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The Papuan Language of Tambora

Mark Donohue

MONASH UNIVERSITY

I present data from Tambora, a now extinct language of central Sumbawa, and argue from the lexical data and the inferred phonology, compared with areal norms, that it was a Papuan language spoken by a trading population of southern Indonesia. The existence into historical times of a large and non-reclusive Papuan political entity this far west forces a major revision of our ideas about the linguistic macrohistory of Eastern Indonesia.

1. AIMS. The linguistic knowledge available for the non-Austronesian languages of southern Indonesia has improved dramatically in the last few decades. Following on a varied history of research on the languages of Timor and de Josselin de Jong's monumental monograph (1937) on the Oirata language of Kisar, Stokhof's survey work published in the middle-seventies (Stokhof 1975) opened the way for subsequent researchers on the islands of Timor, Alor, and Pantar, and the amount of linguistic data now available for these non-Austronesian languages must be considered to be significant when compared with the virtual absence of information other than a name and a location that is all we have for scores of other (Austronesian) languages in the southern and eastern Indonesian region.

One language has not been researched beyond the first wordlists that appeared in the early nineteenth century, and that is the non-Austronesian language of the Sanggar peninsula of Sumbawa, in the Indonesian province of Nusa Tenggara Barat, known as Tambora (sometimes *Temborá*) (see map 1 for the location of Tambora). The lack of any follow-up research on this language is due to the fact that the language, along with its speakers, was lost in a gigantic volcanic eruption, the most cataclysmic in historical times (Oppenheimer 2003), in April 1815. Reports of the effects of the eruption paint a devastating picture:

Of the whole villages of Tomboro, Tempo, containing about forty inhabitants, is the only one remaining. In Pekáté no vestige of a house is left: twenty-six of the people, who were at Sumbawa at the time, are the whole of the population who have escaped. From the most particular inquiries I have been able to make, there were certainly not fewer than twelve thousand individuals in Tomboro and Pekáté at the time of the eruption, of whom only five or six survive. The trees and herbage of every description, along the whole of the north and west sides of the peninsula, have been completely destroyed, with the exception of a high point of land near the spot where the village of Tomboro stood; on it a few trees still remain. In the night of the eruption, two men and two women, I am informed, escaped to this point, and were saved (Raffles 1817, 1830). Estimates of the scale of the eruption are chilling: approximately seven times the volume of molten and pulverized rock was

ejected into the atmosphere as happened later at Krakatoa, or 200 times the volume ejected in the Mount St. Helen's eruption in 1980, including 50 cubic kilometers of lava. A column of smoke and ash 43 km high was seen from eastern Java, and the noise of the eruption was heard over 2,500 km away. Ash rained on Borneo, and the total amount of ash and volcanic gases thrown into the stratosphere was enough to cause the next year, 1816, to become known in the northern hemisphere as "the year without a summer." Before the eruption Mt. Tambora stood an estimated 4,300 m tall; now it is less than 2,800 m, with a 1,250 m deep caldera.

Pyroclastic flows of incandescent ash poured down the slopes, destroying everything in their paths, killing an estimated 10,000 people instantly as they flowed into the sea 40 km away (Sigurdsson and Carey 1989). Huge floating rafts of pumice up to 5 km long trapped ships at harbor, and were a shipping hazard in the sea between Java and Sulawesi for the next three years. All in all, approximately 100,000 people died as a direct result of the volcano's eruption, mostly due to the famine that followed the destruction of crops; the whole of the Sanggar peninsula on which Tambora was spoken was rendered lifeless.

The only materials we have on the language are lexical, and those are highly limited. Examining those lexical materials, however, it is clear that Tambora was not an Austronesian language. This is not a new discovery; Crawford, in a series of publications (1848, 1863, 1865) noted the "non-Malay" nature of the Tambora language, comparing it to the language of Tidore in North Halmahera, and noting that there were only two Austrone-

**MAP 1. LOCATION OF TAMBORA, AND OTHER LANGUAGES
MENTIONED IN TABLE 4 †**



† 1: Tambora; 2: Sasak; 3: Komodo; 4: Manggarai; 5: Ngadha; 6: Keo; 7: Palu'e; 8: Sika; 9: Galoli; 10: Mairasi; 11: Semimi; 12: Abinomn. (Baruga and Yareba are off-map to the east.)

sian lexical items in the wordlist available to him, and those transparently recent loans from Malay (a third item can be identified—see below). Zollinger (1850) identified more possible Austronesian etyma, but the number remains small, only 15 percent of the total.

This non-Austronesian, or Papuan, presence in Sumbawa is striking in light of the fact that the southern Indonesian area is almost universally Austronesian, with the only currently attested Papuan languages appearing on Pantar, Alor, and Timor, more than 500 km to the east. There have been suggestions that the language of Tambora might be “Mon-Khmer,” related to Vietnamese (as reported in *The Guardian*, March 1, 2006). The basis of this claim appears to be the writing found on pottery recently excavated from the Museum Gorge archaeological site by Haraldur Sigurdsson (Abrams and Sigurdsson 2007), and the general design and decoration of the artifacts recovered from that site. As suggested by John Miksic, “If Vietnamese-style ceramics reached the island, it was probably through trade with intermediaries” (reported in *Live Science*, February 28, 2006). In section 5 I present an argument that Tambora is best thought of as being ultimately connected, either through genealogical descent or through long-term areal association, with the Papuan languages further east. I briefly discuss the implications of this enlargement of the area in which Papuan languages are attested into modern times in section 6, after presenting and discussing the data that we have for Tambora.

2. THE TAMBORA DATA. While we are fortunate to have materials on Tambora available (unlike on many of the languages of eastern Indonesia and other areas in which innumerable languages have vanished without record, thus denying us insights into linguistic prehistory), it is a source of great regret that the data are so minimal. Table 1 shows the lexical items that can be culled from Raffles (1817, 1830). Zollinger (1850) replicates Raffles’s wordlist, and does not claim to have any additional sources, but nonetheless has a number of different spellings for the words. In the interests of presenting as full a picture as possible, even though it is almost certain that the differences in spelling simply represent adaptations to his version of Dutch orthography (e.g., <oe> for [u]) and typographic errors, I give both authors’ lists.¹ The words are presented as they appear in the wordlists in the original sources, with no attempt at phonological interpretation at this stage. Note also that the data consist of individual words; there are no clauses or even phrases for us to study.²

Phonetic details from these lists can only be guessed at. I will make the assumption that we can rely on the transcription in the original; this seems to be a reasonable assumption, to judge from the fact that the other wordlists representing languages for which we have more recent data (Bugis, Makassar, Mandar, Wolio [= Raffles’s *Buton*], Sasak, Bima, Sumbawa [= *Sembawa*], and Ende) appear to be reliable and accurate. On the

1. Zollinger (1850:208a) states that “Raffles geeft eene kleine woordenlijst in zijne *History of Java*, welke ik hieronder over zal nemen.” (“Raffles gives a small wordlist in his *History of Java*, which I shall repeat below.”)

2. Forms marked with a Z in the “Origin” column refer to Zollinger’s speculations: he lists Javanese ‘egg’ as *endokh*, Madurese ‘water’ as *ain*, Bugis ‘man’ as *horo-anie* (cognate with ‘father’), and Sangar ‘man’ as *ese*. He notes that even more speculatively we might associate *gonong* ‘earth’ with Malay *gunung* ‘mountain’, *si-yang* ‘white’ with Malay *siang* ‘midday’ (which he lists as meaning ‘day’ or ‘light’), and *hok-hok* ‘sit’ with German *hocken* ‘squat’. Unacknowledged lexical speculation in this column is my own.

other hand, it is not at all clear how phonetic details that could not be accommodated into an English/Malay orthography would be represented; from our knowledge of the other languages of the area we should not be surprised to encounter implosion, for instance, but this is not indicated by any means.³ The function of the acute accent is not explained, but quite possibly represents erratic stress marking. We can assume that the trigraph *ng'* indicates a [ŋ] pronunciation, and not a [ŋg], based on East African orthographic conventions that were probably known to Raffles or to other colonial officers serving under him, and based on its use to represent [ŋ] in other languages from the wordlists.

TABLE 1. THE TAMBORA VOCABULARY

| RAFFLES | ZOLLINGER | ORIGIN? | ENGLISH | RAFFLES | ZOLLINGER | ORIGIN? | ENGLISH |
|------------|------------|--------------------|---------------|-------------|-------------|-------------------|---------|
| seena | seena | Austronesian? | 'one' | maimpo | maimpo | | 'foot' |
| kálac | kalo | | 'two' | kiro | kiro | | 'blood' |
| nih | nih | | 'three' | kóngkong | kongkong | | 'day' |
| kude-in | koede-in | | 'four' | tádung | tadoeng | | 'night' |
| kutélin | koetelin | | 'five' | kidjum | kidjoem | | 'sleep' |
| báta-in | bata-in | | 'six' | sílam | silam | | 'dead' |
| kúmba | koemba | | 'seven' | si-yang | sijang | Z: Malay? | 'white' |
| koného | koncho | | 'eight' | naido | naido | | 'black' |
| láli | lali | | 'nine' | sámar | samar | | 'good' |
| saróne | sarone | | 'ten' | gonóre | gonore | | 'bad' |
| sisaróne | si sarone | | 'twenty' | maing'aing | maingding | | 'fire' |
| simári | simarie | | 'one hundred' | naino | naino | Z: Madura | 'water' |
| doh | doh | Bima | 'person' | gónong | gonong | Z: Malay? | 'earth' |
| sia-in | sia-in | Z: Sangar | 'man' | ilah | ilah | | 'stone' |
| óna-yit | ona jit | | 'woman' | kíwu | kiwoe | | 'pig' |
| homóri | homarie | | 'father' | kilaíngkong | kilaingkong | | 'bird' |
| yelai | djelai | | 'mother' | andik | andik | Z: Javanese | 'egg' |
| kokóre | kokore | | 'head' | karáyi | karaji | | 'fish' |
| saing'óre | saing-ore | | 'eye' | ingkong | ingkong | | 'sun' |
| saing kóme | saing kome | | 'nose' | mang'ong | mangong | | 'moon' |
| búlu | boeloe | Malay | 'hair' | kingkong | kingkong | | 'star' |
| sóntong | sontong | | 'teeth' | mákan | makan | Malay | 'eat' |
| sumóre | somore | | 'belly' | hok-hok | hok-hok | Z: German? | 'sit' |
| taintu | taintoe | Timor-Alor-Pantar? | 'hand' | morihoh | morihok | undetermined loan | 'God' |

3. PHONOLOGY. The phonology that we can infer is shown in table 2, consisting of 15 consonants and five vowels; suprasegmental features cannot be inferred, though if the frequent acute accents in Raffles's list indicate stress, it appears to be penultimate. Depending on the interpretation of the hyphen there might be a glottal stop as well.⁴

The only consonant clusters found in the data involve homorganic nasals + stops, or sequences of glide + consonant(s). The attested nasal + stop clusters are those shown in table 3; note the appearance of a [p] following [m]. Given the absence of any other tokens of [p], I prefer not to assume that there is a voiceless bilabial phoneme (with a highly restricted distribution), but rather assume that the [p] in this cluster represents another

3. Other possibilities might include central vowels, aspiration (attested in one language of Flores and one of Timor), or even nasalized vowels (found phonetically in eastern Flores).

phoneme that has the allophone [p] following a nasal. The most likely candidate is /h/; this phoneme is not found following a nasal, and attestations of /h/ behaving like a bilabial consonant are not hard to find in other languages.⁵ In these languages the modern /h/ is derived from an earlier *ɸ—and ultimately a bilabial stop—and the same might also be true of Tambora, which would provide the “missing” labial fricative that is expected in eastern Indonesia/New Guinea, though this cannot be proved.

TABLE 2. A PROBABLE SEGMENTAL PHONOLOGY OF TAMBORA

| | | | | | | |
|---|-----|----|---|-----|---|---|
| | t | | k | (?) | i | u |
| b | d | dʒ | g | | e | o |
| m | n | | ŋ | | | a |
| | s | | | h | | |
| | r l | | | | | |
| w | | y | | | | |

TABLE 3. CONSONANT CLUSTERS IN TAMBORA

| | | |
|-----|-----|-----|
| mp | nt | ŋk |
| mb | nd | |
| ymp | ynt | yŋk |
| | yn | yŋ |

4. SEMANTIC SPECULATIONS. There are not enough data to speak confidently of semantic patterns, but given the extreme unlikelihood of any further information on Tambora appearing, it is worthwhile to present some notes.

Two words, both describing a facial body part, are recorded with *saing* as the initial syllable: *saing'óre* ‘eye’ and *saing kóme* ‘nose’. The fact that two other body parts begin with *soN* (*sóntong* ‘teeth’ and *sumóre* ‘belly’) is also suggestive of possible reduction of *saing* to a shorter syllable preceding monosyllables, or preceding nonvelar consonants. It is tempt-

4. The reader might question how reliable a phoneme count can be from a wordlist of fewer than 50 items. The Tambora list from Raffles contains 293 characters, probably representing ± 270 attestations of individual phonemes; this means that even phonemes with a 0.5% frequency should be represented. Due to the well-attested problems in the transcriptions of vowels, we can be least sure about the accuracy of the vowel description, but we can be more confident about checking consonants. Checking the same wordlist on other languages with small consonant inventories, as posited for Tambora, we find 16/16 consonants attested for Abui, 14/14 for Saweru, 13/13 for Ambai, 12/12 for Molmo One, 11/12 for Biak, 11/11 for Sou Amana Teru (thanks to Simon Musgrave), 10/11 for Damal, 10/10 for Kara One, and 9/9 for Lani. The near-100% success rate (in these nine languages 106 phonemes were identified, out of 108 phonemes present in the languages) suggests that the list of consonantal phonemes in Tambora is likely to be accurate, though there is, of course, the chance of a consonant having been missed. Checking the same list against languages with larger consonant inventories reveals many more gaps: 21/25 consonants were identified for English, 20/23 for Palu'e, and 19/23 for Tukang Besi, revealing the unsurprising fact that in large consonant systems there are more likely to be more low-frequency phonemes that will not turn up in a small sample.
5. In Japanese, the placeless nasal interacts with a following /h/ to yield a bilabial nasal + stop sequence, as in /saN/ ‘disperse, scatter’ + /ho/ ‘walk’ > [sampo] ‘stroll’. Closer to Tambora, Tukang Besi shows interaction between the prefix *hoN-*, with a placeless nasal coda, and initial consonants: it combines with *ha'o* ‘hammer’ to yield [homãʔo] ‘hammer purposefully’, with *puai* ‘dry in sun’ to form [homtuai] ‘set something to dry completely’, and with *kumbu* ‘arrowhead fist’ to produce [hoŋtũmbtu] ‘hit forcefully with arrowhead fist’.

ing to consider this to be a possessive prefix, though no explanation is forthcoming as to why the same putative prefix is not found with *kokóre* ‘heart’ and *kíro* ‘blood’, or ‘hand’ and ‘foot’, the other body parts in the data.⁶ With no supporting data, we can only speculate, while acknowledging that chance is just as likely to have produced the similarities.

An *sV-* initial prefix is possibly found with *sisaróne* ‘twenty’, related to *saróne* ‘ten’. This might also be found in the initial syllable of *simári* ‘one hundred’, plausibly related to *seena* ‘one’.⁷ If so, this might be evidence of a vigesimal system of counting. As possible counterevidence for this, we might wonder whether *saróne* contains the morphemes *sa-* ‘one’ and *doh* ‘person’ (with intervocalic lenition of *d* to *r*?), and an unidentified ending *-ne*. The use of the terms for ‘person’ to represent ‘twenty’ is common in the non-Austronesian languages of the Bird’s Head in western New Guinea. It might be that, in the transfer from a base–twenty to a base–ten system, the morphological make-up of the numeral for ‘twenty’ was retained with a new reference, to ‘ten’, using the new term for ‘person’, *doh*, which appears to be a loan from the neighboring (Austronesian) language Bima *dou* ‘person’.⁸

Just one word, *taintu* ‘hand’, is plausibly related to a form found in the non-Austronesian languages of Timor–Alor–Pantar, **tan* (Donohue 2007a) attested in, among others, Abui *taŋ*, Oirata *tana*, Kui *tan*. The similarity in shape of this word and *maimpo* ‘foot’ suggest underlying forms something like /*tayn-ho/* (or /*tayn-hu/*) and /*maym-ho/* (or /*maym-hu/*), with assimilation of the underlying *h* to the place of the preceding nasal.

The final element *kong* or *ong* appears with a number of words denoting the natural world: *kóngkong* ‘day’, *kilańgkong* ‘bird’, *ingkong* ‘sun’, *mang’ong* ‘moon’, *kingkong* ‘star’, *gónong* ‘earth’. While it is hard to discern any consistent meaning associated with this putative suffix other than a concentration on celestial objects, it does indicate that suffixation was probably found in Tambora.

Reduplication is apparent in *hok-hok* ‘sit’, but since the only other active verb we have is ‘eat’, given as *mákan*, transparently a loan from Malay *makan*, we cannot decide whether this was productive or fossilized reduplication, and whether it occurred with a particular function or not. The other obvious loan from Malay, *bílu* ‘hair’ < *bulu* ‘body hair’, may have undergone semantic shift or else may simply be a misglossing.⁹

The correspondence between *homóri* ‘father’ and *moríhoh* ‘God’ is striking, with the latter apparently representing a (Sanskrit?) loan, appearing in other languages abutting on the Sea of Flores: for example, Tukang Besi *Kawasa Mo’ori* ‘(pre-Islamic) God’ (*kawasa* is ultimately derived from Sanskrit *kvasa* ‘power’).

Four words end in a written *-óre*. Because these words are distributed across a range of meanings (*kokóre* ‘head’, *sańg’óre* ‘eye’, *sumóre* ‘belly’, *gonóre* ‘bad’), it is hard to assert any lexical meaning to it, and it may simply be chance.

6. Similarities with the *n-* ‘inalienable possession’ prefix found in Bunak, an aberrant non-Austronesian language of Central Timor (Donohue and Schapper 2007), are striking.

7. *Seena* is a plausible Austronesian loan, though the provenance of the loan cannot be determined.

8. Similarly in Skou, from north-central New Guinea, the shift from a base–4/8/12 system to one with quinary elements has meant that the numeral that previously referred to ‘four’ now refers to ‘five’, with the result that ‘seven’ is compositionally ‘five plus three’ when seen in synchronic perspective.

9. The same shift is attested in Tukang Besi *hotu* ‘hair’ < Proto–Muna–Buton *potu* ‘head’ (van den Berg 2003).

5. THE DATA IN TYPOLOGICAL PERSPECTIVE. It is clear from the lexical data that Tambora was either not Austronesian, or else was a lexically highly aberrant Austronesian language. Unfortunately we do not have any grammatical data (beyond the highly speculative notes in the previous section) on which to base further analysis, but we have the reasonably well-attested evidence of the phonology.

If Tambora was not Austronesian, the obvious contenders (on the grounds of geographic proximity) for possible relatedness are (a) Papuan languages, (b) Australian languages, or (c) Southeast Asian languages. All three of these areas contain non-Austronesian languages, and given the archaeological and historical evidence that the Tambora people were a wide-ranging, sea-faring population, it is not implausible to suggest any of these areas as candidates for possible linguistic relations. In addition to showing few links with Austronesian languages, the lexicon gives no suggestion of any links with any of these other, non-Austronesian (Papuan, Australian, Southeast Asian) languages (other than one possible cognate with the non-Austronesian languages of the Timor–Alor–Pantar area—see the previous section). Further, unlike the genetic label “Austronesian”, the terms “Papuan” and “Southeast Asian” are areal, and not genetic, labels.

We know what patterns of segments can be expected in the languages of central-southern Indonesia, where Tambora was spoken, and also what patterns are found in the surrounding areas (e.g., eastern Indonesia, New Guinea, Australia, western Indonesia, Borneo, and Southeast Asia). For instance, the presence of exactly two fricatives, *s* and *h*, is a well-attested feature of the languages of western Indonesia; there are, of course, exceptions, but the languages that match these patterns form an overwhelming majority in the region. To the east, by contrast, one labial fricative is commonly found. In this respect Tambora matches the areal norms of the languages to the west. A number of aspects of the phonology of Tambora can be examined in this way, following the principles set out in Maddieson (1984), in order to determine how well it “fits” with different areas.

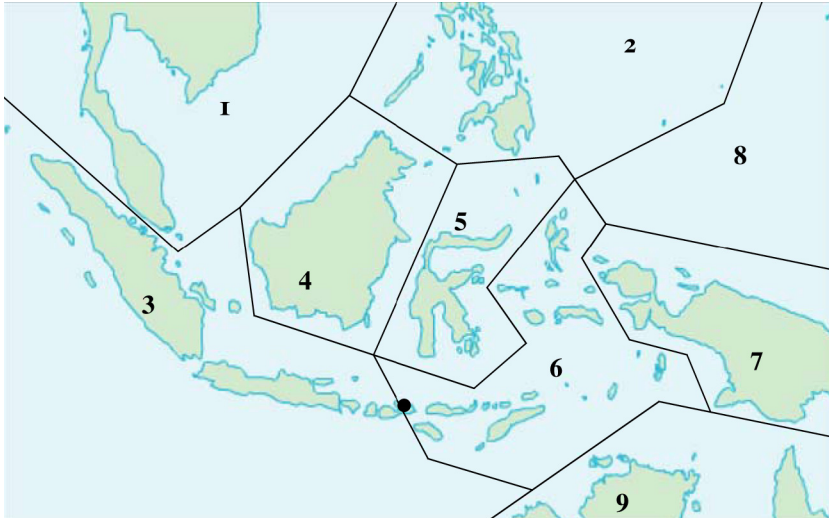
5.1 VOICING CONTRASTS. There are four contrasting supralaryngeal places of articulation, a point in common with most of the languages of southern Indonesia. The Austronesian languages in the area, however, typically show voicing contrasts at all of these places, as can be seen in the data in the first part of table 4. Sasak (Jacq 1998), for example, is a typical Austronesian language spoken to the west of Tambora. In Tambora, by contrast, while there are four contrasting places, and while voicing is a contrastive feature in the language, there are gaps for the expected voiceless bilabial and voiceless palato-alveolar positions, /p/ and /tʃ/. Such gaps—indicated by boxes in tables 4 and 7—are not typical for the area in southern-central Indonesian in which Tambora was located; in addition to the Sasak data, table 4 also presents data from representative Austronesian languages to the immediate east of Sumbawa: the essentials of Bima phonology appear to be identical to the Komodo description of Verheijen (1982), Manggarai data is from Verheijen and Grimes (1995), and Ngadha from Djawanai and Grimes (1995), but they are typical of languages closer to a modern Papuan presence, or of many Papuan languages on New Guinea itself. In the bottom part of table 4 we see data from languages of Flores showing the lack of a /c/ or /tʃ/ (Keo, reanalyzed slightly from Baird 2002, Palu'e from

my own notes, and Sika from Lewis and Grimes 1995).¹⁰ Galoli, further east on northern Timor, shows an example of a language with a gap for /p/ (data from Hinton 2000).

TABLE 4. THE CONSONANTAL PHONOLOGY OF TAMBORA COMPARED WITH SOME NEARBY AUSTRONESIAN LANGUAGES

| | | | | | | | | | | | | | | | | | | | | | |
|-----------|----------------|----------------|-----------------|----------------|---|----|----|-----|----|---|----|---|---|----------------|----------------|----------------|---|---|---|---|---|
| Tambora | □ | t | □ | k | b | d | dʒ | g | m | n | ŋ | s | h | r | l | w | j | | | | |
| Sasak | p | t | tʃ | k | ? | b | d | dʒ | g | m | n | ɲ | s | h | r | l | w | j | | | |
| Komodo | p | t | tʃ | k | ? | b | d | dʒ | g | ʙ | dʹ | m | n | ɲ | f | s | h | r | l | w | j |
| | mp | nt | ntʃ | ŋk | | mb | nd | ndʒ | ŋg | | | | | | | | | | | | |
| Manggarai | p | t | tʃ | k | ? | b | d | dʒ | g | m | n | ŋ | s | h | r | l | w | j | | | |
| | mp | nt | ntʃ | ŋk | | mb | nd | ndʒ | ŋg | | | β | | | | | | | | | |
| Ngadha | p | t | □ | k | ? | b | d | dʒ | g | ʙ | dʹ | m | n | ŋ | f | s | x | r | l | w | |
| Keo | p | t | □ | k | ? | b | d | dʒ | g | ʙ | dʹ | m | n | ŋ | f | s | x | r | l | | |
| | | | | | | mb | nd | ŋg | | | | | | v | z | ɣ | | | | | |
| Palu'e | p | t | □ | k | ? | b | d | dʒ | g | ʙ | | m | n | ŋ | v | s | | r | l | | |
| | p ^h | t ^h | tʃ ^h | k ^h | | mb | nd | ŋg | | | | | | | | | | | | | |
| Sika | p | t | □ | k | | b | d | dʒ | g | m | n | ŋ | s | h | r | l | | | | | |
| | | | | | | | | | | | | | β | ʔ _r | ʔ _l | ʔ _w | | | | | |
| Galoli | □ | t | | k | ? | b | d | g | | m | n | | s | h | r | l | | | | | |

MAP 2. AREAS REFERRED TO IN TABLES 5–15 †



† 1: Southeast Asia; 2: Philippines; 3: Sumatra–Java–Sunda; 4: Borneo; 5: Sulawesi; 6: East Indonesia; 7: New Guinea; 8: Near Oceania; 9: Australia. Off map: South Asia, East Asia, Formosa, Far Oceania. Tambora is located on the line separating areas 3 and 6, on the northern peninsula of Sumbawa, indicated by the dot.

10. Palu'e can be argued to lack a true /tʃ^h/; the phoneme is only present initially (except in recent loans), in complementary distribution with /dʒ/ (both /tʃ^h/ and /dʒ/ derive from *R), and shows much interspeaker variation with /s/.

Examining a large range of languages from Indonesia and relevant related areas, we find that the number of languages displaying a gap for /p/ or /c~tʃ/ varies significantly across regions (see tables 5 and 6).¹¹ While languages missing a /c/ or /tʃ/ phoneme are relatively common among the New Guinea Papuan languages, they are much rarer east of New Guinea, and unheard of in Australia, mainland Asia, or Formosa. Among the Austronesian languages west of New Guinea we find this is very common in Borneo,

TABLE 5. DISTRIBUTION OF GAPS FOR /p/ OR /c/

| AREA | LANGUAGES LACKING /p/ | LANGUAGES LACKING /c/ | SAMPLE SIZE |
|--------------------------------------|-----------------------|-----------------------|-------------|
| South Asia | 0% | 13.30% (2) | 15 |
| East Asia | 0% | 0% | 15 |
| Southeast Asia | 0% | 0% | 29 |
| Formosa | 0% | 0% | 11 |
| Philippines | 9.72% (5) | 12.5% (9) | 72 |
| Sumatera–Java–Sunda | 8.33% (2) | 8.33% (2) | 24 |
| Borneo | 5.12% (2) | 33.33% (13) | 39 |
| Sulawesi | 0% | 14.81% (8) | 52 |
| Eastern Indonesia | 15.90% (7) | 16.03% (8) | 44 |
| Combined Western Austronesian | 6.75% | 15.70% | 242 |
| NG Papuan | 12.40% | 12.60% | 436 |
| NG Austronesian | 13.10% | 4.60% | 130 |
| Near Oceania | 19.10% | 9.10% | 47 |
| Far Oceania | 1.30% | 1.20% | 81 |
| Australia | 0% | 0% | 197 |
| TOTAL | 7.40% | 8.80% | 1434 |

TABLE 6. DISTRIBUTION OF GAPS FOR /p/ AND /c~tʃ/

| AREA | LANGUAGES LACKING BOTH /p/ AND /c~tʃ/ | %AGE |
|--------------------------------------|---------------------------------------|------|
| South Asia | 0 | 0% |
| East Asia | 0 | 0% |
| Southeast Asia | 0 | 0% |
| Formosa | 0 | 0% |
| Philippines | 0 | 0% |
| Sumatera–Java–Sunda | 0 | 0% |
| Borneo | 1 | 2.6% |
| Sulawesi | 0 | 0% |
| Eastern Indonesia | 0 | 0% |
| Combined Western Austronesian | 1 | 0.4% |
| NG Papuan | 14 | 3.2% |
| NG Austronesian | 2 | 1.5% |
| Near Oceania | 1 | 2.1% |
| Far Oceania | 0 | 0% |
| Australia | 0 | 0% |

11. A language has only been counted as showing a gap for /c~tʃ/ if it *does* have a plosive utilizing that place. Galoli in table 4, for instance, is not assumed to have a /c~tʃ/ gap, since it also has no /dʒ/. By contrast a language is taken as showing a gap for /p/ even without any other corresponding bilabial plosive, on the grounds that /p/, /t/, and /k/ are the most “basic” plosive contrasts cross-linguistically (e.g., Maddieson 1984, Lass 1984, Donohue 2006).

and not unexpected in the Philippines, Sulawesi, and Eastern Indonesia. Languages with a gap for /p/ are more concentrated about New Guinea, in both the Austronesian and Papuan languages, and in Oceania as well, particularly Vanuatu. West of New Guinea this pattern is found frequently in Eastern Indonesia, and with scattered examples elsewhere in the islands south of Formosa.¹²

When we count the languages with a gap for both /p/ and /c~tʃ/, the picture is even more striking. The only local area with more than a single isolated instance of a language lacking both these plosives is New Guinea, especially among the Papuan languages.

Table 7 exemplifies languages in or close to New Guinea with the double gap that is also found in Tambora: Semini and Mairasi are spoken in the west of New Guinea facing Maluku (Peckham 1982, 1991); Abinomn (my own notes) is in the northwest in the eastern Lakes Plains; and both Baruga and Yareba are in the southeast tail of New Guinea (Farr and Farr 2005, Weimer and Weimer 1975).

The data we obtain from examining gaps in the plosive system strongly suggest that Tambora should be treated as a Papuan language, albeit one that is found much further west than other contemporary Papuan languages.

5.2 FUNCTIONAL LOAD BORNE BY VOICING. When we examine the degree to which voicing is contrastive in a language, in addition to a simple “yes/no” divide (“the language does/does not employ voicing as the sole means of distinguishing stops”), we can also calculate a ratio, between 0 and 1.0, showing the extent to which voicing is used to contrast stops (see table 8). In such a calculation, a glottal stop is ignored, as it is articulatorily impossible to produce a voiced glottal stop, and the number of voicing contrasts found is divided by the number of supralaryngeal places of articulation in use; in both Balinese and Sasak, for instance, the ratio will be 1.0, since there is a voiced stop corresponding to each voiceless stop. In Ngadha, by contrast, the ratio is 0.75, as there is no voiceless counterpart of /dʒ/. Note that a separate count for implosion is needed to fully describe the plosive contrasts of Ngadha (the ratio for this will be 0.5). In Keo we can see that prenasalization also features, with a ratio of 0.75, and that in a very

**TABLE 7. THE CONSONANTAL PHONOLOGY OF TAMBORA
COMPARED WITH SOME PAPUAN LANGUAGES**

| | | | | | | | | | | | | | | | | | |
|---------|---|---|---|---|----------------|----|----|----|-----------------|----------------|---|---|---|---|---|---|---|
| Tambora | □ | t | □ | k | b | d | dʒ | g | m | n | ŋ | s | h | r | l | w | j |
| Mairasi | □ | t | □ | ? | | | dʒ | | m | n | | ϕ | s | | l | w | |
| | | | | | mb | nd | | ŋg | ŋg ^w | | | β | | | | | |
| Semini | □ | t | □ | k | ? | | dʒ | | m | n | | ϕ | s | | l | w | j |
| | | | | | mb | nd | | ŋg | | | | β | | | | | |
| Abinomn | □ | t | □ | k | k ^w | b | d | dʒ | g | g ^w | m | n | | | r | w | j |
| Baruga | □ | t | □ | k | | b | d | dʒ | g | | m | n | | | l | | j |
| | | | | | | | | | | | | | β | ɣ | | | |
| Yareba | □ | t | □ | k | | b | d | dʒ | g | | m | n | | | l | | j |
| | | | | | | | | | | | | | β | | | | |

12. In this and in the following tables, “Near Oceania” is used as a cover term for the Solomon Islands, Vanuatu, and New Caledonia; “Far Oceania” is used for all Oceanic languages other than in these areas, or in New Guinea. See map 2.

few languages of Indonesia aspiration is contrastive.¹³ In almost all areas there are at least some languages for which voicing is not contrastive in plosives, just as almost all areas contain some languages for which voicing bears a high functional load in building contrasts in the plosives (that is, for each supralaryngeal place of articulation used for plosives, there is a voicing contrast). The average values, however, vary wildly from a high in the Philippines and western Indonesia, where the maximal use of voicing is the norm, to lows seen in Australia and far Oceania, where it is normal for voicing not to be used to distinguish plosives (other gestures, such as prenasalization, or aspiration, or laryngealization, have not been counted here). Tambora shows two voicing contrasts for its four supralaryngeal places of articulation, yielding a ratio of 0.5. This most closely matches the averages for Southeast Asia, Eastern Indonesia's Austronesian languages, and the Papuan languages of New Guinea.

5.3 PRENASALIZATION, ASPIRATION, AND LARYNGEALIZATION.

Examining prenasalization contrasts is not particularly informative (see table 9). There are no areas with exclusively high concentrations of prenasalization, though Sulawesi has a very high average.¹⁴ Tambora lacks prenasalization, but this would not be out of place for any of the areas under consideration.

TABLE 8. VOICING CONTRASTS IN SUPRALARYNGEAL PLACES

| AREA | RANGE | AVERAGE |
|--------------------------------------|------------|---------|
| South Asia | 0.0 – 1.0 | 0.75 |
| East Asia | 0.0 – 1.0 | 0.4 |
| Southeast Asia | 0.0 – 1.0 | 0.5 |
| Formosa | 0.0 – 0.8 | 0.2 |
| Philippines | 0.0 – 1.0 | 0.9 |
| Sumatera–Java–Sunda | 0.0 – 1.0 | 0.9 |
| Borneo | 0.0 – 1.0 | 0.8 |
| Sulawesi | 0.25 – 1.0 | 0.8 |
| Eastern Indonesia | 0.0 – 1.0 | 0.6 |
| Combined Western Austronesian | 0.0 – 1.0 | 0.8 |
| NG Papuan | 0.0 – 1.0 | 0.5 |
| NG Austronesian | 0.0 – 1.0 | 0.7 |
| Near Oceania | 0.0 – 1.0 | 0.2 |
| Far Oceania | 0.0 – 1.0 | 0.1 |
| Australia | 0.0 – 1.0 | 0.1 |
| Tambora | | 0.5 |

13. There are, of course, complex cases. Auye, for example, contrasts a voiceless aspirated stop with a voiced imploded stop at labial and coronal places, and an aspirated stop with a voiced (laterally released) stop with dorsal articulation (thus /p^h t^h k^h b d^hg^hl/). It is not clear whether this should count as an aspiration contrast, or an implosion contrast, or both. Here it has been assumed that a voiceless series is modal in a language, and if there is only one voiceless series, whether it happens to be aspirated or not, then it is the base against which other series contrast. Thus Auye has been coded as showing an implosion contrast in each of the bilabial and coronal places, and a voicing contrast in the dorsal place.

14. Note that, unlike the values for voicing and aspiration, which have a theoretical maximum of 1.0 (when each supralaryngeal place of articulation shows the contrast), prenasalization contrasts can exceed 1.0. This is because there are a small number of languages that have prenasalized glottal stops (in the Markham valley of eastern New Guinea), and many languages with more than one prenasalized stop per place of articulation. Manggarai, for instance (table 4), shows both /mb/ and /mp/ (as well as /p/ and /b/) in the labial place. These instances have been counted as involving two prenasalization contrasts, and not an additional contrast in voicing. Postnasalized stops have been included in table 9.

Another common means of differentiating series of stops via voice onset timing contrasts is by having an aspiration contrast between two voiceless series. As can be seen from table 10, this is far from common in the languages of the southwest Pacific, but it is extremely common in mainland East and Southeast Asia. The fact that Tambora falls completely outside the Southeast Asian range for the utilization of aspiration argues that Tambora is not a language from that part of the world.

TABLE 9. PRENASALIZATION CONTRASTS

| AREA | RANGE | AVERAGE |
|--------------------------------------|-----------|---------|
| South Asia | 0.0 | 0.0 |
| East Asia | 0.0 | 0.0 |
| Southeast Asia | 0.0 – 1.0 | 0.1 |
| Formosa | 0.0 | 0.0 |
| Philippines | 0.0 | 0.0 |
| Sumatera–Java–Sunda | 0.0 | 0.0 |
| Borneo | 0.0 – 1.0 | 0.1 |
| Sulawesi | 0.0 – 2.0 | 1.2 |
| Eastern Indonesia | 0.0 – 2.0 | 0.2 |
| Combined Western Austronesian | 0.0 – 2.0 | 0.3 |
| NG Papuan | 0.0 – 2.0 | 0.3 |
| NG Austronesian | 0.0 – 2.0 | 0.3 |
| Near Oceania | 0.0 – 2.0 | 0.5 |
| Far Oceania | 0.0 – 0.7 | 0.02 |
| Australia | 0.0 – 1.0 | 0.1 |
| Tambora | | 0.0 |

TABLE 10. ASPIRATION CONTRASTS IN SUPRALARYNGEAL PLACES

| AREA | RANGE | AVERAGE |
|--------------------------------------|------------|---------|
| South Asia | 0.0 – 1.0 | 0.25 |
| East Asia | 0.0 – 1.0 | 0.8 |
| Southeast Asia | 0.5 – 1.0 | 0.6 |
| Formosa | 0.0 | 0.0 |
| Philippines | 0.0 | 0.0 |
| Sumatera–Java–Sunda | 0.0 | 0.0 |
| Borneo | 0.0 | 0.0 |
| Sulawesi | 0.0 | 0.0 |
| Eastern Indonesia | 0.0 – 0.75 | 0.03 |
| Combined Western Austronesian | 0.0 – 1.0 | 0.02 |
| NG Papuan | 0.0 – 1.0 | 0.02 |
| NG Austronesian | 0.0 | 0.0 |
| Near Oceania | 0.0 – 1.0 | 0.1 |
| Far Oceania | 0.0 – 1.0 | 0.1 |
| Australia | 0.0 | 0.0 |
| Tambora | | 0.0 |

Table 11 shows the distribution of secondary laryngeal articulations on supralaryngeal plosives. This includes preglottalization, implosion, and (rarely, in this area) ejectives (which might be described as postglottalization).¹⁵ There are only three areas in which laryngeal coarticulations are moderately frequent: Southeast Asia, Sulawesi, and Eastern

Indonesia.¹⁶ Even in these areas the ratios are quite low, largely because it is uncommon to have a full set of laryngeal contrasts at every supralaryngeal place of articulation.¹⁷ The fact that there are no laryngeal contrasts reported for Tambora does not help us to place the language in any particular area, or to exclude it from any area.

TABLE 11. LARYNGEAL CONTRASTS IN SUPRALARYNGEAL PLACES

| AREA | RANGE | AVERAGE |
|--------------------------------------|------------|---------|
| South Asia | 0.0 – 1.0 | 0.07 |
| East Asia | 0.0 | 0.0 |
| Southeast Asia | 0.0 – 0.8 | 0.13 |
| Formosa | 0.0 – 0.5 | 0.04 |
| Philippines | 0.0 | 0.0 |
| Sumatera–Java–Sunda | 0.0 | 0.0 |
| Borneo | 0.0 – 0.5 | 0.01 |
| Sulawesi | 0.0 – 0.7 | 0.18 |
| Eastern Indonesia | 0.0 – 1.0 | 0.13 |
| Combined Western Austronesian | 0.0 – 1.0 | 0.05 |
| NG Papuan | 0.0 – 1.0 | 0.02 |
| NG Austronesian | 0.0 – 0.7 | 0.01 |
| Near Oceania | 0.0 | 0.0 |
| Far Oceania | 0.0 – 0.75 | 0.01 |
| Australia | 0.0 | 0.0 |
| Tambora | | 0.0 |

5.4 VOWEL SYSTEMS. Another indication of the proper area in which to place Tambora can be found by examining the kinds of vowel systems of languages spoken in different areas. Table 12 shows the range and average size of vowel systems in different areas close to Sumbawa.

Tambora is recorded with five vowels. This means that it lies completely outside the ranges found in Southeast Asian languages for both consonants and vowels. While the range of vowels found in Sumatera–Java–Sunda covers the five that are found in Tambora, the average language from this part of the world has six vowels. The areas into which Tambora best fits are Sulawesi, Eastern Indonesia, or New Guinea Austronesian.

15. Phonetically, it would be possible for a language to show more than one laryngealization contrast at one place of articulation, thus achieving a laryngeal ratio greater than 1.0. We might imagine a language with contrasting /pʰ/, /p/, /ʰb/, /b/, and /b̥/, for instance, which if maintained across the other supralaryngeal places of articulation would yield a value of 4.0. I am not aware of any such language, certainly not in the areas considered here, suggesting that it is phonologically valid to group these different laryngeal gestures together.

16. Specifically south-central Indonesia, where the ratio is 0.23; the region in Sulawesi in which all of the implosion contrasts are found is insular Southeast Sulawesi, immediately north of the Sumbawa–Flores–Sumba–Timor area that is south-central Indonesia, separated by the Sea of Flores. In insular Southeast Sulawesi, the ratio is as high as 0.44.

17. In my database only three languages, Bhumij (Munda, South Asia), Sawu (Austronesian, south-central [Eastern] Indonesia), and Sahu (Papuan), have laryngeal contrasts in all possible supralaryngeal places (five, four, and four, respectively). Modally, there are only two laryngeal contrasts in a language.

5.5 CONSONANT SYSTEMS. In addition to examining the kinds of consonants found in an area, the simple total of the number of consonants found in a language is also useful when trying to determine to which area Tambora best fits. Table 13 parallels table 12 in showing the range and average size of a segment system, here the consonant system, in different areas close to Sumbawa.

Tambora has 15 (or possibly 16) consonants. Just as with the vowel systems, this means that it is outside the range found in Southeast Asian languages. Similarly, the

TABLE 12. VOWEL INVENTORIES

| AREA | RANGE | AVERAGE |
|--|--------|---------|
| South Asia | 3 – 6 | 5.3 |
| East Asia | 3 – 12 | 6.6 |
| Southeast Asia | 6 – 11 | 8.1 |
| Formosa | 3 – 6 | 4.2 |
| Philippines | 3 – 8 | 4.8 |
| Sumatera–Java–Sunda | 4 – 9 | 6.4 |
| Borneo | 4 – 8 | 5.6 |
| Sulawesi | 5 – 6 | 5.1 |
| Eastern Indonesia | 5 – 7 | 5.3 |
| Combined Western Austronesian † | 3 – 9 | 5.2 |
| NG Papuan | 3 – 11 | 5.8 |
| NG Austronesian | 3 – 9 | 5.3 |
| Near Oceania | 5 – 12 | 5.6 |
| Far Oceania | 5 – 11 | 6.0 |
| Australia | 2 – 8 | 3.8 |
| Tambora | | 5 |

† including Malagasy (not included in other rows because of its location in southeast Africa)

TABLE 13. CONSONANT SYSTEMS

| AREA | RANGE | AVERAGE |
|--|---------|----------|
| South Asia | 15 – 30 | 21.2 |
| East Asia | 14 – 36 | 21.5 |
| Southeast Asia | 16 – 33 | 21.3 |
| Formosa | 13 – 21 | 16.9 |
| Philippines | 10 – 22 | 16.1 |
| Sumatera–Java–Sunda† | 17 – 25 | 19.3 |
| Borneo | 14 – 23 | 17.4 |
| Sulawesi | 12 – 26 | 20.2 |
| Eastern Indonesia | 9 – 28 | 15.8 |
| Combined Western Austronesian ‡ | 9 – 30 | 17.5 |
| NG Papuan | 6 – 28 | 14.2 |
| NG Austronesian | 7 – 32 | 15.8 |
| Near Oceania | 10 – 32 | 16.8 |
| Far Oceania | 8 – 38 | 15.2 |
| Australia | 12 – 35 | 18.4 |
| Tambora | | 15 (16?) |

† excluding the outlier Enggano languages (which have lost nasalization as a contrastive feature on segments, but retained it as a root-level feature)

‡ including Malagasy (not included in other rows because of its location off southeastern Africa)

range of consonant inventories found in Sumatera–Java–Sunda exceeds the 15 found in Tambora. While Tambora could fit into many areas typologically, it is excluded from Southeast Asia and the western Indonesian Sumatera–Java–Sunda area.

5.6 NASAL-ORAL PLACES. While the Austronesian languages in western Indonesia and the languages of mainland Southeast Asia typically show one nasal corresponding to each oral place of articulation (see, e.g., table 4), the Tambora data lack a palatal nasal; this gap, having one less nasal than oral places, is a pattern quite typically associated with the non-Austronesian languages of New Guinea, and is also found in many of the Austronesian languages to the east in southern Indonesia, such as Manggarai, Keo, Palu'e, and Sika. This fact does indicate that the language is more “oriented” to the east, in terms of its typological profile, than to the west, as table 14 shows.

TABLE 14. NASAL-ORAL SUPRALARYNGEAL PLACE RATIOS

| AREA | RANGE | AVERAGE |
|--------------------------------------|-------------|---------|
| South Asia | 0.6 – 1.0 | 0.8 |
| East Asia | 0.5 – 0.8 | 0.7 |
| Southeast Asia | 0.6 – 1.33 | 0.9 |
| Formosa | 0.5 – 1.0 | 0.7 |
| Philippines | 0.6 – 1.33 | 0.9 |
| Sumatera–Java–Sunda [†] | 0.75 – 1.0 | 0.8 |
| Borneo | 0.75 – 1.33 | 1.0 |
| Sulawesi | 0.75 – 1.0 | 0.9 |
| Eastern Indonesia | 0.5 – 1.0 | 0.8 |
| Combined Western Austronesian | 0.6–1.33 | 0.9 |
| NG Papuan | 0.0 – 1.5 | 0.7 |
| NG Austronesian | 0.33 – 1.25 | 0.8 |
| Near Oceania | 0.5 – 1.0 | 0.9 |
| Far Oceania | 0.67 – 1.5 | 0.9 |
| Australia | 0.67 – 1.33 | 1.0 |
| Tambora | | 0.75 |

[†] excluding Enggano (which has lost nasalization as a segmental feature, but which maintains it at the word level)

TABLE 15. PHONOLOGICAL EVIDENCE FOR THE “AREA” OF TAMBORA: SUMMARY

| AREA | SUGGESTS? | EXCLUDES? | FIRM? |
|-----------------------------|--|---|-------|
| Gap for /p/ | Eastern Indonesia, NG Papuan, NG Austronesian, Near Oceania | East Asia, Southeast Asia, Australia | ✓ |
| Gap for /c~tʃ/ | Philippines, Borneo, Sulawesi, Eastern Indonesia, NG Papuan | East Asia, Southeast Asia, Australia | ✓ |
| Gap for both /p/ and /c~tʃ/ | NG Papuan | | ✓ |
| Voicing | Southeast Asia, Eastern Indonesia, NG Papuan | | |
| Prenasalization | | Sulawesi | |
| Aspiration | | East Asia, Southeast Asia | ✓ |
| Laryngealization | | | |
| Vowels | Sulawesi, Eastern Indonesia, NG Austronesian | East Asia, Southeast Asia, Western Indonesia | |
| Consonants | | Southeast Asia, Western Indonesia | ✓ |
| Nasal-oral places | East Asia, Formosa, Eastern Indonesia | Southeast Asia, Western Indonesia, Australia | |

5.7 THE TAMBORA “TYPE.” In sections 5.2–5.6, different phonological traits of Tambora matched, to different degrees, the phonological traits of different areas. Table 15 summarizes the trends that were observed in the different tables. While Eastern Indonesia and New Guinea Papuan are consistently identified as plausible homes for Tambora (bolding indicating strong correlations), Southeast Asia is much more commonly a dispreferred choice than a preferred one.

The data in sections 2–5 can be summarized easily: the phonological typology indicates that the language belongs in New Guinea, or eastern Indonesia, and certainly not elsewhere in insular or mainland Southeast Asia. Lexically, it is clear that the language we are dealing with is not Austronesian. Phonologically, it does not fit as an Australian or Southeast Asian language. The only conclusion, given the loose definition that encompasses “Papuan,”¹⁸ is that Tambora was a Papuan language.

6. IMPLICATIONS FOR THE LINGUISTIC MACROHISTORY OF SOUTHERN INDONESIA. With the addition of the Tambora data we have evidence of the existence (until recent times) of Papuan languages throughout the area occupied by the Austronesians that have been assigned to the Central–Malayo–Polynesian and South Halmahera–West New Guinea subgroups of Austronesian. While the Papuan influence on the grammars of Oceanic languages spoken in the east of New Guinea has long been acknowledged and debated (since at least Ray 1911, 1926; see most recently Pawley 2006), there has been too little discussion of the very similar social situation that must have held in the islands to the west of New Guinea (though see Donohue 2004, 2007b), largely because of the lack of a modern Papuan presence west of Pantar. With the data on Tambora now more widely circulated, and the evidence that it should be considered to have been a Papuan language made public, I hope that theories of Austronesian change will now more readily consider Papuan substrate influence to be a property not just of some “aberrant” languages spoken near or on eastern New Guinea, but of the vast majority of Austronesian languages in what has been called the Central-Eastern Malayo–Polynesian group (e.g., Donohue 2005).

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18. Foley (1986:1) states that “the Papuan languages occupy those areas of New Guinea and adjacent islands not claimed by Austronesian languages.” Tryon (1995:5) summarizes the term as follows: “the term ‘Papuan’ is a convenient term for the non-Austronesian languages of Papua New Guinea and eastern Indonesia, not all of which are demonstrably related.”

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