenut colonization follows hydrographic axes from the original Polynesian settlements located at mid and high elevation, and that they were replaced over time through plant succession. Moreover, relict colonies are threatened by alien trees such as the *Miconia calvescens* de Candolle or the Gabon tulip tree (*Spathodea campanulata* Palisot.), both introduced in the 1930s (Meyer and Florence 1996). The elongated shape of these forests can be explained by the downhill migration of diaspores. While the historic migration of seeds makes it difficult to establish a significant correlation between the localization of *A. moluccana* forests and that of the archeological vestiges, the spatial distribution of the candlenut formation might be also a legacy of the ancient colonization of the valleys.

Conclusions

This study of the dispersal and distribution patterns of two Polynesian-introduced plants, the Polynesian bamboo *Schizostachyum glaucifolium* and candlenut *Aleurites moluccana*, is the first to use geographic methods to test the relation between landscape elements and the presence and location of ancient sites of Polynesian occupation. We found a significant correlation between the current distribution of *S. glaucifolium* bamboo groves and pre-European archeological sites in Tahiti. The presence of *S. glaucifolium* groves testifies to the cultural importance of bamboo to ancient human settlements. This finding also supports the hypothesis that Polynesian bamboo is an aboriginal introduction in Tahiti. The restricted distribution of the species might reflect both its habitat requirements and its poor dispersal capacities. However, our results are constrained by the lack of an exhaustive dataset on all the archeological vestiges in Tahiti. It would be interesting to use bamboo groves as a bio-indicator of the presence of potential archeological sites.

We did not observe any clear correlation between candlenut forests and pre-European settlements. Contrary to the present, in which Tahitian populations occupy the entire littoral plain, pre-European populations extended well into the valleys. The later abandonment of the island's interior allowed the diaspores of candlenut trees, with several decades of delay, to follow the river system and become established downstream. Thus, the spatial distribution of *A. moluccana* is more extensive than that of *S. glaucifolium*.

The localization of candlenut forests and bamboo groves testify to the profound human reorganization of Tahiti Island's plant cover, even in its long-abandoned isolated valleys (Larrue 2007). While the pressure of human impact on littoral plain vegetation is considerable, anthropogenic *Aleurites moluccana* forests and *Schizostachyum glaucifolium* bamboo groves thrive at altitude in a naturalized state. Well integrated into the present day landscape of French Polynesia, candlenut and bamboo represent introduced species of high cultural heritage value.

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