Banana (*Musa* spp.) Domestication in the Asia-Pacific Region: Linguistic and archaeobotanical perspectives

Mark Donohue and Tim Denham

Research

Abstract

An examination of linguistic terms for 'banana' within Island Southeast Asia and Melanesia sheds light on the history of *Musa* spp. domestication. Linguistic investigations suggest a westward dispersal of banana from New Guinea, mixing with a Philippine variety (or at least sphere of cultural usage), then westward again to mainland Southeast Asia, and (as far as can be linguistically inferred) onward to the western edge of South Asia. The linguistically-derived interpretation accords generally with the archaeobotanical evidence and botanical models for the dispersal of banana cultivars.

Banana Terminologies and Historical Inference

De Langhe and de Maret (1999) outlined a relative history of banana domestication originating in New Guinea. This phytogeographic history has received some genetic support, with modification (e.g., Carreel *et al*. 2002, Perrier *et al*. 2009), and some circumstantial archaeobotanical corroboration (Denham *et al*. 2003). Current understandings of banana domestication, including the geography and history of domestication, are likely to change as more multi-disciplinary data are generated, become more widely accessible and are integrated with existing interpretations.

This paper investigates the role of historical linguistics in the reconstruction of banana domestication and whether it can contribute to, or call into question, existing understandings. Indeed, there is a gap in the archaeobotanical record for bananas in Southeast Asia. This gap can now be investigated using the linguistic database of banana terms across the region in order to elicit any traces of a pre-Austronesian dispersal of bananas westward from New Guinea. Although it seems unlikely to a historical linguist, a study of terms used to refer to bananas (either generically or, where such information is available, particular species) shows patterns that appear in some areas to reflect millennia of conservatism (e.g., De Langhe & de Maret 1999, Denham & Donohue 2009).

In this paper, patterns in linguistic terminology gathered for languages across a wide region – from Southwest Asia to the Pacific – but with a focus on Island Southeast Asia and Melanesia – are presented. The focus is Austronesian languages but includes (opportunistically) other terminology from Southeast and South Asia and Papuan languages, as it has become available to us. Although there is no necessary correspondence between linguistic terms and specific species, an historical linguistic assessment can bring to light patterns, relative change and directionality that have a bearing on a broad understanding of banana domestication in the past.

The database of banana terminology currently contains 850 entries, representing either generic terms in a language or a number of species terms, where this detail is available. The terms have been sorted into cognate sets, namely groups of words that are plausibly related to each

Correspondence

Mark Donohue, Research School of Pacific and Asian Studies, Australian National University, ACT 0200, AUSTRALIA.
mark@donohue.cc

Tim Denham, School of Geography and Environmental Science, Monash University, Calyton VIC 3800, AUSTRALIA.
Tim.Denham@arts.monash.edu.au

Ethnobotany Research & Applications 7:293-332 (2009)

Published: July 30, 2009

www.ethnobotanyjournal.org/vol7/i1547-3465-07-293.pdf

other historically. The grouping of words into cognate sets depends on a number of known facts about sound change and the relationships of sounds; for example, while **tagin** (Bolaang), **saing** (Tausug) and **sagin** (Totoli, Boano) present close and unambiguous matches, **magi** (Lamma) is not a likely cognate. In some instances cursory inspection is sufficient to group terms together (Table 1); in other cases, a more detailed knowledge of the historical phonologies of the languages concerned is required (Table 2) (drawing on Ross 1996).

There are 24 cognate sets in our database, as well as a 'miscellaneous' category used for terms that do not show widespread cognacy in Austronesian languages (Figure 1; Appendix 1). The Austronesian language family, members of which form the core of the database, originates on the island of Taiwan; it has dispersed southward through Indo-Malaysia and eastward across the north coast of New Guinea into the Pacific at remarkable speed. Glottochronological dates put less than 500 years difference between the first reconstructable proto-language out of Taiwan, Proto-Malayo-Polynesian and Proto-Oceanic in the Bismarck Archipelago (e.g., Blust 1993), though there are both interpretative and methodological issues involved that make these dates less reliable than might be hoped.

A conservative view of the phylogeny of these languages, following Ross (1995), is shown in Figure 2 (upper); we note that support for the Central-Eastern Malayo-Polynesian and Eastern Malayo-Polynesian nodes is weak

Table 1. Banana reflexes of ***saging** (sample only). The asterisk in ***saging** indicates a reconstructed proto-form; modern reflexes attested as a form in a contemporary or historically-attested language are italicized.

Area	Language(s)	*saging
N. Philippines	Tagalog	**saging**
	Aklanon	**saaging**
S. Philippines	Mamanwa	**saging**
	Mansaka	**saging**
	Tausug	**saing**
N. Sulawesi	Dampelas	**saging**
	Totoli	**sagin**
	Boano	**sagin**
	Bolaang	**tagin**

Table 2. Banana reflexes of ***sakup** (sample only).

Area	Language(s)	*sakup
SW Indo-Malaysia	Sundanese	**cau**
SE New Guinea	Taupota	**hakova**
	Motu	**dau**
	Sinaugoro	**daua**
	Tawala	**hakowa**
	Gumawana	**yagowa**
Solomons	Gao	**tsao**
	Maringe	**cau**
	Simbo, Roviana	**hakua**
	Babatana	**siiku**
	Sisiqa	**siku**
	Kokota	**kaku**
Vanuatu	Paamese	**sou-sou**

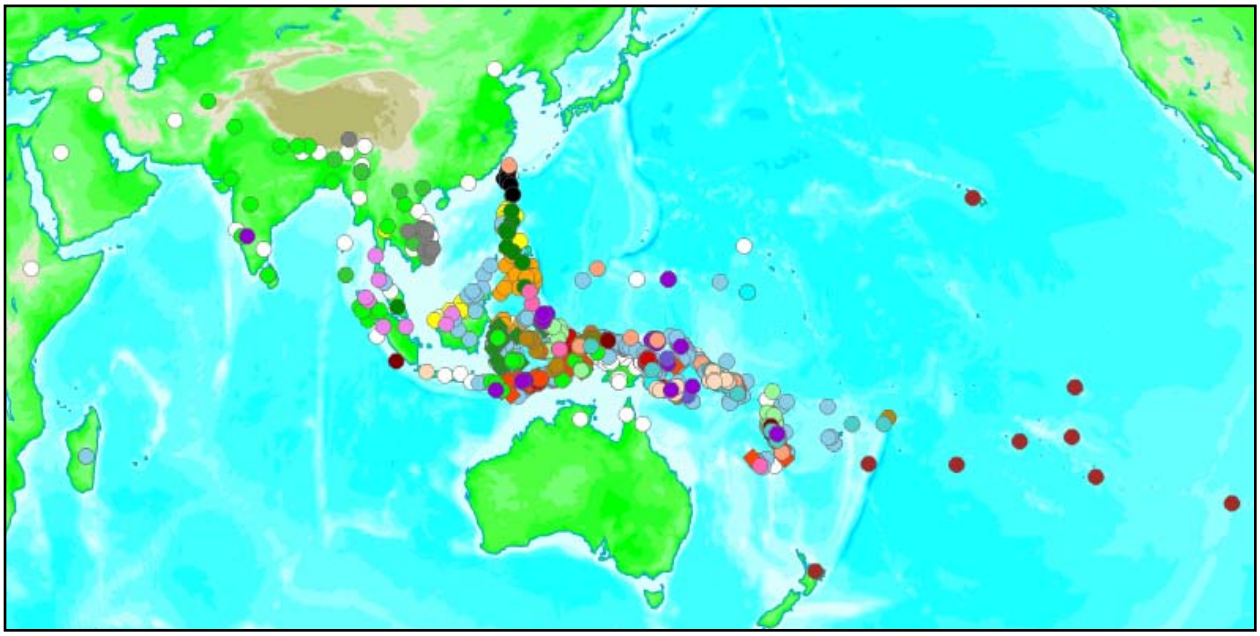


Figure 1. Banana terms in the database, colour-coded by cognate set (see Appendix 1). See text and later figures for distributions of the major cognate sets identified.

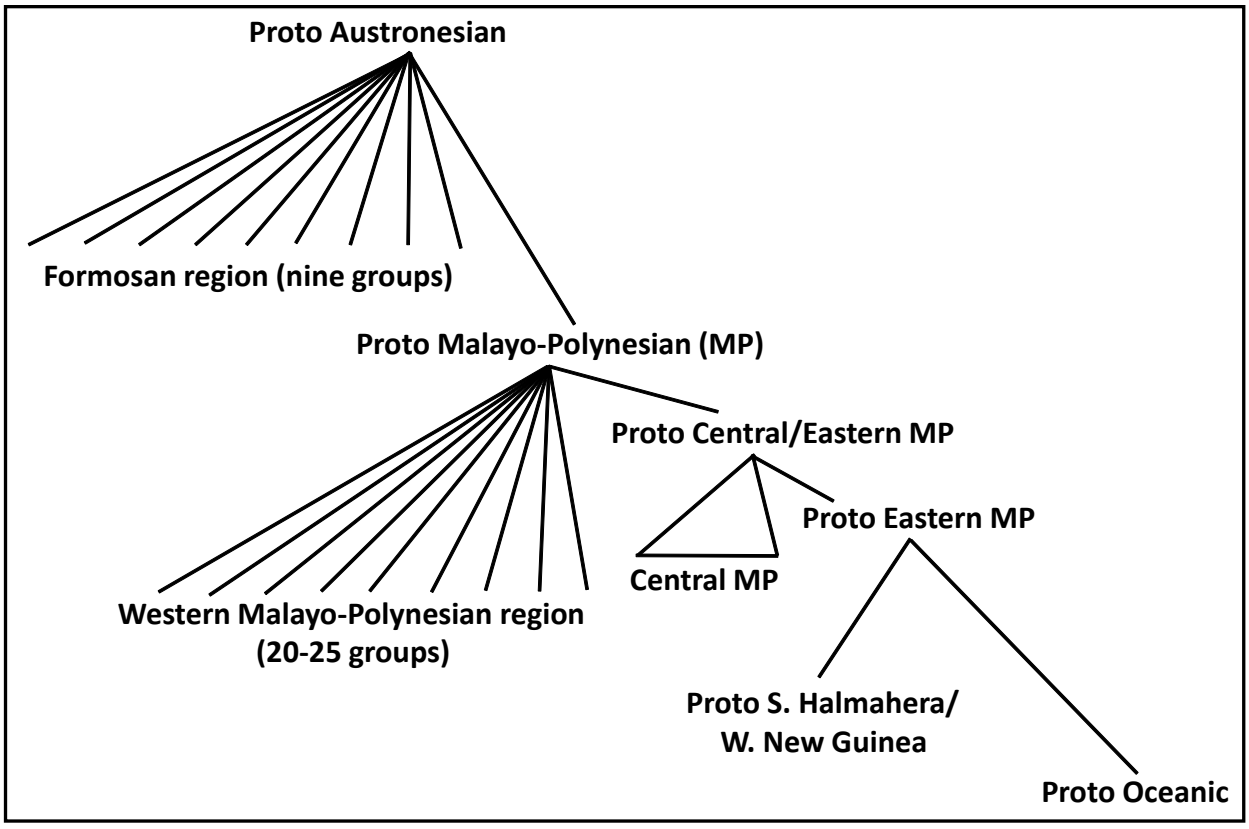
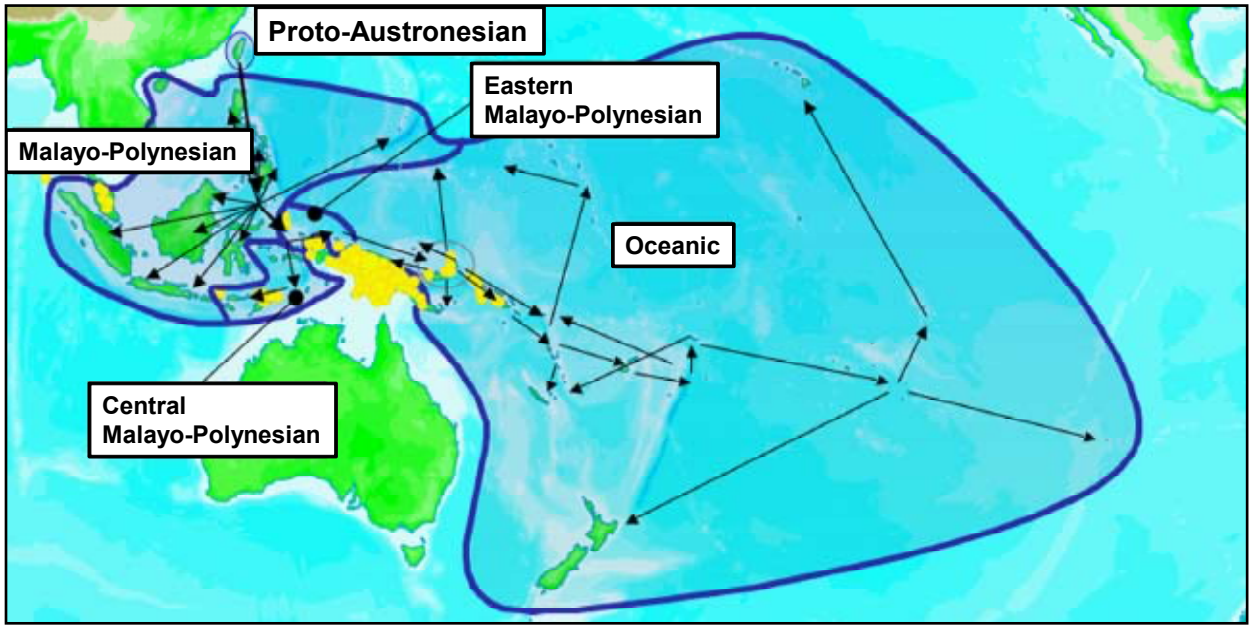


Figure 2. Austronesian language phylogeny and dispersal. Upper: A conservative view of the Austronesian language phylogeny (after Blust 1995). Lower: Orthodox view of Austronesian language dispersal (following Bellwood 1996, Blust 1995). Arrows show likely dispersal paths for Malayo-Polynesian languages. Nine first-order subgroups of Austronesian languages remained on Taiwan, and one group, Malayo-Polynesian, expanded into the islands to the south. In addition to dispersal in Indo-Malaysia, Eastern Malayo-Polynesian spread over the northwest of New Guinea and later founded Oceanic, which rapidly dispersed across the Pacific. Yellow indicates the locations of non-Austronesian languages within the area of Austronesian language dispersal.



(Donohue & Grimes 2008). The area of the Austronesian languages and the approximate assumed trajectory for their dispersal are shown in Figure 2 (lower).

In the sections that follow we detail the distribution of some of the more significant of the cognate sets we identified and discuss the inferred history of the terms, where directionality can be ascertained. First, however, we briefly sketch the archaeobotany of *Musa* spp. dispersal.

The Archaeobotany of Bananas

De Langhe and de Maret (1999), as well as numerous genetic studies (see Carreel *et al*. 2002), shed light on the complexities of banana occurrence, dispersal and hybridization in Island Southeast Asia. Even though the archaeobotanical record for bananas in this region is geographically dispersed and partial, we present the evidence that is relevant to the present argument (Figures 3 and 4; Table 3; from Denham & Donohue 2009, also see Vrydaghs & De Langhe 2003, Kennedy 2008, in press).

All terminal Pleistocene and early Holocene records of bananas are equivocal in terms of human management. *Musa acuminata* Colla ssp. *banksii* (F. Muell.) Simmonds and *Musa ingens* Simmonds phytoliths are present at Kuk Swamp in the highlands of New Guinea approximately 10,000 years ago (Denham *et al*. 2003). *Musa balbisiana* Colla and cf. *M. acuminata* seeds have been identified in terminal Pleistocene contexts at Beli-Lana in Sri Lanka (Kajale 1989). Only the Beli-Lana finds are directly associated with human exploitation (Kajale 1989), although the uses of fruits or seeds there are unknown.

The earliest evidence for banana cultivation, including for section Eumusa, derives from Kuk Swamp at 7000-6500 years ago in highland New Guinea (Denham *et al*. 2003). The archaeobotanical evidence at Kuk circumstantially corroborates genetic and phytogeographic interpretations for an initial and potentially long process of domestication of *M. acuminata* ssp. *banksii* in the New Guinea region (Perrier *et al*. 2009). Other archaeobotanical evidence for South(east) Asia is largely indeterminate in terms of banana cultivation and cultivar diffusion. There is no published archaeobotanical evidence of bananas in Island Southeast Asia, which solely reflects a lack of research rather than the distribution of cultivated and wild species. On mainland Southeast Asia, most finds occur within the natural range of some bananas species (e.g., Kealhofer 2003) and are late (e.g., Laotian finds in Bowdery 1999), while others are only suggestive of human agency (Zhao & Piperno 2000).

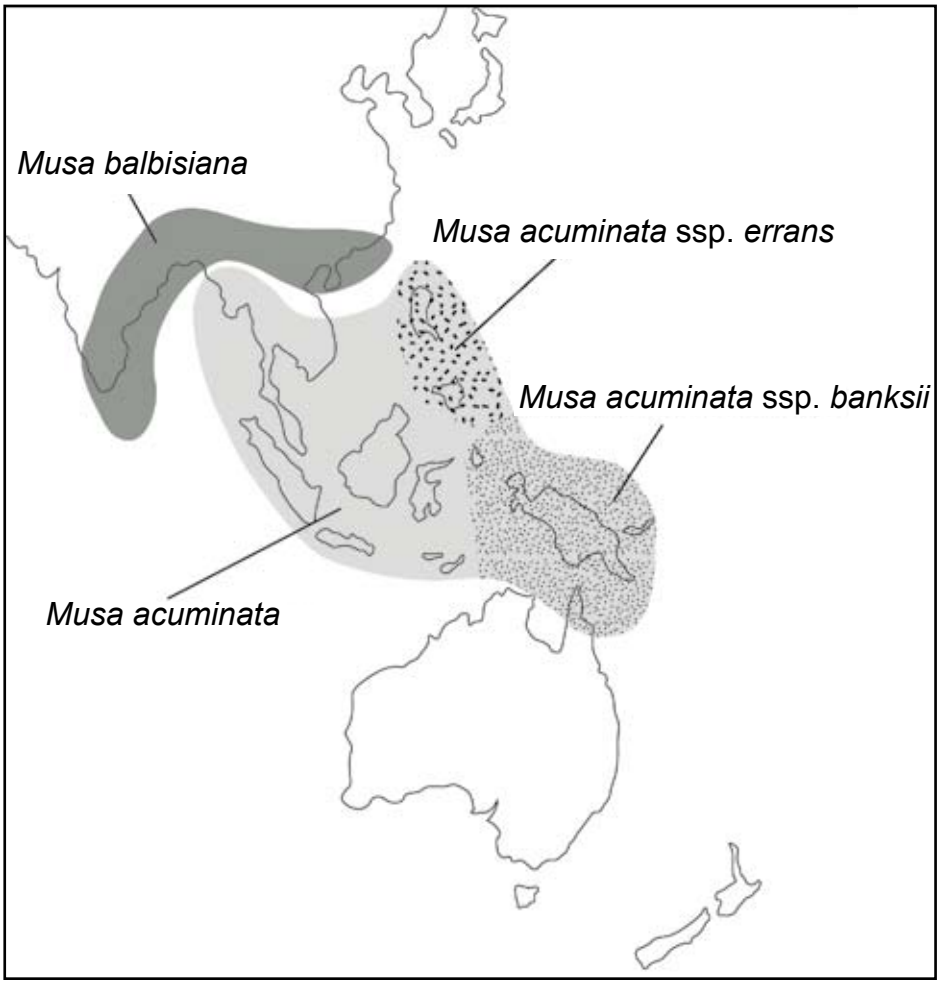


Figure 3. Banana species in Southeast Asia discussed in the text (reproduction of Denham and Donohue 2009: Figure 1B). Note that some occurrences of/some parts of the range of *M. balbisiana* in the South Asia subcontinent might be anthropogenic.

Given current limitations on the discrimination of banana volcaniform phytoliths (Vrydaghs *et al*. 2009) and starch grains (Scott Cummings pers. comm. 2008, Lentfer 2009a), cultivation and domesticatory relationships can be inferred from the archaeobotanical record in two ways: the presence of a *Musa* banana marker beyond its natural range, e.g., in Africa (Vrydaghs & De Langhe 2003); and, the frequency and archaeological association of banana markers, e.g., with

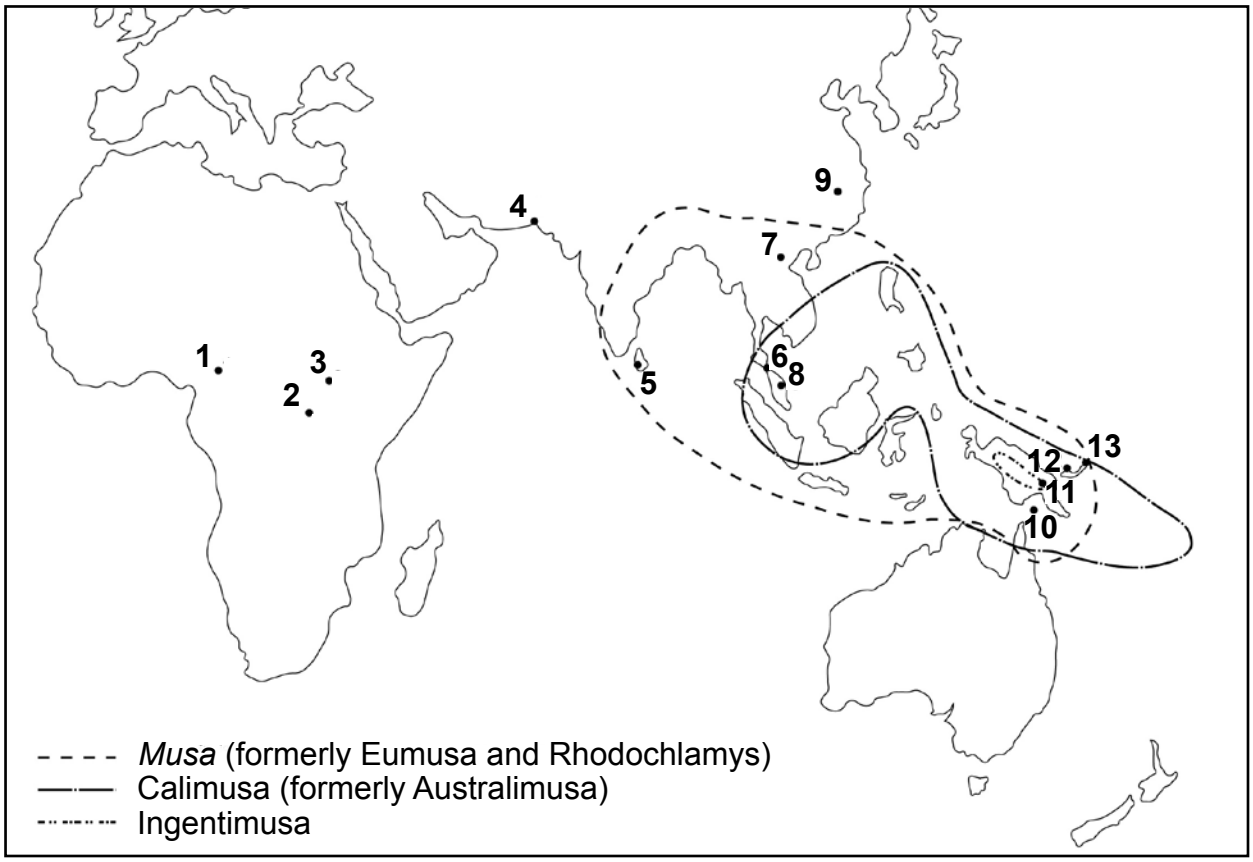


Figure 4. The natural ranges of *Musa* sections Callimusa, Ingentimusa and Eumusa (INIBAP 2006) and numbered locations of sites with archaeobotanical evidence of banana (Table 3: reproduction of Denham & Donohue 2009: Figure 1A). Note that it has recently been proposed to reclassify *Musa* spp. into three sections: *Musa* (formerly Eumusa and Rhodochlamys sections), Callimusa (formerly Callimusa and Australimusa sections) and Ingentimusa (unchanged) (after Wong *et al*. 2002, cf. De Langhe *et al*. 2009). However there is no general agreement on section classifications for *Musa* spp.

Table 3. Summary table of archaeobotanical evidence for bananas from New Guinea to Africa (cross-reference to Figure 3; reproduction of Denham & Donohue 2009: Table 1). The list is not exhaustive and focuses on archaeobotanical finds in New Guinea and regions to the west (see previous reviews in Vrydaghs & De Langhe 2003 and Kennedy 2008, in press), rather than Pacific regions to the east (included in Kennedy in press).

Site	Country	Map Ref.	Earliest/ Associated date (B.P.)	Banana type	Evidence	Reference	Comments[1]
Nkang	Cameroon	1	c. 2500	*Musa* sp.	Phytoliths	Mbida *et al*. 2000, 2001	Discrimination of *Musa* sp. from *Ensete* sp. Inferred cultivation of sterile triploids
Bunyakiri	D.R. Congo	2	post 200?	*Musa* sp.	Phytoliths	Runge 2001	Recent origin based on chronostratigraphy
Munsa	Uganda	3	pre 5400-5000	*Musa* sp. *Ensete* sp.	Phytoliths	Lejju *et al*. 2006	Problematic chronostratigraphy Discrimination between *Musa*, *Ensete* and undifferentiated Inferred cultivation of *Musa* sp. cultivars
Kot Diji	Pakistan	4	c. 4000 (Kennedy in press)	*Musa* sp. (AB hybrid?)	Phytoliths	Fuller & Madella 2001	Uncertain identification If hybrid confirmed, introduced cultivar

Site	Country	Map Ref.	Earliest/ Associated date (B.P.)	Banana type	Evidence	Reference	Comments[1]
Beli-Lena	Sri Lanka	5	c.11,500-13,500	*M. balbisiana M*. cf. *acuminata*	Seeds	Kajale 1989	*M. balbisiana*, *M. acuminata* tentative Exploitation of wild populations
Nong Thalee Song Hong	Thailand	6	c. 5000	*Musa* sp.	Phytolith	Kealhofer 2003	No subgenus discrimination
Lao Pako Plain of Jars	Laos	7	c. 2500-1500	*Musa* sp.	Phytoliths	Bowdery 1999	No subgenus discrimination
Gua Chawas	Malaysia	8	c. 10,700	Musaceae	Phytoliths	Bowdery 1999	No subgenus discrimination Dating uncertain in Bowdery 1999
Poyang Lake	China	9	post c.11,500? post c. 4000	*Musa*-type	Phytoliths	Zhao & Piperno 2000	'*Musa*-type' Problematic chronostratigraphy pre-4000 cal B.P., after which increased frequencies *Musa*-type
Ormi, Dauar Island	Australia	10	c. 2200-1900	*Musa* sp.	Phytoliths	Parr & Carter 2003	Also note *Musa* sp. at another site on Dauar, Sokoli, at 1600-1400 B.P. Inferred to represent introduced cultivars, although possibly introduced plant parts (i.e., via trade).
Yuku	Papua New Guinea	11	c. 5200	*Musa* sp.	Phytoliths Pollen	Horrocks *et al*. 2008	Inferred to represent suite of exploited plants, although potentially present in the landscape
Kuk	Papua New Guinea	11	c. 10,000	Musaceae *M. acuminata* ssp. *banksii M. ingens*	Phytoliths	Bowdery 1999 Denham *et al*. 2003 Wilson 1985	Discrimination of species, sections and subspecies using phytoliths from seeds and other plant parts
			c. 7000-6500	*Ensete glaucum*			Inferred cultivation of *Musa* at 7000-6500
Garua Island	Papua New Guinea	12	post 1100	*Musa* sp.	Phytolith	Kealhofer *et al*. 1999, Parr *et al*. 2001	No subgenus discrimination, extracted from artefact Identified in sediments associated with settlement
Reber-Rakival, Watom Island	Papua New Guinea	13	c. 2400-1350	*Musa* spp.	Phytoliths	Lentfer & Green 2004	Discrimination of Eumusa section bananas Tentative interpretation of human introduction of cultivars, although uncertain

Notes:

1. 'Inferred' indicates interpretation in original article, whereas comments following 'although' represent the views of the current authors.

2. Pasveer (2004:191) mentions the identification of banana seeds at cave sites on the Bird's Head Peninsula in far western New Guinea, Indonesia; however, they are excluded from the table as no further information on identification, age, site or cultural association is provided.

cultivation at Kuk Swamp (Denham *et al*. 2003). Lentfer's work (2009b) on the discrimination of seed phytoliths, although significant (e.g., Denham *et al*. 2003), requires further investigation and replication. Without further advances in the discrimination of microfossils and macrofossils (De Langhe 2009), the interpretation of archaeobotanical finds will be ambiguous. To illustrate, the phytolith-based evidence for *Musa* sp. at Kot Diji may represent the anthropogenic diffusion of wild or domesticated bananas to western India by 4000 cal B.P. (Fuller & Madella 2001, 2009; Kennedy in press).

Of major significance, African *Musa* cultivars are triploids, predominantly sterile and beyond the natural range of the genus. Consequently, any *Musa* phytoliths in Africa are indicative of cultivation – whether for food, fiber or fodder – and can be used to track agriculture across the continent (Vrydaghs & De Langhe 2003). The Nkang finds represent the diffusion of AAB plantain cultivars, which are in part descended from New Guinea (Carreel *et al*. 2002), to Cameroon by at least 2500 years ago (Mbida Mindzie *et al*. 2001); although Neumann and Hildebrand (2009) question the ability to discriminate *Ensete* and *Musa* phytoliths in this region (cf. Lentfer 2009). Because there are no naturally wild *Musa* bananas in the region, these archaeobotanical traces are thought to have dispersed under cultivation from a presumed point of introduction in eastern Africa (De Langhe 2007; cf. Blench 2009).

Putatively earlier evidence of banana dates to c. 5000 years ago at Munsa in Uganda (Lejju *et al*. 2006), although this is problematic (Neumann & Hildebrand 2009). Taken contextually with respect to the Nkang (2500 cal B.P.), Indian (c. 4000 cal B.P.) and New Guinean (c. 7000-6500 cal B.P.) evidence, a much longer chronology for banana domestication and dispersal is emerging. Thus, despite some shortcomings with the Munsa evidence (Neumann & Hildebrand 2009), the chronological timeframe is unsurprising.

The timing and nature of banana dispersal accord with scenarios of initial domestication in the New Guinea region and subsequent processes of hybridization and dispersal westward to Africa during the mid-to-late Holocene (see Perrier *et al*. 2009). The dispersal of bananas from New Guinea to Island Southeast Asia seems to predate Austronesian influence, given that speakers of Austronesian languages arrived in the New Guinea region around c. 4000-3500 years ago, although they seemingly had only limited influence on New Guinea until a thousand years later (Bellwood 1996).

The Historical Linguistics of Bananas in Island Southeast Asia

As mentioned above, there is a gap in the archaeobotanical record for bananas in Southeast Asia. This gap can now be investigated using the linguistic database of banana terms across the region in order to elicit any traces of the pre-Austronesian dispersal of bananas westward from New Guinea.

*Pan Malayo-Polynesian: *punti*

There are no accepted reconstructions for terms for bananas at the Proto-Austronesian level, although ***punti** is generally accepted as a Malayo-Polynesian term (e.g., Blust 1984/1985) (the asterisk in ***punti** indicates that we are discussing a reconstructed proto-form, and not nec-

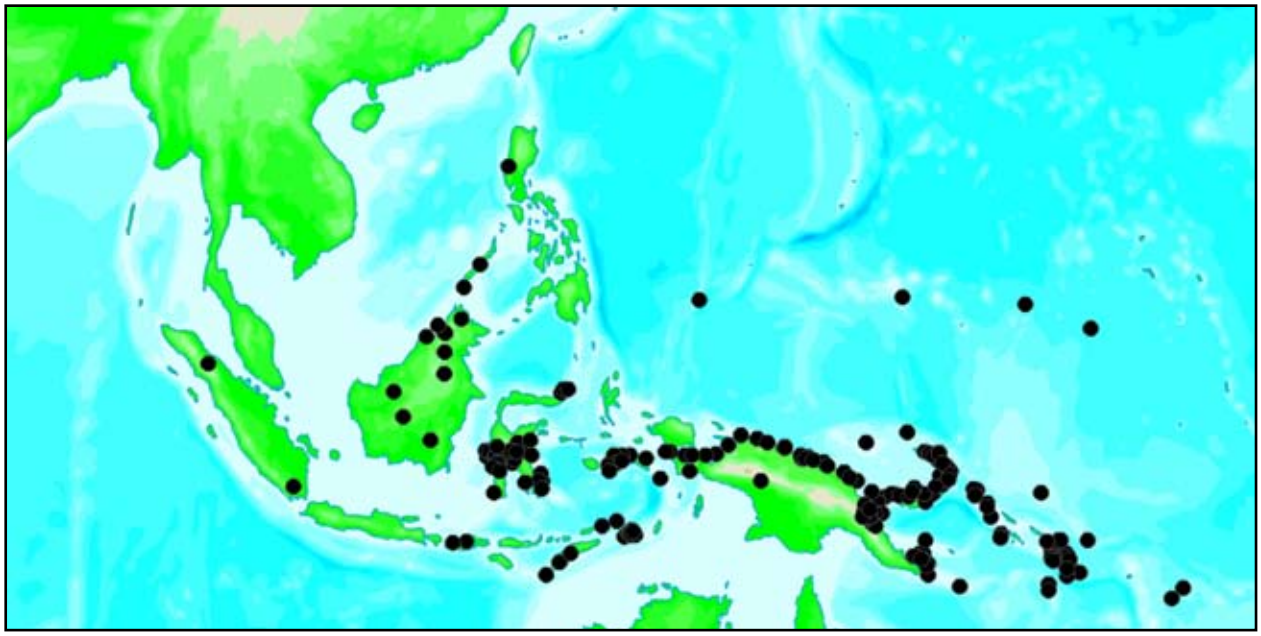


Figure 5. Geographic distribution of ***punti** terms for banana.

essarily a modern reflex attested as a form in a contemporary or historically-attested language). This implies that *__punti__ was not present in an ancestral Austronesian language on Taiwan, but only occurred after the dispersal of the Austronesian language family south from Taiwan. While reflexes of *__punti__ are widely distributed in Indo-Malaysia and the Pacific (Figure 5), they are not universal. The proto-term's reflexes are entirely absent from the Malay Peninsula and Java, and occur only twice in Sumatera and once in the northern Philippines (in Pangasinan). The absence from most of the Philippines is unexpected if the term is a Malayo-Polynesian innovation, given that this subgroup of Austronesian is thought to be associated with Austronesian language dispersal southward from Taiwan and to have developed in the north of its range, probably in the Philippines (e.g., Blust 1995). The various gaps in occurrence of this term through western Indo-Malaysia are explained below as we examine some of the more geographically restricted cognate sets.

Although *__punti__ is reconstructed as a Malayo-Polynesian term, its absence from the Philippines does not necessarily indicate that it was formerly more widespread there prior to linguistic replacement by a later spread of *__saging__ and possibly *__baRat__. Rather than reflecting a Malayo-Polynesian innovation that has been lost in the Philippines, *__punti__ may be a southern Austronesian term that originated in central/eastern Indonesia and later spread westwards. The few northerly occurrences of this term could represent later introductions from the south.

Northern Austronesia: *belbel, *saging, *baRat

Three terms are largely confined to Taiwan and the Philippines, with some spread south (Figure 6). Their distribution is largely exclusive of that of *__punti__ (Figure 5). The first term, *__belbel__ (Figure 6, black dots), is confined to Taiwan and the Batanes Strait. Although it does occur in more than one first-order subgroup of Austronesian, the geographic confinement to the Taiwan area makes the reconstruction of *__belbel__ as a Proto-Austronesian term methodologically contentious, as its modern spread may be due to later diffusion. The second term, *__saging__ (Figure 6, orange dots), is spread over most of the Philippines, extending into northern Sulawesi. Finally, *__baRat__ (Figure 6, yellow dots) is found in the northern Philippines and in western Borneo with a shift to *__baRak__. The noncontiguous distribution of reflexes of *__baRat__ suggests that it is the prior term in the Philippines' area. Most of the languages of the Philippines that maintain *__saging__ also have the term __balat__ meaning 'peel (banana, etc.)'; *__saging__ seems to be an innovation that has eliminated much of the earlier range of *__baRat__ with the meaning 'banana', and in these same areas *__baRat__ has undergone semantic shift and survived. This suggests that the cultural utilisation of bananas has a long history in the Philippines, including changes of focus or intensity.

Western Indo-Malaysia: *pisang

The term __pisang__, known widely from Malay/Indonesian, is largely confined to languages closely related to Malay and spoken in areas adjoining the homeland of Malayic, a language of the Western Malayo-Polynesian region (Fig-

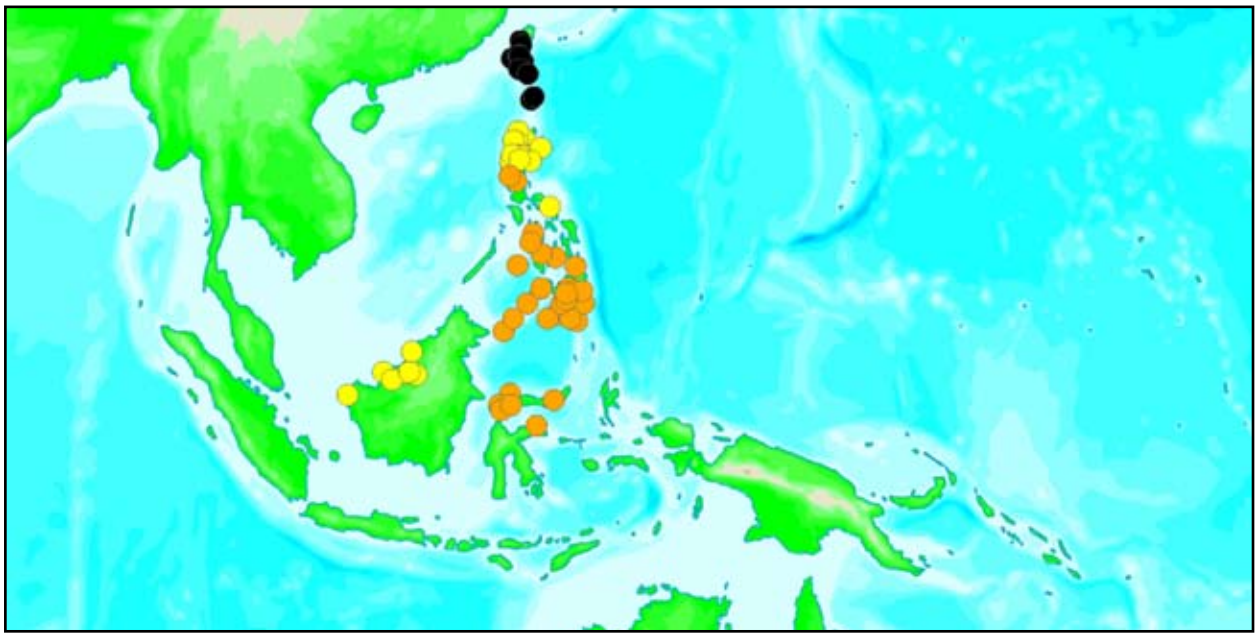


Figure 6. Geographic distribution of *__belbel__ (black), *__saging__ (orange) and *__baRat__ (yellow) terms for banana.

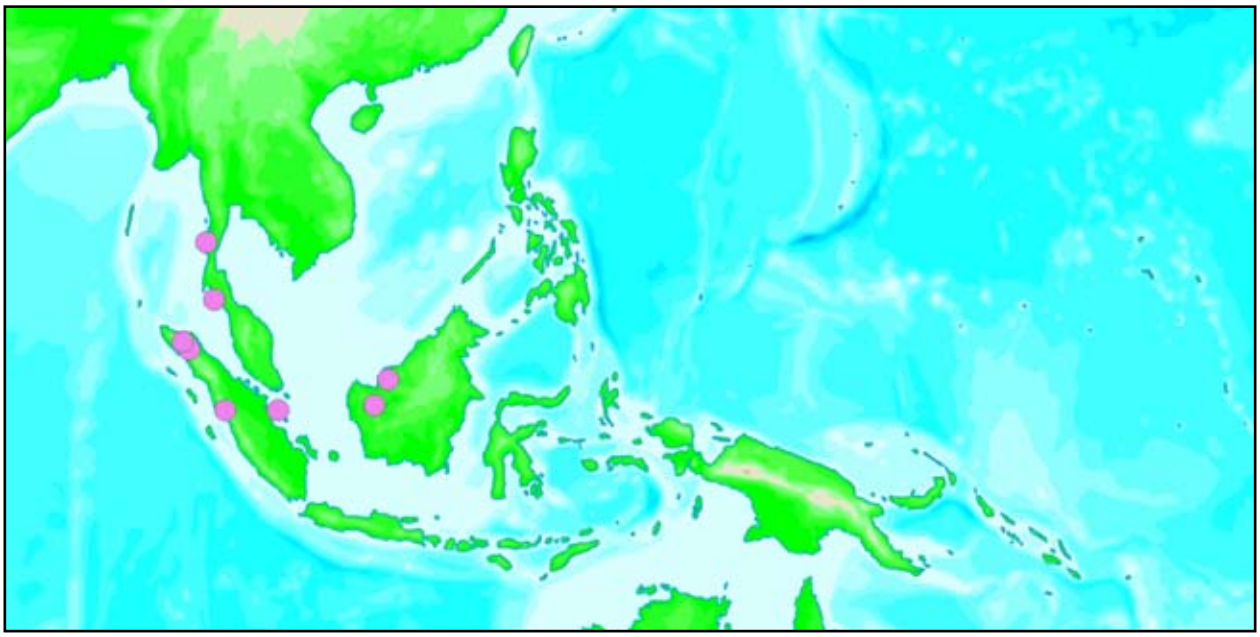


Figure 7. Geographic distribution of ***pisang** terms for banana.

ure 7). Given these tight linguistic and geographical restrictions, ***pisang** probably represents a relatively recent spread, probably no longer than c. 2000 years, assuming that ***pisang** was an innovation in Proto-Malayic, and that the modern distribution of the term reflects either retentions from this source, or borrowings (into Acehnese and Gayo) in areas that show large degrees of Malay influence (e.g., see Adelaar 1992 for estimates of Proto-Malayic). Consequently, ***pisang** was a Proto-Malayic innovation, with its distribution reflecting languages descended from Proto-Malayic, which has had only a recent spread (as determined by the high percentage of shared vocabulary and the relatively uniform morphological profiles of the different languages), as well as reflecting some limited borrowing by neighboring ethnolinguistic groups, which was influenced by the dominant political position of Malay over the last 1500 years.

Regionally restricted terms: *prllt, *geDang, *bief, *rando, *busa

A number of regionally-restricted terms can be identified west of New Guinea and in IndoChina (Figure 8). There are few conclusions that can be drawn from the distribution of these terms, other than to note that the greatest cluster of local terms is in the northwest of New Guinea. In IndoChina we see a single term, ***priit**, found in a number of closely related Austro-Asiatic languages and their neighbors. If ***priit** can be related to ***baRat**, the term found in the northern Philippines and western Borneo (see yellow on Figure 6), then we would have some additional support for the previous existence of an interaction sphere extending from Borneo to mainland Southeast Asia.

Before leaving these terms we should mention the possibility that the ***priit** terms from mainland Southeast Asia are related to the ***baRat** terms found in the Philippines and in Borneo. As well as geographic proximity, there is other evidence linking Borneo and the mainland, including a possible Borneo-Malay Peninsula linguistic substrate (e.g., Adelaar 1995), the pre-Austronesian distribution of basket-impressed pottery and edge-ground stone tools (Bulbeck 2008), and the plausible phonological match in the consonants. The only reasons this has not been presented as a major hypothesis are (a) the complete and unexplained irregularity of the vowels, and (b) the fact that the (putative) reflexes of ***baRat** in Borneo mostly show the irregular development to ***baRak** (just as there is velar/coronal crossover in ***saging** when it is found south of the Philippines). The second of these points might represent a later development in some languages of Borneo, but the mismatch in vowels is more problematic. However, we note Sou **pariat**, Mon **brat** and Nyah Kur **phraat** suggest that, as with *t > *k in Borneo, the vowel irregularities on mainland Southeast Asia might be a later development (we thank Roger Blench for discussion on this point).

Expanding terminology: *muku and *qaRutay

Two terms for banana, ***muku** and ***qaRutay**, are potentially the most significant for understanding the domestication history of the plant.

Denham and Donohue (2009) discuss the likely history of ***muku** (Figure 9 red and yellow dots), from its source in New Guinea extending west within the historically-attested limits of the spread of Papuan languages into Indo-Malaysia. Additional evidence of ***muku** terms in the Pacific occurs in southeast New Guinea, in the Solomons and in southern Vanuatu (Figure 8; Vanuatu not depicted, though see Figure 15).

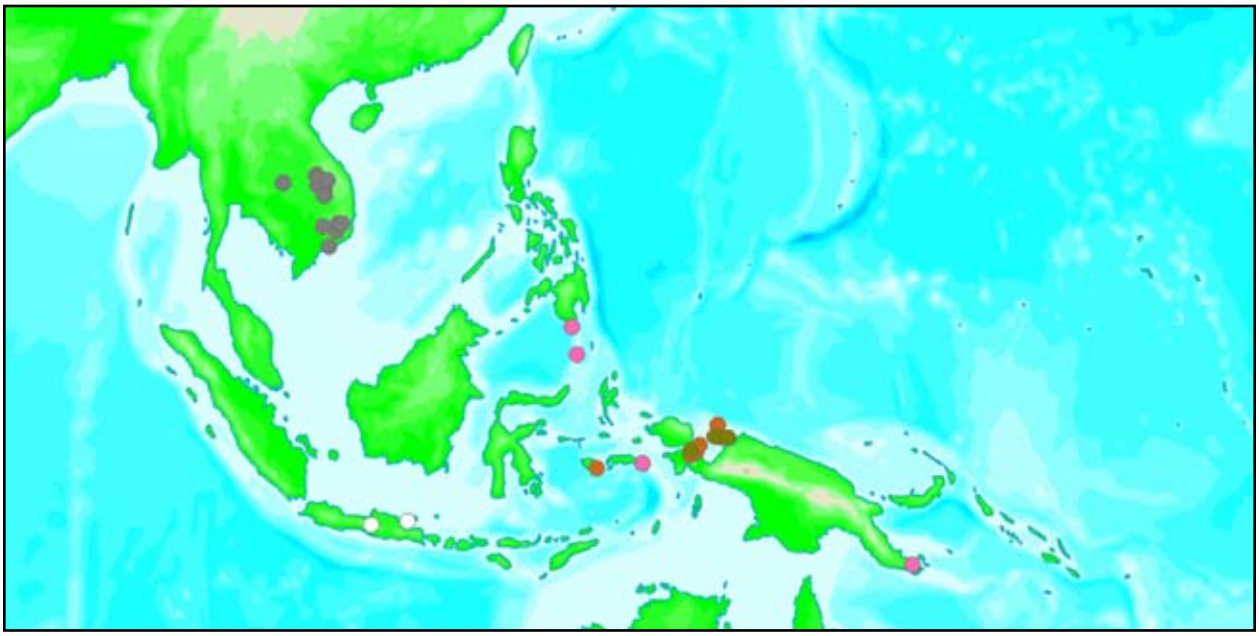


Figure 8. Geographic distribution of regionally restricted terms for banana: ***priit** (grey, mainland Southeast Asia), ***geDang** (white, Java), ***bief** (light brown, Buru and Cenderawasih Bay), ***rando** (dark brown, Cenderawasih Bay) and ***busa** (pink, Southern Philippines, East Seram and Papuan Tip).

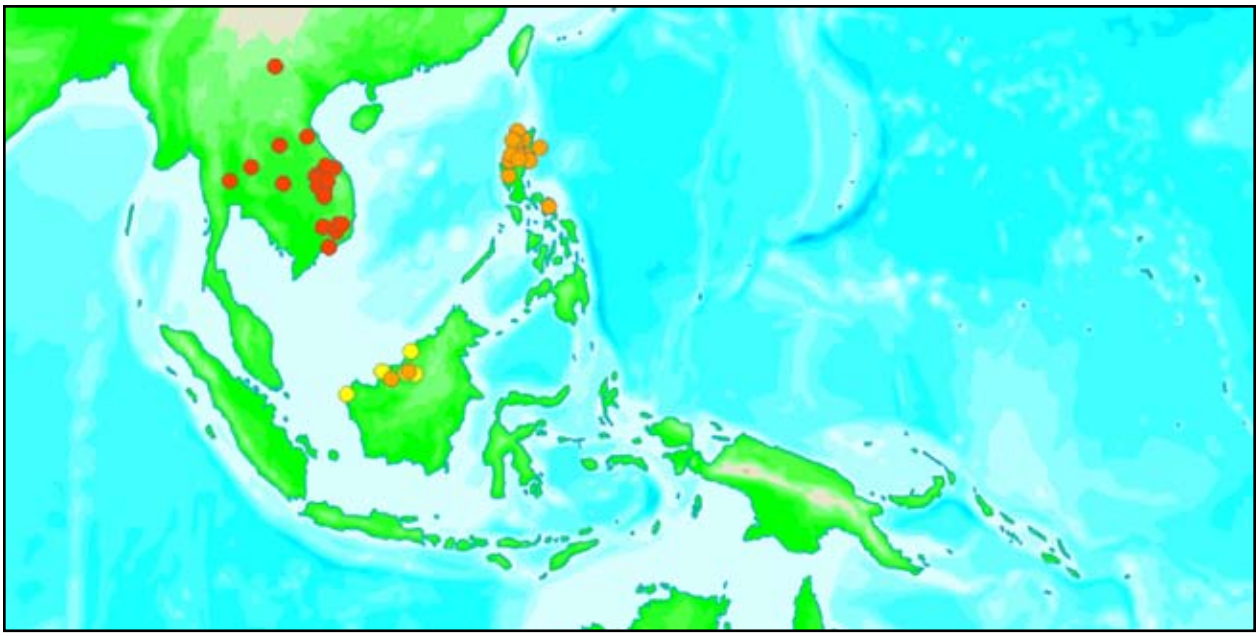


Figure 9. Comparison of the distribution of: ***priit** (red, mainland Southeast Asia), ***baRat** (orange, Philippines and Borneo) and ***baRak** (yellow, Borneo) terms for banana.

The distribution of typical forms reflecting ***qaRutay** are widespread (Figure 10; Table 4), but the form can be traced to an origin in the Philippines in Negrito languages, where the term has also been reported as a reference to the fibrous inedible plant abaca (Reid 1994). It is quite possible that 'abaca' is a functional, rather than botanical, identification, given the overlapping uses of certain banana species and abaca as a source of fiber (Kennedy 2009). This hypothesis is strengthened by the fact that the *Musa* Germplasm Information System, cited in Carreel *et al*. (2002), identifies a particular Philippine banana (*M. acuminata* ssp. *errans* (Blanco) R.V.Valmayor) as **agotay**, a term with a clear northern Philippines provenance that is clearly lexically related to the material presented in Table 4 (particularly Hanunóo; see also Appendix 1). Unfortunately we do not have details about where this term was recorded, but it is likely that 'abaca' has been used with a wider sense than just *Musa textilis* Née (and, conversely,

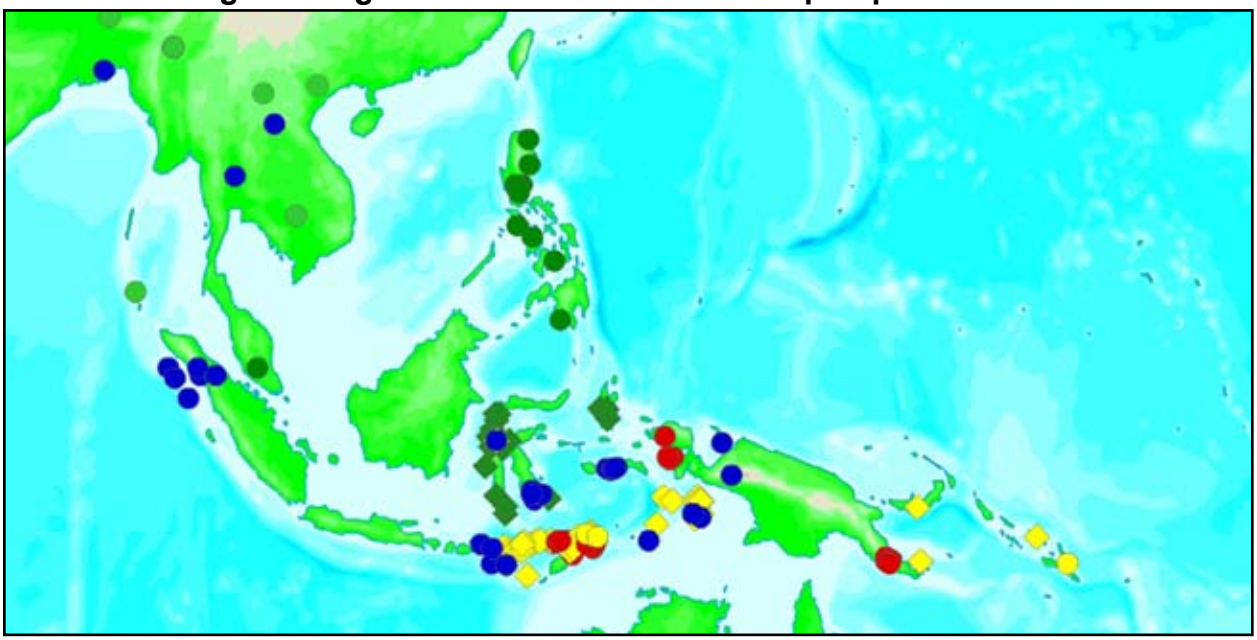


Figure 10. Geographic distribution of *__qaRutay__ (green and blue) and *__muku__ (red and yellow) terms for banana. Red circles show non-Austronesian languages with *__muku__ reflexes, while yellow diamonds show the appearance of this term in Austronesian languages. Dark green circles (Philippines and Malay Peninsula) shows the least-reduced, and so probably most conservative, variants of the *__qaRutay__ term (see Figures 10 and 14). Blue shows forms that can be derived from *__kaloy__ and dark green diamonds (mainly around Sulawesi) show the distribution of forms that have undergone metathesis from *__kola__ to *__loka__.

Table 4. Sequential developments of *__qaRutay__ term for banana.

Stage	Reconstruction	Region	Reflexes	Language
1	*__qaRutay__	Philippines	**kelutay**	Tboli
		Philippines	**agútay**	Hanunóo
2a	**__kaloy__	E. Indonesia	**kalú**	Kambera
		W. Papua	**karei**	Saweru
		E. Indonesia	**kalei**	Muna
		Indochina	**kluay**	Thai
		S. Indonesia	**kalo**	Komodo
		W. Sumatera	**galo**	Batak
2a1	**__kola__	E. Indonesia	**kula**	Asilulu
		South Asia	**kola**	Bangla
2a2	**__kela__	W. Papua	**kelo**	Damal
		South Asia	**kelã**	Marathi
		South Asia	**kera**	Nepali
		South Asia	**kela`h**	Pashto
2a3	**__loka__	C. Indonesia	**loka**	Tukang Besi
		E. Indonesia	**loke**	Weda
2b	*__taloy__	Malaya	**telui**, **kelui**	Sakai
		Indochina	**təlɔɔy**	Palaung
		Indochina	**taloi**	Khmer
		Indochina	**chuoi**	Vietnamese
		Indian Ocean	**təluuy**	Nicobarese

a *M. textilis* could easily be mislabeled as a 'wild banana') (following Jean Kennedy pers. comm. 2008). The variation in reported reference for ***qaRutay** in the Philippines suggests an earlier fiber-directed use of bananas, rather than (or at least supplementary to) their being used for food. A shift in reference of the term from one plant to another could additionally reflect in part the changing use of the plants, as well in part relatively recent leveling of earlier Austronesian linguistic diversity in the Philippines (e.g., Blust 1991, 2005).

An examination of diversity of modern cognates establishes ***qaRutay** as the prior term (Figure 11; Tables 4 and 5). We do not enter into a discussion of the details of the phonetic and historical theory (e.g., Dyen 1963, Joseph & Janda 2003, Ladefoged 2006), but the summary in Table 5 demonstrates that the only plausible reconstruction, representing our 'best guess' of the original form, is ***qaRutay**. Reflexes of this term are now widespread in both eastern Indo-Malaysia and in the far west of Sumatera, being absent only from the centre around Java and Bor-

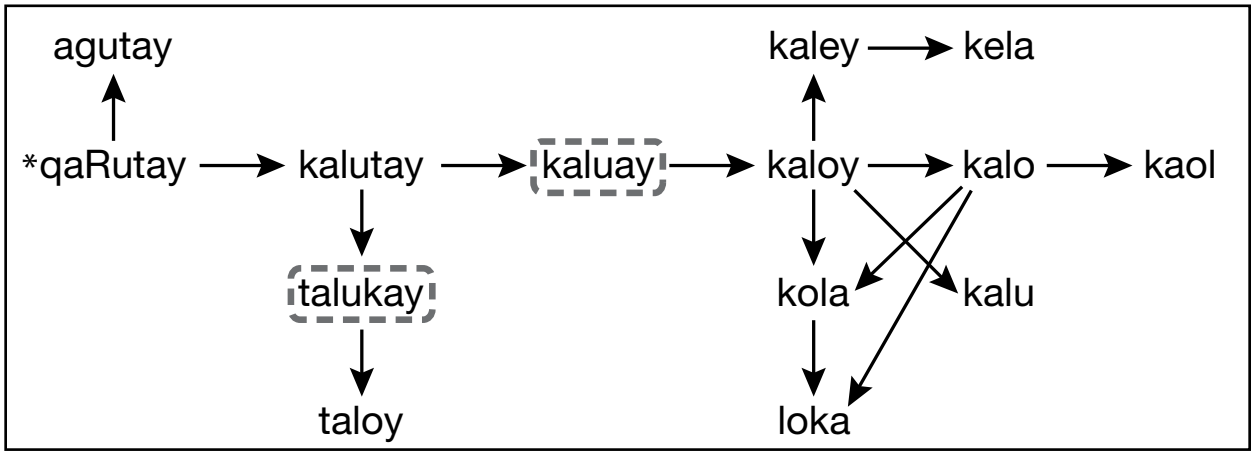


Figure 11. Directionality in the development of ***qaRutay** term for banana (see Tables 4 and 5). The developments from ***qaRutay** involve a number of sound changes that are frequently attested in Island Southeast Asia, and frequent metathesis, also frequently attested in languages of the region (see Donohue & Grimes 2008). The terms **talukay** and **kaluay** are hypothesised inter-stages, unattested in the modern data.

Table 5. Sound changes and discussion of directionality (Figure 11).

Change	Discussion	Counter-arguments
*q > Ø	the post-velar *q is frequently lost in many Malayo-Polynesian languages	*Ø > q is unjustified, and unprincipled
*q > k	the post-velar can develop into a velar; this is rare, but also attested in other Austronesian languages.	*k > q is plausible; it is not essential to the argument that the original segment be q, and not k.
*R > g	widely attested in the Philippines	*g > R is plausible, but not attested in the Philippines area
*R > l	widely attested	*l > R would be unusual
*t > Ø	this is an unusual change, but not unknown	*Ø > q is unjustified, and unprincipled
*ua > o	widely attested; witness the pronunciation of, e.g., want in English as [wont]	*o > ua is not impossible, but would be unusual
*oy > ey	very natural change, involving assimilation in terms of backness of *o to *y	*ey > oy would be unusual
*ey > e, *oy > o	very widespread	*e > ey would not be unusual; *o > oy would be unmotivated.
*oy > u	not unusual, involving *o assimilating in terms of height to *y	*u > oy would be very unusual
metathesis (swapping of segments or larger units)	common, though erratic, in central and eastern Indonesia (such as ***kola** > **loka**, ***kale**(**y**) > **kela**, or ***kalo** > **kaol**)	directionality is a priori hard to establish, and relies on external evidence

neo. The gap in the distribution of ***qaRutay** probably reflects empire-building and the spread of Indian-inspired polities, primarily SriWijaya in eastern Sumatera and Majapahit on Java (Bellwood *et al*. 1995, Munoz 2006), which occurred much later than the early spread of ***qaRutay**, its descendants and the bananas they denote. Such larger polities are often associated with the leveling of linguistic differences and diversity (e.g., Joseph & Janda 2003 for principles). For example, eight languages are spoken by 130 million people on Java, where a series of large empires were based, whereas over 1000 languages are spoken by less than 10 million people on New Guinea (Gordon 2005), which has not witnessed large-scale polities until colonial times.

The term ***qaRutay** originated in the Philippines and spread south to the islands west of New Guinea, where it later became dominant. ***qaRutay** was the only one of the island terms that spread to mainland Asia, while also con-

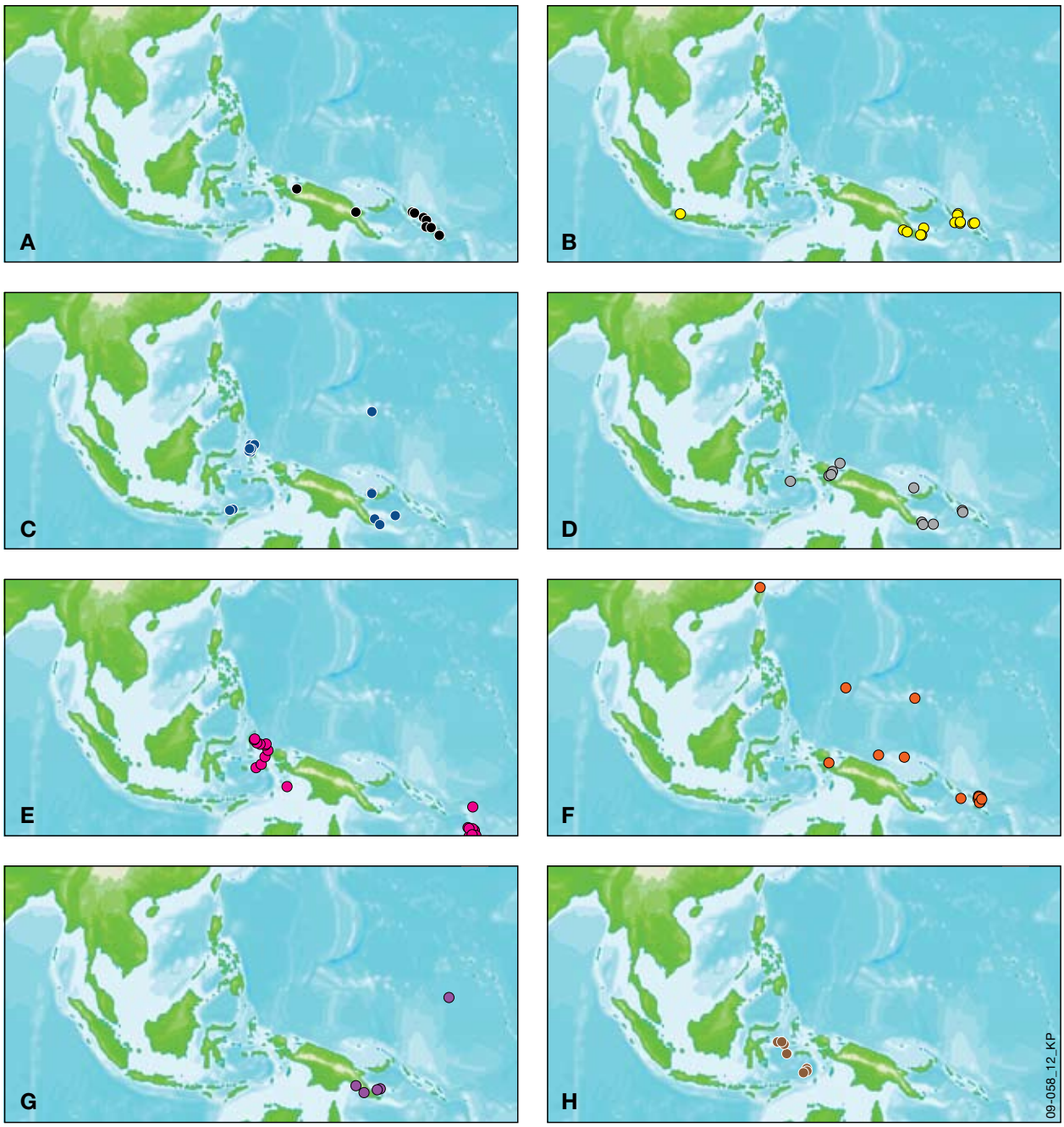


Figure 12. Geographic distribution of ***joRaga** (A), ***sakup** (B), ***bwera** (C), ***bwatiq** (D), ***bateli** (E), ***baqapun** (F), ***tawai** (G) and ***fiak** (H) terms for banana as attested in Melanesia and in areas to the west.

tinuing to diversify in the islands. The trail of Island Southeast Asian terms ends in the west of South Asia.

*Other circum-Papuan terms: *joRaga, *tawai, *sakup, *fiak, *bweRa*

A number of banana terms are found surrounding New Guinea, appearing both to the east and west of the island (Figure 12). For instance, ***joRaga** is a reconstructed cognate term widely reflected in the Solomons, found in Vanuatu and Samoa, as well as in the Markham valley and (speculatively) in one non-Austronesian language of Cenderawasih Bay (Tarunggare) (Figure 12A). The term ***sakup** (Table 2; Figure 12B) is found mostly in the Pacific, but is also possibly attested in Sundanese **cau**, a term without cognate in Indo-Malaysia. ***bwera** and ***bwatiq** show more even distributions west and east of New Guinea (Figures 11C and 11D, respectively). The term ***baqapun** is the only one of the terminologies discussed with a northern element to its distribution, relying on the cognacy of Mabalay Atayal **buqoh**.

The word ***bateli** is common in eastern Indonesia, as reflexes of the intermediate form ***tala**, but also appears with near overwhelming frequency in Vanuatu north of Malakula (Figure 12E). Two terms, ***tawai** and ***fiak**, are quite uneven: ***tawai** is found exclusively in the Pacific, in New Guinea, Vanuatu and Kosrae in Micronesia (Figure 12G); and, ***fiak** is found almost exclusively in Maluku (Figure 12H), but also appears in Samoan (off map to the east).

Some of these terms, ***joRaga**, ***sakup**, ***bwera**, ***bwatiq** and ***baqapun**, have been reconstructed as Proto-Oceanic terms, ancestral to the Austronesian languages of the Pacific, and might, as Ross suggests, represent different cultivars or clusters of cultivars (e.g., Pawley 2007, Ross 1996), but our expanded database shows that they have a distribution that suggests a pre-Austronesian origin in Melanesia. Our interpretation is based on the distribution of terms both east and west of New Guinea; consequently, the only level to which the term could be reconstructed would be Proto-Malayo-Polynesian, the ancestor of all Austronesian languages outside Formosa. With such a reconstruction, however, the complete absence of more languages attesting the form west or north-west of New Guinea would be very suspicious and unlikely (see Figure 2 for a conservative view of the Austronesian phylogeny and its geographic distribution).

The Melanesian locus

While the maps in the preceding section show a multiplicity of terms that are separate cognate sets without a linguistic connection, they do share a common locus around New Guinea. This geographic concentration is manifest in the distribution of highly localized, miscellaneous terms, frequently attested only in individual languages (Figure 13). The greatest concentration of localized idiosyncratic terms is in New Guinea and the islands of near Oceania to the east and Maluku to the west. Although these terms do not point to a single, unified history, they might perhaps indicate that human involvement with bananas has a longer, or at least more diverse, history in and around New Guinea. Note that Figure 13 does not adequately represent the diversity in Melanesia, since the present sample is geared towards Austronesian languages (see Appendix 1), a family which in New Guinea is present mainly on

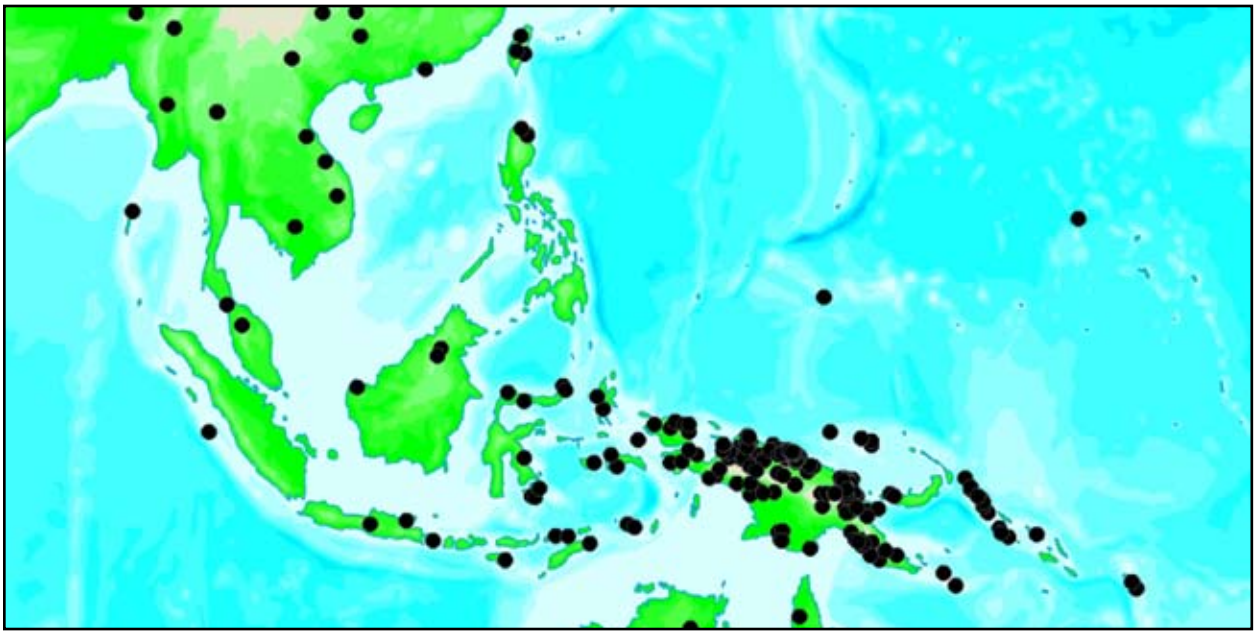


Figure 13. Geographic distribution of miscellaneous terms for banana.

the north coast, and are completely absent from the south and southwest coast.

Some tentative historical reconstructions

We can make the following speculative conclusions from the linguistic data. The greatest diversity in banana terminology is focused in the New Guinea region. While this diversity may solely reflect the enormous phylogenetic diversity in languages of the region, it is also suggestive of a greater time depth for banana salience in the cultures of this region, a conclusion that accords with the botanical history of bananas (Carreel *et al*. 2002, De Langhe & de Maret 1999, Perrier *et al*. 2009). The terminological diversity is surprisingly reflected in Austronesian languages of the New Guinea region, which effectively reflects a transmission of terms from non-Austronesian to Austronesian languages in this region. This is significant because it suggests a considerable inheritance of the term, and plausibly the plant, from people living in the region before the advent of Austronesian languages.

The present day distribution of the terms ***qaRutay** and ***muku**, as well as inferred directionality in the development of reflexes, enable a complex historical linguistic reconstruction of terminological (and inferentially plant) movements (Figure 14; see Table 5). We suppose two distinct geographic sources for the two etymologies: ***muku** was local to New Guinea and later saw some spread to the east as well as the west. From an origin in the Philippines (Figure 10A), the ***qaRutay** term extends south (Figure 13B), and relatively rapidly spreads west (Figure 13C). This leads to two southern centres for diffusion, one in the east retaining the k (< *q), and one in the west retaining the t (Figure 13D). Local metatheses (the change from ***kalo** to **loka** in the east, and ***kalo** to **kaol** in the west, shown in dashed ovals) show later localization of the terms, and attest to the more robust adoption of the ***kaloy** term that was originally the eastern variant. The fact that descendants of ***kaloy** (via ***kaley** and ***kela**) later spread westwards past South Asia (see Figure 15) attests to the adoption of this term by the culture that had the most successful engagement in inter-regional exchange. See Table 5 for a summary of the reasoning behind the relative chronology of the changes that trace the source of the different contemporary terms. In addition to the northern Philippines' term, a New Guinea-centric term ***muku** is also found, now attested only on the western and eastern tips of the island (Figure 13A, possibly reflecting later replacement in the centre). These terms showed limited evidence of a spread to the east (Figure 13B), being found in southern Vanuatu and New Caledonia (Figure 15), but have extensive spread to the west. ***qaRutay** was the only one of the island terms that spread to mainland Asia, while also continuing to diversify in the islands. The trail of Island Southeast Asian terms ends in South Asia and only Arabic-derived terms are found west from this point (Figure 15).

The claim for an east-to-west spread across the Indian Ocean from linguistics (Figures 10 and 14) is similar to that reconstructed from botany and phytogeography (Figure 16; De Langhe 1995 but also Perrier *et al*. 2009). There is extremely limited linguistic evidence for the spread of bananas into Africa, since the spreads of Arabic and Arabic-derived terms in northern Africa and western Asia in his-

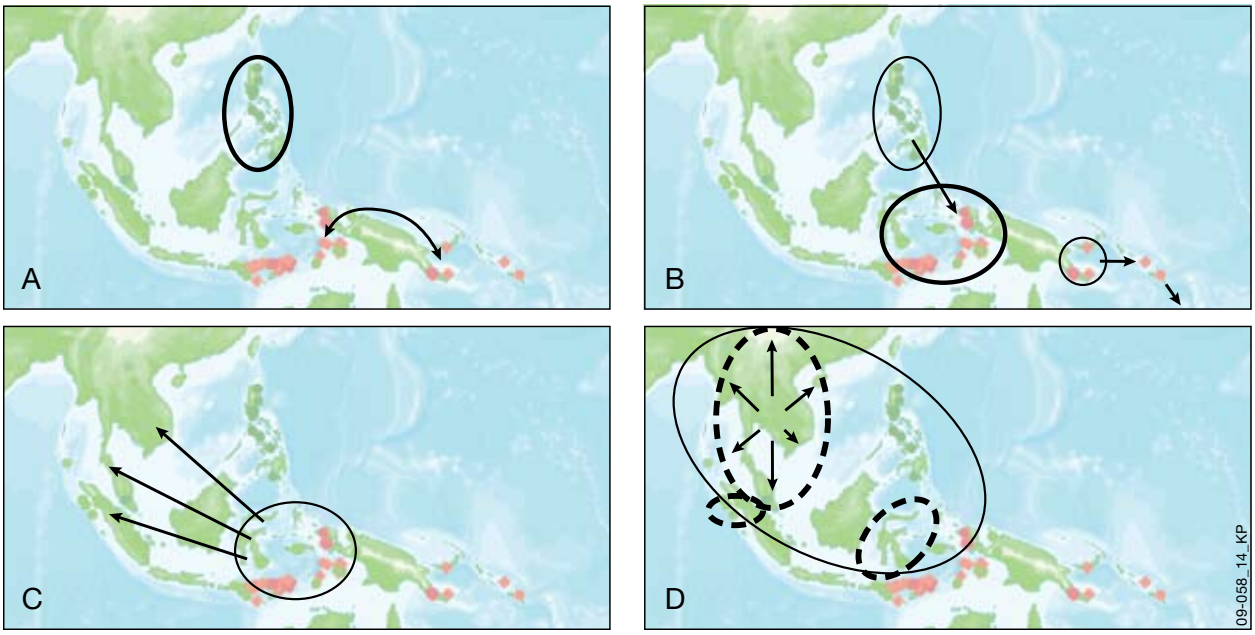


Figure 14. Geographic distribution of ***qaRutay** and ***muku** terms for banana showing inferred historical linguistic reconstruction of banana dispersal.

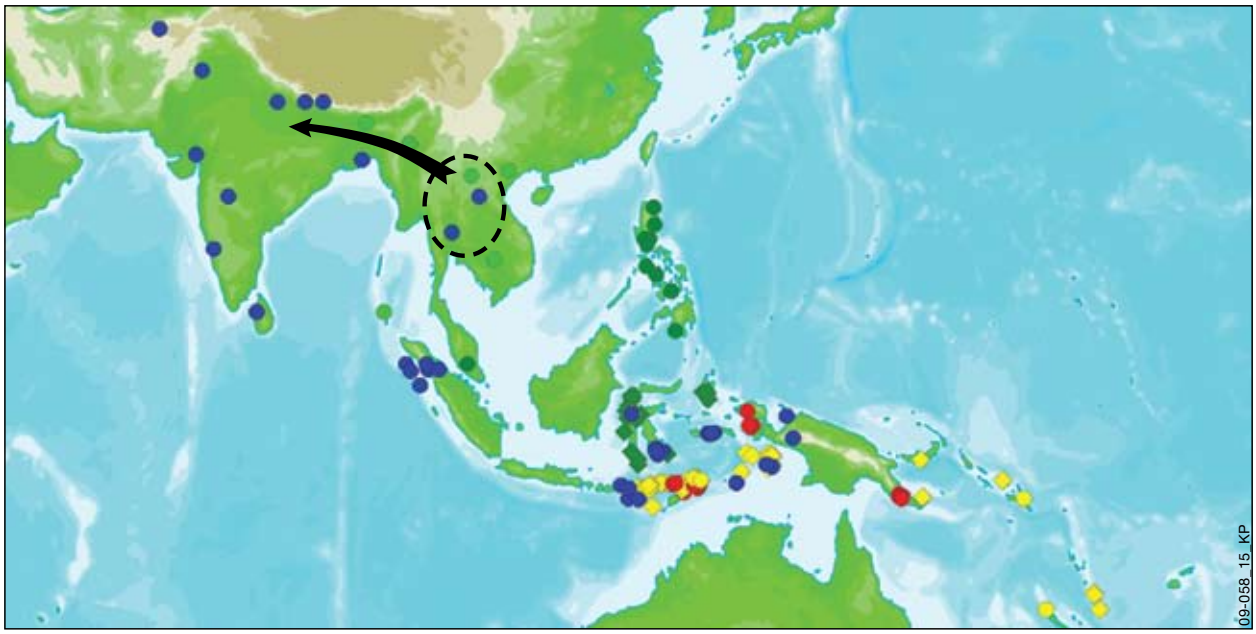


Figure 15. Geographic distribution of ***qaRutay** and ***muku** terms for banana on an expanded scale. Colours as per Figure 8.

torical times have eliminated a possible earlier diversity. Blench (2009) does reconstruct ***kom** for Benue-Congo languages, which is possibly suggestive of ***muku** plus metathesis and vowel lowering (**muku** > ***moko** > ***komo** > **kom**), though the similarity with such a short word, without even the sequence of segments matching, could well be due to chance. Another possible coincidence is the term **huti** 'cooking banana sp.' from Tanzania, though the etymology of this term deserves to be investigated further (De Langhe, pers. comm. 2008). The resemblance between the Munda form ***kondog** and this putatively metathesised ***muku**, compounded with a metathesised ***kola** (thus, ***kom-lok**, which becomes ***kondok** through regular assimilatory processes) is similarly intriguing, though unconfirmed. Similar compounding is widely attested in the Alor region of southern Indonesia and the Madang region of northeast New Guinea, resulting in forms such as Blagar **mogal** and Jilim **muŋgul**. Similarly, as can be seen in Figure 11, metathesis of these forms is attested in other areas as well, making the account somewhat less speculative (thanks to Roger Blench for discussion on this point, though his conclusions may differ from ours).

Prior to the westward dispersal to the Southeast Asian mainland, we must hypothesise a movement south from Philippines into western Melanesia/eastern Indonesia, where a significant amount of 'overlap' occurs. Again, this movement fits with what we know of the botany of bananas and plantains and the interhybridization that occurred (Perrier *et al*. 2009). Following linguistic 'consolidation' in western Melanesia/eastern Indonesia the terminology was (fairly quickly) exported to the Southeast Asian mainland, whence it spread, with relatively little variation (compared to the diversity found for the term in Island Southeast Asia) westwards. The linguistic trail ends in South Asia, after which, as noted earlier, Arabic-derived terms dominate (Fuller & Madella 2009).

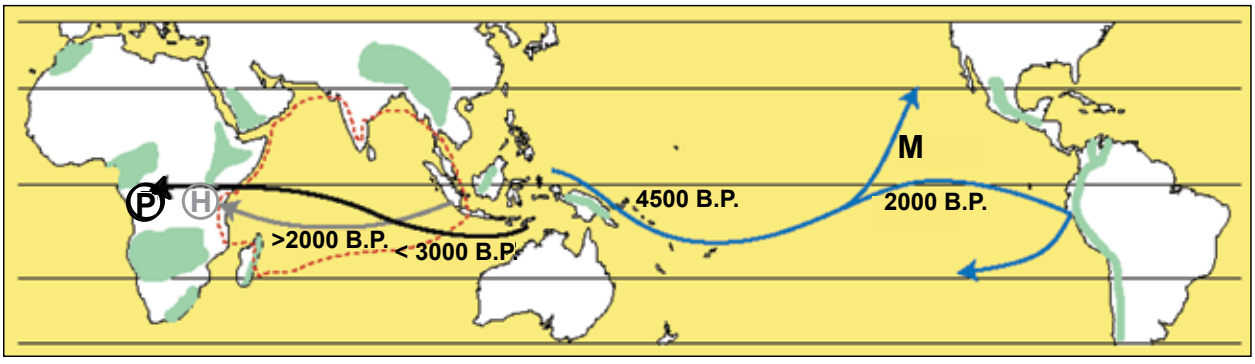


Figure 16. The spread of bananas (De Langhe 1995).

Conclusions

The close match between the proposed history of bananas in (Southeast) Asia based on botanical classification and the history derived from an examination of linguistic terminology is surprising and indicates a salience, and resilience, of bananas in the cultures concerned. Dates for the arrival of bananas in Africa, and the antiquity of the terms in Papuan languages, rather than the 'intruder' Austronesian languages, strongly suggest a pre-Austronesian dispersal across Island Southeast Asia. The fact that the terminology has remained relatively intact over many thousands of years, subject to some replacement but still recoverable despite wholesale language shift in many cases (to Austronesian languages), speaks of the integration of the plant into the social fabric of the societies that use it, not simply as a food source but also as a metaphor for the culture itself.

The linguistic evidence fills the gap in the archaeobotanical record, allowing us to both map and (approximately) date the dispersal of bananas from New Guinea. We can date the dispersal of bananas as preceding the arrival of Austronesian languages in eastern Indonesia and New Guinea, namely prior to c 4000 years ago (see Denham & Donohue 2009). This dispersal is in accordance with evidence for an early maritime culture in the area and also accords with archaeobotanical evidence for the prior domestication of bananas in the New Guinea region and dispersal to Island Southeast Asia and onwards eventually to Africa. In the future, the independent line of evidence from historical linguistics can be compared against genetic and phytogeographic lines of evidence, within the time frame of current archaeobotanical data, to provide a better understanding of the complex domestication histories for bananas.

Literature Cited

Adelaar, K.A. 1992. *Proto Malayic: The reconstruction of its phonology and parts of its lexicon and morphology*. Pacific Linguistics, Canberra.

Bellwood, P. 1996. Early agriculture and dispersal of the Southern Mongoloids. Pp. 287-302 in *Prehistoric Mongoloid Dispersals*. Edited by T. Akazawa & E. Szathmary. Oxford University Press, Oxford.

Bellwood, P., J.J. Fox & D. Tryon. 1995. Editors of *The Austronesians*. The Australian National University, Canberra.

Blench, R. 2009. Bananas and plantains in Africa: Re-interpreting the linguistic evidence. *Ethnobotany Research and Applications* 7:363-380.

Blust, R. 1984/1985. The Austronesian homeland: a linguistic perspective. *Asian Perspectives* 20:45-67.

Blust, R. 1991. The Greater Central Philippines hypothesis. *Oceanic Linguistics* 30:73-129.

Blust, R. 1993. Central and Central-Eastern Malayo-Polynesian. Oceanic Linguistics 32:241-293.

Blust, R. 1995. The prehistory of the Austronesian-speaking peoples: A view from language. *Journal of World Prehistory* 9:453-510.

Blust, R. 2005. The linguistic macrohistory of the Philippines: Some speculations. Pp. 31-68 in *Current Issues in Philippine Linguistics and Anthropology*. Edited by H-C. Liao & C.R. Galvez Rubino. The Linguistic Society of the Philippines and SIL Philippines, Manila.

Bowdery, D. 1999. Phytoliths from tropical sediments: Reports from Southeast Asia and Papua New Guinea. *Bulletin of the Indo-Pacific Prehistory Association* 18:159-67.

Bulbeck, D. 2008. An integrated perspective on the Austronesian diaspora: The switch from cereal agriculture to maritime foraging in the colonisation of Island Southeast Asia. *Australian Archaeologist* 67:31-51.

Carreel, F., D. Gonzalez de Leon, P. Lagoda, C. Lanaud, C. Jenny, J.P. Horry & H. Tezenas du Montcel. 2002. Ascertaining maternal and paternal lineage within *Musa* chloroplast and mitochondrial DNA RFLP analyses. *Genome* 45:679-92.

De Langhe, E. 1995. Banana and plantain: The earliest fruit crops? Pp. 6-8 in *INIBAP Annual Report 1995*. International Network for the Improvement of Banana and Plantain, Montpellier.

De Langhe, E. 2007. The establishment of traditional plantain cultivation in the African rain forest: A working hypothesis. Pp. 361-70 in *Rethinking Agriculture: Archaeological and Ethnoarchaeological Perspectives*. Edited by T.P. Denham, J. Iriarte & L. Vrydaghs. Left Coast Press, Walnut Creek.

De Langhe, E. 2009. Relevance of banana seeds in archaeology. *Ethnobotany Research and Applications* 7:271-281.

De Langhe, E. & P. de Maret. 1999. Tracking the banana: Its significance in early agriculture. Pp. 377–396 in *The Prehistory of Food: Appetites for change*. Edited by C. Gosden & J. Hather. Routledge, London.

Denham, T.P., S.G. Haberle, C. Lentfer, R. Fullagar, J. Field, M. Therin, N. Porch & B. Winsborough. 2003. Ori-

gins of agriculture at Kuk Swamp in the Highlands of New Guinea. *Science* 301:189-93.

Denham, T. & M. Donohue. 2009. Pre-Austronesian dispersal of banana cultivars west from New Guinea: Linguistic relics from eastern Indonesia. *Archaeology in Oceania* 44:18-28.

Donohue, M. & C.E. Grimes. 2008. Yet more on the position of the languages of eastern Indonesia. *Oceanic Linguistics* 47:115-159.

Dyen, I. 1963. Why sound change is regular. *Language* 39:631-637.

Fuller, D.Q. & M. Madella. 2001. Issues in Harappan archaeobotany: Retrospect and prospect. Pp. 317-90 in *Indian Archaeology in Retrospect*. Vol. 2. *Protohistory*. Edited by S. Settar & P. Korisettar. Manohar, New Delhi.

Fuller, D.Q. & M. Madella. 2009. Banana cultivation in South Asia and East Asia: A review of the evidence from archaeology and linguistics. *Ethnobotany Research and Applications* 7:333-351.

Gordon, R.G. 2005. Editor of *Ethnologue: Languages of the world*. SIL International, Texas.

Horrocks, M., S. Bulmer & R.O. Gardner. 2008. Plant microfossils in prehistoric archaeological deposits from Yuku rock shelter, Western Highlands, Papua New Guinea. *Journal of Archaeological Science* 35:290-301.

INIBAP. 2006. *Global Conservation Strategy for Musa (Banana and Plantain)*. International Network for the Improvement of Banana and Plantain, Montpellier.

Joseph, B.D. & R.D. Janda. 2003. Editors of *The Handbook of Historical Linguistics*. Blackwell Publishing, London.

Kajale, M.D. 1989. Mesolithic exploitation of wild plants in Sri Lanka: Archaeobotanical study at the cave site of Beli-Lana. Pp. 269-81 in *Foraging and Farming: The evolution of plant exploitation*. D.R. Harris & G.C. Hillman. Unwin Hyman, London.

Kealhofer, L. 2003. Looking into the gap: land use and the tropical forests of southern Thailand. *Asian Perspectives* 42:72-95.

Kealhofer, L., R. Torrence & R. Fullagar. 1999. Integrating phytoliths within use-wear/residue studies of stone tools. *Journal of Archaeological Science* 26:527-546.

Kennedy, J. 2008. Pacific bananas: Complex origins, multiple dispersals? *Asian Perspectives* 47:75-94.

Kennedy, J. in press. Bananas: Towards a revised prehistory. In *Ethnobotanist of Distant Pasts: Essays in Honour of Gordon Hillman* Edited by A. Fairbairn & E. Weiss. Oxbow, Oxford.

Ladefoged, P. 2006. *A Course in Phonetics*. Thomson/ Wadsworth, Boston.

Lejju, B.J., P. Robertshaw & D. Taylor. 2006. Africa's earliest bananas? *Journal of Archaeological Science* 33:102-13.

Lentfer, C.J. 2009a. Going bananas in Papua New Guinea: A preliminary study of starch granule morphotypes in Musaceae fruit. *Ethnobotany Research and Applications* 7:217-238.

Lentifer, C.J. 2009b. Tracing domestication and cultivation of bananas from phytoliths: An update from Papua New Guinea. *Ethnobotany Research and Applications* 7:247-270.

Lentfer, C.J. & R.C. Green. 2004. Phytoliths and the evidence for banana cultivation at the Lapita Reber-Rakival site on Watom Island, Papua New Guinea. Pp. 75-88 in *A Pacific Odyssey: Archaeology and anthropology in the Western Pacific. Papers in Honour of Jim Specht*. Edited by V. Attenbrow & R. Fullagar. Records of the Australian Museum 29. Australian Museum, Sydney.

Mbida Mindzie, C.M., W. Van Neer, H. Doutrelepont & L. Vrydaghs. 2000. Evidence for banana cultivation and animal husbandry during the first millennium BC in the forest of southern Cameroon. *Journal of Archaeological Science* 27:151-62.

Mbida Mindzie, C.M., H. Doutrelepont, L. Vrydaghs, R.L. Swennen, R.J. Swennen, H. Beeckman, E. de Langhe & P. de Maret. 2001. First archaeological evidence of banana cultivation in central Africa during the third millennium before present. *Vegetation History and Archaeobotany* 10:1-6.

Munoz, P.M. 2006. *Early Kingdoms of the Indonesian Archipelago and the Malay Peninsula*. Editions Didier Millet, Singapore.

Neumann, K. & E. Hildebrand 2009. Early bananas in Africa: The state of the art. *Ethnobotany Research and Applications* 7:353-362.

Parr, J.F. & M. Carter. 2003. Phytolith and starch analysis of sediment samples from two archaeological sites on Dauar Island, Torres Strait, northeastern Australia. *Vegetation History and Archaeobotany* 12:131-41.

Parr, J., C. Lentfer & W. Boyd. 2001. Spatial analysis of fossil phytolith assemblages at an archaeological site in West New Britain. Pp. 125-34 in *The Archaeology of*

Lapita Dispersal in Oceania. Terra Australis 17. Edited by G.R. Clark, A.J. Anderson & T. Vunidilo. Pandanus Books, Research School of Pacific and Asian Studies, Australian National University, Canberra.

Pasveer, J. 2004. *The Djief Hunters: 26,000 years of rainforest exploitation on the Bird's Head of Papua, Indonesia*. Modern Quaternary Research in Southeast Asia 17. Balkema, Leiden.

Pawley, A. 2007. The origins of early Lapita culture: The testimony of historical linguistics. Pp. 17-49 in *Oceanic Explorations: Lapita and Western Pacific settlement*. Edited by S. Bedford, C. Sand & S.P. Connaughton. Australian National University, Canberra.

Perrier, X., F. Bakry, F. Carreel, Ch. Jenny, J.-P. Horry, V. Lebot & I. Hippolyte. 2009. Combining biological approaches to shed light on evolution of edible bananas. *Ethnobotany Research and Applications* 7:199-216.

Reid, L. 1994. Possible Non-Austronesian lexical elements in Philippine Negrito Languages. *Oceanic Linguistics* 33:37-72.

Ross, M. 1995. Some current issues in Austronesian linguistics. Pp. 45-120 in *Comparative Austronesian Dictionary*. Edited by D. Tryon. Mouton de Gruyter, Berlin.

Ross, M. 1996. Reconstructing food plant terms and associated terminologies in Proto-Oceanic. Pp. 163-221 in *Oceanic Studies: Proceedings of the first international conference on oceanic linguistics*. Edited by J. Lynch & F. Pat. Pacific Linguistics C-133, Canberra.

Runge, F. 2001. Evidence for land use history by opal phytolith analysis: examples from the Central African tropics (Eastern Kivu, D.R. Congo). Pp. 73-85 in *Phytoliths: Applications in earth science*. Edited by J.D. Meunier & F. Colin. Taylor and Francis, London.

Vrydaghs, L., T. Ball, H. Volkaeart, I. van den Houwe, J. Manwaring & E. De Langhe. 2009. Differentiating the volcaniform phytoliths of bananas: *Musa acuminata*. *Ethnobotany Research and Applications* 7:239-246.

Vrydaghs, L. & E. De Langhe. 2003. Phytoliths: An opportunity to rewrite history. Pp. 14-17 in *INIBAP Annual Report 2002*. International Network for the Improvement of Banana and Plantain, Montpellier.

Wilson, S.M. 1985. Phytolith analysis at Kuk, an early agricultural site in Papua New Guinea. *Archaeology in Oceania* 20:90-97.

Wong, C., R. Kiew, G. Argent, O. Set, S.K. Lee & Y.Y. Guan. 2002. Assessment of the validity of the sections in *Musa* (Musaceae) using AFLP. *Annals of Botany* 90:231-238.

Zhao, Z. & D.R. Piperno. 2000. Late Pleistocene/Holocene environments in the Middle Yangtze River Valley, China and rice (*Oryza sativa* L.) domestication: The phytolith evidence. *Geoarchaeology* 15:203-22.

Appendix 1. Banana terms in 850 modern languages.
The data from which we made classifications and drew the maps presented is shown below. For reasons of space we do not present a list of all of our sources, but wish to thank the following persons, who have contributed their expertise: René van den Berg, Robert Blust, John Brownie, Beatrice Clayre, Jonathan & Veronica Coombs, James Fox, Alex Francois, John Havilland, Edmundo Luna, John Lynch, Waruno Mahdi, Michael Martens, David Mead, Roger Mills, Ulrike Mosel, Bill Palmer, Richard Parker, Elizabeth Pearce, Mary Pearson, Lloyd Peckham, Ken Rehg, Sasi Rekha d/o Muthiah, Gillian Sankoff and Antoinette Schapper. The data is arranged by cognate class, shown on the right, and by language, shown on the left.

Language	Family	Banana term	Class	proto-form
Adzera	Austronesian	**ganaŋ**, **rintai**	0	Miscellaneous
Agta (Central)	Austronesian	**dupɯt**	0	
Airoran	Kwerba	**hwaam**	0	
A`jie	Austronesian	**k^{w}ijɛi**	0	
Aka-Bo	Andamanese	**yá**	0	
Alune	Austronesian	**tema**	0	
Amara (Longa)	Austronesian	**eivul**	0	
Amharic	Afro-Asiatic	**muz**	0	
Amis	Austronesian	**pawli**	0	
Anêm	Anêm-Ata	**okuk**	0	
Arabic	Afro-Asiatic	**mooz**	0	
Asumboa	Austronesian	**wo**	0	
Atayal	Austronesian	**ɣuqiɬuh**, **ɣuquh**	0	
Atta	Austronesian	**dupaq**	0	
Avava	Austronesian	**apm**	0	
Awad Bung	Austronesian	**aniŋ**	0	
Awyi	Border	**wafa**	0	
Balinese	Austronesian	**biu**	0	
Bariji (Aga Bereho)	Binandere	**oru**	0	
Barupu	Skou	**apon**	0	
Bilua	Solomons	**naka**	0	
Blablanga	Austronesian	**zeku**	0	
Boro	Sino-Tibetan	**terik**	0	
Buma (Teanu)	Austronesian	**undo**	0	
Burmese	Sino-Tibetan	**hŋâpyawθi**	0	
Burmeso	(isolate)	**nibo**	0	
Cemuhi	Austronesian	**jùhi**	0	
Ciacia	Austronesian	**kaɗese**	0	
Dai	Austronesian	**diamŋon**	0	
Dani	Dani	**lawi**	0	
Dawera-Daweloor	Austronesian	**urus**	0	
Demta	Sentani	**ayp**	0	
Dholuo	Nilo-Saharan	**rabolo**	0	
Dumo	Skou	**ñe**	0	
Dusur	Skou	**ñe**	0	
Ekagi / Ekari	Wissel Lakes	**mapi**	0	

Language	Family	Banana term	Class	proto-form
Farsi	Indo-European	**mouz**	0	
Fijian (Standard)	Austronesian	**jaina**	0	
Fuyughe (Mafufu)	Goilalan	**hamb**	0	
Gorontalo	Austronesian	**lambi**	0	
Guugu Yimidhirr	Pama-Nyungan	**malbiin**	0	
Hakö	Austronesian	**poso**, **iaßa**	0	
Hausa	Afro-Asiatic	**ayaba**	0	
l`saka	Skou	**wĭ**	0	
Jahai	Austroasiatic	**jay**	0	
Javanese	Austronesian	**gəɖaŋ**	0	
Kaimbulawa	Austronesian	**kaʔusu**	0	
Kambera	Austronesian	**kalú pandaku**, **teru**	0	
Kanum	Pama-Nyungan	**teyá**, **wew**	0	
Katbol	Austronesian	**apm**	0	
Kayeli	Austronesian	**umpulue**	0	
Kazukuru	Austronesian	**vinovo**	0	
Kele	Austronesian	**pupuy**	0	
Khmer	Austroasiatic	**jaik**, **jek**	0	
Kiribati	Austronesian	**banana**	0	
Kolana	West Papuan	**mlulu**	0	
Kurdish	Indo-European	**moz**	0	
Kusunda	(isolate)	**motsa**	0	
Kuuk Thaayorre	Pama-Nyungan	**punan**	0	
Kwamera	Austronesian	**taik**	0	
Kwerba (Aurimi)	Kwerba	**kasana**	0	
Lameni	Austronesian	**per-œw**	0	
Lani	Dani	**lawi**	0	
Larevat	Austronesian	**nə-fsax**	0	
Lasalimu	Austronesian	**ŋane**	0	
Leitre	Austronesian	**ni**	0	
Lun Dayeh	Austronesian	**boŋ**	0	
Madurese	Austronesian	**gəɖhaŋ**	0	
Maisin	Austronesian	**me**	0	
Malagasy	Austronesian	**akonɖo**	0	
Manadonese	Austronesian	**lensa**	0	
Manem	Border	**mayu**	0	
Marind	Marind	**napet**	0	
Marshallese	Austronesian	**keepraŋ**	0	
Matbat	Austronesian	**mah**, **hama**	0	
Mekeo East	Austronesian	**oo**	0	
Mekeo NorthWest	Austronesian	**kui**	0	
Mekeo West	Austronesian	**poa**	0	

Language	Family	Banana term	Class	proto-form
Nembao	Austronesian	**nakwe**	0	
Mentawai	Austronesian	**bago**	0	
Mishmi	Austronesian	**ablaŋ**	0	
Mishmi	Austronesian	**tatyaŋ**	0	
Misima	Austronesian	**e`rurubagabaga**	0	
Moi	West Papuan	**o**	0	
Momo (Fas)	Kwomtari	**athi**	0	
Morori	(isolat)	**napet**	0	
Motu	Austronesian	**dui, biku**	0	
Nabi	Austronesian	**werom**	0	
Nafri	Sentani	**eum**	0	
Nedebang	West Papuan	**may**	0	
Nehan	Austronesian	**pos**	0 (4?)	
Nengone	Austronesian	**waʔeɳe**	0	
Ngaju Dayak	Austronesian	**harias**	0	
Ningera	Border	**puu**	0	
Nouri	Skou	**opon**	0	
Nusalaut	Austronesian	**kokino**	0	
Oiso	Binandere	**axo`a**	0	
One (Inebu)	Torricelli	**tuam**	0	
One (Kabore)	Torricelli	**pan**	0	
One (Kara)	Torricelli	**tuwam**	0	
One (Kwamtim)	Torricelli	**faan**	0	
One (Molmo)	Torricelli	**fani**	0	
One (Romei)	Torricelli	**fan**	0	
One (Siama)	Torricelli	**fani**	0	
Orya	?	**waha**, **gwaha**	0	
Pacoh	Austroasiatic	**peʔ**	0	
Papapana	Austronesian	**nawgono**	0	
Piru	Austronesian	**tema**	0	
Pitta-Pitta	Pama-Nyungan	**(ŋ)alutya**	0	
Plema	Torricelli	**fani**	0	
Puare	Skou	**wo**	0	
Ramo	Skou	**opon**	0	
Rawo-Poko	Skou	**wu**	0	
Rhade	Austronesian	**mtei**	0	
Sa`ban	Austronesian	**uəŋ**	0	
Sakao	Austronesian	**iðel**	0	
Sause	?	**puru**	0	
Sentani	Sentani	**eum**	0	
Seta (Yakoma)	Torricelli	**fan**	0	
Seti (Mauwil)	Torricelli	**fan**	0	

Language	Family	Banana term	Class	proto-form
Sherpa	Sino-Tibetan	**bo**	0	
Sinaugoro	Austronesian	**ʔarivata**	0	
Sissano	Austronesian	**apone**	0	
Skou	Skou	**ĭno**	0	
Solos	Austronesian	**pos**	0 (4?)	
Somali	Afro-Asiatic	**muus-ka**	0	
Sori-Harengan	Austronesian	**mborru**	0	
Sudest	Austronesian	**ʔa**	0	
Sumararu	Skou	**wambo**	0	
Sumo	Skou	**apon**	0	
Taikat	Border	**wafe**	0	
Tamil	Dravidian	**vaaʒai paʒam**	0	
Tandia	Austronesian	**namaria**	0	
Tanima (Tetau)	Austronesian	**unda**	0	
Tanimbili	Austronesian	**nowundʒo**	0	
Tanna	Austronesian	**nə-pwan**, **nu-kus**	0	
Tanna (North)	Austronesian	**nəmbən**	0	
Teop	Austronesian	**veresun**	0	
Ternate	West Papuan	**koi**	0	
Thulung Rai	Sino-Tibetan	**ljasi**	0	
Tidore	West Papuan	**koi**	0	
Tondano	Austronesian	**se`ut**	0	
Tonga	Austronesian	**siaine**	0	
Torau	Austronesian	**ŋolo**, **aadi**, **kakata**	0	
Totoli	Austronesian	**lemo**	0	
Tsou	Austronesian	**tsnımı**	0	
Unua	Austronesian	**namic**	0	
Urat	Torricelli	**ŋamban**	0	
Uruava (Poraka)	Austronesian	**keiraka**	0	
Vano	Austronesian	**puŋa**	0	
Waris	Border	**mawe**, **mayu**	0	
Waru	Austronesian	**tißo**	0	
Woleaian	Austronesian	**wiʃi**	0	
Wolof	Niger-Congo	**banana**	0	
Womo	Skou	**wa**	0	
Wutung	Skou	**ñe**	0	
Yabi	Austronesian	**mapi**	0	
Yei	?	**taye**	0	
Zarma	Nilo-Saharan	**banana**	0	
Ivatan	Austronesian	**vinivıɣ**	1	***bəlbəl**
Ivatan (Southern)	Austronesian	**viñıvıh**	1	
Kanakanabu	Austronesian	**ta-bulbul**	1	

Language	Family	Banana term	Class	proto-form
Paiwan	Austronesian	**vəly-vəly**	1	
Pazeh	Austronesian	**bələbən**	1	
Puyuma	Austronesian	**bulibul**	1	
Rukai	Austronesian	**bələbələ**	1	
Saaroa	Austronesian	**ta-bulbul**	1	
Siraiya	Austronesian	**Bunbun**	1	
Thao	Austronesian	**bilbil**	1	
Yami	Austronesian	**vinəvə**	1	
Balangao	Austronesian	**balat**	2	***baRat**
Bikol	Austronesian	**batag**	2	
Bintulu	Austronesian	**balak**	2	
Bontok	Austronesian	**balat**	2	
Daro-Matu (Melanau)	Austronesian	**balak**	2	
Dumagat (Casiguran)	Austronesian	**biget**	2	
Gaddang	Austronesian	**qabat**	2	
Ifugao (Amganad)	Austronesian	**balat**	2	
Ifugao (Batad)	Austronesian	**baalat**	2	
Ifugao (Bayninan)	Austronesian	**baalat**	2	
Inibaloi	Austronesian	**balat**	2	
Isneg	Austronesian	**baagat**	2	
Itawis	Austronesian	**bahat**	2	
Itneg	Austronesian	**balat**	2	
Kajaman	Austronesian	**balat**	2	
Kalinga (Linimos)	Austronesian	**baalat**	2	
Kankanay	Austronesian	**baqat**	2	
Kapampangan	Austronesian	**balat**	2	
Kayapa, Kallahan	Austronesian	**balat**	2	
Keley-I, Kallahan	Austronesian	**balat**	2	
Lara`	Austronesian	**barak**	2	
Mon	Austronesian	**braat**	2	
Penan (Nibong)	Austronesian	**balak**	2	
Tanjong	Austronesian	**balat**	2	
Ukit	Austronesian	**balak**	2	
Yogad	Austronesian	**bagát**	2	
Aklanon	Austronesian	**saagiŋ**	3	***sagiŋ**
Ata Monobo	Austronesian	**sagiŋ**	3	
Ba:ngingi Sama	Austronesian	**saiŋ**	3	
Balaesang	Austronesian	**sagiŋ**	3	
Binukid	Austronesian	**sagiŋ**	3	
Boano	Austronesian	**sagin**	3	
Cebuano	Austronesian	**sagiŋ**	3	
Cotabato Manobo	Austronesian	**sagiŋ**	3	

Language	Family	Banana term	Class	proto-form
Dampelas	Austronesian	**sagiŋ**	3	
Dibabawon	Austronesian	**sagiŋ**	3	
Hiligaynon	Austronesian	**sagiŋ**	3	
Iilianen manobo	Austronesian	**sahiŋ**	3	
Kagayanen	Austronesian	**sagiŋ**	3	
Kalagan	Austronesian	**sagiŋ**	3	
Kapampangan	Austronesian	**sagiŋ**	3	
Kinaray-a	Austronesian	**sagiŋ**	3	
Koronadal Blaan	Austronesian	**sagiŋ**	3	
Magindanano	Austronesian	**sagiŋ**	3	
Mamanwa	Austronesian	**sagiŋ**	3	
Mansaka	Austronesian	**sagiŋ**	3	
Mongondow	Austronesian	**tagin**	3	
Saluan	Austronesian	**sagin**	3	
Sama	Austronesian	**sagiŋ**	3	
Sarangani Blaan	Austronesian	**sagiŋ**	3	
Sarangani Manobo	Austronesian	**sagiŋ**	3	
Subanen, Sindangan	Austronesian	**sagiŋ**	3	
Subanen, Siocon	Austronesian	**sagiŋ**	3	
Tagalog	Austronesian	**sagiŋ**	3	
Tausug	Austronesian	**saiŋ**	3	
Tigwa	Austronesian	**sagiŋ**	3	
Totoli	Austronesian	**sagin**	3	
Ali	Austronesian	**ur**	4	***punti**
Alune	Austronesian	**udi**	4	
Amahai	Austronesian	**usiro**	4	
Anejom~	Austronesian	**nohos**	4	
Aniwa	Austronesian	**futʃi**	4	
Anuta	Austronesian	**puti**	4	
Apma	Austronesian	**is**	4	
Aralle-Tabulahan	Austronesian	**punti**	4	
Are `Are	Austronesian	**husi**	4	
Arguni	Austronesian	**fud**	4	
Arosi	Austronesian	**hugi**	4	
Asilulu	Austronesian	**kula ela puti**	4	
Atchin	Austronesian	**na-ßitʃ**	4	
Axamp	Austronesian	**na-ßütʃ**	4	
Baeggu	Austronesian	**fundi**	4	
Baelelea	Austronesian	**fundi**	4	
Baki	Austronesian	**para-ßi**	4	
Bam	Austronesian	**ud**	4	

Language	Family	Banana term	Class	proto-form
Bariai	Austronesian	**pud**	4	
Barok	Austronesian	**un**	4	
Bauro	Austronesian	**huki**	4	
Bellona	Austronesian	**huti**	4	
Bierebo	Austronesian	**para-ßi**	4	
Bieria	Austronesian	**ni-ßi**	4	
Big Nambas	Austronesian	**nas**	4	
Bilur	Austronesian	**un**	4	
Birao	Austronesian	**vundʒi**	4	
Bola	Austronesian	**vudi**	4	
Bonggo	Austronesian	**fun**	4	
Buang	Austronesian	**ßud**	4	
Bughotu	Austronesian	**vudi**	4	
Bugis	Austronesian	**utti**	4	
Bukawa	Austronesian	**hùŋ**	4	
Bulu	Austronesian	**vudi**	4	
Bunama	Austronesian	**hudi**	4	
Bungku	Austronesian	**punti**	4	
Burmbar	Austronesian	**na-ßis**	4	
Bwaidoka	Austronesian	**udi**	4	
Central Maewo	Austronesian	**undi**	4	
Dakaka	Austronesian	**ßis**	4	
Damar	Austronesian	**usso, vi**	4	
Dami (Marik)	Austronesian	**uudi**	4	
Diodio	Austronesian	**udi**	4	
Dixon Reef	Austronesian	**a-ßəs**, **na-ßøs**	4	
Dobu	Austronesian	**udi**	4	
Dohoi	Austronesian	**puti**	4	
Duau	Austronesian	**hudi**	4	
Duri	Austronesian	**punti**	4	
Emae	Austronesian	**futi**	4	
Embaloh	Austronesian	**unti**	4	
Empelawas	Austronesian	**utiɛʔ**	4	
Enrekang	Austronesian	**putti**	4	
Eton	Austronesian	**na-t**	4	
Fagani	Austronesian	**huki**	4	
Futuna-Aniwa	Austronesian	**futʃi**	4	
Gela	Austronesian	**vundi**	4	
Ghanonga	Austronesian	**vundi**	4	
Ghari	Austronesian	**vundi**	4	
Ghari (Ndi)	Austronesian	**vundi**	4	

Language	Family	Banana term	Class	proto-form
Gitua	Austronesian	**pudi**	4	
Gresi	Nimboran	**udu**, **wadu**	4	
Halia	Austronesian	**wur**	4	
Hanu (Raga)	Austronesian	**ihi**	4	
Hote (Misim)	Austronesian	**vuŋ**	4	
Iaai	Austronesian	**ovic**, **waʔaṭe**	4	
Imroing	Austronesian	**utiɛ**	4	
Irarutu	Austronesian	**ɸudə**	4	
Iresim	Austronesian	**piti**	4	
Iwal (Kaiwa)	Austronesian	**vud**	4	
Kadazan	Austronesian	**punti**	4	
Kahua	Austronesian	**huki**	4	
Kaiep	Austronesian	**ud**	4	
Kairiru	Austronesian	**ur**	4	
Kaliai-Kove	Austronesian	**puDi**	4	
Kamariang	Austronesian	**uki**	4	
Kamaru	Austronesian	**pusi**	4	
Kandas	Austronesian	**un**	4	
Kara	Austronesian	**fut**	4	
Kayan (Baram)	Austronesian	**putui**	4	
Kayan Kenyah	Austronesian	**petei**	4	
Kayupulau	Austronesian	**ori**	4	
Kela	Austronesian	**uŋ**	4	
Kemtuik	Austronesian	**udu**	4	
Kilenge	Austronesian	**pur**	4	
Kiriwina (Kilivila)	Austronesian	**usi**	4	
Kodeoha	Austronesian	**pudi**	4	
Koroni	Austronesian	**punti**	4	
Kosraean	Austronesian	**usr**	4	
Kowiai	Austronesian	**funu**	4	
Kuanua, Tolai	Austronesian	**vudu**	4	
Kulisusu	Austronesian	**punci**	4	
Label	Austronesian	**hun**	4	
Labo	Austronesian	**n-is**	4	
Labu	Austronesian	**ho**	4	
Lampung	Austronesian	**punti**	4	
Larike	Austronesian	**ure**	4	
Lau	Austronesian	**fundi**	4	
Lelepa	Austronesian	**na-di**	4	
Lemolang	Austronesian	**punti**	4	
Lengu	Austronesian	**vundi**	4	
Letemboi	Austronesian	**na-ßəs**	4	

Language	Family	Banana term	Class	proto-form
Lewo	Austronesian	**vi**	4	
Lingarak	Austronesian	**na-ßuns**	4	
Litzlitz	Austronesian	**ne-ßənts**	4	
Longgu	Austronesian	**vuŋgi**	4	
Lonwolwol	Austronesian	**vih**	4	
Lote	Austronesian	**uri**	4	
Luang	Austronesian	**udi**	4	
Luangiua	Austronesian	**huki**	4	
Lungga	Austronesian	**vundi**	4	
Lusi	Austronesian	**puzi, puri**	4	
Ma`anyan	Austronesian	**punri**	4	
Madak	Austronesian	**un**	4	
Mae	Austronesian	**ba-ßis**	4	
Maii	Austronesian	**ni-ßi**	4	
Makassar	Austronesian	**unti**	4	
Malango	Austronesian	**vundʒi**	4	
Malua Bay	Austronesian	**na-ßit**	4	
Mamasa	Austronesian	**punti**	4	
Mamuju	Austronesian	**punti**	4	
Manam, new	Austronesian	**udi**	4	
Manam, old	Austronesian	**udi**	4	
Manga Buang	Austronesian	**vud**	4	
Mangap-Mbula	Austronesian	**pin**	4	
Mapos Buang	Austronesian	**vud**	4	
Marino	Austronesian	**udi**	4	
Masela Central	Austronesian	**ut**	4	
Masela East	Austronesian	**ut**	4	
Maskelynes	Austronesian	**na-ßis**	4	
Massenrempulu	Austronesian	**putti**	4	
Medebur	Austronesian	**ud**	4	
Mekwei	Austronesian	**andu**	4	
Mele	Austronesian	**futʃi**	4	
Mele-Fila	Austronesian	**putʃi**, **futʃi**	4	
Mengen	Austronesian	**puri**	4	
Meramera (Melamela)	Austronesian	**vudi**	4	
Minigir	Austronesian	**vud**(**u**)	4	
Mlap (Kwansu)	Austronesian	**undu**	4	
Molbog	Austronesian	**punti**	4	
Molima	Austronesian	**udi**	4	
Mono-Alu	Austronesian	**undi**	4	
Mor	Austronesian	**hut**(**a**)	4	
Mori Atas	Austronesian	**punsi**	4	

Language	Family	Banana term	Class	proto-form
Mori Bawah	Austronesian	**punti**	4	
Moronene	Austronesian	**punti**	4	
Mpotovoro	Austronesian	**ba-ßis**	4	
Mussau	Austronesian	**uri**	4	
Nadroga	Austronesian	**ßudi**	4	
Nakanai	Austronesian	**vugi**	4	
Nalik	Austronesian	**fud**(**u**)	4	
Namakura	Austronesian	**vih**	4	
Naman	Austronesian	**ne-vəns**	4	
Nasarian	Austronesian	**na-ßøs**	4	
Nemi	Austronesian	**pijiŋ**	4	
Nese	Austronesian	**no-v'ic**	4	
Nguna	Austronesian	**na-di**	4	
Nimboran	Austronesian	**uändu**	4	
Niue	Austronesian	**futi**	4	
North Ambrym	Austronesian	**ßi**	4	
North Babar	Austronesian	**udvija**	4	
Notsi	Austronesian	**udi**	4	
Nukuoro	Austronesian	**hudi**	4	
Numbami	Austronesian	**undi**	4	
Nyindrou	Austronesian	**bur**	4	
Onin	Austronesian	**fugi**	4	
Ormu	Austronesian	**weri**	4	
Oroha	Austronesian	**husi**	4	
Owa (Kahua)	Austronesian	**huki**	4	
Paamese	Austronesian	**ahis**	4	
Padoe	Austronesian	**pusi**	4	
Paktong	Austronesian	**buun**	4	
Palauan	Austronesian	**punti**	4	
Pangasinan	Austronesian	**punti**	4	
Patpatar	Austronesian	**hudu**	4	
Petats	Austronesian	**fur**	4	
Pije	Austronesian	**pijiʔŋ**	4	
Pitu Ulunna Salu	Austronesian	**punti**	4	
Piu	Austronesian	**yud**	4	
Po-Ai	Austronesian	**pijiʔŋ**	4	
Ponapean	Austronesian	**uut**	4	
Port Sandwich	Austronesian	**mbre-vüc**	4	
Port Vato	Austronesian	**ßih**	4	
Puluwat	Austronesian	**wuru**	4	
Putoh	Austronesian	**feti**	4	
Raga	Austronesian	**ihi**	4	

Language	Family	Banana term	Class	proto-form
Rahambuu	Austronesian	**pundi**	4	
Ramoaaina	Austronesian	**udu-udu**	4	
Rennellese	Austronesian	**huti**	4	
Repanbitip	Austronesian	**na-ßis**	4	
Rerep	Austronesian	**ne-ßitʃ**	4	
Roma	Austronesian	**wui**	4	
Rote	Austronesian	**huni**	4	
Rotuman	Austronesian	**pɔri**	4	
Sa	Austronesian	**is**	4	
Sa`a	Austronesian	**hudi**, **huti**, **hutʃi**	4	
Sasak	Austronesian	**puntiʔ**	4	
Sekar	Austronesian	**fudi**	4	
Seke	Austronesian	**ih**	4	
Seko Padang	Austronesian	**putti**	4	
Sera	Austronesian	**bur**	4	
Serili	Austronesian	**ut**	4	
Sikaiana	Austronesian	**huti**	4	
Simbo	Austronesian	**vundi**, **ßudi**	4	
Sissano	Austronesian	**wur**	4	
Sissano	Austronesian	**vur**	4	
Sobei	Austronesian	**firo**	4	
Solos	Austronesian	**hut**	4	
South Efate	Austronesian	**naur**	4	
Southeast Ambrym	Austronesian	**his**	4	
South-east Babar	Austronesian	**utÓ^{h}**	4	
Sowa	Austronesian	**wais**	4	
Sudest	Austronesian	**ɣudu-ɣudu**	4	
Sumbawa	Austronesian	**punti**	4	
Sursurunga	Austronesian	**hun**	4	
Sye	Austronesian	**novoh**	4	
Tabar (Lir, Lihir)	Austronesian	**uin**	4	
Tabar (Mandara)	Austronesian	**vudi**	4	
Tagabanwa	Austronesian	**punti**	4	
Taiof (Saposa)	Austronesian	**fur**	4	
Takia	Austronesian	**fud**	4	
Taloki	Austronesian	**punti**	4	
Tami	Austronesian	**pun**	4	
Tarpia	Austronesian	**pu**	4	
Tela-Masbuar	Austronesian	**utiɛ**	4	
Tenis	Austronesian	**uri**	4	
Tetun Fehan	Austronesian	**hudi**	4	
Tigak	Austronesian	**ur**	4	

Language	Family	Banana term	Class	proto-form
Tikopia	Austronesian	**futi**	4	
Timugon Murut	Austronesian	**puti**	4	
Tindal	Austronesian	**punti**	4	
Tobati	Austronesian	**ure**	4	
Tolaki	Austronesian	**punti**	4	
Tolo	Austronesian	**vutʃi**	4	
Tomadino	Austronesian	**punsi**	4	
Tombulu	Austronesian	**punti**	4	
Tonsea	Austronesian	**puntu**	4	
Tontemboan	Austronesian	**punti**	4	
Toraja (Sa`dan)	Austronesian	**punti**	4	
Torau	Austronesian	**udi**	4	
Tubetube	Austronesian	**udi**	4	
Tumleo	Austronesian	**wuər**	4	
Tuvalu	Austronesian	**futi**	4	
Uab Meto	Austronesian	**uki**	4	
Ulau-Suain	Austronesian	**ud**	4	
Ura	Austronesian	**novus**	4	
Uruava (Poraka)	Austronesian	**vudi**	4	
Vao	Austronesian	**v`ete**	4	
Vehes	Austronesian	**vud**	4	
Vinmavis	Austronesian	**na-ßint**	4	
Wakasihu	Austronesian	**ure**	4	
Wala (Langalanga)	Austronesian	**fudi**	4	
Warembori	Austronesian	**uti-ro**	4	
Waropen	Austronesian	(**h**)**uiʔa**	4	
Watubela	Austronesian	**phúdi**	4	
Watut (North), Silisili (Bubwaf)	Austronesian	**fun**	4	
Wawonii	Austronesian	**punti**	4	
Wemale	Austronesian	**hudi**	4	
Western Fijian	Austronesian	**ßuji**	4	
Whitesands	Austronesian	**ne-pən**	4	
Wotu	Austronesian	**punti**	4	
Xaracuu	Austronesian	**p^{w}ĩ**	4	
Yabêm	Austronesian	**in**	4	
Yaur	Austronesian	**idi**	4	
Yeretuar	Austronesian	**idi**	4	
Banggai	Austronesian	**lo/a**	5	***loka** (< ***kateloy**, < ***qaRutay**)
Da`a	Austronesian	**loka**	5	
Giman	Austronesian	**loka**	5	

Language	Family	Banana term	Class	proto-form
Konjo	Austronesian	**loka**	5	
Laiyolo	Austronesian	**loka**	5	
Lauje	Austronesian	**loka**	5	
Mandar	Austronesian	**loka**	5	
Pamona	Austronesian	**loka**	5	
Pendau	Austronesian	**loka**	5	
Rampi	Austronesian	**lokaʔ**	5	
Sarudu	Austronesian	**loka**	5	
Sawai	Austronesian	**lokɛ**	5	
Selayar	Austronesian	**loka**	5	
Tajio	Austronesian	**loka**	5	
Topoiyo	Austronesian	**loka**	5	
Tukang Besi	Austronesian	**loka**	5	
Uma	Austronesian	**lokaʔ**	5	
Weda	Austronesian	**loke**	5	
West Makian	Austronesian	**loka**	5	
Wolio	Austronesian	**loka**	5	
Adang	Austronesian	**moʔoy**	6	***muku**
Anejom~	Austronesian	**namek**	6	
Aneme Wake	Austronesian	**moʔo**	6	
Aputai	Austronesian	**mu**	6	
Baham	Bomberai	**muŋgue**	6	
Batuley	Austronesian	**mug**	6	
Blagar	West Papuan	**mogal**	6	
Bunak	West Papuan	**mok**	6	
Dobel	Austronesian	**muʔu**	6	
Ende	Austronesian	**muku**	6	
Fataluku	West Papuan	**mu**	6	
Fordata	Austronesian	**muʔu**	6	
Iha	Bomberai	**nomNgbo**	6	
Ili`uun	Austronesian	**mu**	6	
Kabola	West Papuan	**moʔoy**	6	
Kafoa	West Papuan	**miyal**	6	
Woisika	West Papuan	**moger**	6	
Kambera	Austronesian	**kalú muku**	6	
Karey	Austronesian	**mogo**	6	
Kaulong	Austronesian	**muhuk**	6	
Kedang	Austronesian	**muʔu**	6	
Kei	Austronesian	**muk**	6	
Kemak	Austronesian	**mu**	6	
Kéo	Austronesian	**muku**	6	
Kisar	Austronesian	**muʔu**	6	

Language	Family	Banana term	Class	proto-form
Klon	West Papuan	**mogal**	6	
Kokota	Austronesian	**muku**	6	
Kola	Austronesian	**muk**	6	
Kompane	Austronesian	**muku**	6	
Kui	West Papuan	**mogal**	6	
Lamaholot	Austronesian	**mugo**	6	
Lamma	West Papuan	**maggi**	6	
Lamma	West Papuan	**maqa**	6	
Lio	Austronesian	**muku**	6	
Lola	Austronesian	**moko**	6	
Lorang	Austronesian	**muku**	6	
Maiadom (Yamalele)	Austronesian	**moʔe**	6	
Makalero	West Papuan	**mu**	6	
Makasai	West Papuan	**muʔu**	6	
Mambai	Austronesian	**mu**	6	
Manggarai	Austronesian	**muku**	6	
Manombai	Austronesian	**muku**	6	
Moikodi	Austronesian	**mo'o**	6	
Mor	(isolate)	**moga**	6	
Nawaru (Sirio)	Yareban	**mo**	6	
Nelemwa (Kumak)	Austronesian	**mugic**	6	
Ngadha	Austronesian	**muku**	6	
Oirata	West Papuan	**mu**	6	
Oroha	Austronesian	**makara**	6	
Palu`e	Austronesian	**muku**	6	
Perai	Austronesian	**mu**	6	
Rongga	Austronesian	**muku**	6	
Sawu	Austronesian	**womu`u**	6	
Sika	Austronesian	**muʔu**	6	
Solor	Austronesian	**muko**	6	
Sye	Austronesian	**yamoʔ**	6	
Talur	Austronesian	**muʔu**	6	
Tanglapui	West Papuan	**maka**	6	
Tehit (Imian)	West Papuan	**oga**	6	
Teiwa	West Papuan	**muxul**	6	
Teor-Kur	Austronesian	**muk**	6	
Tugun	Austronesian	**muʔu**	6	
Ujir	Austronesian	**muk**	6	
Uma	Austronesian	**lokaʔ moku**	6	
Ura	Austronesian	**yamek**	6	
Yareba	Yareban	**mo**	6	
Asilulu	Austronesian	**kula**	7	***kateloy** (< ***qaRutay**)

Language	Family	Banana term	Class	proto-form
Bangla	Indo-European	**kola**	7	
Barakai	Austronesian	**kalaur**	7	
Batak Pakpak	Austronesian	**galo**	7	
Bima	Austronesian	**kalo**	7	
Busoa	Austronesian	**alei**	7	
Damal	(isolate)	**kelo**	7	
Garo	Austronesian	**talit**	7	
Gujarati	Indo-European	**kelũ**	7	
Haruku	Austronesian	**kura**	7	
Hindi	Indo-European	**kelaa**	7	
Kambera	Austronesian	**kalú**	7	
Kammu-Yuan	Austroasiatic	**təlɔɔy**	7	
Karo Batak	Austronesian	**gaɔl**	7	
Khmer	Austroasiatic	**taloi**	7	
Komodo	Austronesian	**kalo**	7	
Kota	Austronesian	**kol**	7	
Kumbewaha	Austronesian	**kalei**	7	
Laha	Austronesian	**kula**	7	
Lao	Tai-Kadai	**kuay**	7	
Manange	Sino-Tibetan	**kol**	7	
Marathi	Indo-European	**kelã**	7	
Muna	Austronesian	**kalei**	7	
Muna (South)	Austronesian	**kalei**	7	
Nepali	Indo-European	**kera**	7	
Nias	Austronesian	**gahe**	7	
Palaung	Austroasiatic	**kədo**	7	
Palaung	Austroasiatic	**kluəy**	7	
Palaung	Austroasiatic	**təlɔɔy**	7	
Pancana	Austronesian	**kalei**	7	
Pashto	Indo-European	**kela`h**	7	
Sakai	Austroasiatic	**telui**, **kelui**	7	
Saparua	Austronesian	**kula**	7	
Saweru	West Papuan	**karei**	7	
Selaru	Austronesian	**kwe**	7	
Sichule	Austronesian	**gai**	7	
Simalur	Austronesian	**kaul**	7	
Sinhalese	Indo-European	**kesel geDiya**	7	
South Nicobarese	Austroasiatic	**təluui**	7	
Souw Amana Teru	Austronesian	**kula**	7	
Thai	Tai-Kadai	**kluay**	7	
Toba Batak	Austronesian	**gaol**	7	
Uma	Austronesian	**lokaʔ kaleʔ**	7	

Language	Family	Banana term	Class	proto-form
Urdu	Indo-European	**kaylaa**	7	
Vietnamese	Austroasiatic	**chuoi**	7	
Wanukaka	Austronesian	**kalo`a**	7	
West Tarangan	Austronesian	**kalor**	7	
Hawaiian	Austronesian	**maiʔa**	8	***maika**
Mangareva	Austronesian	**meika**	8	
Maori	Austronesian	**maika**	8	
Rapa Nui	Austronesian	**maika**	8	
Rarotongan	Austronesian	**maika**	8	
Tahitian	Austronesian	**maiʔa**	8	
Tongan	Austronesian	**maika**	8	
Tuamotuan	Austronesian	**maika**	8	
Aklanon	Austronesian	**agugútay**	9	***qaRutay**
Alta	Austronesian	***arutay**	9	
Cebuano	Austronesian	**agútay**	9	
Central Agta	Austronesian	***arutay**	9	
Dumagat (Casiguran)	Austronesian	***arutay**	9	
Hanunoo	Austronesian	**agútay**	9	
North Agta	Austronesian	***arutay**	9	
Sinauna	Austronesian	***arutay**	9	
Tboli	Austronesian	**kelutay**	9	
Acehnese	Austronesian	**pisaŋ**	10	***pisang**
Gayo	Austronesian	**pisaŋ**	10	
Iban	Austronesian	**pisaŋ**	10	
Indonesian	Austronesian	**pisaŋ**	10	
Minangkabau	Austronesian	**pisaŋ**	10	
Moken	Austronesian	**pecÓaŋ**	10	
Mualang	Austronesian	**pisaŋ**	10	
Urak Lawoi’	Austronesian	**pisak**	10	
Akei	Austronesian	**ßotali**	11	***betali**
Ambae	Austronesian	**ßatali**	11	
Amblom	Austronesian	**fotal**	11	
Aore	Austronesian	**ßatali**	11	
Araki	Austronesian	**ßɛrale**	11	
Baetora	Austronesian	**ßatali**	11	
Buli	Austronesian	**tela**	11	
Butmas Tur	Austronesian	**fatal**	11	
Central Maewo	Austronesian	**fatali**	11	
East Tarangan	Austronesian	**taragwar**	11	
Fort Senal	Austronesian	**ßotali**	11	
Gebe	Austronesian	**tele**	11	
Hiw	Austronesian	**ßotoi**	11	

Language	Family	Banana term	Class	proto-form
Kawe	Austronesian	**tala**	11	
Koro	Austronesian	**ßœtœl**	11	
Laganyam	Austronesian	**tala**	11	
Lakona	Austronesian	**ßatel**	11	
Lehali	Austronesian	**ßetœl**	11	
Lehalurup	Austronesian	**ßetʃel**	11	
Lolovoli (East Ambae)	Austronesian	**ßatali**	11	
Maba	Austronesian	**tela**	11	
Mafea	Austronesian	**v`atali**	11	
Malo (Tamambo?)	Austronesian	**ßetai**	11	
Matbat	Austronesian	**talah**	11	
Maya	Austronesian	**tala**	11	
Merei	Austronesian	**votal**	11	
Merlav	Austronesian	**ßitel**	11	
Morouas	Austronesian	**ßotali**	11	
Mosina	Austronesian	**ßetel**	11	
Mota	Austronesian	**ßetal**	11	
Motlav	Austronesian	**na-ptel**	11	
Narango	Austronesian	**fɔɔtal**	11	
Navut	Austronesian	**ßotali**	11	
Nokuku	Austronesian	**ßetɔli**	11	
Nume	Austronesian	**ßetel**	11	
Nusalaut	Austronesian	**telewa**	11	
Patani	Austronesian	**tele**	11	
Piamatsina	Austronesian	**ßetali**	11	
Pileni	Austronesian	**taveli**	11	
Polonombauk	Austronesian	**fatal**	11	
Roria	Austronesian	**tatal**	11	
Tamambo (Malo)	Austronesian	**ßetai**	11	
Tambotalo	Austronesian	**ßetalia**	11	
Tangowa	Austronesian	**ßetali**	11	
Tasmate	Austronesian	**ßetal**	11	
Telute	Austronesian	**pelewa**, **telewa**	11	
Tiale (Malmariv)	Austronesian	**ßotali**	11	
Toga (Loh)	Austronesian	**ßətel**	11	
Tolomako	Austronesian	**ßetali**	11	
Tutuba	Austronesian	**ßatali**	11	
Valpei	Austronesian	**ßatali**	11	
Vatrata	Austronesian	**ßaʔal**	11	
Vunapu	Austronesian	**ßatali**	11	
Wailapa	Austronesian	**ßetali**	11	
Nduindui	Austronesian	**ßotali**	11	

Language	Family	Banana term	Class	proto-form
Wetamut	Austronesian	**ßatal**	11	
Wusi	Austronesian	**patali**	11	
Abui	West Papuan	**baleey**	12	***b**[**ao**]**le**
Andra-Hus	Austronesian	**mBur**	12	
Baluan-Pam	Austronesian	**mun**	12	
Bipi	Austronesian	**bux**	12	
Galela	West Papuan	**bole**	12	
Kannada	Dravidian	**baale**	12	
Kuot	(isolate)	**udebun**	12	
Lamma	West Papuan	**banesiŋ**	12	
Lamogai	Austronesian	**obul**	12	
Loloda	West Papuan	**bole**	12	
Modole	West Papuan	**bale**	12	
Mok Aria (Bibling)	Austronesian	**obul**	12	
Mokerang	Austronesian	**buu**	12	
Pagu	West Papuan	**bole**	12	
Ponam	Austronesian	**mBuh**	12	
Sahu	West Papuan	**bele**	12	
Saliba	Austronesian	**baela**	12	
Tabaru	West Papuan	**bole**	12	
Tobelo	West Papuan	**bole**	12	
Tulu-Bohuai	Dravidian	**buuk**	12	
Wanukaka	Austronesian	**kaloʔa hobbul**	12	
Ambelau	Austronesian	**biyeh**	13	***bief**
Biak	Austronesian	**imbyef**	13	
Dusner	Austronesian	**bief**	13	
Meoswar	Austronesian	**bief**	13	
Ron	Austronesian	**bief**	13	
Saliba	Austronesian	**bihia**	13	
Tawala	Austronesian	**bihiya**	13	
Ambai	Austronesian	**rando**	14	***rando**
Ansus	Austronesian	**nando**	14	
Serui-Laut	Austronesian	**nando**	14	
Wandamen	Austronesian	**nando**	14	
Brao	Austroasiatic	**prıt**	15	***priit**
Cheng	Austroasiatic	**prıt**	15	
Chrau	Austronesian	**pəriit**	15	
C-Mnong	Austroasiatic	**priit**	15	
E-Mnong	Austroasiatic	**prit**	15	
Jru`	Austroasiatic	**prıət**	15	
Katuic	Austroasiatic	**priit**	15	
Köho	Austroasiatic	**pəriit**	15	

Language	Family	Banana term	Class	proto-form
Kuy	Austroasiatic	**priit**	15	
Lavi (Lawi)	Austroasiatic	**prɯɯt**	15	
Nyaheun	Austroasiatic	**prɪət**	15	
Stieng	Austroasiatic	**pəriit**	15	
Su`	Austroasiatic	**prɪət**	15	
Baelelea	Austronesian	**mbau**	16	***baqapun**
Baniata/Touo	Solomons	**vahu**	16	
Dori`o	Austronesian	**baʔu**	16	
Fataleka	Austronesian	**mbau**	16	
Gula`alaa	Austronesian	**bou**	16	
Iresim	Austronesian	**mambau**	16	
Kwaio	Austronesian	**baʔa**	16	
Kwaio	Austronesian	**bou**	16	
Kwara`ae	Austronesian	**bauʔ**	16	
Lau	Austronesian	**bou**	16	
Lenakel	Austronesian	**nə-pən**	16	
Loniu	Austronesian	**pakɔw**	16	
Mabalay Atayal	Austronesian	**buqoh**	16	
Puluwat	Austronesian	**(wuru)paawo**	16	
Teop	Austronesian	**pauna**	16	
Toqabaqita	Austronesian	**mbaʔu**	16	
Torau	Austronesian	**abau**	16	
Wala (Langalanga)	Austronesian	**bou**	16	
Wuvulu	Austronesian	**pahafu**	16	
Yap	Austronesian	**pʔaaw**	16	
Bantik	Austronesian	**busa**	17	***busa**
Patani	Austronesian	**busa**	17	
Sangil	Austronesian	**busa**	17	
Sangir	Austronesian	**busa**	17	
Wedau	Austronesian	**busa**	17	
Buru	Austronesian	**fuat**	18	***fiak**
Kadai	Tai-Kadai	**fia**	18	
Mairasi	Mairasi	**weʔi**	18	
Mangole	Austronesian	**fia**	18	
Nila	Austronesian	**hia**	18	
Samoan	Austronesian	**faʔi**	18	
Sera	Austronesian	**wia**	18	
Soboio	Austronesian	**fiak**	18	
Sula	Austronesian	**fia**	18	
Taliabu	Austronesian	**fia**	18	
Teun	Austronesian	**fiwa**	18	
Berik	Tor	**gwur**	19	***ŋkit**(**a**)

Language	Family	Banana term	Class	proto-form
Hoava	Austronesian	**lokita**	19	
Kusaghe	Austronesian	**lɔkita**	19	
Kwesten	Tor	**kwir**	19	
Malfaxal	Austronesian	**ni-ŋgit**	19	
Nduke	Austronesian	**lukata**	19	
Shark Bay	Austronesian	**kite**	19	
Southwest Bay	Austronesian	**ni-ŋgut**	19	
Enggano	Austronesian	**eʔito**	20	***tawai**
Gumawana	Austronesian	**towe(ga, nea)**	20	
Iduna	Austronesian	**tawai(nega)**	20	
Kosraean	Austronesian	**toa**	20	
Mono-Alu	Austronesian	**toitoi**	20	
Paamese	Austronesian	**tahui**	20	
Roro	Austronesian	**uʔu(na)**	20	
Sinaugoro	Austronesian	**(lewa)toɣo**	20	
Bali-Vitu	Austronesian	**beti**	21	***b^{w}atiq**
Marovo	Austronesian	**mbatia**	21	
Misima	Austronesian	**b^{w}ahiki**	21	
Vangunu	Austronesian	**mbatia**	21	
Arosi	Austronesian	**toraga**	22	***joRaga**
Eastern Fijian (Bauan)	Austronesian	**soaga**	22	
Laghu	Austronesian	**nasau**	22	
Lavukaleve	Solomons?	**saa**	22	
Maragus	Austronesian	**ni-sax**	22	
Nguna	Austronesian	**soaga**	22	
Paamese	Austronesian	**sooko**	22	
Ririo	Austronesian	**suaŋg**	22	
Samoan	Austronesian	**soaʔa**	22	
Savosavo	Solomons	**sou**	22	
Tape	Austronesian	**nisaɣ**	22	
Tunggare	Geelvink bay	**oa**	22	
Vaghua	Austronesian	**soŋga**	22	
Varisi	Austronesian	**soŋga**	22	
Watut (North), Silisili (Bubwaf)	Austronesian	**cok**	22	
Zabana	Austronesian	**nasau**	22	
Babatana	Austronesian	**siiku**	23	***sakup**
Gao	Austronesian	**tsao**	23	
Gumawana	Austronesian	**yagowa**	23	
Kokota	Austronesian	**kaku**	23	
Maringe (Cheke Holo)	Austronesian	**cau**	23	
Motu	Austronesian	**dau**	23	
Paamese	Austronesian	**sou-sou**	23	

Language	Family	Banana term	Class	proto-form
Roviana	Austronesian	**hakua**	23	
Simbo	Austronesian	**hakua**	23	
Sinaugoro	Austronesian	**daua**	23	
Sisiqa	Austronesian	**siku**	23	
Sundanese	Austronesian	**tʃau**	23	
Taupota	Austronesian	**hakova**	23	
Tawala	Austronesian	**hakowa**	23	
Ughele	Austronesian	**sakua**	23	
Zazao	Austronesian	**khaku**	23	
Budibud	Austronesian	**b^{w}ela-m^{w}ela**	24	***b^{w}era**
Gapapaiwa	Austronesian	**bora-bora**	24	
Paamese	Austronesian	**a-voi**	24	
Puluwat	Austronesian	**wurũp^{w}er**	24	