Suppose we are wrong about the Austronesian settlement of Taiwan?

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ABSTRACT

The current model of the prehistory of Taiwan assumes that it was first settled some 25,000 years ago by a population of unknown affinities, who reached what is now an island via a landbridge, at a time of much lower sea-levels. Some 5500 years ago, the Ta Pen Keng (TPK) culture, attested on the Peng Hu islands in the Taiwan Strait, apparently represents an incoming Neolithic population. Similar TPK sites are recorded around the shores of Taiwan in the centuries immediately following this. The pervasive assumption has been that these early settlers were the bearers of the Austronesian languages, which then diversified. If so, related Austronesian languages were formerly spoken on the Chinese mainland and these subsequently disappeared as a consequence of the Sinitic expansions. The indigenous Austronesian languages of Taiwan are claimed to reconstruct to a single proto-language, PAN, and from these reconstructions we can derive hypotheses about the lifestyle and subsistence of the earliest settlers.

This paper will argue that the single migration model is mistaken, and that it is not consistent with either the archaeology or the lexicon. If Formosan languages appear to reconstruct to a proto-language it is because they have been interacting over a long period, but they actually represent a continuing flow of pre-Austronesian languages from the mainland. Part of the evidence for this is the exceptional diversity of lexical items which are supposedly part of basic subsistence vocabulary.

Three phases of migration are distinguished, the TPK, the Longshan type culture and the Yuanshan, all of which originate on different places on the Chinese mainland. A further back migration from the Philippines may be responsible for the primary settlement of Green island and parts of the east coast, resulting in the present-day Amis population.

Keywords; Austronesian; Taiwan; China; archaeology; linguistics; genetics

ACRONYMS

ACD	Austronesian Comparative Dictionary
AD	Anno Domini
BP	Before present
BC	Before Christ
PAN	Proto-Austronesian
PMP	Proto-Malayo-Polynesian
TPK	Ta Pen Keng

1. Introduction

The current model of the prehistory of Taiwan assumes that it was first settled some 25,000 years ago by a population of unknown affinities, who reached what is now an island via a landbridge, at a time of much lower sea-levels. Some 5500 years ago the Da Pen Keng (大坌坑) culture is first recorded, representing an incoming Neolithic population (Tsang 1992, 2005). The earliest site known at present is the Tainan Industrial Park, but analogous sites are recorded around the shores of Taiwan in the centuries immediately following. Similar cultural materials are found on the Peng Hu islands off the shore of Fujian. Nothing exactly similar is found on the Chinese mainland, and the source area of these early mariners has thus remained under discussion (Jiao 2013). Various regions have been canvassed, including the dramatic site of Hemudu (河姆渡文化) in Zhejian, south of Shanghai, northwest of Taiwan, which includes stilt buildings, rice cultivation and pigs (Chang 1981). However, aspects of the culture of the indigenous peoples of Taiwan, such as their focus on millet growing and the practice of dental evulsion have made other scholars propose the source area is to be located somewhere drier and further north.

The pervasive assumption has been that these early settlers were the bearers of the Austronesian languages. The indigenous languages of Taiwan are all Austronesian, so the usual model is that related languages were formerly spoken on the Chinese mainland and that they subsequently disappeared as a consequence of the Sinitic expansions. Further contributory evidence is the diverse hypotheses relating Austronesian to the various phyla spoken on the mainland, including Sino-Tibetan and Austroasiatic (e.g. Sagart 2005; Reid 2005). The validity of these can be questioned, but they do suggest early contact at the very least.

Current models argue that Austronesian languages on Taiwan have 9-12 distinct branches and that most or all of these are parallel, i.e. they cannot be nested (Blust 2013; Ross 2012). Despite this, it is generally assumed that an Austronesian proto-language can be reconstructed and that the current and recent situation represents the primary diversification of the language of the first settlers. Blust (1995 and in commentaries to the continuing online Austronesian Comparative Dictionary[1]) has strongly argued that the lifestyle of these early migrants can be established from linguistic reconstructions. Blust (ACD) has a section listing Formosan lexemes which are restricted to the island and are not known elsewhere in Austronesian, but which he considers reasonable to attribute to PAN. If so, then these reconstructions reflect the lifestyle and subsistence of the earliest Neolithic populations.

There is some reason to be uneasy with this procedure. By definition, comparative and historical linguistics deals with assumed cognate forms, and hence reconstructions, once obvious loans have been excluded. The classifications of Formosan languages given above have been based on phonology or grammatical features and the lexicon has been accorded secondary significance. If we do compare the lexicon by semantic heads, it is rather diverse, to say the least, and in particular, the terminology of what may be called economic items turns out to be extremely varied. This does not necessarily suggest a single settlement of Neolithic farmers, but a scatter of ethnolinguistic groups with differing subsistence strategies who have come together. Moreover, there are many lexical items attributed to PAN for which there is a single Formosan attestation. These might equally well be evidence for a migration from elsewhere and a subsequent assimilation of the incoming population.

The archaeology of Taiwan shows considerable diversity after the Ta Pen Keng period, especially after 4000 BP, when sea level change opened up a considerable plain on the west of the mountainous spine, allowing for extensive millet cultivation. The Dahu culture (3800 BP onwards) is characterised by corded ware and distinctive black pottery, which has been connected with the Longshan horizon on the mainland. The evidence that the later diverse farming economies of Taiwan are the descendants of the Ta Pen Keng culture is less than compelling. The archaeological horizons are equally consistent with a continuing flow from the mainland. Exactly where on the mainland must remain controversial, since there is also a mismatch between Hemudu-type settlements and the centrality of foxtail millet to Formosan cultures. Indeed they may represent different groups from different places.

[1] Further references to Blust without a dated bibliographic reference are assumed to apply to the online ACD and its commentaries.

Ferrell (1969) in a wide-ranging survey of Formosan indigenous peoples, and probably the first attempt to tie together archaeological cultures with the diverse ethnic groups, as well as compiling comparative wordlists of key lexemes relating to subsistence, has this to say;

> If the archaeological evidence were not what it is and indicated more uniformity in the early stages of Taiwan's prehistory, we might indeed believe that present linguistic difference could be merely the result of divergence from a single ancestral language after its arrival in Taiwan. However, the archaeological picture of Taiwan, after the very early period characterized by the Cord-marked Pottery Horizon, indicate the fairly sudden appearance of not one but perhaps three main cultural complexes.
>
> (Ferrell 1969: 73)

and he concludes;

> 'The myth of Taiwan's "isolation" is a hardy one. They myth has two phases: (1) Taiwan is supposed to have been cut off from significant outside contact from a very early period until modern contacts began around the 16th century, and (2) the modern ethnic groups are supposed to have been somehow isolated from each other over a period of many centuries in Taiwan'

Another important review is the survey of Chang (1969), which is a wide-ranging survey of the archaeology of Taiwan, but which also considers parallels with the archaeology of the mainland and the proposed connection with the Austronesian expansion. Important recent reviews are Jiao (2013) and Li (2013) which bring Chang's survey up to date, without contributing further to the debate on the origin of the Austronesians.

This paper[2] will argue that Ferrell's insights were correct and that the single migration model is mistaken, that it is consistent neither the archaeology nor the lexicon. If Formosan languages appear to reconstruct to a proto-language is because they have been interacting over a long period, following a continuing flow of pre-Austronesian languages from the mainland. Significantly, the reconstructed forms almost always reflect prior knowledge of the PMP forms, i.e. the argument is on the verge of becoming circular. The failure to reconstruct a nested tree and a consistent phonology of Formosan is precisely a consequence of these multiple origins.

For this argument to work, three elements have to be in place;

a) The diversity of the Neolithic in Taiwan and the abrupt appearance of unexpected cultural materials should be consistent with a continuing flow of migration from outside
b) The analysis of linguistic materials should be congruent with a model whereby the inflow of new, but probably related languages and subsequent interaction and levelling gives the appearance of a reconstructible proto-Austronesian
c) These should be in turn consistent with synchronic ethnography, i.e. oral traditions and material culture

Evidence exists to meet the third requirement, but it is lengthy and will not be dealt with in this paper except in passing.

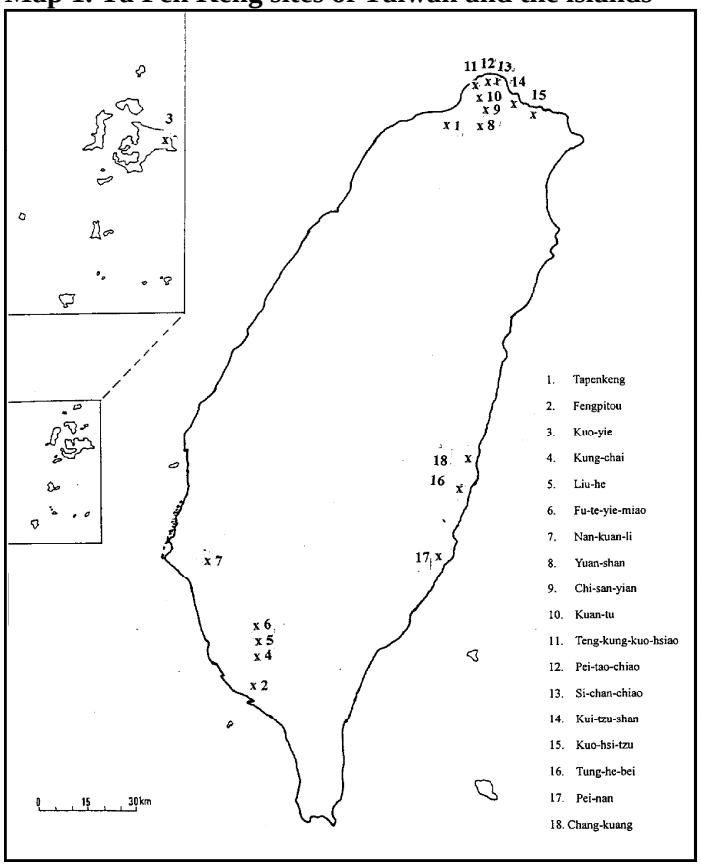
2. Overview of Taiwanese prehistory

Although the settlement of Taiwan is attributed to the Changbinian (~25,000 BP), the Neolithic begins with the Ta Pen Keng (TPK) culture, first recorded in the Penghu islands and then on the mainland by 5500 BP

[2] A first sketch of this idea was presented at the National Museum of Prehistory, Taitung, 28th September, 2014, and my thanks to the director and staff for my invitation to speak as well as Professor Tsang Chang-Hwa for facilitating my presence. I have subsequently been able to examine museum collections around Taiwan and in the Xiamen Museum in Fujian to give more substance to the argument. Thanks to Frank Muyard for stimulating discussions and pointing me in the direction of some valuable references.

(Tsang 2005). Map 1 shows the distribution of TPK sites, named for the type-site in the north, which after their first appearance on the main island, follow rapidly in a series of coastal locations elsewhere. This suggests strongly a highly mobile fishing culture, and that further sites might be found along the ancient shoreline opposite Fujian, since the western plains of Taiwan have only been above water subsequent to the TPK era (Lin 1963: 209-210).

Map 1. Ta Pen Keng sites of Taiwan and the islands



Source: Chang-Hwa (2005)

Photo 1 shows some of the cord-marked ceramics typical of TPK sites. Unfortunately, pottery of this type is not sufficiently diagnostic to link it to a specific region of the mainland, since pottery of this type is found in wide region of coastal China (Li 2013). It is unclear whether these early migrants were farmers. Although cereal grains have been found in early period and impressions of rice on pottery they are not dated precisely enough to say they came with the first migrants. Moreover, even if they did, they may well have been trade, and not the product of cropping *in situ*.

Photo 1. Cord-marked ware, TPK culture

Source: Author photo, National Museum, Taipei

Table 1 shows an outline chronology of the main archaeological cultures recognised in Taiwan. Map 2 shows their approximate location. There is something of a margin of error on these cultures and different museum presentations give slightly different starting and finishing points.

Table 1. Neolithic cultures of Taiwan

Period	Culture	Dates BP
Early Neolithic	Ta Pen Keng	7000—5000
Middle Neolithic	Yuanshan	4500—2000
	Fine-Red-Corded Terracotta	4400—3300
	Chih sanyen	4000—3000
Late Neolithic	Yingpu	3500—1800
	Tahu	3500—2000
	Binan	3500—1500
	Kilin	3500—2000
	Botanical Garden	2800—1800
Bronze Age	Pantsaiyuen	1800—1500
	Tachiuyuen	1800—1000
Iron Age	Shih San Hang	1700—700
	Niaosong	1800—1500
	Jingpu	1300—400
	Gui shan	1500—400

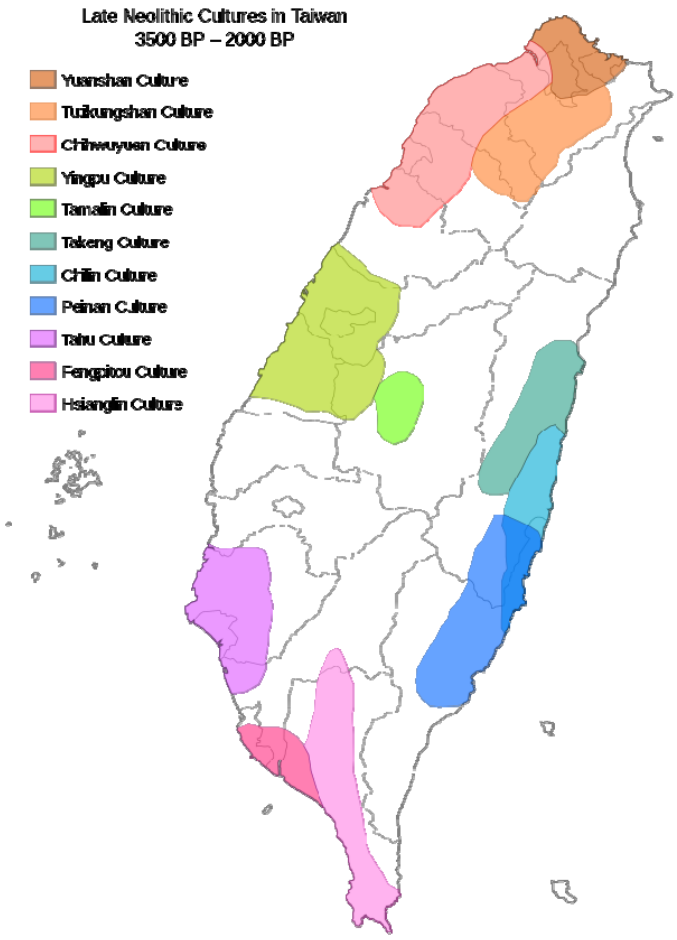
This table needs to be treated with appropriate scepticism especially for labels like 'Bronze Age' and 'Iron Age'. Bronze and iron appear as early imports around 0 AD, and there is no evidence that they were produced locally on any scale. Iron smelting made a brief appearance around 500 AD and then seems to have died out again.

Map 2 shows the locations of the later Neolithic cultures of Taiwan as far as they have been identified.

The primary settlement of Taiwan began with fisher-foragers from the Chinese mainland, who rapidly spread around the island seeking marine resources (Bellwood 2007). Their inheritors are likely to be the people at the O Luan Pi sites (part of the Kenting culture), at the extreme southern tip of Taiwan, who seem not to have been cultivators[3] (Li 2000). Just before 4000 BP, there are a series of new waves coming from the mainland, including the Yuanshan, and the Eastern red corded ware pottery. This coincides with two changed features of the natural and technical environment. The first is that the western plains open up due to changing sea levels.

The primary observation is that they are typologically extremely diverse. The Yuanshan culture in particular seems unrelated to the

Map 2. Later Neolithic cultures of Taiwan



Source: Adapted from CC map

[3] Kuang Ti (2000) says' Unfortunately no agricultural food resources…were recovered'. Unfortunately for whom, one may ask?

prior TPK culture or to the Red-Corded and Chihshanyen cultures, which appear within the same window. The key waves of migration as far as the present model is concerned are the 'Longshan' type sites and the Yuanshan sites. Chang (1969: 246) says; 'At about 2,500 BC two major cultures emerged in the Taiwan scene – the Yuan-shan in the north and the Lungshanoid in the south'. Chang & Stuiver (1966: 540) had already identified the major characteristics of the Longshan type sites as;

> '…a polished stone inventory that includes the flat, trapezoidal hoe, spatula-shaped hoe, rectangular adz, triangular (but not perforated) and stemmed arrowhead, and perforated slate knife (rectangular and semilunar varieties); a rich bone-antler-shell industry; and a melange of ceramic wares, red, buff, gray and black in color, which includes painted incised, engraved and impressed (check, basket and mat) decorative patterns and bowls, beakers and pots with lids, lugs (handles) and *ting* feet and high pedestals with cutouts.

The Longshan culture (*Lóngshān wénhuà* 龍山文化) is a Neolithic culture in China, centered on the central and lower Yellow River and dated from about 2600 BC to 1900 BC (Zhao 2013). The similarities noted by Chang & Stuiver and subsequent authors are very strong, but it remains a puzzle why the movement from this area should be so far to the south. Importantly, the Yellow River, which is clearly a major focus of Longshan culture at that time, followed a different course to the sea, debouching just north of Shanghai. However, such a movement would explain some aspects of Formosan culture, such as the focus on millet, not rice, and the practice of dental evulsion. Map 3 shows the direction of this potential movement.

Map 3. Longshan and Taiwan

Source: superimposed on CC map

Photo 2. Shouldered adzes, Yuanshan culture

Source: Author photo, National Museum, Taipei

Identifying a source for the Yuanshan culture is more difficult. Key material culture items are the characteristic shouldered adzes (Photo 2), polished stone axes, buff-coloured pottery and perforated triangular arrowpoints. In many ways the shouldered adzes are diagnostic, since they do not occur in any of the archaeological cultures in Fujian, and are only found either further south in ISEA in parts of the Philippines and Sulawesi or on the mainland, in Việt Nam and parts of South China. Chang (1969:239) says 'We maintain…the Yüan-shan culture owes its formation to inspiration from the direction of the South China sea-coast and the Gulf of Tonkin as well as to the Lunghanoid'. In a least moves hypothesis, we can assume that the Yuanshan originated somewhere in Guangdong at the mouth of the Pearl River. Again this is somewhat counter-intuitive, since you would expect settlement in Taiwan further south, rather than on the northern tip of the island. However, the profile of the coast may have been quite different in the relevant period, must harder to make a landing and thus to mariners who have only bamboo rafts, a more attractive point of settlement.

The literature suggests as identification of the modern descendants of the Yuanshan peoples with the Atayalic languages (e.g. Ferrell 1969; Chang 1969). However, the actual language spoken in the Yuanshan area were the Northeast Formosan languages, i.e. Basai and Trobriawan, Kavalan and Ketagalan. All these

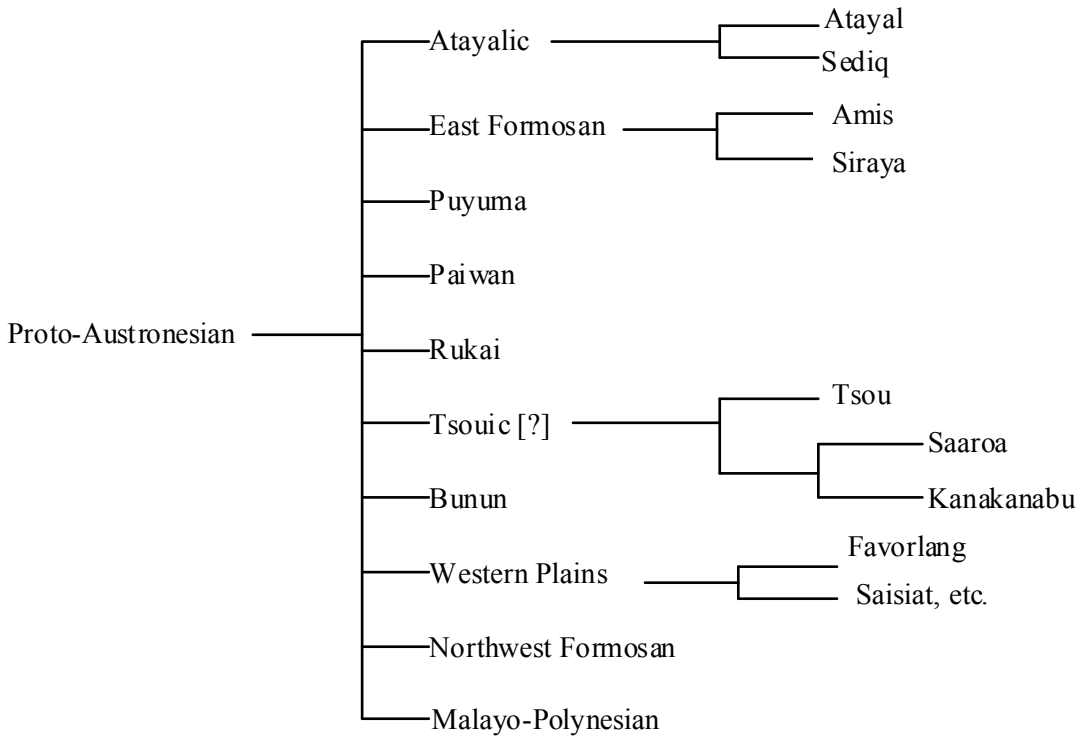
languages are effectively extinct and some are known better than others. It is interesting to note that the only Formosan cognates of the well-attested PMP root **punti* 'banana' are Basai and Trobriawan *puti*. If the languages in this area were indeed the descendants of a migration from a region further south, this root may well be a loan dating from this period. Kavalan *sizu* 'wooden ladle for stirring food in pot' is the only Formosan evidence for PAN **sidu*, otherwise attested with its doublet widely in PMP. By contrast, Atayal itself does not show any of these unique relationships which suggests that we should focus on NE Formosan for the inheritors of the Yuanshan.

3. Proto-Austronesian or?

3.1 The classification of Formosan languages

Austronesian is primarily a linguistic concept, deriving from the original hypothesis of the kinship of over a thousand languages in SE Asia and the Pacific. It was first established using modern linguistic methods by Dempwolff (1920, 1934-8) although he did not include Formosan languages. Since Dyen (1963) and Blust (1984/5, 1999, 2013) it has generally been accepted that Formosan languages are ancestral[4] to all other Austronesian languages. The classification of Formosan languages has been controversial, with a lengthy list of authors arguing for different subgrouping (reviewed in Blust 1999). Blust argues that Austronesian has nine primary branches apart from Proto-Malayo-Polynesian (PMP), the ancestor of all non-Formosan Austronesian languages (Figure 1). Yami, spoken on Orchid island, part of Taiwan, is a Batanic or Bashiic language, part of PMP.

Figure 1. Primary subgroups of Austronesian

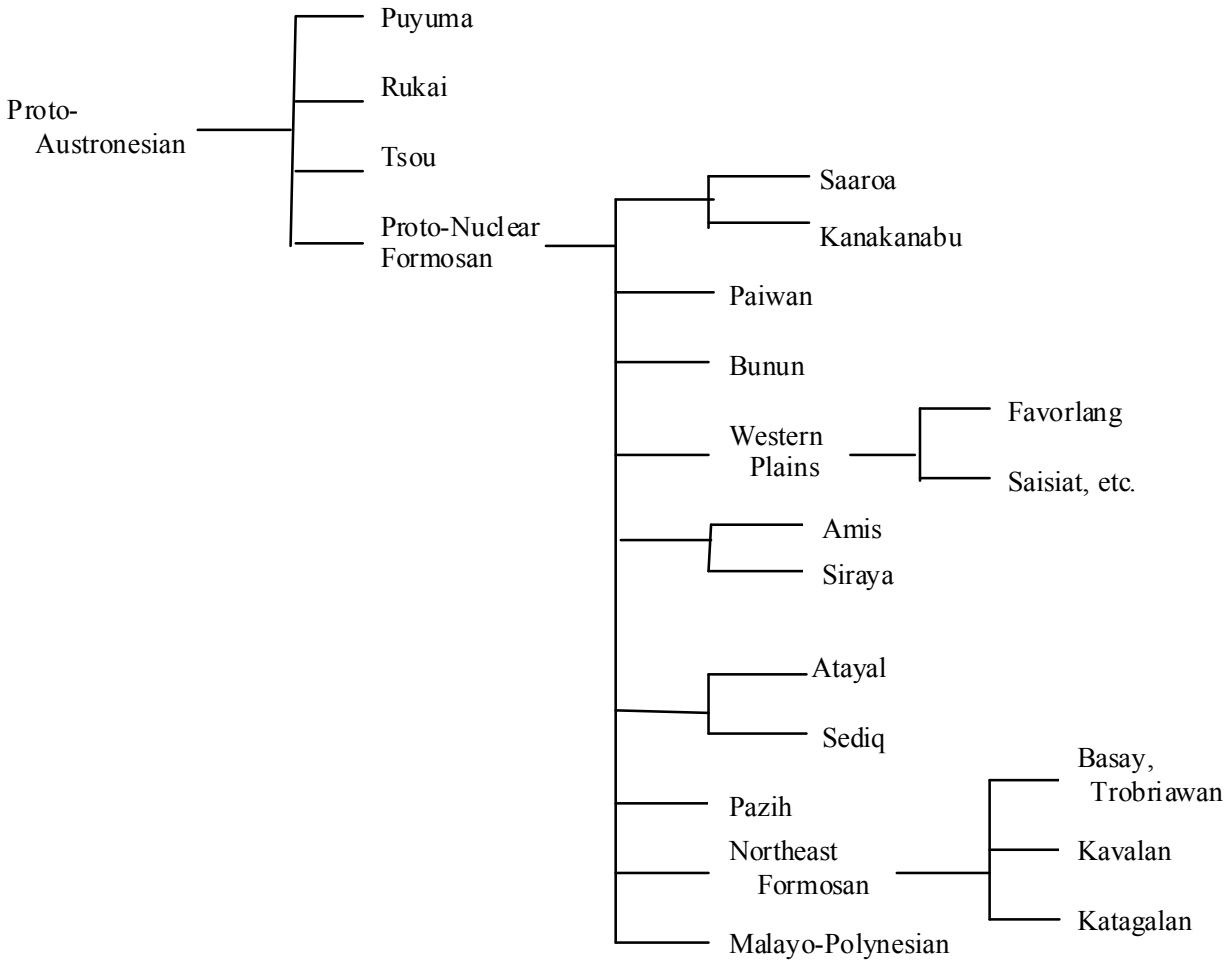


Source: Blust (2103)

Bellwood (1984/85, 1995, 2008) then made the link with the archaeology which remains broadly accepted today. Blust (2013:745) explicitly links this diversification to a settlement model, whereby as the earliest settlers spread around the coast of the island, they gradually coalesced into the ten groups identified. Ross (2012) has argued for a different subclassification of proto-Austronesian which has Puyuma, Rukai and Tsou as primary branches with the others as a fourth, which he names 'Nuclear Austronesian (Figure 2).

[4] Dyen's position was unclear on the relationship of Formosan to PAN

Figure 2. Primary branches of Austronesian in Ross (2012)

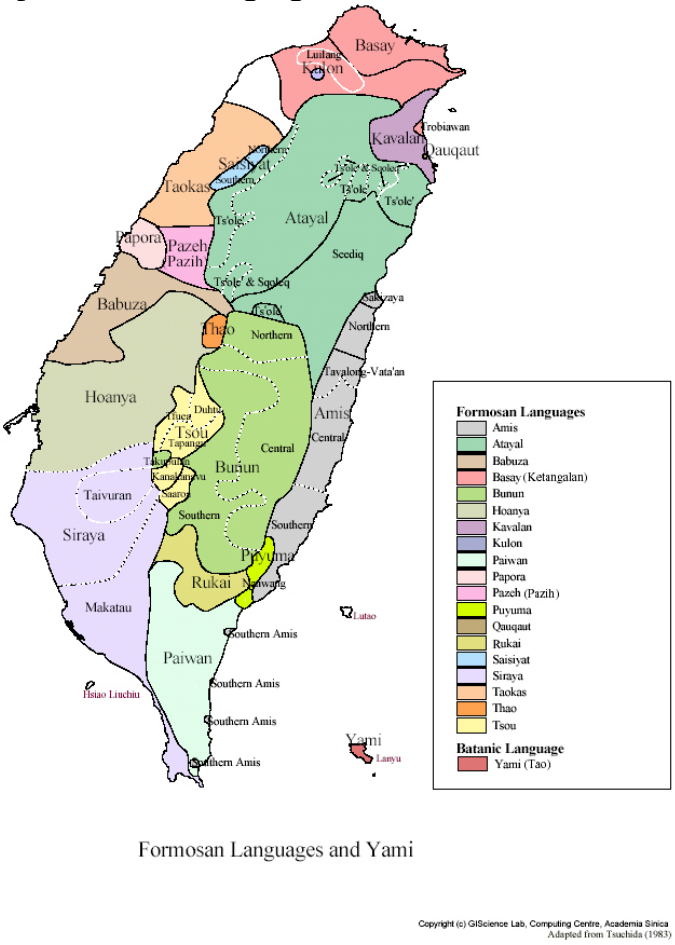


Source: Ross (2012)

Despite their differences, both models display a similar pattern, an array of co-ordinate branches or rake with just one being the ancestor of PMP. From this, it is assumed that a proto-Austronesian can be reconstructed, as ancestral to all these languages.

Map 4 shows the locations of the known Formosan languages, both current and extinct.

Map 4. Formosan languages, current and extinct



Formosan Languages and Yami

Source: Academia Sinica

3.2 Formosan lexical diversity

Models of Austronesian whereby all present-day reflexes of words can be traced back to a hypothetical proto-language which has diversified over time I shall call 'apical'. These can be contrasted with levelling models, which imply that cognacy is in part a result of borrowing and analogical reshaping. At first sight the apical model seems reasonable. Reflexes of **lima* 'five' are attested in almost every branch of Formosan as well as throughout Austronesian as far as New Zealand. There are a few other words for which this is true, for example, 'eye' (**maCa*) or 'three' (**telu*). But this is not the general pattern, as even quite common lexical items show considerable lexical diversity. The practice of reconstructing Austronesian (and other language phyla) is such that cognates are sought, and words without obvious etymologies excluded. As a consequence, the story that this type of extraneous lexicon might tell is typically overlooked. Moreover, if we believe traffic with Taiwan was only in one direction, from the mainland to the island, then the possibility that apparently cognate lexemes are subsequent loanwords is discounted unless known history makes this impossible.

To understand Formosan lexical diversity, it is important to review comparative wordlists organised by semantics. There are at least important three sources, beginning with Ferrell (1969), which appends a large number of lists including important subsistence terms. Ogawa (2006) is a massive compilation of all available sources, including manuscript Japanese materials, but is without commentary. Finally, the Austronesian Basic Vocabulary Database[5] gives some 200 words of basic lexicon, omitting the more obscure sources, and again without commentary. Tryon et al. (1995) is compromised by its strange selection of lexical items despite its large scale and Arnaud et al. (1997) by limiting the languages covered to French researchers[6]. Put together, these materials make it possible to gain a sense of both the unity and diversity of Formosan.

The pattern that emerges is quite surprising. Apart from the pan-Formosan lexemes, there is considerable phonological and lexical diversity. A large number of lexical items are reflected in two or more Formosan languages but not elsewhere in the Austronesian world. Whether these should be assigned to PAN follows the preference of the writer. Dyen (1995) may have been the first author to compile these although Li (1994) includes a significant number of Formosan-only plant names. Not all of Dyen's proposals have stood the test of time, as might be expected when the body of languages to be searched for cognates is as large as Austronesian. Blust's ACD has an extensive 'Formosan' section which includes lexemes only attested on Taiwan and often in two or three languages only. Sometimes these are geographically adjacent to one

[5] http://language.psy.auckland.ac.nz/austronesian/

[6] This results in an extremely strange sample of languages (and two non-Austronesian languages are included, apparently again reflecting the nationality of the researcher).

another, but often not. Puyuma and Paiwan, not languages which are underlying closely related, have stood in an intensive borrowing relationship for some centuries and have thus quite a significant body of common lexemes (cf. Blust 1999, although whether such recent introductions as the pawpaw and pomelo have the same status as the other loans is open to doubt). Historical data on Formosa indicates that populations have both themselves moved and been forcibly moved in various eras, so exactly which languages were in contact in the past must be uncertain.

A proportion of Formosanisms reflect local flora and fauna, such as the soapberry (*Sapindus mukrossi*, *S. saponaria*) or the Formosan hare (*Lepus sinensis formosus*). In some cases, Formosan terms for plants and animals were carried onwards to the rest of the Austronesian world, including quite obscure species, but even for salient fauna, indigenous names stayed in Taiwan. We might attribute these to PAN, but it seems significantly more likely that either these were taken over from the resident populations, or else they were brought from the mainland and transferred to local equivalents. In either case, these words are likely to have restricted distributions.

Unfortunately we know nothing of the languages the present Austronesian languages replaced. Since Taiwan has been inhabited for 25,000 years, it is likely that it was formerly extremely linguistically diverse, as is common with small bands of foragers. The oral traditions of several peoples, notably the Saisiyat and the Bunun, point strongly to a survival of 'pygmies' until fairly recent times[7]. These populations could be parallel to the Orang Asli of the Malay Peninsula or the negritos of the Philippines. The Saisiyat people continue to hold ceremonies to thank the pygmies for their medical and agricultural [!] skills. That said, although we know Taiwan was long inhabited by foragers we have no evidence for their physical anthropology and the small size could be simply a gloss on their subordinate status. It seems highly unlikely that there is no lexical legacy from millennia of interaction, and many exclusively Formosan lexical items were probably borrowed from the resident languages. However, with no possibility to make comparisons with surviving languages this is difficult to demonstrate.

3.3 Puzzling aspects of PAN reconstruction

Proto-Austronesian was first reconstructed in some manner by Dempwolff (1934-8). However, his failure to include Formosan meant that he was reconstructing what we would now call PMP. Dyen (1963) may well be the first author to include Formosan in a reconstruction of PAN phonology, followed by Dahl (1976) and Blust (1990). A history of these developments is given in Adelaar (2005) together with a judicious synthesis of possible PAN phonemes. However, the argument has continued, with both major reconstructions such as Wolff (2010) and new proposals such as Norquest & Downey (2013). Wolff (2010) is a recent convert to the Sino-Austronesian theories of Sagart (2005 and elsewhere) and Norquest & Downey (2013) also consider the possibility that Formosan languages are 'sisters' to PMP, thereby compromising the 'out of Taiwan' narrative.

Austronesian syntax may first have been treated on a comparative basis by Humboldt (1836-9) but is only with the appearance of modern grammatical treatments of individual languages that a more inclusive approach was possible. Modern approaches to comparative morphology and syntax probably begin with Starosta (1995). In recent times, Ross (2009, 2012) has actively promoted a comparative analysis of Formosan grammar as a tool for classification. However, Li (2008b) in a wide ranging review of Formosan morphosyntax provides examples of its astonishing internal diversity compared with Malayo-Polynesian. If indeed all extant Formosan languages are descended from one hypothetical PAN, this is surprising at the least.

Despite the now fairly complete coverage of surviving Formosan languages, progress seems to be rather limited. I suggest the answer is relatively simple, if contrary to accepted wisdom, namely that PAN cannot be reconstructed because it did not exist. It has historically been considered bad practice to conflate the findings of different disciplines, but in this case the archaeology is difficult to ignore. Taiwan appears to

[7] Alvarez (1927) quotes Chinese sources which suggest that as early as the seventh century a negrito was captured and sent back to the Chinese court. The same account appears to describe the different appearance of populations in the north and south of the island.

have been the subject of a series of migrations from different parts of the Chinese mainland, and these populations brought their languages. Contact, long-term interaction and analogical levelling have created 'Austronesian' from these disparate incoming languages[8], but this should not be taken to mean that the Formosan languages will ever fit together seamlessly. Austronesian languages on Taiwan are a composite and their diversity reflects both multiple origins and adaptation of pre-existing languages.

This conclusion will clearly be indigestible to linguists working on Austronesian reconstruction. Moreover, given the sheer weight of scholarship, can such a relatively simple solution really be the explanation? There are two reasons for thinking that it can. The first is that the impossibility of comparing Formosan languages with their likely mainland sources, will make a definitive resolution in favour of either account inaccessible. Similarly, the absence of surviving forager languages inevitably means the hypothesis of borrowing from substrates is equally unprovable. Second, language levelling is also difficult to demonstrate, especially as the process is only partially complete in Formosan. Historical linguists like trees and levelling confuses the picture. Nonetheless, it is increasingly adopted in the Austronesian world and must surely partly explain the mosaic of uniformity and diversity that is apparent for Taiwan.

There is a clear problem of circularity in relation to PMP reconstruction. The number of non-Formosan languages is vast and the number of well-supported PMP forms, extensive. We therefore seek for cognates in Formosan which support PAN rather than PMP, and very often we can find a probably related form in one or several languages. This form does not always have the appropriate shape, but since borrowing is usually discounted, the root is attributed to PMP and, crucially, its shape is partly determined by the PMP form. In other words, PAN is extensively coloured by extra-Formosan forms.

Photo 3. Indigenous Formosans fishing and hunting

Source: Qing period album (1746)

The conclusion from this is that we should try and concentrate on the actual Formosan lexical data and clear our minds of the PMP material. If we then focus on key lexemes which are relevant to the peopling of Taiwan, then the picture becomes muddier rather than clearer. An area which deserves investigation is subsistence terminology. If it is the case that the incoming TPK populations brought with them both hunting and fishing, and some knowledge of agriculture, then it should be the case that salient terms manifestly reconstruct to PAN. This is a bedrock of hypotheses focusing on Indo-European; the *Worte und Sachen* approach. 'Horse', 'salmon' and 'alder' reconstruct in proto-Indo-European and we are thus justified in attributing these entities to the subsistence and environment of its speakers. §4. examines a similar approach in relation to PAN.

4. Subsistence terminologies

4.1 Fish and fisheries

Fishing was a core activity for the early Austronesians in Formosa and to judge by sites like O Luan Pi, remained so for a long period. Even where there was no access to the sea, inland rivers have abundant fish. We might therefore expect the word for 'fish' to be universal across Formosan, as it is in PMP, where the root **ikaN* is reflected in languages from Luzon to New Zealand. Table 2 compiles the basic lexeme for 'fish' in Formosan Austronesian and its diversity is at once apparent. Even the reflexes of **ikan* are reduced by Rukai which is a borrowing. Columns I and II represent clusters of forms which appear to be related.

[8] Perhaps more truthfully, linguists have created 'Austronesian' from these materials.

Table 2. Names for 'fish' in Formosan languages

Language	Lect	Attestation	I	II
Amis		fotiŋ		
Atayal	Squliq		quleh	
Atayal	Ci'uli		ʔucih	
Bunun	N.			kaan
Bunun	S.			iskaan
Favorlang		tsi		
Hoanya				sikan
Kanakanabu			vutukulu	
Kavalan		baʔət		
Paiwan		ciqaw		
Pazeh			ʔalaw	
Puyuma			vulaw	
Rukai				ka'aŋ
Saaroa			butukuło	
Saisiyat			ʔalaw	
Seediq		qəcurux		
Siraya		tʰuŋ		
Taokas		giati		
Thao			ruθaw	
Tsou				eoskə

The PAN reconstruction given by Blust is **Sikan*, although this is clearly not a form based on the actual Formosan data but an inference from PMP **hikan*. Even the PMP form is not well supported, since Philippines languages invariably have *ikan*, and only remote Dobel has *siʔa*, which would appear to require **sikan*. It suggests that fishing was not the descendant of a single culture and language brought over by the TPK people, but came from diverse cultural sources.

Hunting was clearly also essential for subsistence, and is attested as a major source of diet in most archaeological horizons. Photo 3 is from a Qing album from 1746 which depicts indigenous Formosans fishing and hunting. Table 3 shows the words for 'spear' in Formosan Austronesian, and as with 'fish' the picture is of great diversity. The one lexeme that appears to be reflected in several independent branches, something like #*snbuŋan*, is probably a series of loanwords.

Table 3. Names for 'spear' in Formosan languages

Language	Lect	Attestation	Gloss
Amis		kotaŋ	
Amis		ʔiłoc	
Atayal	Squliq	pcziux	
Atayal	Squliq	lauiʔ	
Atayal	Squliq	bəteyux	
Atayal	Ci'uli	sinbaʒaŋan	
Bunun		ʔbuŋan	
Favorlang		biloag	
Favorlang		bottul	
Favorlang		aga	
Favorlang		bisa	
Kanakanabu		paŋaru	
Kavalan		snubuŋan	
Paiwan		vuruq	
Pazeh		dadakus	
Puyuma		ʔilus	
Puyuma		akutan	
Puyuma	Rikavoŋ	ilos	

Language	Lect	Attestation	Gloss
Puyuma	Rikavoŋ	ʈolaŋ	
Rukai		ʔidiriʔ	
Rukai	Oponohu	ʔavahə	
Saaroa		limaŋuło	
Saisiyat		ʔobak	
Seediq		suquʔ	
Seediq			simburaŋan
Siraya		tawal	
Siraya		apig	
Thao			ʃinaʔbuunan
Tsou		meŋzu	

Formosan Austronesian speakers hunted game with the bow and arrow, and perhaps fought with it. Blust gives PAN ***busuR*$_2$ 'hunting bow' although its reflexes are scattered across Formosan languages. This is reflected as *busog* in Philippines languages and has often shifted to apply to the instrument used to card cotton, presumably as the hunting bow was displaced by the blowpipe. The PAN/PMP reconstructed forms seem to favour Malay *busur* and thus Bunun, whereas the Philippines forms rather resemble those with a final velar such as Mayrinax *buh<in>ug* and Pazeh *buzux* 'arrow'. Table 4 shows a set of apparently related terms for 'bow' in Formosan languages which do not point to the regular reflection of proposed PMP **busur*.

Table 4. Names for 'bow' in Formosan languages

Language	Lect	? PAN	Other	Gloss
Amis		focol		quiver, sheath for arrows
Amis		focər		bow
Atayal	Mayrinax	buh<in>ug		bow
Atayal	Squliq	bliqii		bow
Atayal	Ci'uli	paboliʔ		bow
Bunun		busul		hunting bow
Favorlang		bree		bow
Kanakanabu		buuru		bow
Kavalan			paniʔ	bow
Paiwan			vətəlatan	bow
Pazeh		buzux		arrow
Pazeh			lau'in	bow
Puyuma			kadalis	bow
Puyuma	Rikavoŋ	vosor		bow
Rukai		bo'o		bow
Rukai	Oponohu	voʔo		bow
Saaroa		booro		bow
Saisiyat		bœhœlʸ		bow
Seediq		bəhəniq		bow
Siraya			tapkoug	bow
Thao		futuł		bow
Tsou		fsu		hunting bow

The point emerging from these data tables is that PAN reconstructions do not reflect the Formosan data as if it were analysed without reference to extra-Formosan material, but represent a gloss on these. Undoubtedly Formosan languages have some cognates with proposed PMP forms, but these do not show regular relationships with one another or with the Philippines material. The irregular relations within the Formosan lexicon point to a complex mixing process rather than some regular diversification from an apical PAN.

4.2 Cereal growing

Another aspect of Formosan diversity is in the names related to subsistence terminology. If it were indeed the case that the original TPK migrants were farmers growing foxtail millet, then we might surely expect

these core lexical items to be well reflected in the synchronic lexicon. But this is far from the case, millet names seem to be highly diverse, as if they have been adopted from a wide variety of sources. Blust gives two PAN reconstructions for 'millet' **baCaj millet sp.* and **beCeŋ* millet sp., probably foxtail millet: *Setaria italica* [doublet **betem*]. Table 5 shows the Formosan names for 'foxtail millet'.

Table 5. Formosan names for 'foxtail millet'

Language	Attestations
Amis	ʔəmiʔ, dawa, lamuru, ramuro, havay
Atayal	tarakis, tarakkisi
Bunun	maduʔ, madoh
Favorlang	batur
Kavalan	luʐay, ruʐay, savak
Paiwan	vaqo, kapałaŋ [glutinous millet]
Pazih	pixun, byaxun
Puyuma	dawa
Rukai	bəcəŋə
Saaroa	əbəʧəŋə
Saisiyat	tatakisi, tataʔ
Seediq	maʧu, masso
Thao	kamar
Tsou	tonʔu, vina

The evidence supporting **beCeŋ* is thus extremely weak if indeed early Austronesian speakers were millet cultivators. Table 6 shows the Formosan names for 'broomcorn millet'.

Table 6. Formosan names for 'broomcorn millet'

Language	Attestations
Ami	farisan, balaisan, balisan
Atayal	basino, basaw, basag
Bunun	sumsum, batal
Kavalan	bulaisan, braysan
Paiwan	baraisan
Puyuma	baraisan
Saisiyat	basaw
Seediq	basaw
Tsou	sanaisara, cumcum, batayu

It will be seen that the opposite problem is found. Almost all languages have something extremely similar or else completely unrelated. (the forms *sumsum, cumcum* seem to be words for 'sorghum'). The original seems to be something like *baraysan*, and forms such as Seediq *basaw*, reductions of this where the intervocalic -r- has been lost. The reconstruction of **baCaj* for a 'k.o. millet' (Blust ACD) seems inherently unlikely. Unlike the other names, *basag* does appear to have cognates outside Taiwan, in languages of the Philippines, if the following are accepted as metatheses;

Bontok	sabog
Ifugao	habug
Igorot	sabug

4.3 'What immortal hand or eye, can frame thy fearful symmetry?'

The case for an apical Austronesian is supported in part by a core of lexemes which have cognates in almost all Formosan languages. These include 'five/hand', 'eye', 'kill' and others. These can be easily consulted in the ACD and ABVD and do not need to be set out here. Examples can be multiplied, but the point should be clear. Formosan languages show a small core of prototypical Austronesian lexemes whose reflexes are found in most languages and a large body of lexical items whose forms are highly diverse and whose origin is

difficult to determine. In particular, lexemes which should have been extremely salient for the subsistence strategies of the PAN-speakers do not show the expected uniformity. Many PAN reconstructions both reflect the choice of one or two items in a sea of non-cognate forms and prior knowledge of PMP forms. But the message lies in the diversity, not the uniformity.

What accounts for this pattern? It may be that Formosan languages are as diverse as they appear to be, because they represent a series of distinct migrations to the island, as is suggested by the archaeological record. Whether any survivor of the language of the TPK culture still persists is almost impossible to tell. But the marked early differentiation between corded-ware, the Yuanshan and the southern Longshan horizon cultures argues that by 4000 BP there had been as many as three distinct movements across the Taiwan strait. The apparent uniformity of some lexical items is then the result of a subsequent levelling process. This is not as surprising as it might seem; pan-Amazonian and pan-Australian lexemes have long been known to specialists of those regions (Dixon 2002; Aikhenvald 2012). In these cases, a rather random set of words have spread across phyletic boundaries, but this is unlikely to be the case in Taiwan. The source languages, presumably from China, but perhaps including a back-migration from the Philippines, are almost certainly all Austronesian or pre-Austronesian.

Language levelling is now a well-accepted process in the Austronesian world. Blust (2005, 2009) has identified levelling in the Philippines and Borneo, and it is fairly certain that levelling accounts for the similarities between Malagasy dialects. The causes of levelling are less certain, since the most common scenario involves the imposition of a particular lect by a central political authority (e.g. Khalkh Mongol) or the use of a lect in innovative media (printing in Western Europe). The pattern in Taiwan is unusual by any standards, since levelling seems to have been very selective in its application, maintaining extreme diversity in some areas.

5. Genetics

If indeed the diversity of Formosans is as suggested, then this ought to be visible in their genetics. Fortunately, there has been a substantial set of samples of indigenous peoples taken in recent years and the results are summarised in Trejaut et al. (2008). One haplogoup in particular strongly points to the persistence of a heritage from the prior foragers. The link with the Saisiat and the Philippines points to the recent and continuing presence of negritos in these areas. They say;

> Haplogroup E (nps 16,362 and 16,390), a subset of haplogroup M9, is nearly unseen in continental Asia…Two specific subclades, E1 and E2, cover the vast majority of its lineages in Taiwan. The rare type of E2 (characterized by np 16,051) shows virtually no downstream mutations and has been observed in PNG and the Philippines. In contrast, haplogroup E1 (characterized by np 10,834) is relatively more divergent, specifically in the Saisiat population, and is frequent in the Philippines.
>
> Trejaut et al. (2008)

Among the Austronesian Formosans an important finding is a significant difference between Northern and Southern groups. The authors say;

> Haplogroup F3b, previously labeled as R9a, has been encountered at low frequencies in South and West China. High frequencies of this clade were observed specifically among the three southernmost populations (Puyuma, Paiwan and Rukai).
>
> Trejaut et al. (2008)

Broadly speaking, a key finding is the internal diversity of Formosan into three major components. Trejaut et al. (2008) say 'Most noticeably, the northern tribes (Atayal, Saisiat) are well separated from the three southern tribes (Puyuma, Rukai and Paiwan) and the eastern tribes (Ami and Tao).'

6. The Amis problem

Among all Formosan groups, the people who appear as strikingly different from their neighbours are the Amis. Their oral traditions (along with the Kavalan-Katagalan) state that they arrived from Green Island (Sasanai) which although long-settled, was uninhabited when European navigators reached the region (Ferrell 1969). The Amis have a rich vocabulary for boats unrelated to other Formosan names, and indeed one of their yearly rituals re-enacted their arrival by sea at their present location. As Map 4 shows, there were originally small Amis settlements in pockets down the east coast of Taiwan as far as the southern tip. The Amis are exceptional for their elaborate cosmogonic mythology, their black 'paddle and anvil' pottery, their long, harpoon-like spears and glass bracelets. Photo 4 shows the highly individual black pottery used by the Amis for sacrifices, which hardly resembles any other ceramics on Taiwan, either formally or technologically. Kano (1952) argued that these features closely resembled the cultures of some Northern Philippines people. The Amis have loosely organised acephalous lineage societies quite unlike the structured hierarchies typical of southern Taiwan. This is also supported by the genetics and Trejaut et al. (2008) mention 'the closeness of the Ami to Malayo-Polynesian populations'.

Photo 4. Amis ritual pottery

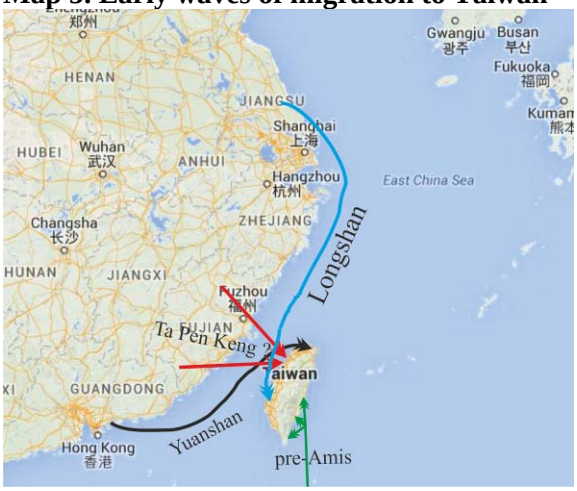
Source: Author photo, Shun Ye Museum

Harvey (1982) proposed a variant of the Malayo-Polynesian hypothesis, positing an Amis-Malayo-Polynesian branch of Austronesian. Although dismissed by Blust (2013:744) this remains a valuable observation, if not quite in the sense of Harvey's original proposal. Amis shares significant isoglosses with Northern Philippines languages, which may be because it is one, or because it was heavily influenced by migration from this region. Blust (ACD) interprets Vakon Amis *kuren*, 'cooking pot' as a reflex of a hypothetical PAN **kuden*, but it is then suspicious this should be the only Formosan witness. Given Philippines and Borneo forms such as Hanunóo *kurún*, Maranao *kodən* and Kelabit *kudən* it is more likely a loan from further south, accompanying a distinctive form of pot. Indeed the ACD has quite a number of PAN forms for which Amis is the only evidence. Similarly for the PAN **pahekuh* 'edible fern that grows by rivers' *Athyrium esculentum,* Amis *pahko* is the only evidence. For PAN **puRuq* 'a bird**,** the quail' Amis *puluq* 'quail, partridge' is the sole Formosan witness. My point here is that the default interpretation should be that these are inherited from pre-Amis, which was itself a back-migration from the Philippines.

7. Conclusions

If the arguments in this paper are adopted, then the prehistory of Taiwan would be significantly different from the accepted account. The primary settlement of Taiwan in the Neolithic period was by fisher-foragers from the mainland opposite, who would have known about cereals, but did not necessarily grow them. Their initial strategy was to circulate around the coast of the island, seeking marine resources. Sites like O Luan Pi (Li 2000) represent this type of subsistence strategy, which may have persisted into historical times. We do not know what language the TPK people spoke and there is no necessary reason why any of the languages still spoken should be its direct descendant.

Map 5. Early waves of migration to Taiwan



The opening up of the western plains around 4000 BP attracted a range of new mainland populations, with a variety of source locations and cultural practices. The most widespread of these is the cultures of the Taipei Basin going southwards to Tainan. The material culture of these people points to the Longshan culture considerably further north on the Chinese mainland. The arrival of settlers just as the Longshan culture ends and the Yellow River changes course may or may not be coincidental. At nearly the same time the Yuanshan culture appears with shouldered adzes. The affiliations of this are less clear but point to the Pearl River Delta or further south towards Vietnam (Map 5).

The two second wave migrations brought dry rice and a range of millets, as well as Job's tears, probably as a consequence of the opening of the western plains. It is conceivable that there was also a flow back from the Philippines, bringing taro, and accounting for the irregular correspondences with taro names. At some time difficult to determine, migrants from Luzon reach Green Island (and presumably Lanyu) and then resettle on the mainland east coast, in the region now occupied by Amis and the former Kavalan. Iron smelting was probably introduced in the north around 1500 BP from the Philippines, although traded iron from the Chinese mainland had brought craft products centuries before this. The correspondingly improved ability to clear land and cut down trees, may have brought new populations or merely new skilled craftsmen, but would certainly have facilitated the colonisation of new regions.

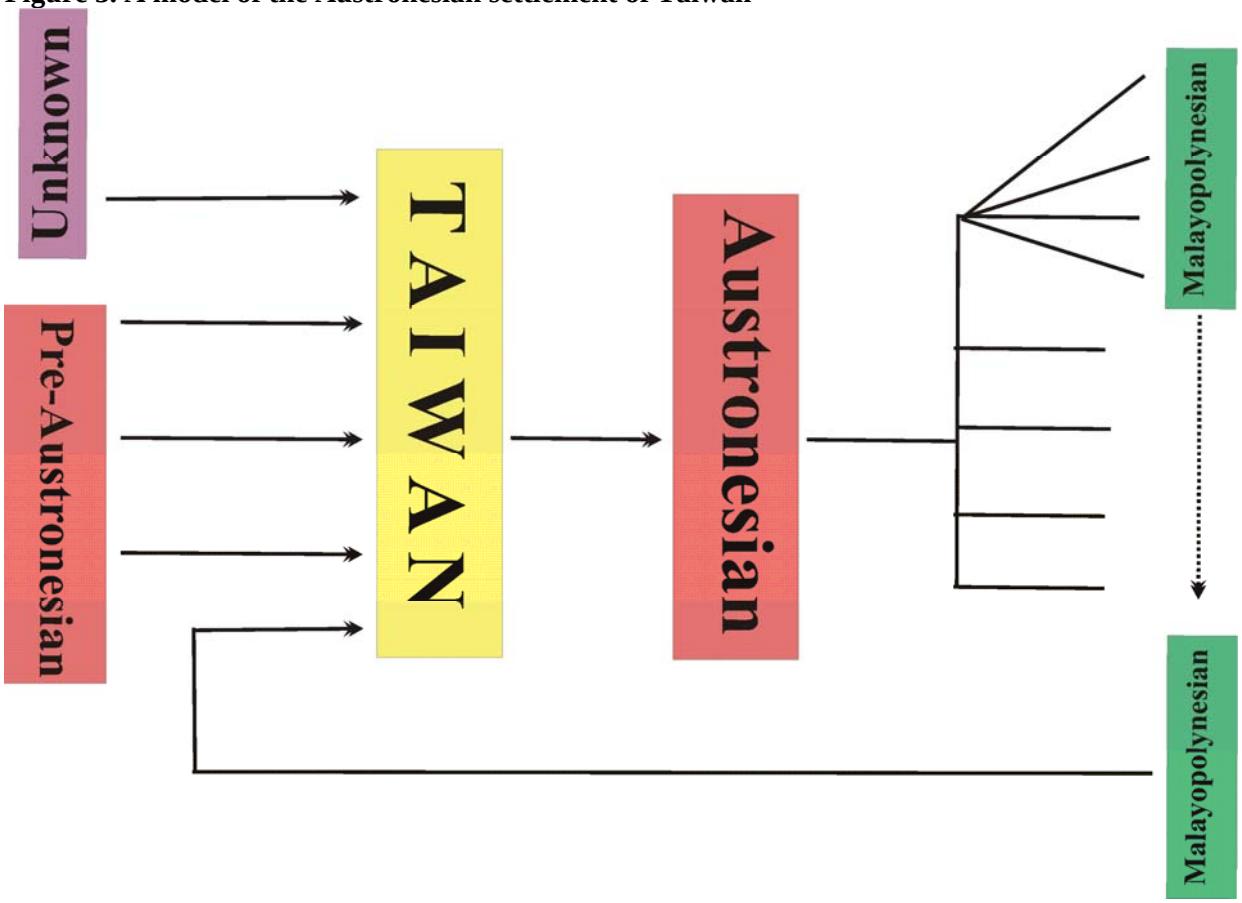
These incoming populations probably all spoke languages related to Austronesian and its predecessors, although their phonology and grammar would have been quite diverse. Probably during the period when agriculture began to spread, this exerted a strong force acting to level languages, bringing together diverse but already related languages, such as apparently occurred in the Philippines (Blust 2005), Borneo (Blust 2009) and on Madagascar. This explains the unusual pattern which has strong lexical uniformity for small body of key lexemes, and a great diversity around many others, including millet and iron. The lexical diversity attested for indigenous flora and fauna may be explained in part by taking over terms from the indigenous foragers.

From this it follows that a single PAN cannot be reconstructed, in the sense of an apical ancestor, merely a Common Formosan (CF). The Formosanisms identified by Dyen and Blust are not PAN but rather local innovations. This explains why reconstructions of PAN phonology and grammar have always tended to be inconclusive. The flat arrays proposed by Blust and Ross would thus be a reflection of prehistory, although not in the sense originally intended.

The difficulties encountered in proposing an uncontroversial structure for PMP and identifying a single predecessor on Taiwan may be due to a parallel situation. PMP is not a unitary apical ancestor, but an attempt to impose coherence on a complex maritime community drawing on various populations, active in the Luzon Strait four thousand years ago. Hence the array of subgroups which remain difficult to structure.

Figure 3 is a schematic representation of the Austronesian settlement of Taiwan, suggesting that a series of parallel migrations reached it both from mainland sources and from islands further south. After these groups reached Taiwan they were subject to partial levelling, giving the appearance of a single diversified language, Austronesian. Interaction with the speech of resident foragers gave rise to a number of low-frequency lexemes confined to Taiwan. The modern languages represent parallel branches, but the Malayopolynesian languages may arise from an array of related ancestral populations rather than being a single branch of Formosan Austronesian.

Figure 3. A model of the Austronesian settlement of Taiwan



This is an overview of the primary settlement of Taiwan, and does not venture into the problems of the later 'Iron Age' cultures. Data on these is ably summarised in Tsang (2000) and there are equally many unresolved problems, notably the Guishan culture of the southern tip of Taiwan, present from around 500 AD, and showing remarkable pottery fragments decorated with heart-shaped faces (shades of Lapita!). The broad conclusion is we must not take the relationship between archaeology and linguistics as something now resolved. Regarding the Formosan lexical data as a record of the many movements into and away from Taiwan over an extensive period allows to understand it quite differently.

References

[This bibliography includes lexical sources used to compile the tables, not necessarily referenced intext]

Adelaar, K. Alexander 2011. *Siraya: Retrieving the Phonology, Grammar and Lexicon of a Dormant Formosan Language*. (Trends in Linguistics. Documentation, 30.) Berlin: Mouton.

Adelaar, K. Alexander & Nikolaus P. Himmelmann eds. 2005. *The Austronesian Languages of Asia and Madagascar*. London/New York: Routledge.

Arnaud, V. et al. eds. 1997. *Lexique thématique plurilingue de trente-six langues et dialectes d'Asie du Sud-est insulaire*. Paris : L'Harmattan.

Bellwood, Peter 1984/85. A hypothesis for Austronesian origins. *Asian Perspectives*, 20:107-117.

Bellwood, Peter 1995. Austronesian prehistory in Southeast Asia: homeland, expansion and transformation. In: *The Austronesians.* Bellwood, Peter, J. Fox and D. Tryon (eds.) 96-111. Canberra: Australian National University.

Bellwood, Peter 2007. Southeast China and the Prehistory of the Austronesians. In: *Lost Maritime Cultures: China and the Pacific*. T. Jiao (ed.) 36-53. Hawaii: Bishop Museum Press,

Bellwood, Peter 2008. Austronesian cultural origins: out of Taiwan, via the Batanes Islands, and onwards to western Polynesia. In: *Past human migrations in East Asia: matching archaeology, linguistics and*

genetics. Alicia Sanchez-Mazas, Roger Blench, Malcolm D. Ross, Ilia Peiros and Marie Lin (eds.) 23–39. London: Routledge.

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

Blust, Robert A. 1995. The Prehistory of the Austronesian-speaking peoples: A view from language. *Journal of World History*, 9 (4): 453-510.

Blust, Robert A. 1999b. Subgrouping, circularity and extinction: some issues in Austronesian comparative linguistics. In: *Selected papers from Eighth International Conference on Austronesian linguistics*. E. Zeitoun & P. Jen-Kuei Li eds. 31-94. Taipei: Academica Sinica.

Blust, Robert A. 2005. The linguistic macrohistory of the Philippines: Some speculations. In H.-C. Liao, C.R.G. Rubino, K. Lawrence and A. Reid (eds.) *Current issues in Philippine linguistics and anthropology* Manila: The Linguistic Society of the Philippines and SIL, Philippines, 31-68.

Blust, Robert A. 2009. The Greater North Borneo Hypothesis. *Oceanic Linguistics* 49(1):44-118.

Chang, Kwang-Chih 1969. *Fengpitou, Tapenkeng and the Prehistory of Taiwan*. Yale University Publication in Anthropology, no. 73. New Haven: Yale University Press.

Chang, Kwang-Chih 1981. The affluent foragers in the coast areas of China: extrapolation from evidence on transition to agriculture. In: *SENRI Ethnological Studies*, 9:177-186. Osaka: National Museum of Ethnology.

Chang, Kwang-Chih 1995. Taiwan Strait archaeology and proto-Austronesian. In: *Austronesian Studies Relating to Taiwan*. P. J-K Li et al. eds. 161-183. Taipei: Academia Sinica.

Chang, Kwang-Chih and W.H. Goodenough 1996. Archaeology of southeastern China and its bearing on the Austronesian homeland. In: *Prehistoric Settlement of the Pacific*. W.H. Goodenough (ed.). 28-35. Philadelphia: American Philosophical Society.

Dahl, Otto 1976. *Proto-Austronesian*. Scandinavian Institute of Asian Studies Monograph Series, No. 15. London: Curzon Press.

De Busser, Rik L.J. 2009. *Towards a grammar of Takivatan Bunun: Selected Topics*. Ph.D. Bundoora, Victoria: La Trobe University.

Dyen, Isidore 1963. The Position of the Malayopolynesian Languages of Formosa. *Asian Perspectives,* 7 (1-2): 261-71.

Dyen, Isidore 1995. Borrowing and Inheritance in Austronesianistics. In: *Austronesian Studies Relation to Taiwan*, Paul Jen-kuei Li, Cheng-hwa Tsang, Ying-kuei Huang, Dah-an Ho & Chiu-yu Tseng (eds.). 455-519. Taipei: Academia Sinica.

Egerod, Søren 1999. *Atayal-English dictionary*. Copenhagen: C.A. Reitzels.

Ferrell, Raleigh 1969. *Taiwan Aboriginal Groups: Problems in Cultural and Linguistic Classification*. Institute of Ethnology, Academia Sinica, Monograph series, no. 17.

Ferrell, Raleigh 1982. *Paiwan dictionary*. Pacific linguistics, Series C-73. Canberra: ANU.

Harvey, M. 1982. Subgroups in Austronesian. In: Halim, A., L.Carrington and S.A. Wurm, eds. 1981-1983. 4 vols. *Papers from the Third International Conference on Austronesian Linguistics*. 2: 47-99. Canberra: Pacific Linguistics.

Humboldt, W. von. 1836-1839. *Über die Kawi-Sprache auf der Insel Java, nebst einer Einleitung über die Verschiedenheit des menschlichen Sprachbaues und ihren Einfluss auf die geistige Entwicklung des Menschengeschlechts*. Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin, part 2. Berlin: Königlichen Akademie der Wissenschaften.

Jeng, Heng-hsing 1972. *A Bunun-English Dictionary*. Taipei: Academia Sinica.

Jiao, Tianlong 2007. *The Neolithic of Southeast China: cultural transformation and regional interaction on the coast*. New York: Cambria Press.

Jiao, Tianlong 2013. First farmers and their coastal adaptation in prehistoric Taiwan. In: Underhill, Anne P. (ed.) *A Companion to Chinese Archaeology*. 612-633. London: Blackwell.

Jiao, Tianlong, Fan, X., and B.V. Rolett 2009. The Keqiutou site and early Neolithic cultures of the Taiwan Strait (Keqiutou yi zhi yu Taiwan ha ixia zao qi xin shi qi shi dai wen hua) (In Chinese). *Fujian Wenbo* (Journal of the Fujian Provincial Museum, Fujian, China) 53:8-12.

Li, Kuang Ti 2000. Change and stability in the dietary system of prehistoric O-Luan-Pi inhabitants in southern Taiwan. *Bulletin of the Indo-Pacific Prehistory Association*, 20: 159-163.

Li, Kuang Ti 2013. The Neolithic archaeology of Southeast China. In: Underhill, Anne P. (ed.) *A Companion to Chinese Archaeology*. 599-611. London: Blackwell.

Li, Liu 2005. *The Chinese Neolithic: Trajectories to Early States*. Cambridge: Cambridge University Press.

Li, Paul Jen Kuei 1978. *A comparative vocabulary of Saisiyat dialects*. Bulletin of the Institute of History and Philology 49. 133-199.

Li, Paul Jen Kuei 2008a. Time Perspective of Formosan Aborigines. In: *Past Human Migrations in East Asia: Matching Archaeology, Linguistics and Genetics*, 211-218.

Li, Paul Jen Kuei 2008b. The great diversity of Formosan languages. *Language and Linguistics*, 9(3): 523-546.

Li, Paul Jen-kuei and Tsuchida, Shigeru 2001. *Pazih Dictionary*. (Language and Linguistics Monograph Series, A2.) Taipei: Academia Sinica, Institute of Ethnology.

Li, Paul Jen-kuei and Tsuchida, Shigeru 2006. *Kavalan dictionary*. (Language and linguistics monograph series / A, 19.) Taipei, Taiwan: Inst. of Linguistics, Academia Sinica.

Lin, Hsiu-man et al. 2014. The Pathology and Dental Morphology of Neolithic Burials from the Wu-Shan-Tou Site, Southwestern Taiwan. *Journal of Archaeology and Anthropology*, 80: 251-282.

Norquest, P. & S. Downey 2013. Expanding the PAN consonant inventory. *JSEALS*, 6: 99-145.

Ogawa, Naoyoshi 2006. *A Comparative Vocabulary of Formosan Languages and Dialects*. Tokyo: ILCAA.

Pan, Chia-jung 2012. *A Grammar of Lha'alua, an Austronesian Language of Taiwan*. Ph.D. James Cook University.

Pecoraro, Ferdinando 1977. *Essai de dictionnaire taroko-français*. Paris: S.E.C.M.I.

Rolett, B.V. 2007. Southeast China and the Emergence of Austronesian Seafaring. In T. Jiao (ed). *Lost Maritime Cultures: China and the Pacific*. 54-61. Honolulu: Bishop Museum Press.

Rolett, B., T. Jiao, and G. Lin 2002. Early seafaring in the Taiwan Strait and the search for Austronesian origins. *Journal of East Asian Archaeology*, 4:307-319.

Rolett, B.V., Zheng, Z., and Yue, Y. 2011. Holocene sea-level change and the emergence of Neolithic seafaring in the Fuzhou Basin (Fujian, China) *Quaternary Science Reviews* 30:788-797.

Ross, M.D. 2012. In defense of Nuclear Austronesian (and against Tsouic). *Language and Linguistics,* 13: 1253-1330.

Ross, M.D. and S. Teng 2005. Formosan languages and linguistic typology. *Language and Linguistics*, 6: 739- 781.

Sagart, L. 2005. Sino-Tibetan-Austronesian: an updated and improved argument. In: Sagart, L., R.M. Blench and A. Sanchez-Mazas, eds. *The peopling of East Asia: putting together archaeology, linguistics and genetics*. 161-176. London and New York: RoutledgeCurzon.

Starosta, S. 1995. A grammatical subgrouping of Formosan languages. In: *Austronesian Studies Relation to Taiwan*, Paul Jen-kuei Li, Cheng-hwa Tsang, Ying-kuei Huang, Dah-an Ho & Chiu-yu Tseng (eds.). 683-726. Taipei: Academia Sinica.

Thompson, Laurence G. 1964. The earliest eyewitness accounts of the Formosan aborigines. *Monumenta Serica, Journal of Oriental Studies* 23: 163-204.

Tsang, Cheng-hwa 1992. *Archaeology of the P'eng-hu islands*. Taipei: Academia Sinica.

Tsang, Cheng-hwa 1995. New archaeological data from both sides of the Taiwan straits and their implications for the controversy about Austronesian origins and expansion. In: *Austronesian studies relating to Taiwan*, Li P.J. et al. (eds), 185-225. Taipei: Institute of History and Philology, Academia Sinica.

Tsang, Cheng-hwa 2000. Recent advances in the Iron Age archaeology of Taiwan. *Bulletin of the Indo-Pacific Prehistory Association*, 20: 153-158.

Tsang, Cheng-hwa 2001. Maritime adaptations in prehistoric Southeast China: implications for the problem of Austronesian expansion. *Journal of East Asian archaeology*, 3(1/2):15-46.

Tsang, Cheng-hwa 2005. Recent discoveries of the Tap'enkeng culture in Taiwan: Implications for the problem of Austronesian origins. In: *Perspectives on the Phylogeny of East Asian Languages.* Sagart, L. Blench, R.M. & A. Sanchez-Mazas, (eds.) 63-73. London: Curzon Press.

Tryon, D. et al. eds. 1995. *Comparative Austronesian dictionary.* [5 vols.]. Berlin/New York: Mouton de Gruyter.

Underhill, Anne P. (ed.) 2013. *A Companion to Chinese Archaeology*. London: Blackwell.

Wolff, John U. 2010. *Proto-Austronesian Phonology with Glossary*. 2 volumes. New York: Southeast Asia Program Publications, Cornell University.

Zhao, Chunqing 2013. The Longshan culture in Central Henan Province, c. 2600-1900 BC. In: Underhill, Anne P. (ed.) *A Companion to Chinese Archaeology*. 236-254. London: Blackwell.