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KAUTE: AN ENDEMIC EAST POLYNESIAN HIBISCUS?

LEX A.J. THOMSON
University of the Sunshine Coast

PAUL A. GERAGHTY
University of the South Pacific

WILLIAM H. WILSON
University of Hawai'i

ABSTRACT: *Kaute* and its derivatives *koute, 'oute* and *'aute* are Polynesian names for a red-flowered *Hibiscus*. Since its first botanical collection on Tahiti by Banks and Solander (1769), this hibiscus has been referred to as *H. rosa-sinensis* L. and assumed to have been introduced by the bearers of the archaeological culture known as Lapita. Lapita people settled West Polynesia around 2800 BP and spoke a language derived from Proto-Oceanic, the common ancestor of almost all the Austronesian languages of Island Melanesia and Micronesia as well as Polynesia. However, whereas Proto-Oceanic names can be reconstructed for many plants found in East Polynesia, the term *kaute* cannot be attributed to Proto-Oceanic, the name likely being locally derived in East Polynesia from that of paper mulberry (*Broussonetia papyrifera* (L.) L'Hér. ex Vent.). On the basis of linguistic evidence, we contend that *kaute* was domesticated in a high island area of Central Eastern Polynesia and then dispersed in relatively recent pre-European times (ca. 500–700 BP) westwards through West Polynesia, to nearby islands such as the Fiji archipelago and Rotuma and to Polynesian Outliers in Papua New Guinea and the Solomon Islands. Dissemination occurred before the *-au-* sequence changed to *-ou-* and *k* sporadically changed to *'*, so that *kaute* rather than contemporary Marquesan *koute* and *'oute* was the term that was carried westward from the Marquesas. *Kaute* is here suggested to be an endemic East Polynesian species, different from *H. rosa-sinensis* L. Further field and genetic research is needed to definitively determine the phylogenetic relationships of *kaute* and a taxonomic description is required for formal recognition.

Keywords: red-flowered hibiscus, *Hibiscus rosa-sinensis*, *kaute*, plant translocations, Polynesian cognates, *Broussonetia*, Marquesas, East Polynesia

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In 1769 a double-petalled red-flowered hibiscus was collected by Joseph Banks and Daniel Solander—botanists on Lieutenant James Cook's HMS *Endeavour* voyage—on Tahiti, Society Islands, French Polynesia (BM013730470, British Natural History Museum; P06705205, Muséum national d'Histoire naturelle [MNHN]; US01299807, United States National Herbarium; Fig. 1). The single-petalled form of this same hibiscus, as indicated by its similar deltoid, coarsely and irregularly serrated leaves, was

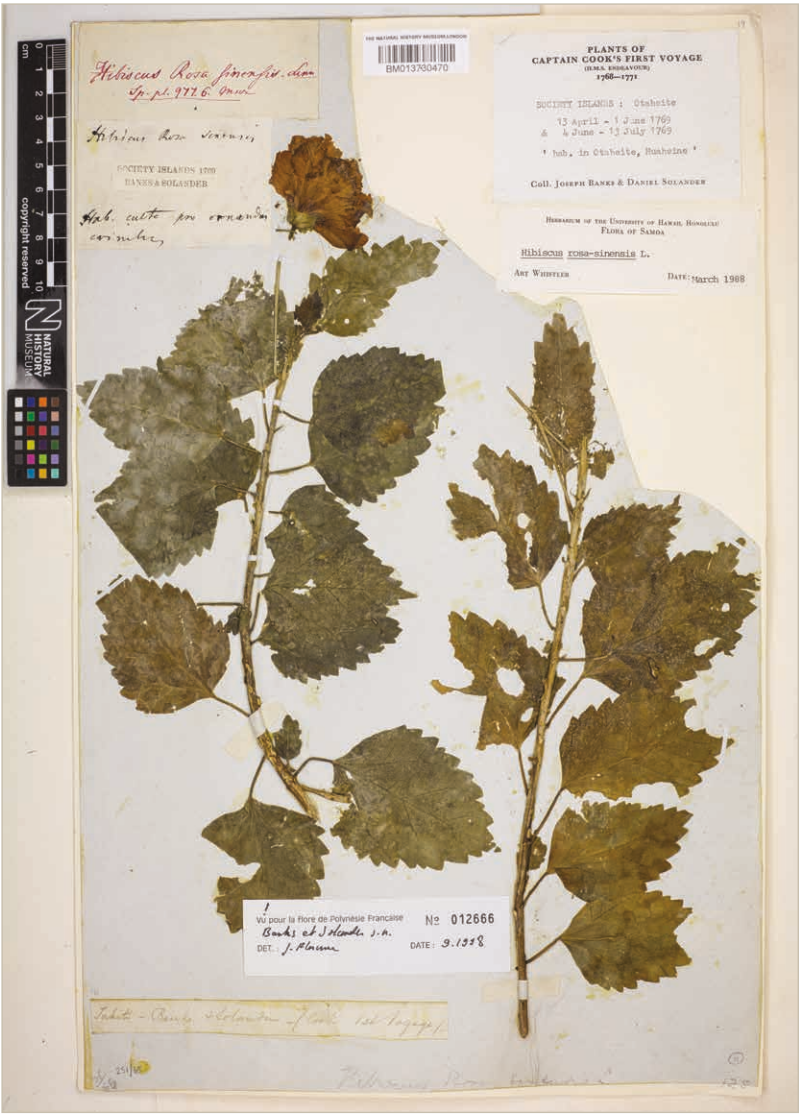

Figure 1. Botanical specimen of *kaute* (double-petalled form) collected by Joseph Banks and Daniel Solander on Tahiti, Society Islands, French Polynesia, in 1769 on Lieutenant James Cook's first voyage to the South Pacific Islands (BM013730470, British Natural History Museum, London).

also observed and illustrated by Cook's botanical artist, Sydney Parkinson (Endeavour Botanical Drawings SI1/11, https://www.nhm.ac.uk/discover/endeavour/single?id=2260, courtesy of Trustees of the Natural History Museum, London). The plant was observed in the previous year by Philibert Commerson, the botanist on French explorer Louis Antoine de Bougainville's voyage to Tahiti, but not botanically described. Its Tahitian name, *'aute*—in contemporary Tahitian—was written *aoute* by Bougainville (Lanyon-Orgill 1979: 243), who defined it as 'rose', and *aiowte* by Parkinson ([1773] 1973). We will henceforth use the name *kaute*, which would have been its earlier form, before the application of the regular Tahitian sound change *k* > *'* (Note: The glottal stop is represented by the symbol *'*).

In this earliest botanical collection of *kaute* on Tahiti and in subsequent collections, it was referred to as *Hibiscus rosa-sinensis* L.: a double-petalled, red-flowered hibiscus from cultivation in Asia (India, Sri Lanka and Indonesia) described by Linnaeus in 1753. However, even sterile dried specimens of *kaute* (from East and West Polynesia) are differentiated from *H. rosa-sinensis* on the basis of leaf shape and length : width ratio of the lamina, typically averaging 1.6–1.7 for *H. rosa-sinensis* as compared to 1.3–1.5 for *kaute* (Fig. 2), and by its near glabrous petioles and more

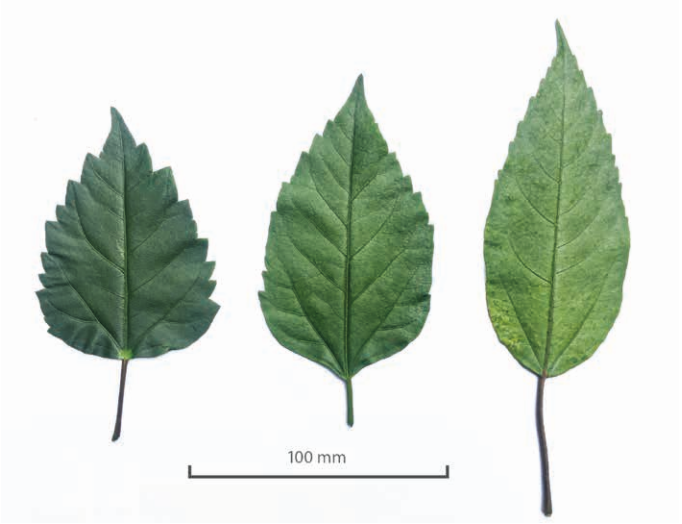

Figure 2. Leaf of typical *kaute* (left), *H. rosa-sinensis* (middle) and *H. cooperi* (right). The length : width ratio of the lamina typically averages 1.3–1.5 for *kaute*, 1.6–1.7 for *H. rosa-sinensis* and 2.1–2.7 for *H. cooperi*; differences in leaf serration are also apparent. Photo by Lex Thomson. Note: The recently reinstated Vanuatu species *H. cooperi* is included here as it has often been confused with *H. rosa-sinensis*.

coarsely serrated leaf margins. The calyx lobes are also narrower in *kaute* as compared to *H. rosa-sinensis*, viz. in *kaute* the triangular calyx lobes have a L:W at base ratio of ~1.1–1.3 for double flowers and ~1.5–1.7 for single flowers, whereas in *H. rosa-sinensis* these ratios are typically ~1.3–1.5 for double flowers and ~1.8–2.5 for single flowers. These data are based on hundreds of individual morphological measurements to be detailed in a separate manuscript: here we have only reported on the ratios of related morphological characteristics, which are far less susceptible to environmental variation.

Both floral forms of *kaute*, especially the single-petalled type (Fig. 3), have become increasingly scarce in the Pacific Islands, based on the observations of the first author and including in French Polynesia (Jean-François Butaud, pers. comm.), and are being rapidly displaced by "*H. rosa-sinensis*" hybrids, especially those involving *H. schizopetalus* (Dyer) Hook f. (including *H.* × *archeri* W.Watson), which are hardier in cultivation and readily propagated by branch cuttings.

Figure 3. Single-petalled form of *kaute*, ʻOhonua, ʻEua, Tonga (left; photo by Lex Thomson) and Apia, Samoa (right; photo by François Martel).

WAS *KAUTE* A LAPITA INTRODUCTION FROM SOUTHEAST ASIA?

Hibiscus plants with red flowers appear to have been cultivated prehistorically, under the name *kaute* or a derivative, through much of Polynesia including American Samoa, Cook Islands, French Polynesia, Niue, Samoa, Tonga, Wallis and Futuna and Polynesian Outlier islands in the Solomon Islands and Papua New Guinea as well as Fiji and Rotuma (see Table 1 for a listing of Polynesian names). Such red-flowered hibiscus entities, under the botanical name *H. rosa-sinensis*, have hitherto been considered an ancient introduction. Noted American botanist Elmer Merrill (1955: 342) described it as a "pre-Magellan, man-introduced ornamental species from the islands to the West", and subsequent botanists and researchers of *Hibiscus* have not questioned this assertion (e.g., Brown 1935; Florence 2004: 210–12; Gast 1980: 3; Sykes 2016: 696; Wagner and Lorence 2002; Whistler 1991: 54; 2000: 159; 2009: 130–32).

Kaute appears to have been accorded introduced status on the basis of its frequent presence in Polynesian village gardens, apparent failure to set viable seed and/or requirement for vegetative propagation, and absence from truly wild habitats—as opposed to trails, old garden sites and the like (Florence 2004: 210–11; Lepofsky 2003: 85; Whistler 2009: 130–32). However, Jouan (1865: 94) found *koute* (referred to as "*Hibiscus rosa-sinensis*") growing at the head of valleys on Nuku Hiva (Marquesas), far from any settlements, in very wild places: it was described as very rare and not truly naturalised. Furthermore, Nadeaud (1873: 67) reported that while *aute* ("*Hibiscus rosa-sinensis*") was cultivated by Polynesians, he found it growing in a wild state, in the middle of cliffs near the end of Pirae valley (Nahoata River) and elsewhere in the interior of Tahiti.

Kaute has been observed to set fruits in Tahuata, Marquesas (Fig. 4) and in other locations (MNHN specimens: P06705182, H. Jacquinot, Levuka, Fiji, 1838; P06705216, J. Lépine, Tahiti, 1847; P06736334, New Caledonia, pre-1860). Fruit set in *kaute* is far more common than in *H. rosa-sinensis* L. Indeed fruit set in *H. rosa-sinensis* is extremely rare: fruits and seeds of both single and double forms are not mentioned in the type description and other early references to the species except to state that it does not produce seed (e.g., Van Rheede 1679). Fruits were not observed on any images of preserved botanical specimens of *H. rosa-sinensis* inspected as part of this study (including >26 specimens from mainland Asia, >26 specimens from Indonesia, >34 specimens from Pacific Islands, >36 specimens from throughout the tropics and numerous living plants in the South Pacific Islands). Reports of *H. rosa-sinensis* freely naturalising along trails and in thickets and forest in Fiji (Smith 1981) are probably incorrect, referring to endemic Fiji *Hibiscus* species (Thomson and Braglia 2019: 85, 117–18).

Table 1. Names of red-flowered *Hibiscus* in Polynesian languages (and Rotuman).

Region/country	Island(s) (language)	Names	Assumed species	Source
EAST POLYNESIA				
Southern Cook Islands	Rarotonga	*kaute*, *kaute ʻenua*, *kaute kumu*	*kaute*	Buse 1996; Sykes 2016
Northern Cook Islands	Penrhyn	*kaute*, *kaute kula*	*kaute*	Shibata 2003
French Polynesia	Northern Marquesas	*koute*, *koute ʻenana*, *kōute*	*kaute*	Brown 1935; Butaud 2010a; Charpentier and François 2015
French Polynesia	Southern Marquesas	*koute*, *ʻoute*, *kōute*, *ʻōute*, *ʻoute ʻenata*	*kaute*	Butaud 2013; Charpentier and François 2015
French Polynesia	Society Islands	*ʻaute*, *ʻaute māʻohi*, *ʻaute ʻumuʻumu* (*flore pleno*)	*kaute*	Charpentier and François 2015; Jean-François Butaud, pers. comm.
French Polynesia	Tuamotu Islands	*ʻaute*, *kaute*	*kaute*	Butaud and Jacq 2009; Butaud 2009, 2010b; Charpentier and François 2015
French Polynesia	Austral Islands	*pareava*, *ūaʻa aute* (open flower)	*kaute*	Charpentier and François 2015; Jean-François Butaud, pers. comm.
French Polynesia	Gambier Islands	*koute*	*kaute*	Butaud 2010c; Charpentier and François 2015

Region/country	Island(s) (language)	Names	Assumed species	Source
WEST POLYNESIA				
Niue		*kaute* (pronounced *kause*)	*kaute*	Sperlich 1997; Whistler 2000; Randolph Thaman, pers. comm.
Rotuma (Fiji)		*kauta*	*kaute*	Inia *et al.* 1998
Sāmoa		*ʻaute*, *ʻaute Sāmoa*	*kaute*	Pratt 1911; University of Hawaiʻi at Mānoa n.d.; Whistler 2000
Tokelau		*aute*	*kaute*	Simona *et al.* 1986
Tonga		*kaute*, *kaute kula*	*kaute*	Churchward 1959
Tuvalu		*aute*, *losa*	*kaute*	Ranby 1980
Wallis and Futuna (ʻUvea)	East ʻUvea	*kaute*	*kaute*	Mayer 1976
Wallis and Futuna	East Futuna	*kaute*	*kaute*	Moyse-Faurie 1993
POLYNESIAN OUTLIERS				
PNG	Nuguria, near New Ireland (Nukeria)	*kaute*	*kaute*	Davletshin 2013 (see also Greenhill and Clark 2011)
PNG	Takuu, near Bougainville	*kaute*	*kaute*	Moyle 2011

– *Table 1 continued over page*

Region/country	Island(s) (language)	Names	Assumed species	Source
PNG	Nukumanu	*kaute*	*kaute*	Wycliffe Bible Translators 2013
New Caledonia	ʻUvea (Faga-uvea)	*bedrila*, *bedrilë*	*H. cooperi*	Hollyman 1987; Ozanne-Rivierre 1984
Solomon Is.	Luangiua/Ontong Java	*uke*	*kaute*	Salmond 1975
Solomon Is.	Sikaiana	*laakau ula*	?	Donner 2012
Solomon Is.	Tikopia	*kaute*	*kaute*	Firth 1985
Solomon Is.	Anuta	*kaute*	*kaute*	Yen and Gordon 1973
Solomon Is.	Taumako & Reef Is. (Aua, Matema, Nifiloli, Nupani, Nukapu, Pileni)	*vaeakula*	*kaute*	Basil Gua, pers. comm.
Solomon Is.	Rennell and Bellona	*mengo*, *kongomea*	*H. cooperi* (& *kaute*?)	Elbert 1975
Vanuatu	Emae (Fakamakata)	*papakalo*	*H. cooperi*	James Kaltong, pers. comm.
Vanuatu	Mele, near Efate (Mele-Fila)	*p̃aakala*	*H. cooperi*	Clark 1998
Vanuatu	Futuna	*pomea*, *mimwi*	*H. cooperi*	Capell 1984; Futuna cultural performers, pers. comm.
Vanuatu	Aniwa	*nandrap*	*H. cooperi*	Phyllis Kalimista, pers. comm.

Figure 4. Fruit set on *kaute* in Tahuata, Marquesas Islands, French Polynesia (left); dehisced fruit showing mature seed (right). Photographs by Jean-François Butaud.

There is an absence of linguistic evidence that might support *H. rosa-sinensis* being an original Lapita introduction to Polynesia. Whereas, for example, PPn[1] **fau* for *Hibiscus tiliaceus* L. comes from Proto-Oceanic (POc) **paRu* (Ross 2008: 138) and POc terms can be reconstructed for many other useful plants of Polynesia, there is no reconstructable POc term for "*H. rosa-sinensis*". Assuming that POc was spoken by the bearers of the early Lapita culture in the Bismarcks, then this probably means that *H. rosa-sinensis* did not occur in the Bismarck Archipelago in POc times, i.e., around 3,200 years ago (Malcolm Ross, pers. comm.). Similar plants clearly did occur in various parts of Oceania, but we believe that when the Polynesians settled East Polynesia, ca. 1050 BP (Niespolo *et al*. 2019; Sear *et al*. 2020), they had either lost knowledge of them or not come into contact with them due to their rarity in interior, high-elevation locations, and were forced to coin a new term for the hibiscus they discovered there. As illustrated with other newly discovered or introduced plants, such plants may have been named by either compounding or extension, since borrowing was not an option (Geraghty 2004), and in the case of *kaute*, we propose that the mechanism was extension. We further argue that this plant was then spread to many other Pacific islands, along with the name that was coined in East Polynesia.

SPREAD OF THE POLYNESIAN NAME *KAUTE*

There is linguistic evidence discussed below that the term *kaute* 'cultivated red-flowered hibiscus' is a recently borrowed term within a late prehistoric contact area stretching from Central East Polynesia to Central West Polynesia, Fiji and Rotuma and including Tikopia, Anuta and the Central Northern Outliers (Fig. 5).

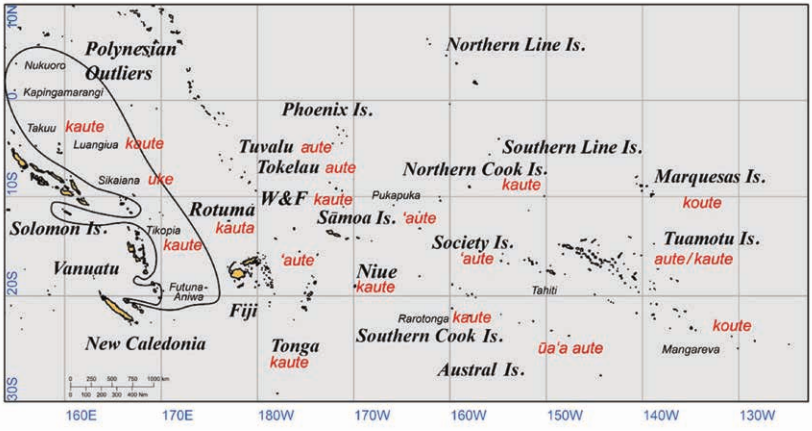

Figure 5. Distribution of reflexes of the term *kaute* 'cultivated red-flowered hibiscus'.

While the extent of reflexes of the term *kaute* could strictly speaking allow that term to be reconstructed to Proto-Polynesian, and even Proto-Central Pacific (Rotuman, East and West Fijian and Proto-Polynesian), there is distributional and linguistic evidence that it spread well after the initial Lapita settlement of Fiji and Central West Polynesia and after the settlement of the farthest reaches of East Polynesia and the Polynesian Outliers.

Distant Hawai'i, New Zealand and Rapa Nui Languages Lack a Kaute Cognate

Although *H. rosa-sinensis sens. lat.* is grown today in New Zealand, Hawai'i and Rapa Nui,[2] it was not found in those areas at initial European contact, nor is there a native plant species to which a cognate of *kaute* has been applied. This distribution suggests that the plant spread in East Polynesia after the settlement period and indeed after regular contact ceased between Central East Polynesia and those distant points of the Polynesian Triangle.

By way of contrast, other cultivated plant species of Polynesia—clearly present in the Proto-Polynesian period with terms reconstructed to Proto-Polynesian—have reflexes in at least one or two of those distant points and often all three. Such names are applied to similar plants when the original referent is lacking locally. For example, PPn **fau*[3] '*Hibiscus tiliaceus*'—a species of cultural importance—is reflected with regular sound change throughout tropical Polynesia. Its reflexes in the distant corners of the Triangle are Haw *hau* '*Hibiscus tiliaceus*'; Mao *whau*, *whau-ama*, *hau-ama*

'*Entelea arborescens* R.Br.' (lit. 'outrigger *whau*', a name consistent with its use for various sorts of floats parallel to the use of *H. tiliaceus* net floats and outriggers in Hawai'i (Handy and Handy 1972: 233), including outriggers in tropical Polynesia); Rpn *hauhau* '*Triumfetta semitriloba* Jacq.', which like *hau* in Hawai'i and *whau* in New Zealand was traditionally used for cordage.

Rapa Nui lacks a native hibiscus or similar plant that might have been referred to by the term *kaute*, but New Zealand has a native hibiscus, *H. richardsonii* Sweet ex Lindl., with a cream-coloured flower. Its Māori name, however, is *puarangi* (lit. 'sky flower' or 'heavenly flower'), which does not have cognates in any other Polynesian language.

Hibiscus australensis Fosberg is a rare hibiscus in section *Furcaria* from the Austral and Gambier Islands (French Polynesia) and Pitcairn Island (Butaud 2014; Fosberg 1966; McCormack 2007; Wilson 1993). The species is poorly known by local inhabitants and goes by names derived from two better-known local *Hibiscus* species, such as *'aute 'oviri* (lit. 'wild '*aute*') on Tubuai and *pugau ha'eha'a* (low or small *Hibiscus tiliaceus*). Other local names such as *fautia* and *hautia* likely refer to *Abelmoschus moschatus* and are more correctly spelt as *fauti'a/hauti'a* and *'auti'a* on Rapa (Jean-François Butaud, pers. comm.) parallel to the Tahitian cognate name of that plant, i.e., *fauti'a*, lit. 'upright *Hibiscus tiliaceus*' (Fare Vāna'a 2017).

Hawai'i has a generic term for hibiscus including the nine native species in section *Lilibiscus* (Huppman 2013), some of which have red flowers like *kaute*. None of their names is cognate with *kaute*, nor is there any term derivable from an earlier *kaute* in this sense in Hawaiian. The generic term for hibiscus, including cultivated varieties like *H. rosa-sinensis* introduced since European contact, is *pua aloalo*, which probably derives from PPn **walowalo* '*Premna* sp.', a tree with strikingly similar leaves to several Hawaiian *Hibiscus* spp. and yielding a soft wood used as a fire plough in parts of Polynesia.

Among indigenous wild Hawaiian hibiscus species are *koki'o ke'oke'o* '*Hibiscus arnottianus* A. Gray' and '*Hibiscus waimeae* A. Heller' (lit. white *koki'o*), both shrubs and trees with white flowers. Sharing the unique and obscure name *koki'o* is *koki'o 'ula'ula* '*Hibiscus clayi* O.Deg. & I.Deg.' (lit. red *koki'o*), a shrub with red flowers. Hawaiian *'akiohala*, *'akiahala*, *hau hele* and *hau hele wai* (lit. 'fresh water *hau hele*') are names for '*Hibiscus furcellatus* Desr.', a shrub growing in marshy areas and having pink flowers. The source of its first two names is unclear, but Hawaiian *hau hele* has cognates in other East Polynesian languages including Mqa *hau he'e* '*Hibiscus tiliaceus* subsp. *tiliaceus* cv. sterilis' and Mao *hou-here* '*Hoheria populnea* A.Cunn.', a tree whose inner bark was used for cordage. The terms in this cognate set are all derivable from PPn **fau* '*Hibiscus tiliaceus*' modified by PPn **sele* 'snare, tie up'. Haw *hau hele 'ula* (lit. 'red

hau hele') was also used for *koki'o 'ula'ula*. *Koki'o ke'oke'o* and *koki'o 'ula'ula* are reported to have been planted near homes in traditional times for their blossoms (Handy and Handy 1972: 233).

A further indigenous Hawaiian hibiscus is the yellow-flowered *ma'o hau hele* '*Hibiscus brackenridgei* A.Gray' (lit. '*hau hele*–like *ma'o*'). The *ma'o* 'Hawaiian cotton (*Gossypium tomentosum* Nutt. ex Seem.)' has yellow flowers and is in the same family as hibiscus, with cognates that are names of plants in both East and West Polynesia, including New Zealand, all likely derived from PPn **mako* '*Trichospermum richii* (A. Gray) Seem.' from Fiji and Sāmoa. Given that both the terms PEPn **fau* and PEPn **fau sele* were introduced into New Zealand and Hawai'i and the existence of *Hibiscus* species that could have been named with the term *kaute*—because of their morphology or colour—it is noteworthy that the term *kaute* has no reflexes in Hawaiian or Māori. The implication is that the red-flowered hibiscus *kaute* was unlikely to have been cultivated by the ancestors of the original settlers of New Zealand, Hawai'i or Rapa Nui.

Kaute Cognates Clustered among Outlier Languages with Close Connections to East Polynesian

The distribution of cognates of *kaute* in the Polynesian Outliers is similar to that in East Polynesia in that they cluster around a distinctive cultural area with a history of close interaction, an area that, as we shall see below, also has close connections to East Polynesia (Fig. 6). That area with regular reflexes of *kaute* is the Central Northern Outliers (CNO). Each of the four CNO languages—Takuu, Nukeria (on Nuguria Island), Nukumanu and Luangiua—reflect *kaute*: Tak *kaute* '*Hibiscus rosa-sinensis*', Nkr *kaute* 'hibiscus, a kind of flowering shrub', Nkm *kaute* 'flower' and Lua *uke* 'flower'.[4] The development of reflexes of *kaute* in Nukumanu and adjoining Luangiua to mean 'flower' provides some support for the antiquity of the term in those islands.[5]

The Polynesian Outlier languages most distant from the Central Northern Outliers—that is, the three located in Vanuatu (Emae; Ifira, spoken on Ifira island and nearby Mele settlement; and West Futunan, spoken on Futuna and Aniwa islands) and another in New Caledonia (West Uvean, spoken on 'Uvea Island)—all lack cognates for *kaute*, although all have terms for red-flowered hibiscus. Indeed, the red-flowered *Hibiscus cooperi* Veitch is native to Vanuatu and is assumed to have been cultivated by indigenous peoples of Vanuatu before the colonisation of small offshore islands and nearby coastal areas by Polynesians. If *kaute* had been part of the Polynesian language that those Polynesian colonists took with them, one could assume they would have applied that name to such local hibiscus, just as they applied Polynesian names to other culturally useful plants already in use by indigenous Austronesian-speaking peoples. Note that at least one, and

often several, of these Southern Outlier languages have directly inherited Polynesian cognates, rather than borrowings from nearby Melanesian languages, for PPn **kawa* '*Piper methysticum* G.Forst.', PPn **toro* 'sugar cane *Saccharum* spp.', PPn **tii* '*Cordyline fruticosa* (L.) A.Chev.', PPn **kofe* 'bamboo species'; PPn **nonu* '*Morinda citrifolia* L.' and other useful plants. However, their names for red-flowered hibiscus are totally unrelated to those in Polynesian Triangle languages.

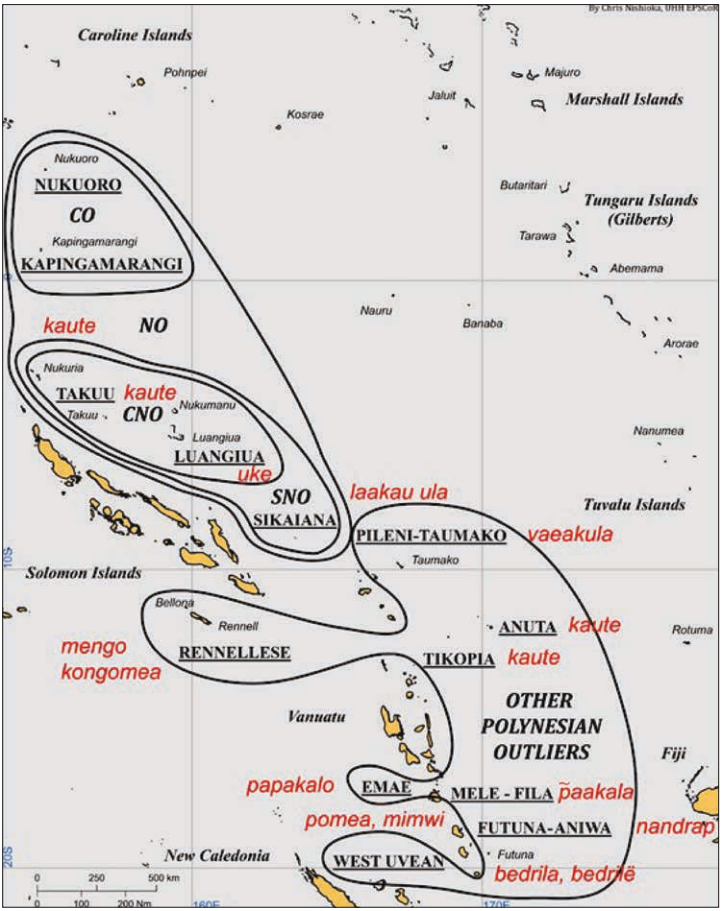

Figure 6. Distribution of Polynesian Outlier names for 'cultivated red-flowered hibiscus'.

Also lacking cognates of *kaute* are the languages of the Northern Outliers other than the CNO mentioned above. For the Caroline Outliers (CO) of Kapingamarangi and Nukuoro to the immediate north of the CNO, no cognates for *kaute* or other terms for red-flowered hibiscus are recorded in the standard dictionaries in spite of careful listing therein of other native and introduced plants with their Latin and indigenous names (Carroll and Soulik 1973; Lieber and Dikepa 1974). For Sikaiana, the Southern Northern Outlier (SNO), there is no cognate for *kaute*, and red hibiscus—used for decoration—is called *laakau ula* (Donner 2012: 157), lit. 'flame or red plant', a transparent and likely recent term.

That there are no cognates for *kaute* in the Northern Outliers (NO) other than in the CNO is unexpected: Northern Outlier languages are closely related and descend from a common ancestor under all proposed subgroupings (Howard 1981; Marck 2000; Pawley 1996; Wilson 2012, 2014, 2018). Furthermore, as will be explored in more detail below, there is evidence that the Northern Outliers form an exclusive subgroup with East Polynesian languages. If *kaute*/red-flowered hibiscus was an integral element of the ancestral cultures present in the Northern Outliers then the term *kaute* would be expected to be reflected more widely than just CNO.

Of the languages of the Southeast Solomons Outliers to the immediate south of Sikaiana, proposed as related closely to Northern Outlier languages (Wilson 2018), only those of Tikopia and Anuta (near Tikopia and culturally connected to it but linguistically distinct) have been recorded as having cognates of *kaute*, i.e., Tik *kaute* 'flowering hibiscus species'; Anu *kaute* '*Hibiscus rosa-sinensis*'. Tikopia has strong cultural ties to the Central Northern Outliers through seasonal voyages undertaken between these islands from ancient times into early contact times (Bayliss-Smith 2012: 119). The term *kaute* could have spread from Tikopia to the Central Northern Outliers. Tikopians knew of Pukapuka, an island on the border between East Polynesia and Central West Polynesia. The Pukapukan language has borrowings from Tikopia, the Central Northern Outliers and East Polynesia (Wilson 2014: 413–15), and Pukapuka would have been a way station on the transportation of *kaute* to the Outliers from East Polynesia. The name *kaute* may also have been introduced from West Polynesia to Tikopia, since Tongans have traditions of voyages to Tikopia (Gifford 1929: 14–15). Tikopians knew of Rotuma, Sāmoa, Pukapuka, 'Uvea and Tonga and had been visited by Tongans (Dillon 1829, vol. 2: 103, 112, 135; Firth 1961: 27, 61).

Vaeakula is the current term for red-flowered hibiscus in the Vaeakau-Taumako Outlier language spoken in the Reef and Duff Islands, lying between Sikaiana and Tikopia. Vaeakau-Taumako likely had considerable contact with CNO peoples as a waypoint on the annual voyage mentioned

above and may yet be found to have a *kaute* term, or it may have been lost. Well-documented Rennellese (Elbert 1975), the largest and most isolated of the Southeast Solomons Outlier languages, clearly does not have a *kaute* term for hibiscus or for any other meaning. Red-flowered hibiscus does grow on Rennell and adjoining Bellona, where a dialect of Rennellese is spoken. Rennellese has two terms for hibiscus species: *kogomea* 'red coral hibiscus' and *mego* '*Hibiscus rosa-sinensis*': those terms have cognates in other Polynesian languages, but the plants they refer to are not related to hibiscus. Rennellese *mego* reflects PPn **melo* 'red, brown', with cognate *mero* meaning 'red' in nearby and related Tikopian and Anutan, while the second morpheme of *kogomea* clearly reflects PPn **mea* 'reddish'. These Rennellese names therefore derive from the colour of the flower and were likely local innovative names for the plant.

THE TERM *KAUTE* OUTSIDE EAST POLYNESIA AND THE OUTLIERS

The distribution of the cognates of *kaute* is the primary evidence for *kaute* not being present in the language of the initial colonisers of East Polynesia and their early ancestors, who spoke various proto-languages beginning with Proto-Southeast Solomons Outlier-East Polynesian. There is also evidence that *kaute* is a relatively new word in the original far eastern Lapita settlement area of Fiji, Tonga and Sāmoa.

For Rotuman, the term *kauta* meets the criteria established by Biggs (1965) for identifying Polynesian borrowings. If Rotuman *kauta* were directly inherited from Proto-Oceanic, the Rotuman term corresponding to Polynesian *kaute* would be *'aufa* rather than *kauta*. There is also evidence that Tongan and Niuean *kaute* are also borrowings. In Tongan and Niuean antepenultimate **-au-* and **-aCu-* sequences normally change to *-ou-*, *-oCu-*, e.g., PPn **taume* 'spathe of coconut palm' > Ton, Niu *toume*; PPn **taura* 'rope' > Ton, Niu *toua*; PPn *fanua* > Ton, Niu *fonua*. The lack of this change indicates that the term *kaute* was introduced into Tongan and Niuean after that change had run its course. There are examples of East Polynesian terms other than *kaute* introduced into Niuean that also maintain antepenultimate **-aCu-* and **-au-*, e.g., PEPn **tafuqa* 'platform, foundation, base' borrowed into Niuean as *tafua* 'platform' and PEPn **rauka* 'got, obtained, able' borrowed into Niuean as *lauka* 'a comparative, better'.

For Fijian, there is evidence of an external source in the name *senicikobia* 'red-flowered hibiscus' (lit. 'flower of Cikobia') (Seemann [1862] 1973: 375, where it is misspelt *senicicobia*). Cikobia is an island distant from the main body of Fijian Islands, with traditional contacts with nearby Polynesian East Futuna. The distribution of another name, *'aute*, in Taveuni and much of eastern Vanualevu—places relatively close to West Polynesia and with traditional and historical contacts with Polynesia—is evidence for the

relatively recent introduction from Polynesia of the term, which has become generic for all species similar to *Hibiscus macverryi* Thomson and Braglia.

Tuvaluan and Tokelauan, both spoken on atolls, have the term *aute* for red-flowered hibiscus. This term is marked as a borrowing by the lack of an initial /*k*/, and likely derives from Sāmoan *ʻaute*, the source of many post-European-contact borrowings in those two languages (Jackson 2001: 9; Simona *et al*. 1986: ix). Red-flowered hibiscus often struggle to survive on low coral islands, suffering lime-induced iron chlorosis, and were unlikely to be cultivated to any extent on such islands in prehistoric times, except on well-watered, more fertile and uplifted islands.[6]

The replacement of PPn **k* in Sāmoan, Tahitian and Luangiua by a glottal stop (represented orthographically by ʻ) is likely a rather recent recurrent phenomenon, albeit prehistoric, since nearby closely related languages all reflect PPn **k* as /*k*/. Marquesan also replaces PPn **k* with /ʻ/ but only sporadically with a number of doublets, including Mqa *koute*, *ʻoute* 'red-flowered hibiscus', suggesting that the change PPn **k* > /ʻ/ in that language is also recent.

The change *-au-* > *-ou-* in Marquesan and Mangarevan is also considered recent and spread through contact between the two (Fischer 2001: 116–18). The same *-au-* > *-ou-* change does not occur in related Rapa Nui or in likely early borrowings from Marquesan or Mangarevan.[7] We therefore propose that initially the term for the red-flowered hibiscus in older forms of Marquesan and Mangarevan was *kaute*.

MOVEMENT WITHIN AND BEYOND EAST POLYNESIA'S CENTRE OF CONCENTRATION OF *KAUTE* TERMS

In reviewing the distribution of *kaute* terms with expected regular sound shifts, we see that they are most solidly spread among the high islands of Central East Polynesia but not found in distant Hawaiʻi, New Zealand and Rapa Nui. There is also evidence that they have some antiquity in the CNO and possibly Tikopia and nearby Anuta. There is linguistic and other data indicating that the term and plant only spread into Central West Polynesia, Fiji and Rotuma in more recent prehistoric times, that is, after New Zealand had been settled and regular contact between there and the rest of East Polynesia had ended, i.e., sometime after 1200 (Kirch 2017: 240). We therefore assume that the term developed in Central East Polynesia and spread from there.

A Central East Polynesian source of the term and the plant requires an explanation of how, where and when the term arose and how it spread within the context of the prehistory of East Polynesia. We turn now to the evidence that East Polynesia was settled from the CNO and that there remained connections between the CNO and East Polynesia for some time after that initial settlement.

For a considerable period it has been generally believed that East Polynesia was settled from Sāmoa or thereabouts (see Geraghty 2009: 446 and references therein), but with limited linguistic, ethnographic or archaeological evidence unambiguously linking the two areas. In discussing East Polynesian archaeology, Allen (2010: 152, 159–61), Kirch (2017: 202–3) and Sinoto (1983) have noted that its earliest material cultural assemblages are distinct from those found in Central West Polynesia. Among distinctive material culture features are short hand clubs and highly developed fishing technology. Those features along with other cultural features seen as distinctive of East Polynesia such as large anthropomorphic figures and wooden or stone food pounders (Kirch and Green 2001: 72) are also found in the CNO (Wilson 2018: 414–17). The linguistic evidence linking the two areas is particularly extensive, and for a considerable period, leading linguists such as Blust (2013: 729) and Pawley (1996: 406) have accepted the validity of an accumulation of data that the East Polynesian languages are most closely related to the languages of the CNO (Geraghty 2009; Wilson 1982, 1985, 2012, 2014, 2018). The findings of a comprehensive Polynesian genomic study by Hudjashov *et al.* (2018)—specifically their principal component analysis and phylogenetic reconstruction of the Polynesian mitochondrial DNA B4a1a1 subgroups and C2a1-P33 paternal lineages—are consistent with the linguistic evidence for the recent settlement of East Polynesia from Luangiua/Ontong Java (CNO). A linguistic tree illustrating that relationship with Proto-East Polynesian placed as a sister of Proto-Central Northern Outlier in the larger Polynesian subgroup is given in Figure 7.

Alternating wind patterns centred at roughly latitude 5°S and longitude 160°E (Montenegro *et al*. 2014: 246, 248, 251–53) are such that it is relatively straightforward to sail in an easterly direction and later on back during certain periods from the CNO which are located in that very area. When westerlies are blowing they move over the coral Phoenix and Line Islands and then on to the high volcanic Marquesas Islands with a return possible with a shift to more regular easterlies. We assume an initial colonisation history from the CNO with the resultant Proto-East Polynesian speakers inhabiting two widely distinct areas, both in terms of ecology and geographic clustering. One area consisted of the coral islands nearer to the CNO and the other a high-island Marquesas Islands group more geographically remote from the CNO. That settlement pattern is seen as resulting in Proto-East Polynesian splitting into two dialects, East Polynesian Proximal (PEPnP) and East Polynesian Distal (PEPnD), ultimately the source of two later separate subgroups. PEPn is seen as developing in contact with Proto-CNO, with contact greater with its Proximal dialect than with its Distal dialect. That the early East Polynesians living in the Marquesas did have contact with peoples to their west can

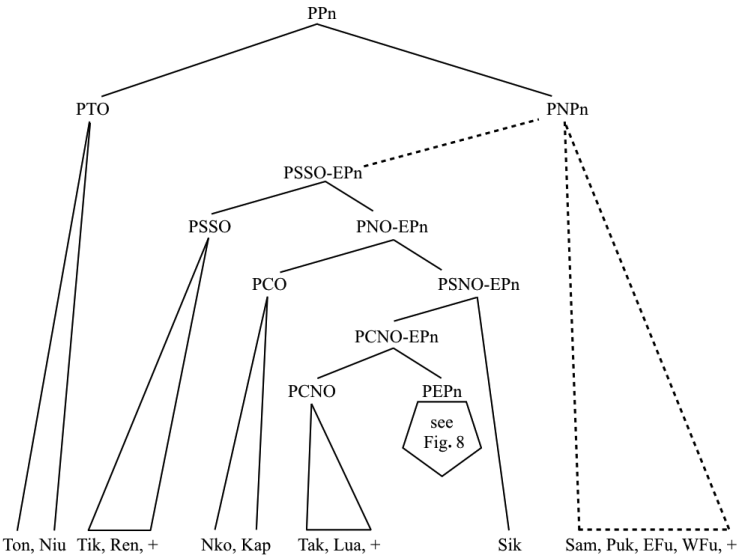

Figure 7. East Polynesian languages within the larger Polynesian subgroup (see note 1 for abbreviations).

be seen in Marquesan borrowings in Northern Outlier languages (Wilson 2012: 319–21) and in the pottery sherds found in the Marquesas that have been sourced to Fiji (Allen *et al*. 2012). That there was contact between Fiji and the Northern Outliers can be seen in Fijian borrowings in the Northern Outlier languages (Geraghty 1996; Wilson 2012: 323–24).

In addition, PEPnP had at least two subdialects spoken among the geographically scattered coral islands between the PEPnD Marquesas homeland and the CNO. One we label the Northern subdialect (PEPnP(N)) with a single descendant, Hawaiian. The other we label the Southern subdialect (PEPnP(S)); it is the same subgroup that Green (1966) labelled "Tahitic".[8] PEPnP(S) is seen as the ancestor of all East Polynesian languages spoken west of 142°W longitude, plus Tuamotuan, a language spoken in various dialects from 148°W to 136°W. PEPnD is proposed as the ancestor of Marquesan, which has remained in the original PEPnD homeland, and also Mangarevan, settled later from the Marquesas. Rapa Nui is seen as having been settled from Mangareva, and these two languages constitute a lower-order subgroup.

Figure 8 illustrates the subgrouping of East Polynesian used here with the addition of Proto-Central Northern Outlier-East Polynesian immediately

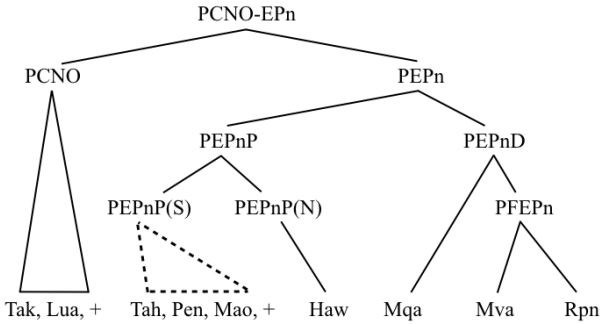

Figure 8. East Polynesian languages subgrouping within Central Northern Outlier-East Polynesian languages (PCNO-Epn; see note 1 for abbreviations).

above Proto-East Polynesian[9]; dotted lines under PEPnP(S) indicate that any further subgrouping under that node has been left indeterminate.

The Line and Phoenix Islands had been abandoned—sometime after 500–600 BP (see Anderson *et al*. 2000; Di Piazza and Pearthree 2001)—before the first European visits. Before that abandonment, it is likely that they remained a means of continued contact between East Polynesia and the CNO and other parts of West Polynesia, including as a stopover point for voyages to and from the Marquesas. The discovery in the Northern Line Islands of basalt from ʻEiao in the Marquesas Islands suggests the possibility of such movement, as does basalt from Sāmoa discovered in the Southern Phoenix Islands (Di Piazza and Pearthree 2001).

CULTIVATION, USE AND NAMING OF *KAUTE* HIBISCUS

Pacific Islands species in section *Lilibiscus* related to *kaute* produce viable fruits during cooler periods, with night temperatures less than 20–23°C. This would likely indicate that *kaute* originated in mid-high mountain areas on a volcanic island. The only islands with such mountains of considerable height in Central East Polynesia are in the Marquesas and Society Islands.[10] Furthermore that wild ancestor may have been quite rare (and/or in very rough terrain) or heavily exploited for its bark shortly after settlement, as one of the difficulties in determining the original source of *kaute* is the lack of any known true wild population anywhere. There is support for an origin for *kaute* both in the Marquesas and in Tahiti based on place names (Table 2). Among the 33 plant species listed as Polynesian introductions into the Marquesas (Dunn 2005; Wagner and Lorence 2002), "*H. rosa-sinensis*" (*koute ʻenana*/*ʻoute ʻenata*) is exceptional: each of the other 32 plant species

Table 2. Land names in the Marquesas and Tahiti that are likely derived from the local name for *kaute* hibiscus.

Island and archipelago	Land name	Possible spelling	Possible etymology
Hiva Oa, Marquesas	Fae-koute	Fa‘e-koute	House of hibiscus
Tahuata & Fatu Hiva, Marquesas	Teoute	Te-‘oute	The hibiscus
Fatu Hiva, Marquesas	Teavaoute	Te-ava-‘oute	Hibiscus pass (plant landmark*)
Tahiti, Society Is.	Teaute	Te-‘aute	The hibiscus
Tahiti, Society Is.	Teaute rahi	Te-‘aute rahi	Big hibiscus
Tahiti, Society Is.	Teaute iti	Te-‘aute iti	Small hibiscus
Tahiti, Society Is.	Arateaute	Ara-te-‘aute	Hibiscus trail (plant landmark)
Tahiti, Society Is.	Tepaaute	Te-pā-‘aute	Hibiscus fortification (plant landmark)
Tahiti, Society Is.	Tearaaute	Te-ara-‘aute	Hibiscus path (plant landmark)

* Plant landmarks are those place names considered likely to be derived from their association with the *kaute* hibiscus.

is either known in the wild in other tropical regions or has a well-documented and accepted domestication locus outside of East Polynesia, and/or has a name in POc or PPn.

Within the subgrouping in Figure 8, the lack of a *kaute* term for *Hibiscus* in New Zealand Māori provides some further support for the Marquesas as the source of *kaute* by eliminating other high islands of Central East Polynesia as the source of the plant and term. New Zealand Māori is an EPnP(S) language, like the languages of the high islands of the Society Islands, Austral Islands and Southern Cook Islands. There is innovative vocabulary shared between Māori and those languages, including plant terms, e.g., PEPnP(S) **poo-fatu* 'small tree or bush, *Sophora tomentosa* L.' with a variant **poo-futu*, cognate with Mao *pōhutu-kawa* '*Metrosideros excelsa* Sol. ex Gaertn.'. If *kaute* had been an early discovery and domesticate on one of the EPnP(S)-speaking high islands such as those of the Society Islands, it is likely that the name *kaute* would have been taken to New Zealand. Furthermore, because in our settlement and subgrouping hypothesis Hawai'i was likely settled directly from one of the coral islands near the equator—an area where *kaute* would not have been native or even easily grown—that hypothesis further explains how the term *kaute* would not have reached Hawai'i with its initial settlers.[11]

With the Marquesas as the likely high-island source of both the *kaute* plant and the term for it, the question arises as to how the plant came to be named. The term *kaute* is quite similar in its final four phonemes to East Polynesian terms for paper mulberry such as Mao *aute*, so we propose that, differences in form notwithstanding, the term for paper mulberry was expanded to include the red-flowered hibiscus. As we shall see later, East Polynesian terms for paper mulberry can be derived from PPn **kau-mafute* 'paper mulberry stick stripped of its bark', with the PEPnD subgroup especially rich in reflexes of **kau-mafute*. The diversity of derivations from **kau-mafute* within the PEPnD homeland, which is the Marquesas, is evidence that the Marquesas is where paper mulberry was first grown in East Polynesia.

Kaute shares morphological similarities with paper mulberry, notably its typically serrated, subcordate leaves (sometimes near-identical to paper mulberry), plant habit and strong, long-fibred bark. In using the hibiscus for its bark or fibre or when bringing the hibiscus into cultivation, the similarities to paper mulberry would have become more evident and the term for paper mulberry would have been applied to it, eventually changing to *kaute* through phonological changes described below. However, in order to name the *kaute* after the paper mulberry, the latter needed to be present in the Marquesas. Further, there needed to be a source and a means through which a distinct name for paper mulberry similar in sound to *kaute* could have developed.

Kaute and Paper Mulberry Terminology Development in the Marquesas. Polynesian paper mulberry is propagated asexually and could not have been naturally present in East Polynesia at initial settlement. The East Polynesian settlement proposal within the NO-EPn Hypothesis has the original settlers of East Polynesia deriving from a population living on the coral CNO.[12] Pre-contact voyaging between the CNO and Tikopia (Bayliss-Smith 2012: 117) would have provided a means for ancient CNO inhabitants to gain access to certain high-island products such as turmeric powder and paper mulberry bark cloth, as well as knowledge of high-island flora and fauna. Indeed there are names of some high-island tree species shared among the languages of the Southeast Solomons Outliers, East Polynesia and the CNO, but not those of Sāmoa and other Central West Polynesian islands (Wilson 2018: 407). Other possible sources of paper mulberry taken by early CNO inhabitants to East Polynesia are New Ireland and the Solomon Islands. Nuguria (Nukeria) is about 230 km from New Ireland, and Takuu is a similar distance from Bougainville. New Ireland, Bougainville and other nearby areas of Melanesia would provide access to distinctive cultivars of paper mulberry not found in Central West Polynesia. A comprehensive genetic study of *Broussonetia papyrifera* in Remote Oceania (Olivares *et al.* 2019) detected a surprisingly high level of genetic diversity in East Polynesia for a relatively recently introduced (< 1,000 years) asexually propagated crop. This included 40 genotypes exclusive to East Remote Oceania (ERO), greater diversity in ERO than West Remote Oceania (WRO) and considerable genetic structuring: we consider this data suggests that ERO's *Broussonetia* was highly unlikely to have been derived principally from WRO.

Given the agroecological conditions of the coral Phoenix and Line islands, we assume that paper mulberry was not grown by the early PEPnP speakers living there and that imported paper mulberry bark cloth would have been a rare prestige item. Possible evidence for the rarity of the bark cloth of paper mulberry for PEPnP speakers can be found in the PEPnP reflex of PPn **siapo* 'paper mulberry, paper mulberry bark cloth' that exists in the compound PEPnP **mata-siapo* 'first-born child' (possibly also meaning 'precious, prized' as does its reflex in EPnP Māori or 'chief' as does its reflex in Rarotongan). If East Polynesia had been settled from an area of northern Central West Polynesia such as Sāmoa, we would expect the term *siapo* to have been introduced with the paper mulberry plant, but as we shall see below, East Polynesian languages use other terms for paper mulberry.

The well-watered high-island Marquesas where PEPnD speakers resided are ideal for growing paper mulberry, and the plant is still cultivated there. We postulate that descendants of residents of the coralline Central Northern Outliers—who settled the Marquesas after first moving through the coral Phoenix and Line Islands—and the initial settlers of the Marquesas also

likely lacked paper mulberry and used other plants to make bark cloth, including banyan, PPn **qaoa* > Mqa *ao'a*; Nko *aoa*; Tah *aoa*; Tik *aoa*. A linguistic line of reasoning for such a history is Mqa *hiapo* 'young banyan from which tapa is made' and Mva *'iapo* 'name of a plant now extinct', providing a basis for reconstructing PEPnD **siapo* 'young banyan shoots used to make bark cloth', a term distinct from PEPnP **mata-siapo*, yet relatable to it through the idiom Mqa *epa hiapo* 'chief' (lit. swaddling clothes of young banyan').

It is quite possible that the initial Marquesan settlers used the inner bark of *kaute* in the manufacture of fibre as recorded in the Cook Islands (Eimke 2018). *Kaute*, and *Hibiscus tiliaceus*, are processed for their fibre by scraping off the outer bark and retting the wooden core with the inner bark attached in the sea or streams to produce a white, shiny, silky fibre: these "threads" can be used to sew together pieces of tapa (Tepu Kea (elder on Atiu/Cook Islands) and Andrea Eimke, pers. comm.). *Hibiscus rosa-sinensis*—a close relative of *kaute*—is suited to manufacture of paper (Channer 2013: 7–9), and in China the bark of *Hibiscus rosa-sinensis* and paper mulberry were reportedly used for the same purpose, that is, to make a form of tissue paper (Julien 1869: 149). However, Andrea Eimke (pers. comm.) considers it highly unlikely that traditional tapa techniques can be employed to make tapa from *kaute*. The inner bark of *Hibiscus tiliaceus* was reportedly employed in tapa manufacture in Hawai'i, but the three preferred genera for production of bark cloth were *Broussonetia*, *Ficus* and *Artocarpus* (Kamen-Kaye 1984: 76). A dark red or black dye obtained from *kaute* flowers was used to decorate tapa cloth in Polynesia (Setchell 1924), providing another association between *kaute* and *Broussonetia* tapa.

Eventually the highly valued paper mulberry did reach the Marquesas Islands, and a term developed for it, PEPnD **kau-mafute* 'paper mulberry'. Given the interaction sphere from the Central Northern Outliers with Tikopia and another postulated interaction sphere from the Central Northern Outliers on to the Phoenix, Line and Marquesas Islands, it is possible that the paper mulberry introduced to PEPnD speakers living in the Marquesas originated in Tikopia or other areas within relatively easy sailing reach from the Central Northern Outliers including the Solomons, New Ireland and other nearby areas of western Melanesia. Indeed our parsimonious interpretation of the genetic research on *Broussonetia papyrifera* undertaken by Olivares *et al*. (2019) is that the Eastern Polynesian material was introduced directly from near New Guinea.

There is linguistic evidence for introduction from Tikopia, or at least the source of the name from that area, in a cognate of PEPnD **kau-mafute* in Tik *kau-mafuta* 'tripod of poles as a filter stand for turmeric extraction', which in turn is likely a more recent derivation from PPn **kau-mafute* 'paper mulberry

stick stripped of its bark'. Table 3 illustrates how all East Polynesian terms for paper mulberry can be derived from PPn **kau-mafute*, most of them by loss of the morpheme **kau-* 'stick', followed by a variety of losses and/or changes in the first two consonants of the **-mafute* element. Because EPnD languages contain all the cognates needed to reconstruct **kau-mafute* 'paper mulberry' and EPnP cognates all follow a narrow pattern related to developments in Marquesan, it is likely that EPnP terms for 'paper mulberry' are the result of borrowing from early Marquesan. This is consistent with EPnP languages deriving from languages spoken originally on small coral islands where paper mulberry did not grow, and then obtaining the plant and its name as Polynesians spread out later to high islands like Tahiti, where paper mulberry could be cultivated.

Only in the case of Rpn *mahute* are consonant correspondences between contemporary languages and PPn regular in Table 3. Irregular consonant correspondences and consonant losses occur in other terms in various languages of East Polynesia. Beyond Rapa Nui, in all cases the phoneme **f* appears to have been lost or replaced with another consonant like **q* (glottal stop) or **h*, which was later regularly lost. The reflexes of the **m* are the most variable. In other East Polynesian terms where there are variable consonant correspondences of this sort, a PEPn **q* is sometimes indicated as an intermediate step, especially in initial position. We therefore assume that one of the terms derived from PEPnD **kau-mafute* 'paper mulberry' at an early period in East Polynesia was ***qaute* (or ***qaCute*, with another lost consonant (*C*) also possibly reflecting PPn **q* or **h*). The double asterisk indicates a stage intermediate between a proto-language and a contemporary language such as **m* > **q* > **s* > Mqa *h* in the derivation of Mqa *kou-hauti*. We also assume that the term ***qaute* and the plant were then borrowed into early EPnP languages with some irregularly reflecting the **q* with another consonant, i.e., Hawaiian /*w*/ and Rarotongan /ʻ/, ultimately through an earlier **s*.[14] As PPn **q* is eventually normally lost in all East Polynesian languages other than Rapa Nui, the spread of the term ***qaute* for paper mulberry must have occurred before that loss occurred in Hawaiian or Rarotongan.

The spread of ***qaute* as a borrowing from the Marquesas among early EPnP languages, possibly as early as PEPnP, is supported by the lack of any other terms descended from **kau-mafute* in any EPnP language. However, the term *mahute* 'paper mulberry' reached Rapa Nui as part of its linguistic inheritance of **kau-mafute* directly from high-island-Marquesas-resident PEPnD-speaker ancestors. The later developed term ***qaute*, which spread among EPnP languages, does not appear to have ever reached that isolated eastern island.

Table 3. East Polynesian terms for paper mulberry derived from PPn **kau-mafute*.

PPn	* k a u + m a f u t e	paper mulberry stick stripped of its bark
PEPnD	* k a u + m a f u t e	paper mulberry
EPnD terms		
Rapa Nui	- - - + m a h u t e	paper mulberry
Marquesan	k o u + h a - u t i	paper mulberry variety
Marquesan	- - - + - a - u t e	*tumu-aute* paper mulberry tree (*tumu* 'tree trunk' not shown to the left)[13]
Marquesan	- - - + - - - u t e	paper mulberry
Mangarevan	- - - + - e - u t e	paper mulberry
Mangarevan	- - - + - - - u t e	paper mulberry (small)
EPnP terms		
Tahitian, Māori	- - - + - a - u t e	paper mulberry
Hawaiian	- - - + w a - u k e	paper mulberry
Rarotongan	- - - + ʻ a - u t e	paper mulberry

During the period when ***qaute* 'paper mulberry' is assumed to have been spreading among EPnP speakers, the Marquesas shared through contact with Mangareva the closely related ***qaCute*. Eventually ***qaCute* developed into modern Mva *eute*, *ute* and Mqa *ute*. However, distinctively from Mangarevan and all other East Polynesian languages, Marquesan also retained other terms descended from PEPn **kau-mafute*, i.e., *tumu-aute* 'paper mulberry tree' (most closely cognate with PEPnP **qaute* and

likely from early Marquesan **tumu-a-qaute*) and *kou-hauti* 'type of paper mulberry', further evidence that the Marquesas was the original part of East Polynesia where paper mulberry was cultivated.[15]

We also propose that a variant pronunciation of ***qaute* or ***qaCute*, namely ***kaute*, developed in the early Marquesas and was increasingly used for the newly cultivated hibiscus species originating in the mountains of the Marquesas. While there is a possibility that the distinctive Polynesian hibiscus has an origin in the Society Islands and that the term *kaute* was innovated there, a Marquesan origin is more likely not only in view of the several cases in Marquesan where an initial PPn **q* irregularly becomes /*k*/ and /ʻ/ (Marck 2000: 70) but because none have been noted for Tahitian. An example with a three-vowel structure parallel to *kaute* is PPn **qarofa* 'greeting' > Mqa *kaʻoha*. Once the hibiscus had become widely cultivated in its homeland, the plant and its name *kaute* were then spread to EPnP-speaking high islands of Central East Polynesia as well as to Mangareva, but only after ***qaute* 'paper mulberry' had already spread among EPnP languages during an earlier period of more distant navigation.[16]

EVIDENCE FOR INTERACTION SPHERES THROUGH WHICH *KAUTE* LIKELY SPREAD

There is general agreement among archaeologists that East Polynesia was settled considerably later than Central West Polynesia and also quite rapidly (Kirch 2017: 198–203). The few early dates available from archaeological work in the Northern Outliers, e.g., AD 658–768 for Nukuoro (Kirch 2017: 161), are slightly earlier than the earliest dates of AD 900–1100 agreed upon as valid for the first settlement of East Polynesia (Kirch 2017: 200), thus allowing for the possibility of East Polynesia being settled from the Central Northern Outliers.

Archaeologists have also discovered early and widespread dissemination of basalt from the Marquesas into the Society Islands, Mangareva, the Austral Islands, the Southern Cook Islands and the Line Islands (Di Piazza and Pearthree 2001; Weisler *et al.* 2016). The earliest periods of dispersal of Marquesan basalt may have paralleled the spread of paper mulberry known by the term ***qaute* from the Marquesas among early EPnP speakers colonising new island groups including New Zealand and Hawaiʻi. Subsequent, although somewhat diminished, contact between peoples living in the Marquesas and elsewhere in Central East Polynesia—but not New Zealand and Hawaiʻi—likely carried the newly domesticated *kaute* hibiscus and its name throughout Central East Polynesia. As already noted, dissemination of that plant to other parts of East Polynesia would have occurred before the *-au-* sequence changed to *-ou-* in Marquesan and before Marquesan /*k*/ sporadically changed

to /ʻ/, making *kaute*, rather than contemporary Marquesan *koute* and *ʻoute*, the term carried to other parts of Polynesia.

Travel between the Marquesas (or Societies) and the Central Northern Outliers through the Line and Phoenix Islands would have provided a means for the dissemination of *kaute* (both the plant and its name) to those Outliers. Subsequently *kaute* could have been taken to Tikopia and nearby Anuta during the annual voyage that connected the two areas. Linguistic evidence for such contact between East Polynesia and the Northern Outliers and Tikopia has been identified (Wilson 2012: 318–21).

Archaeologists have discovered Sāmoan basalt in sites in the Cook Islands along with Marquesan basalt (Cochrane and Rieth 2016; Weisler *et al.* 2016). We interpret this as evidence for interisland movement and trade providing a means for *kaute* hibiscus to first reach the Southern Cook Islands from the Marquesas Islands and later to be taken to Sāmoa and Tonga. There is also supportive linguistic evidence for late contact between EPnP-speaking areas and West Polynesia in Niuean, a language spoken on an island that may have served as a way station between EPnP-speaking areas of East Polynesia and Central West Polynesia (Marck 2000: 112; Wilson 2014: 407).

From Central West Polynesia, the term and plant *kaute* spread to nearby Fiji and Rotuma, with the phonological markers indicating that its arrival was probably fairly recent in that area, that is, after PPn antepenultimate **-au-* became *-ou-* in Tongan and Niuean (Schmidt 2001: 215–17). Late prehistoric transport of Sāmoan basalt reached not only the Southern Cook Islands but also Tonga, East Fiji, Taumako in the Southeast Solomons Outliers and nearby Makira (San Cristobal) of the Solomon Islands as well as the coral island of Manra in the southern Phoenix Islands. This interaction sphere would have provided an alternative to direct movement from the Marquesas for the plant and term *kaute* to reach Tikopia and the Central Northern Outliers.

A third possible route for the movement of *kaute* from East Polynesia to Tikopia, the Central Northern Outliers and possibly Sāmoa as well is through Pukapuka in the Northern Cook Islands, the indigenous language of which has extensive borrowings from Tahitic (EPnP(S)) languages and also possible borrowings from Tikopian and Northern Outlier languages (Clark 1980; Wilson 2014: 413–15). The discovery of Sāmoan basalt in Pukapuka, and also in the Tokelau atolls lying between Pukapuka and Sāmoa (Cochrane and Rieth 2016), is further supportive of Pukapuka being part of an interaction sphere connecting East Polynesia, Sāmoa and Tikopia in the southeast Solomon Islands. The area over which Sāmoan basalt has been found closely approximates the area outside East Polynesia where *kaute* has been reported as a pre-European cultivated plant.

RELOCATING *KAUTE* IN THE WILD

Recently two palm species have been either described (*Pritchardia tahuatana* Butaud & Hodel) or recircumscribed (*Pelagodoxa henryana* Becc.) from the Marquesas, from cultivated individuals, both presumed extinct in the wild (Butaud and Hodel 2017; Hodel *et al.* 2019). It is possible that *kaute* also now only survives in cultivation, given its natural rarity and possible early overexploitation for bark, in addition to threats from invasive species (Meyer 2004; Russell *et al.* 2017) and climate change to montane ecosystems in French Polynesia (Pouteau *et al.* 2010). Based on ecological preferences of related Pacific *Lilibiscus* species, *kaute* more likely originates in mid-high elevations, i.e., ≥400 m. In the Marquesas, upland plant communities are in much better condition than those in low-mid elevations, and this especially applies to cliff-edge communities (Jean-François Butaud, pers. comm.). Whilst many of the rugged high-elevation habitats in the Marquesas have been botanically explored over the past three decades (David Lorence, pers. comm.), there remain peaks and cliffs which have yet to be studied (Jean-François Butaud, pers. comm.). A thorough exploration of botanically unexplored upland areas of the Marquesas, likely using unmanned aerial vehicles (drones), will be required before *kaute* can be declared extinct in the wild. Attention ought to be initially focused on islands and locations with names or cultural connections to *kaute*/*koute*, especially those islands with suitable, unexplored habitats such as on Hiva Oa (with *kaute*-related place names such as Faekouteeua and Faekoute) and Fatu Hiva (Teavaoute, Teoute, Outepoe).

* * *

The following is a chronological summary of events proposed in this paper:

1. *Ca. 2800 BP*. Lapita colonists settle in the western Pacific as far east as Tonga (Burley *et al*. 2015: 11) and likely become familiar with local species of red-flowered *Hibiscus*, including *H. cooperi* (in Vanuatu) and *H. macverryi* (in Fiji).
2. *Ca. 1200–850 BP*. West Polynesians begin to settle "Outliers"—islands to the west in geographical Micronesia and Melanesia. These settlers lose knowledge of any red-flowered hibiscus since they do not grow well on atolls. Note: The Carolinean outlier Nukuoro might have been settled as early as 1200 BP (Kirch 2017: 161), while the southeast Solomons high-island Outlier Tikopia was likely first settled by Polynesians in 850 BP (Kirch and Swift 2017: 333). Further archaeological research in the CNO is needed to clarify Polynesian settlement dates of these islands.

3. *Ca. 1050–785 BP*. East Polynesia is settled (Allen 2014: 3; Anderson *et al*. 2019: 1; Conte and Molle 2014: 135; Kirch 2017: 200; Niespolo *et al*. 2019: 21; Sear *et al*. 2020). Polynesians from the Northern Outliers voyage east, via the Phoenix and Line Islands, to the Marquesas, as proposed by Wilson (2012), where they encounter a red-flowered hibiscus growing wild in the mountains. They name it *kaute*, derived from the name for the paper mulberry, likely due to its use for making bark cloth/fibre and/or the similarity of leaves on mature specimens of both species.
4. *Ca. 700–500 BP*. The plant *kaute* and its name are deliberately introduced to Tahiti (where it may also be native) and nearby islands, thence to West Polynesia, and thence to Fiji and Rotuma. They are also introduced to four Outliers of PNG and the Solomon Islands. The introduction to Tikopia and Anuta, Outliers in the East Solomons, may have been via the more northerly Outliers, via Pukapuka or from Central West Polynesia.
5. *1769*. *Kaute* is discovered in Tahiti and described by Banks and Solander, who misidentified it as *Hibiscus rosa-sinensis*, contributing to the long accepted but erroneous belief that the plant originated in Southeast Asia, or elsewhere, and was taken into the Pacific by the Lapita settlers.

In sum, we argue that the Polynesian red-flowered hibiscus known as *kaute* was an endemic East Polynesian species, rather than *H. rosa-sinensis* L. We present historical, linguistic and distributional evidence that is supportive, and which points to an east-to-west dispersal in Polynesian times. Further field and genetic research is required to fully evaluate this model, and is already underway.

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NOTES

1. Language abbreviations, names and default sources, where relevant, are as follows: Anu Anuta (Yen and Gordon 1973), EFu East Futunan (Moyse-Faurie 1993), EUv East Uvean (Rensch 1984), Haw Hawaiian (Pukui and Elbert 1986), Lua Luangiua (Salmond 1975), Mao Māori (Williams 1975), Mqa Marquesan (Dordillon 1904), Mva Mangareva (Tregear 1899), Niu Niuean (Sperlich 1997), Nkm Nukumanu (Wycliffe Bible Translators 2013), Nkr Nukeria (Nuguria) (Davletshin 2013), PCNO Proto-Central Northern Outlier (Wilson 2012), Pen Penrhyn (Shibata 2003), PEO Proto-Eastern Oceanic (Geraghty 1983), PCP Proto-Central Pacific, PEPn Proto-East Polynesian (Wilson 1985), PEPnD Proto-East Polynesian Distal (Wilson forthcoming), PEPnP Proto-East Polynesian Proximal (Wilson forthcoming), PEPnP(N) Proto-East Polynesian Proximal Northern (Wilson forthcoming), PEPnP(S) Proto-East Polynesian Proximal Southern (Wilson forthcoming), PMP Proto-Malayo-Polynesian, PNO Proto-Northern Outlier (Wilson 1985, 2012), POc Proto-Oceanic (Ross, 2008), PPn Proto-Polynesian (Greenhill and Clark 2011), PSSO Proto-Southeast Solomon Outlier (Wilson forthcoming), Rar Rarotongan (Buse 1996), Ren Rennellese (Elbert 1975), Rot Rotuman (Inia *et al.* 1998), Rpn Rapa Nui (Englert 1978), Sam Sāmoan (Milner 1966), Sik Sikaiana (Donner 2012), Tah Tahitian (Atiu *et al*. 2019; Lemaître 1973), Tak Takuu (Moyle 2011), Tik Tikopian (Firth 1985), Tokelauan (Simona *et al*. 1986), Ton Tongan (Churchward 1959), Tua Tuamotuan (Stimson and Marshall 1964), Tuv Tuvaluan (Ranby 1980), WFu West Futunan (Capell 1984), WUv West Uvean (Hollyman 1987).
2. A *flore pleno* form of *H. rosa-sinensis sens. lat.* is present on Rapa Nui, but with no ancient reported name, and probably introduced from Tahiti in the nineteenth century (Jean-François Butaud, pers. comm.).
3. PPn **fau* is traceable through various proto-languages all the way back to Proto-Malayo-Polynesian through mostly regular sound changes: PMP **baru* '*H. tiliaceus*' > POc **paru* > PEO **vaRu* > PCP **vau* > PPn **fau.*

4. It is possible that the first syllable of *kaute* was reanalysed in Luangiua as an article or as a noun-forming prefix and thus deleted. Note for example PPn **renga* 'processed turmeric' > PSNO-EPn **renga*, **ka-renga* > Sik *ka-lena* 'turmeric powder', Lua *a-lenga* 'red dye'; PPn **talinga* 'ear' > Lua *kalinga*, *a-kalinga* 'ear'.
5. Another case where an iconic cultivated decorative floral species takes on the meaning of 'flower' is Tahitian and Rarotongan *tiare* 'flower' from PPn **tiale* '*Gardenia* sp.'. Note that Mao *tīare*, *tīere* 'scent' and Haw *kiele* 'gardenia' (generic term applied to native varieties allied *nānū*, *nā'ū*, *nā'ū'ū*) provide evidence for familiarity with gardenias at the settlement period of East Polynesia. Further support is found in cognates in the Southeast Solomon Outliers and Northern Outliers, e.g., Tik *tiare* '*Gardenia taitensis* DC.'; Lua *kiale* 'creeper, white flower'; and Tak *tiare* 'plant species whose leaves are used for personal decoration', allowing for reconstruction of the term **tiale* for a species of fragrant gardenia used for personal adornment at the PSSO-EPn, PNO-EPn and PCNO-EPn levels as well as PEPn **tiare*. PPn **pua* '*Fagraea berteroana* A.Gray ex Benth.' has also become a generic term for 'flower' in East Polynesia.
6. Botanists consider the hibiscus a modern introduction in most of the atolls in French Polynesia, except perhaps uplifted islands such as Makatea and Niau in the Tuamotus (Jean-François Butaud, pers. comm.). The Central Northern Outliers atolls and some raised coral islands are more suitable for hibiscus due to higher rainfall (e.g., Takuu with 2,926 mm annual rainfall, based on climate modelling from the WorldClim database) than that of other atolls, e.g., the Phoenix Islands atolls (Kiribati), with typically less than 1,000 mm annual rainfall.
7. Note the following examples illustrating the outcome *-ou-* from PPn **-au-* for Marquesan and Mangarevan but the retention of *-au-* in Rapa Nui: PPn **taura* 'rope, cord' > Mqa *tou'a*; Mva *toura* but Rpn *taura*; PEPnD **rau-qof/so* 'head hair' (replacing PPn **lau-qulu* 'head hair') > Mqa *'ouoho*; Mva *rouo'o* but Rpn *rau-'oho*. An example where the *-au-* > *-ou-* change is not found in likely early borrowings from Marquesan or Mangarevan is Haw *lauoho* 'head hair'. Another possible example is Rapa Nui *raupaka* 'taro leaves' cognate with Mqa *'oupa'a* 'taro leaves ready for cooking' or Mva *roupaka* 'food taken to fishermen to get fish', but also cognate with Mao *raupaka* 'taro leaves'.
8. Linguistic evidence connecting the two PEPnP dialects to dry coral-island homelands include vocabulary such as innovative PEPnP **maka-tea* 'raised coral' (their primary geological feature) and loss in the Southern subdialect of certain terms associated with standing fresh water.
9. Although not presently available in any publication, the East Polynesian subgrouping in Figure 8 has been in development by Wilson for some time. The relationships reflected in the lower-level subgrouping here called East Polynesian Distal has been proposed previously by Green (1999: 8) and Kieviet (2017: 1–2, 11). What is here called East Polynesian Proximal is referred to in Wilson (2010; 2014: 405, 408–9; 2018: 408) and is a re-analysis that returns Hawaiian to subgrouping with the Tahitic languages, as in Elbert (1953). Reference to the existence of the subgrouping in Figure 8 is in Wilson (2018: 419). A presentation by Walworth and Davletshin (2019) outlined a grouping quite similar to that in Figure 8 but proposed this as a set of contact-derived networks rather than as subgroups descended from a proto-language.

10. Rapa Island (in the Australs Group) also has a suitable climate for seed formation due to its elevation (up to 600 m) and more southerly latitude.
11. While archaeologists generally hold that Hawai‘i was settled from the Marquesas (Kirch 2017: 210–11), linguistically, Hawaiian shares more innovations with other PEPnP languages than with PEPnD Marquesan (Wilson 2014: 408–9, 431). A number of those linguistic features are distinctive of coralline island environments (see, e.g., note 9).
12. Paper mulberry is not normally present or very infrequently cultivated on coralline atolls (Hogbin 1940; Turbott 1949).
13. The *-a-* element in Mqa *tumu-a-ute* (Dordillon 1931: 430) is parallel to the *-a-* element in Mqa *tumu-a-‘ehi* ‘coconut tree’ and likely reflects PPn **-aa-*, a morpheme joining elements in compound words. This *-a-* does not occur after *tumu* ‘tree trunk’ with most Marquesan plant names, e.g., *tumu-mei* ‘breadfruit tree’, *tumu-meika* ‘banana plant’, and its retention in the cases of *tumu-a-‘ehi* and *tumu-a-ute* may reflect the existence of a dropped vowel /*e*/ or /*a*/. Note that cognates of Mqa *‘ehi* ‘coconut’, i.e., Mva *ere‘i* and Tua *erehi*, like the Mva *eute* cognate of Mqa *ute* ‘paper mulberry’ listed in Table 3, have an initial vowel /*e*/.
14. The history of irregular consonant correspondences involving the often-lost consonants PPn **q* and PPn **h* is a distinct topic in itself and not explored in detail here. Some discussion of irregular correspondences of PPn **q* and **h* in East Polynesian languages can be found in Marck (2000: 70–72), Wilson (2010: 302–3; 2018: 418–19) and Davletshin (2016: 365–66).
15. Marquesan retains both an *-au-* and *-eu-* sequence for terms for paper mulberry, indicating that the reason that Mva *eute*, *ute* and Mqa *ute* are seen as likely deriving from **qaCute* is that there is an optional phonological rule shared by Marquesan and Mangarevan that raises an antepenultimate **a* to *e* before *-Cu-*, e.g., PPn **qatule* ‘big-eyed scad fish’ > Mva *eture*; Mqa *etu‘e*. Another rule that drops an initial antepenultimate *e*, e.g., Mqa *e‘e‘o*, *‘e‘o* ‘tongue’, explaining the *eute*, *ute* variation. The existence of the consonant (*C*) between *-aCu-* explains why the common Marquesan and Mangarevan rule of antepenultimate **-au-* > *-ou-* did not affect their terms for paper mulberry while it did affect the term for *Hibiscus*, Mqa, Mva *koute*.
16. There are parallels between the spread of ***qaute* ‘paper mulberry’ and the spread of ***kūmara* ‘sweet potato’, which also must have been brought from an external source, namely in South America, at an early period to some key location in East Polynesia—possibly the Marquesas. The paper mulberry and sweet potato were then dispersed throughout East Polynesia, including to New Zealand, Rapa Nui and Hawai‘i, possibly as early as the initial discovery period of those distant points.

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AUTHOR CONTACT DETAILS

Corresponding Author: Lex A.J. Thomson, Australian Centre for Pacific Islands Research, University of the Sunshine Coast, 90 Sippy Downs Drive, Sippy Downs, QLD 4556, Australia. Email: Lex.Thomson@gmail.com | http://orcid.org/0000-0002-2984-0711

Paul A. Geraghty, Faculty of Arts, Law and Education, University of the South Pacific, Suva, Fiji. Email: paul.geraghty@usp.ac.fj | http://orcid.org/0000-0001-5574-7660

William H. Wilson, Ka Haka ʻUla O Keʻelikōlani College of Hawaiian Language, University of Hawaiʻi at Hilo, Hawaiʻi, USA. Email: wilsonwi@hawaii.edu | http://orcid.org/0000-0003-0296-6063