LANGUAGE & LINGUISTICS IN MELANESIA

Evidence for Membership in Trans-New Guinea

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The goal of this paper is to assess some of the evidence for particular groups belonging to the Trans-New Guinea family (hereafter TNG), using data from the ASJP (Automated Similarity Judgment Program) database (Wichmann et al 2022). This database contains data for a 40-word subset of the Swadesh 100 (Swadesh 1971) for most languages in the world, including most Papuan languages, and for the entire Swadesh 100 for a minority subset of Papuan languages, though generally for at least one language in every family and for most subgroups of larger families.[2] The goal of the paper is somewhat analogous to the goal of Ross (1995, 2005) on pronouns in Papuan languages, in getting a picture of the lay of the land.

One of the motivations behind this study is the lack of published evidence for particular groups belonging to TNG. Pawley (2005) and Pawley and Hammarström (2018) cite a large number of reconstructed protoforms for Proto-TNG, but there is very little published evidence for these proposed protoforms.[3] There is an unpublished list of possible reflexes of these protoforms by Pawley, but examination of this list raises questions about whether many of the reconstructions are based on similarities that are significantly better than chance. One of the criticisms of Greenberg's (1987) Amerind hypothesis, which groups most of the languages of the Western Hemisphere into a single family, is that the pool of forms that he drew from is so large that it is not clear that the similarities in forms that he cites are any better than chance. A similar issue potentially arises with TNG since the pool of forms for TNG is also very large, both because of the large number of different groups that have been claimed to be TNG and because some of the groups, especially Madang and Kainantu-Goroka, are themselves very diverse. The diversity for Madang seems comparable if not greater than the diversity found in Indo-European. One of the goals of this study is to examine the strength of evidence for many of Pawley's reconstructions.

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[1] I am indebted to Lea Brown, Søren Wichmann, Malcolm Ross, and Timothy Usher for comments on earlier drafts of this paper.

[2] A small amount of the data from ASJP used here is not yet included in the online version of ASJP at the time of this writing. Although ASJP contains data for a 40-word subset of the Swadesh 100 for most Papuan languages, it contains data for the full Swadesh 100 for only a small minority of these. Because of the small size of the 40-word set and because the representations in ASJP neutralize some phonetic distinctions, there are obvious limitations in using this data for careful historical work. However, these limitations are less serious for a study like the one done here, given the uncertainty of what groups might belong to TNG. The fact that the ASJP data is available online makes it possible to examine data from a large number of languages. See Wichmann (2012) for another example of the use of ASJP data in investigating genealogical relationships among Papuan languages.

[3] Note that Pawley's reconstructions are not arrived at by strict application of the comparative method but are largely just summaries of similarities in forms in different groups. I discuss this below in §8.

Pawley and Hammarström (2018) cite some evidence for most groups, but the number of possible reflexes cited is sufficiently small that it is not clear that they are better than chance and it is not clear how many of the proto-TNG forms that they cite are based on similarities that are greater than chance.

To illustrate the problem of whether published data is sufficient, consider the data in Table 1 cited by Pawley and Hammarström for East Strickland.[4]

Lg	form in Lg	Proto-TNG	gloss
Samo	*(da)subu*	*sumbu	'ashes'
Samo	*si*	*nj(a,e,i)	'burn'
Samo	*na*	*na	'eat'
Samo	*magara*	*maŋgat[a]	'mouth'
Samo	*korofu*	*(ŋg,k)a(n,t)apu	'skin'
Samo	*mere(ma)*	*me(l,n)e	'tongue'
Samo	*mini*	*mundu	'nose'
Bibo	*(da)suf*	*sumbu	'ashes'
Agala	*fulu(ma) ali*	*pululu	'to fly'

Table 1
Evidence cited by Pawley and Hammarström (2018) for
East Strickland being TNG

On the surface, the data in Table 1 looks relatively promising in the sense that it might seem to be good evidence that East Strickland is Trans-New Guinea. However, compare this to the data in Table 2, from Yale (aka Nagatman), a language isolate of the upper Sepik.[5]

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[4] One problem is that the evidence for *sumbu* as a protoform of 'ashes' is very weak in my data. I only find examples of possible reflexes in East Strickland and Bosavi and only in one of three branches of East Strickland.

[5] As noted above, the data used in this paper comes from the ASJP database. ASJP uses an orthography that neutralizes many phonetic distinctions, described in Brown et al (2008: 306-307). For example, it uses <o> for [o] or [ɔ], <E> for [ɛ] or [æ], and <3> for any nonlow central vowel. In this paper, I have converted the ASJP orthography into a more user-friendly orthography as follows (while maintaining the neutralizations): <E> to <ɛ>, <3> to <ə>, <N> to <ŋ>, <5> to <ɲ>, <8> to <θ>, <7> to <ʔ>, <S> to <ʃ>, <T> to <c>, <c> to <ts>and <C> to <ʧ>. I also do not use what ASJP calls modifier symbols. I represent labialized consonants with <ʷ> and palatalized consonants with <ʸ>. I do not represent aspiration in stops, nor the distinction between dental and alveolar stops. I represent all laterals with <l>.

form in Yale	Proto-TNG	gloss
tede	*ta(l,t)(a,e)	'two'
naba	*nVpV	'eye'
suma(lipa)	*sumbu	'ashes'
te	*nde	'say'
wen(j)i	*wani	'name'
(k)abu	*a(mb,b)u	'tail'
kodabe	*k(i,u)tama	'night'
ti	*inda	'tree'
muna	*[ma]pVn	'liver'

Table 2
Pseudo-evidence for Yale (aka Nagatman) being TNG

This is not evidence that Yale is TNG. Rather it illustrates how easy it is to find what look like plausible reflexes of proposed TNG protoforms in non-TNG languages. Nor, as shown below, is this an idiosyncrasy of Yale. While the list is longer for Yale than it is for most non-TNG groups, it is not uncommon to find smaller sets of forms that look like plausible reflexes of Proto-TNG forms in many alleged non-TNG groups.

What ultimately makes the evidence for TNG-membership for East Strickland more convincing is that when one adds additional plausible reflexes of Proto-TNG forms, the number of such reflexes is more than one expects due to chance. Table 3 adds additional cases of plausible reflexes of Proto-TNG forms in four different East Strickland languages.

Honibo	Samo	Agala	Konai	Proto-TNG	gloss
--	moi	moi	moi	*ma	'not'
--	hobe	--	həbia	*a(mb,b)u	'tail'
--	bu	bu	bu	*amu	'breast'
--	nãla	nolu	nolu	*na	'eat'
--	ogo	digu	dugu	*nVŋg	'see'
--	kela	--	--	*kin(i,u)[m]	'sleep, lie down'
oma	--	--	--	*me	'come'
--	məhõi	--	--	*maka[n]	'ground'
--	ogabi	--	--	*ka(mb,p)utu	'cloud'
hũti	hũti	hũ	huũ	*wani	'name'

Table 3
Additional Evidence for East Strickland Being TNG

Note that I am not claiming that all the forms cited in Table 3 are reflexes of Proto-TNG forms, only that they are *possible* reflexes of Proto-TNG. Given the pseudo-evidence in Table 2 for Yale, we expect that some of the forms cited as possible reflexes are simply accidental resemblances. The evidence for East Strickland being TNG is based on the sheer number of possible reflexes of TNG forms, which is greater than the number of forms that look like possible reflexes that we find for Yale or any other non-TNG group.

I argue below that for some groups that Pawley and Hammarström classify as ones for which the evidence for membership in TNG is relatively strong, the number of possible reflexes of Proto-TNG forms is no better than chance. However, for the majority of groups that Pawley and Hammarström classify as ones for which the evidence for membership in TNG is relatively strong, the number of possible reflexes is indeed better than chance.

2. What groups I investigate for membership in TNG

There are three versions of TNG that I will refer to in this paper. The most conservative version is one in Glottolog (Hammarström et al 2022).[6] Pawley and Hammarström (2018) present two other versions of TNG, one restricted to groups for which they claim that the evidence for membership in TNG is relatively strong, the other that adds to the first version a number of groups which Pawley and Hammarström characterize as ones for which there is evidence for membership in TNG but where that evidence is relatively weak. The Glottolog classification is very conservative in the sense that it does not include the majority of groups that Pawley and Hammarström characterize as ones for which the evidence for membership in TNG is relatively strong. The groups included by Pawley and Hammarström that are not treated as TNG by Glottolog are treated in Glottolog either as separate families or as more than one separate family.[7] I treat all of these groups as separate groups in this paper.[8]

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[6] Throughout this paper, I assume the Glottolog classification of TNG and other Papuan groups, except in a few cases where I feel the evidence clearly warrants an alternative classification. I generally assume the Glottolog classification, not because Glottolog is necessarily correct, but because I need objective criteria in deciding what is a group.

[7] There are two instances of groups that Pawley and Hammarström treat as ones for which the evidence for membership in TNG is relatively strong but which Glottolog treats as more than one independent family. One is Duna-Bogaya, which Pawley and Hammarström treat as a subgroup of TNG but which Glottolog treats as two separate groups (or language isolates), Duna and Bogaya. The second involves Kutubuan, which Glottolog treats as two separate language isolates, Foe and Fasu. In addition, there is a set of languages which Pawley and Hammarström call South Bird's Head and which they classify as a group for which the evidence for membership in TNG is relatively weak, whereas Glottolog treats these languages as falling into three unrelated groups, one that Glottolog calls South Bird's Head but which corresponds to Nuclear South Bird's Head in Pawley and Hammarström's classification, the other two being Inanwatan and Konda-Yahadian. In order to avoid the ambiguity in the expression South Bird's Head, I will follow Pawley and Hammarström's terminology in referring to the group that excludes Inanwatan and Konda-Yahadian as Nuclear South Bird's Head.

[8] There are three other differences between what I treat as a possible subgroup and what Pawley and Hammarström treat as groups. One is that Pawley and Hammarström treat Greater Awyu and Ok-Oksapmin as separate groups while I follow Glottolog in treating them as a single Awyu-Ok group. The two other differences involve languages which all existing classifications that I am aware of treat as members of a group, where the evidence I examined for this paper suggests that they are not members of that group. One of these is the language Mulaha, which is usually treated as Kwalean. The other is Fuyug, which is usually treated as Goilalan. I discuss these further below. I treat Mulaha and Fuyug as separate groups consisting of single languages. I also use the name Asmat - Kamrau Bay rather than Asmat-Kamoro, following arguments by Usher and Suter (2020) for treating Kamrau Bay (or Sabakor) as a sister to Asmat-Kamoro rather than a daughter. The data examined for this paper support this as well.

3. Evaluating the evidence for Pawley's proposed Proto-TNG forms

The first part of this study involves using data in ASJP to investigate Pawley's proposed Proto-TNG forms, by determining how many of the groups that Pawley and Hammarström classify as groups for which the evidence of TNG membership is relatively strong have plausible reflexes of Proto-TNG forms that they (and Pawley 2005) propose. The method of counting groups with a plausible reflex includes fractions of groups where reflexes are found in only one subgroup of a group.

The method for computing these fractions is as follows. If a group is classified in Glottolog as involving n immediate daughters, then if plausible reflexes for a given protoform were found in two or more of those n daughters, then that group was assigned a value of 1 for that proposed protoform.[9] If plausible reflexes were found in only one branch, then the group was assigned a value of $1/n$ for that protoform. This process was applied to the next level down in the sense that if plausible reflexes were found in only one out of n subgroups and in only one out of m subgroups of that subgroup, then the group was assigned a value $1/n * 1/m$. Values less than 1/7 were ignored. An illustration of the method used is given in the Appendix.

Table 4 on page 113 lists the scores for each of Pawley's protoforms for meanings in the Swadesh 100 for which he proposed a protoform. For each protoform and for each of the 38 groups that Pawley and Hammarström classify as ones for which the evidence for membership in TNG is relatively strong, a score is computed in the way just described . The score given in the third column of Table 4 for each protoform is the sum of these scores over the 38 groups. What I want to draw attention to at this point is the number of protoforms for which the score is less than 3, demarcated in the table by a thick line. Of the 84 protoforms listed in Table 4, 27 of them (or almost a third) have a score less than 3. In the second part of this study, described below, protoforms which found in fewer than 3 groups were ignored. The reason for this is that it is not clear that the evidence for these proposed protoforms is any better than chance.

While the choice of a cutoff point of 3 groups is partly arbitrary, it is not hard to find sets of look-alikes found in three putative TNG groups where Pawley did not posit a protoform resembling that set of look-alikes. For example, Pawley posits *wani* as the protoform for 'who, name', but one finds forms like *ape* for 'who' in a number of groups, where the number in parentheses in the following is the score for each group exhibiting forms like *ape*: Greater Binanderean *ape* (1). Enga-Kewa-Huli *api* (1), Bosavi *ibe* (1/2), Paniai Lakes *mi* (1), Gogodala-Suki *ɛpoate* (1/2), and perhaps Foe *ibu* (1/1), for a total of 5. Similarly, Pawley posits *maŋgat[a]* as the protoform for 'mouth'. But one finds forms like *VbV* for 'mouth' in a number of groups: Greater Binanderean *be* (1/2), Kwalean *hebe* (1), Paniai Lakes *ebe* (1), Koiarian *ava* (1/4) Asmat - Kamrau Bay *mea* (1/2), Turama-Kikorian *obo* (1/2), for a total of 3.75. Although these might reflect protoforms that Pawley missed, they illustrate the apparent ease of finding similar forms in more than three groups.

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[9] The rationale behind assigning a value of 1 if a plausible reflex for a given protoform was found in at least two daughters is that, if we assume that the Glottolog classification is accurate, then a reflex probably existed in the protolanguage for that group.

*na	I	29.50	*panV	woman	4.25
*na	eat, drink	24.42	*nd(a,e,i)	burn-1	4.11
*nu, *ni	we	23.00	*mVtVna	head-2	4.08
*inda	tree, fire	21.98	*mbena	hand-2	4.05
*ŋga	you	21.50	*ki	burn-2	3.94
*amu	breasts	20.25	*t(o,u)k(i,u) ti	full	3.94
*ma	not	16.59	*kesa	blood-1	3.83
*ambi	man/person	14.62	*ŋgatata	dry	3.58
*niman, *iman	louse	14.17	*mVna	sit	3.54
*wani	name, who	13.92	*mun(a,e,i)ka	egg	3.46
*maŋgat[a]	mouth, tooth	12.75	*(ŋg,k)iti-maŋgV	eye-1	3.42
*imbi	name	12.17	*k(a,o)nd(a,u)p	fire-1	3.25
*kand(i,e)k[V]	ear	11.73	*[ma]pVn	liver	3.22
*ok[V], *nok	water	11.14	*(ŋg,k)atuk	knee	3.20
*me	come	10.67	*mundu-maŋgV	heart-1	3.11
*mbilaŋ, *me(l,n)e	tongue	10.58	*putu(putu)	fly (verb)	3.09
*iti	leaf, hair	10.56	*kamali	sun-1	3.00
*maŋgV	seed, egg, round	9.78	*sa(ŋg,k)asiŋ	sand	2.39
*(ŋg,k)a(nd,t)apu	skin, bark	9.42	*(nd,t)ebV	good	2.36
*kamb(a,u)na	stone-1	8.70	*[na]muna	stone-2	2.33
*kumV	die	8.21	*sikal, sakil	hand-1	2.28
*a(mb,m)u	tail	8.20	*s(i,u)	bite	2.22
*nde	say	8.12	*sasak	leaf	2.19
*maka[n]	earth-2	7.86	*k(a,o)nd(a,o)C	foot	2.17
*mundu	nose	7.42	*(mb,p)(i,u)tiuC	claw, fingernail	2.13
*yaka[i]	bird-2	7.17	*nVŋg	see, hear, know	2.00
*t(a,e,i)k[V]	stand	6.91	*keɲa	blood-2	2.00
*mV	give	6.70	*nVpV	eye-3	2.00
*kuma(n,ŋ)[V]	neck-2	6.69	*p(e,i)t(e,i)o	sleep	1.75
*n[e]ei	bird-1	6.50	*kin(i,u)[m]	sleep, lie down	1.62
*kamu	heart-3	6.40	*ŋg(a,u)mu	eye-2	1.58
*ta(l,t)(a,e)	two	6.02	*kindil	root	1.54
*t(a,e,i)k[V]	stand	6.01	*(nd,s)umu(n,t)[V]	hair	1.50
*kV(mb,p)utu	head-1	5.67	*simu	heart-2	1.50
*kVtak	new	5.63	*kal(a,i)m	moon-2	1.33
*takVn[V]	moon-1	5.50	*sumbu	ash-1	1.28
*ka(mb,p)utu,			*man[a]	earth-1	1.21
*kambula(ŋg,k)a	cloud, smoke	5.42	*mundun	belly	1.20
*titi	tooth	5.08	*samb[V]	cloud	1.00
*ketane	sun-2	4.75	*kambu	fire-2	1.00
*kondaC	bone	4.75	*k(a,e)(nd,t)ak	neck-1	0.69
*kukam(o,u)	cold	4.58	*k(o,u)t(u,i)p	long	0.26
*k(i,u)tuma	night	4.37	*la(ŋg,k)a	ash-2	0.20

Table 4

Number of groups exhibiting possible reflexes for each of Pawley's Proto-TNG protoforms

4. The problem of related meanings.

It is common in historical studies to include as evidence for particular reconstructions forms that do not have the same meaning as the one for which one is positing a reconstruction, but a related meaning, as in *apa* 'maternal uncle'<   *apa* 'father', cited by Pawley and Hammarström as an example of a possible reflexes of Proto-TNG forms in Chimbu-Wahgi. While there appear to be relatively few such pieces of evidence cited by Pawley and Hammarström, unpublished lists of possible reflexes by Pawley often include this sort of evidence. However, while forms with related meanings can play an important role in identifying protoforms and sound correspondences, they are less useful in determining the likelihood of a group belonging to TNG, since allowing forms with related meanings greatly expands the pool of forms one is drawing from and unless one has a huge number of such (which one rarely does), including such forms increases the possibility that the set of possible reflexes posited is no better than chance.

5. The role of personal pronouns in determining likelihood of a group belonging to TNG

Historically, pronouns have played a large role in how groups are assessed for membership in TNG. One of the claims of this paper is that they have played a much larger role than they should. As background for my reasons for claiming this, consider different stages in the continuum of where two languages or two groups of languages diverge over time. What I will call Stage 1 involve cases where the two groups are sufficiently close, where it is easy to do serious comparative work, identifying cognates and sound correspondences. At Stage 2, the two groups have diverged further, where it is not quite as easy to do serious comparative work, but it is still possible to do so with enough work. At Stage 3, the two groups have diverged to the point where serious comparative work is far more difficult, but where there are enough cognates to make the relationship relatively uncontroversial, but not enough to identify sound correspondences with any degree of confidence and where it is difficult to rule out borrowing or accident as a source for at least some apparent cognates. I would characterize Trans-New Guinea as a level of divergence at State 3. At Stage 4, the number of surviving cognates is very small, too few for one to be able to decide that they are cognates rather than borrowing or accidental resemblance and too few to seriously claim a genealogical relationship. Because of the difficulty deciding which forms are cognate and the possibility that there are other groups that are related but for which there are no surviving cognates, I will refer to a set of languages at Stage 4 as an undetectable family. Finally, at Stage 5, there are no surviving cognates.

The stage that is crucial for present purposes is Stage 4. I am not suggesting that we should be proposing families when the divergence is that great and the shared forms that small. Rather, what I am proposing is that when examining the extent of a family at Stage 3, one must not rule out the possibility that some of the resemblant forms are not actually cognates of that family but rather cognates at a deeper level, of an undetectable family at Stage 4. In fact, it is likely that there will often be cognates of an undetectable family.

The ideas just expressed are relevant to determining the extent of Trans-New Guinea for the following reason. Because personal pronouns, especially first and second person pronouns, are among the most conservative forms crosslinguistically, one must be wary of the possibility that some Papuan groups will have TNG-like pronouns, not because these groups are TNG but rather because they are related to TNG within some undetectable family. The assumption by various writers, including Pawley (2005) and Ross (2005), that pronouns serve as a useful diagnostic for a group being TNG, is thus strictly speaking not valid, since one cannot tell from pronouns alone, whether a group with TNG-like pronouns is a daughter of TNG or a sister of TNG.[10] To show that a group belongs to TNG, one needs further evidence. If a group has TNG-like pronouns, but the other resemblances are no better than chance, then the group is probably related to TNG, but one where we do not have evidence that it belongs to TNG rather than being related to TNG at a deeper level.

An analogy is useful here. The 1SG and 2SG pronouns have been reconstructed for Proto-Uralic as *mi* and *ti* respectively (Aikio 2022). If we were just looking at these pronouns and considered pronouns as evidence for membership in a family, we might take this as evidence that Uralic languages are Indo-European. But it is only by examining further evidence that we decide that Uralic is not Indo-European. It might reflect an undetectable family that Indo-European and Uralic belong to (or Nostratic if one considers there to be evidence for such). But just looking at the pronouns provides us no way to decide whether Uralic is a daughter of Indo-European or a sister.

In assessing the evidence for various groups belonging to TNG below, therefore, I exclude pronouns. If the number of possible reflexes of Proto-TNG forms other than pronouns in a given group is no better than chance, then we do not have evidence that the group is TNG. This is not to say that pronouns are completely irrelevant. If a particular group shows possible reflexes of Proto-TNG forms that *is* better than chance, then having TNG-like pronouns strengthens the case. And shared innovations in pronouns can provide possible evidence of subgrouping. There are actually a few other protoforms of Pawley's where a similar issue arises because one finds other Papuan groups that nobody considers TNG that exhibit similar forms. In the next section, I discuss one of these, namely forms for 'louse'.

6. Forms for 'louse'

Pawley's reconstruction for 'louse' is *(n)iman*. But one finds similar forms in many non-TNG Papuan groups. For example, Pawley's protoform *niman* bears striking similarity to Foley's (2005: 134) reconstruction for 'louse' in Proto-Sepik, *nim*. And the representative forms in the Sko family listed in Table 5 for each of the four Sko subgroups suggest that 'louse' in Proto-Sko was something like *nipi*.

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[10] Despite what I have said here, I believe that Malcolm Ross's study of pronouns in Papuan languages (Ross 1995, 2005) was appropriate given the modest goals of his study. In other words, it made sense to focus on pronouns as a preliminary way of hypothesizing what was TNG and what was not. The argument given here that the use of pronouns is problematic simply means that eventually, it is important not to overly rely on pronouns.

Serra Hills	*ni, nip, nipi*
Warapu	*mi*
Western Sko	*pi, fi, pĩ*
Isaka	*ẽĩ*

Table 5
Forms for 'louse' in subgroups of Sko family

Table 6 shows similar forms in every branch of the Torricelli family (other than Bogia, whose status as Torricelli is highly questionable).[11]

West Wapei	*muni, moni, munola*
Central Wapei	*nəmk, nəmeiləm, nimim*
East Wapei	*nəmaŋgar, namkar*
West Palei	*ɲmulol*
East Palei	*ɣmunə, ɣmul*
Wanap	*ɲiməl*
Urim	*nmin*
Urat	*ŋumbu*
Kombio	*ɲumək, niumukn, ɲumukŋun*
Arapeshan	*numunəl, nəmaŋgof*
Wom	*numulɛ*
Maimai	*ɣomata*
Marienberg	*nəmi, ɲumo, ɲɛm, ɲimi*

Table 6
Forms for 'louse' in subgroups of Torricelli family

Table 7 illustrates forms for 'louse' in other Papuan groups that bear some similarity to the first part *(n)im* in Pawley's reconstruction for 'louse' in Proto-TNG.[12]

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[11] The set of Torricelli subgroups in Table 6 assumes a classification of the Torricelli family that I will defend in work that is currently in preparation.
[12] In both Tables 7 and 8, the forms cited may not occur in all languages in the group in question.

Tayap	*nəm*
Piawi	*nəma*
Eastern Trans-Fly	*nem, bənəm*
Yei (Yam)	*nim*
Kanum (Yam)	*nɛmpin*
Nambu (Yam)	*yaneme, ianami* (2 lgs)
Pyu	*ni*
Yawa	*em, eme*
Mpur	*im*

Table 7

Forms for 'louse' in other non-TNG groups that resemble the first part *(n)im* of Pawley's protoform **(n)iman*

Similarly, Table 8 illustrates forms for 'louse' in other Papuan groups that resemble the second part *man* in Pawley's reconstruction for 'louse' in Proto-TNG.

Senagi	*manə, mani*
Baibai-Fas	*muni, monbur*
Keram	*mən, mwani, mon, mimin*
Ramu-Lower Sepik	*amuin, mənam* (only in Annaberg subgroup)
Waia	*tamani*
Pahoturi	*monda*

Table 8

Forms for 'louse' in other non-TNG groups that resemble the second part *man* of Pawley's protoform **(n)iman*

Some of these similarities, perhaps many of them, are probably accidental. But there are too many Papuan families with forms like this for it to be a coincidence. I think that the most likely explanation is that at least some of them are cognates in an undetectable family. But we have no way of knowing which of them would be such and which are simply coincidental.

One reason for believing that some of these similar forms for 'louse' are cognates in an undetectable family is the results of a study of the relative stability of words in the Swadesh 100 by Holman et al (2008), where words in the Swadesh 100 are ranked according to how frequently similar forms are found in different branches of established families throughout the world. While pronouns are not surprisingly very high on that list, the meaning that Holman et al report as most stable is 'louse'. In other words, we should expect to find instances of similar forms for 'louse' at Stage 4 in the divergence of languages. This makes it likely that at least some of the similar forms for 'louse' in non-TNG families that are similar to those in TNG are cognates in an undetectable family. But whatever the explanation is for the frequency of forms in non-TNG families that resemble forms in TNG languages, this means that having a form for 'louse' in a language group that resembles Pawley's proposed protoform for Proto-TNG provides little reason to think

that that group is TNG. For example, when Pawley and Hammarström cite Gogodala *am* 'louse' as a possible reflex of Proto-TNG *(n)iman*, this provides little evidence that Gogodala is TNG, especially since the form *am* differs from *(n)iman* more than many of the forms for 'louse' in the data above for non-TNG families. For these reasons, the counts of possible reflexes of Proto-TNG forms given below exclude pronouns and 'louse'.[13]

7. Evaluating membership in TNG

The full table of scores for all groups, including both those that Pawley and Hammarström classify as ones for which the evidence for membership in TNG is relatively strong and those which they classify as ones for which the evidence is relatively weak quite long, so I will leave the full table to Appendix 2. Here I will extract a set of subsets in separate tables. Table 8 shows a subset to illustrate how I divide the groups into three categories, separated by two thick lines.[14] For reasons to be explained shortly, what defines the three categories is as follows. The highest category is those groups with a score of 9.9 or higher. The lowest category is those groups with a score of of 8.3 or less. The intermediate category is those groups with a score less than 9.9 but more than 8.3. In the remainder of this paper, I will refer to these three categories of groups as the highest category, the intermediate category, and the lowest category.

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[13] There are four other proposed protoforms of Pawley's where we also find similar forms in some non-TNG groups, namely *amu* 'breast', *na* 'eat, drink', *ma* 'not' and *inda* 'tree, fire'. Whether these similarities are sometimes cognates in an undetectable family is unclear. In the case of *amu* 'breast', an additional factor is the frequency of [m] in words for 'breast' in languages around the world. And in the case of *na* 'eat, drink', one factor is the fact that *na* is possibly the most common syllable among the languages of the world. But whatever the reason, having forms that resemble these protoforms provides limited evidence for groups belonging to TNG. Note that this does not bring into question Pawley's proposed protoforms for these meanings (including pronouns and 'louse'); it just means that forms that are similar to these protoforms do not provide a good basis for thinking that a group is TNG. I also exclude forms for 'dog' because dogs most likely arrived with the Austronesians and hence forms for 'dog' may be borrowed.

[14] The non-integer values in Table 8 (and other tables below) arise partly due to the fact that I assign values less than 1 if a possible reflex is found in only one subgroup of a group and partly due to the fact that I normalize the values for groups where I lack data for some meanings.

Madang	22.67
Chimbu-Wahgi	20.83
Awyu-Ok	20.25
Enga-Kewa-Huli	16.00
Kiwaian	14.73
Paniai Lakes	12.56
Turama-Kikorian	12.50
Dani	11.93
East Strickland	11.90
Gogodala-Suki	10.25
Anim	10.00
Manubaran	9.86
Greater Binanderean	9.83
Nuclear South Bird's Head	8.50
Fasu	8.30
Asmat - Kamrau Bay	8.17
Bogaya	8.15
Mailuan	7.32
Duna	7.00
Kwalean	7.00
Kolopom	6.62
Mek	5.67
Kayagaric	4.67

Table 8
Number of possible reflexes of Proto-TNG forms for a sample of groups, illustrating how
I divide the groups into three categories, separated by thick lines

As just noted, the groups in the lowest category of Table 8 are those whose score is 8.3 or less. These groups are ones for which the data examined here provide little evidence for membership in TNG. This conclusion is based on analogous scores for a set of 34 groups (including isolates) that nobody claims belong to TNG and that Glottolog treats as independent of each other. The 34 groups are listed in Table 9, along with their scores. In other words, I applied the same methodology of computing scores for these non-TNG groups as I did for putative TNG groups. although I assume that in most cases, the forms that I count as looking like possible reflexes are simply coincidental resemblances.[15]

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[15] Strictly speaking, some of the resemblant forms that form the basis of the scores in Table 9 could be due to loans from TNG languages or cognates in an undetectable family. This does not seem relevant to the use I make of this data.

Abun	8.30	Senagi	3.70
Border	7.67	Guriaso	3.50
Yale	7.40	Palei	3.50
North Halmaheran	6.83	Walioic	3.24
Nimboran	6.50	Keram	3.17
Left May	5.50	Taiap	3.05
Kwerba	5.25	Morwap	3.05
Pahoturi	5.00	Anem	3.00
Ram	4.75	Hatam-Mansim	3.00
Sko	4.50	East Lakes Plain	2.59
Bulaka River	4.50	Sulka	2.33
Eastern Trans-Fly	4.50	Yawa	2.25
Geelvink Bay	4.45	Ata	2.04
Yuat	4.32	Kol	2.00
Baibai-Fas	4.15	East Bird's Head	1.50
Baining	3.83	Kebar	0.00
Lower Sepik	3.80	Massep	0.00

Table 9
Number of what look like possible reflexes of Proto-TNG forms in non-TNG groups

The scores in Table 9 simply reflect the frequency with which one can find accidental resemblances to Proto-TNG simply due to chance. Recall Table 2 above, which listed what look like possible reflexes in Yale simply due to chance; Yale has the third highest score in Table 9, based on the forms in Table 2.[16]

    The highest score in Table 9 is 8.30 for Abun (spoken on the Bird's Head). The median value for these groups is 4.24. Again, I am assuming that none of these groups is TNG and that the scores reflect nothing more than what one might find due to chance. But the groups in the lowest category in Table 8 all have scores of 8.30 or less and thus have scores similar to those found with groups that nobody claims are TNG. In other words, if we exclude pronouns and forms for 'louse', these groups in the lowest category in Table 8 are ones where the number of forms that look like reflexes of Proto-TNG forms is no better than chance.[17] Many of these do have pronouns or forms for 'louse' that look like reflexes of Proto-TNG forms, but following the arguments given above, the data here provide no

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[16] There are nine Yale forms in Table 2 above that look like Proto-TNG forms, but two of them are for protoforms that I ignore in computing the scores in Tables 8 and 9 (and other tables below) because I found possible reflexes of those protoforms in fewer than 3 out of 38 groups that Pawley and Hammarström treat as ones for which the evidence for membership in TNG is relatively strong. That leaves seven forms in Yale. The score of 7.40 in Table 9 is an adjustment from 7 by normalizing the data due to gaps in the Yale data.

[17] Some people might question the looseness I use in identifying possible reflexes of Proto-TNG forms. There are two things to bear in mind with respect to this. First, I believe that the looseness is comparable to that used by Pawley (judging from examples cited by Pawley and Hammarström) and is necessary to do justice to his claims. Second, since I apply the same level of looseness in judging what look like possible reflexes of Proto-TNG forms in the non-TNG languages, the looseness does not affect comparing scores in putative TNG groups to scores in non-TNG groups.

basis for deciding whether these groups are daughters of TNG or just related to TNG. Table 10 gives a full list of thirteen groups that Pawley and Hammarström classify as ones for which evidence for TNG membership is relatively strong, but which the data here provide little basis for treating as TNG, since, apart perhaps from pronouns and words for 'louse', they show reflexes of Proto-TNG forms that are no better than chance.[18]

Fasu	8.30
Asmat - Kamrau Bay	8.17
Bogaya	8.15
Mailuan	7.32
Duna	7.00
Kwalean	7.00
Kamula-Elevala	7.00
Kolopom	6.62
West Bomberai	6.25
Mek	5.67
Moraori	4.68
Kayagaric	4.67
Mulaha	4.23

Table 10
Thirteen groups that Pawley and Hammarström classify as groups for which the evidence for membership in TNG is relatively strong but where the data here finds little evidence for membership in TNG

The highest category of groups in Table 8, those above the higher of the two thick lines are those with a score of 9.9 or higher. What distinguishes these from the other groups is that these are ones for which there is less than one chance in 1000 of finding such scores due to chance and hence are groups for which the data here provide relatively strong evidence for membership in TNG.[19] A full list of these is given in Table 11.

[18] Pawley and Hammarström treat Elevala and Kamula as unrelated, classifying Elevala as a group for which the evidence for membership in TNG is relatively strong and Kamula as a language for which there is little evidence for membership in TNG. However, Glottolog now treats these two groups as forming a single family, Kamula-Elevala, following Suter and Usher (2017). Since Pawley and Hammarström treat Elevala as a group for which the evidence for membership in TNG is relatively strong, I take the liberty of treating Kamula-Elevala as a group which Pawley and Hammarström classify as a group for which evidence for membership in TNG is relatively strong.

[19] The level of statistical significance cited here uses the data in Table 9 from non-TNG groups as a basis for determining how many forms that look like possible reflexes of Proto-TNG forms one is likely to find due to chance. More specifically, the scores of Table 9 were used to generate a normally distributed probability distribution for randomly obtaining a certain score, x, based on the mean mu = 5.367 and standard deviation sigma = 1.425 of these scores. A probability for a given value of x is was then obtained using the pnorm() function of R, as follows: pnorm(x, mu, sigma, lower.tail = FALSE). A score of 9.9, for instance, has a probability of 0.000998, i.e. $p < 0.001$.

Madang	22.67
Chimbu-Wahgi	20.83
Awyu-Ok	20.25
Enga-Kewa-Huli	16.00
Kiwaian	14.73
Dagan	14.55
Yareban	14.17
Finisterre-Huon	13.92
Kainantu-Goroka	13.50
Wiru	13.00
Bayono-Awbono	***12.83***
Angan	12.67
Paniai Lakes	12.56
Turama-Kikorian	12.50
Dani	11.93
East Strickland	11.90
Koiarian	11.59
Goilalan	11.42
Bosavi	11.00
Somahai	10.73
Fuyug	10.38
Foe	10.38
Gogodala-Suki	10.25
Damal	***10.10***
Anim	10.00

Table 11
Groups in the highest category along with the number of possible reflexes of Proto-TNG forms, where the number of possible reflexes is sufficiently high that they are unlikely to be due to chance

Two of the groups in Table 11, Bayono-Awbono and Damal, shown in bold italics, are ones that Pawley and Hammarström classify as ones for which evidence for membership in TNG is relatively weak. But the data here provide relatively good evidence that they are TNG. In fact, only 10 of the 38 groups which Pawley and Hammarström classify as ones for which the evidence for membership in TNG is relatively strong have a higher score than the score for Bayono-Awbono, 12.83.

The intermediate set of groups are those whose scores are higher than all the scores for the non-TNG groups in Table 9 but differ from the groups in the highest category to an extent that there is more than one chance in a thousand for finding such scores due to chance. While demanding one chance in 1000 may seem like a high bar for groups to reach, there are two reasons why I use that bar here. One is that I am using this test a large number of times, not only for all the groups considered here but also in a number of further tests below. The second reason is that I assume that treating a group as TNG when it is not is a more serious error than failing to treat as TNG a group that actually is TNG. The cutoff

value for scores corresponding to this level is statistical significance is just below 9.9. Any value of 9.9 or higher satisfies this cutoff value and counts as falling in the highest category; any value less than 9.9 falls short of falling in the highest category.

There are only three groups in the intermediate category, given in Table 12, including one group marked with an asterisk (Nuclear South Bird's Head) which Pawley and Hammarström classify as one for which the evidence for membership in TNG is relatively weak. I treat all three groups in Table 12 as ones for which the evidence for membership in TNG is weak, although I will provide other evidence immediately below that the first two of these groups are in fact TNG.

Manubaran	9.86
Greater Binanderean	9.83
*Nuclear South Bird's Head	8.50

Table 12
Intermediate category of groups, those with scores better than all the non-TNG groups, but where there is more than one chance in a thousand of finding these scores due to chance

8. How reliable are Pawley's reconstructions for Proto-TNG?

This paper depends heavily on Pawley's reconstructions for Proto-TNG. It should be emphasized, however, that because of the remoteness of TNG and the paucity of data for most putative TNG languages, that his reconstructions are not based on application of the comparative method in any strict sense but are highly speculative, being largely best guesses based on similar forms in different groups, without, in general, the possibility of identifying regular sound correspondences. Furthermore, in order to apply the comparative method in a strict sense, we would first need to reconstruct the protolanguages for each group and base the reconstruction of proto-TNG on these. But such work has in general not been done. While it is true that Pawley's reconstructions
are not based on the comparative method in any strict sense, there are reasons why issues surrounding the reliability of his reconstructions are not a serious problem for the claims of this paper. The primary reason is based on the fact that for the majority of groups that Pawley and Hammarström classify as ones for which the evidence for membership in TNG is relatively strong, I found there to be less than one chance in a thousand of finding the number of possible reflexes of his protoforms simply due to chance. What this entails is that there is something right about at least some of his reconstructions. In other words, for these groups, finding as many possible reflexes of Pawley's protoforms as I found entails that there is a pattern of similarities across these groups that is very unlikely to be accidental. This does not mean that the precise form of his protoforms is correct, but only that there are forms across a number of putative TNG groups that bear a resemblance to his protoforms. Another way of putting it is that Pawley's protoforms can be interpreted, not as protoforms per se, but simply as characterizations of what is shared among similar forms across different groups.

Consider, for example, the forms in Table 13 that this paper treats as possible reflexes of Pawley's protoform *imbi* for 'name'.[20]

Group	Possible Reflexes	Score
Madang	imbi, mbɛ, ibe	1
Engan-Kewa-Huli	mbi, bi, mini	1/2
Chimbu-Wahgi	bi, imbi, embem	1
Kainantu-Goroka	bi, wi, abiqi	1/2
Angan	ampə	1/2
Awyu-Ok	pi, fi, ip	1/2
Bayono-Awbono	ɛmbi, pi	1
Fuyug	if	1
Goilalan	apete	1/2
Bosavi	wi	1/2
Koiarian	ivi, ive, ihi	1
Yareban	ibi, ifu, ihu	1
Mailuan	imu, omu, nim	1
Dagan	ebo	1/6
Wiru	ibini	1
Bogaya	əmiñ	1
Kiwaian	ipayna, paina	1

Table 13
Possible reflexes of Proto-TNG *imbi* 'name'

If we examine the forms in Table 13 and attempt to characterize what is common to them, we find many forms that take the form VBV, where V is a vowel and B is a labial sound (where for the purposes of this, I am treating <mb> and <mp> as single sounds). A number of forms that do not conform to this are similar but lack an initial vowel (like *pi*). A few forms do not conform only is lacking a second vowel (like *if*). Among the forms that have the initial vowel, there are nine groups that have forms with <i> as the initial vowel, three groups that have <a> as the initial vowel, two groups that have <e> as the initial vowel, one that has <ɛ> as the initial vowel, and one that has <ə> as the initial vowel. So <i> is more common than all other vowels combined. Similarly, there are seven groups that have forms with <b> as the labial consonant, four groups that have <mb> for this, three with <p>, three with <f>, three with <m>, two with <w> and one with <v>. Finally, we find eleven groups that have forms where the vowel following the labial consonant is <i>, three where this is <e>, two where it is <u>, one group each for <ɛ>, <ə>, <ay>, and <ai>. There are also seven groups with forms where there is additional material following the VBV, though given the nature of the data available, we cannot know whether some of this is

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[20] The numbers in the column labeled 'Score' in Table 13 illustrates the method for computing scores for meanings and for groups outlined in §3. For example the score of 1 for Madang is based on the fact that I found possible reflexes in at least two of the highest branches of Madang, while the score of 1/2 for Enga-Kewa-Huli means that I found possible reflexes in only one of the two primary branches of this group.

suffixes and not part of the root meaning 'name'. Among forms that have this additional material, there are three groups with forms where the first consonant of the additional material is <n>, one where it is <m>, one where it is <ñ>, one where it is <t>, and one where it is <q>. If we put together a summary form that includes the most frequent sound in each position, we come up with *ibi[n]*, which is similar to Pawley's protoform **imbi*. The point is that Pawley's protoforms can be interpreted, not a protoforms per se, but as forms that simply summarize the similarity among the forms in question. In this sense, they are strictly speaking synchronic summaries rather than diachronic protoforms. And what I am calling reflexes of Pawley's protoforms are really just instances of forms within sets of similar forms that can be characterized by summary forms.

In this sense, the fact that Pawley's protoforms are not arrived at by means of strict application of the comparative method does not really matter and the issue of how reliable they are as protoforms does not arise. All that matters is whether there are sets of similar forms that can be summarized by his protoforms and whether they are good summary forms. Ultimately, of course, we would like to have well-motivated protoforms based on strict application of the comparative method. But given the fact that such is not possible at this time (if it ever will be), these summary forms are the most useful way to summarize patterns of similarity in order to evaluate possible membership in TNG.

9. Evidence for membership in TNG from evidence for subgrouping

Although there are 23 groups in the highest category in Table 11 that Pawley and Hammarström classify as ones for which the evidence for membership in TNG is relatively strong, there are 15 groups that Pawley and Hammarström so classify but for which the evidence discussed so far falls short by my criteria, the thirteen groups in Table 10 and the two groups in Table 12 not marked with an asterisk. It turns out, however, that for six of these thirteen groups, there is other evidence for membership in TNG. This is evidence by triangulation or chaining. Namely, for these six groups, there is good evidence that they are related to other groups for which I find that the evidence for membership in TNG is strong, in other words, groups in the highest category, listed in Table 11.

9.1. Foe and Fasu

The first instance of evidence by triangulation involves Fasu, which falls into the lowest category, with a score of 8.3, although this is the highest score for groups in the lowest category and is in fact equal to the score for Abun, the non-TNG group showing the highest score. But there is evidence that Fasu falls in a subgroup with Foe.[21] Table 14 shows pairs of forms in the two languages that exhibit some similarity.

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[21] Franklin (1968, 2001) argues for these being related, referring to the group consisting of them as Kutubuan.

Foe	Fasu	Gloss	Foe	Fasu	Gloss
akay	gi	'tooth'	keame	game	'yellow'
amano	amena	'person'	kiki	kigi	'bone'
anuni	nano	'1sg'	mãiyã	mãi	'flesh'
aru	aru	'tongue'	meno	menage	'one'
asera	ere	'see'	musu	musuʔũnu	'smoke'
epa	ibu	'who'	ne	naʔa	'2sg'
fa	wae	'not'	nena	ni	'eat, drink'
hãẽ	hae	'seed, egg'	oko	hege	'moon'
hemakapura	kama	'know'	pikinu	bagiʔõ	'root'
hĩ	i	'eye'	pikiri	buru	'pikiri'
himu	gamuʔu	'heart'	samano	mano	'small'
hoko	oʔo	'breast'	sape	sabe	'nose'
ikya	iga	'path'	sisipu	sisibu	'hot'
ira	ira	'tree'	sonani	surari	'sand'
kakuna	gaʔanwa	'knee'	su	sunage	'all'
kasa	gesã	'dog'	uni	ũ	'head'
kasoko	kasyaʔo	'liver'	yano	yafo	'name'
kaw	kaʔo	'bark, skin'			

Table 14
Similar forms in Foe and Fasu

I have included the forms for 'dog' in Table 14, but I will ignore them here, given the possibility that the similar forms reflect borrowing, as noted above. There are 34 other pairs in Table 14 and since there are gaps in my data for eight of the meanings in the Swadesh 100 and since I have excluded the forms for 'dog', this means that for 34 out of 91 meanings in the Swadesh 100 (or 38%), there are similar forms in Foe and Fasu. It would be quite unusual to have this many loans, so this probably reflects a genealogical relationship. For this reason, I conclude that there is sufficient evidence for treating Fasu as TNG, despite its falling in the lowest category.

9.2. Mek and Somahai

Another group which lacks significant possible reflexes of Proto-TNG forms, but which shares considerable basic vocabulary with a group that does, is Mek, which shares vocabulary with a small group Somahai, which consists of two languages, only one of which I am aware of data from, namely Momuna. Mek exhibits an especially small number of possible reflexes of Proto-TNG forms, less than many non-TNG groups, so that what it does exhibit is no better than chance. But Somahai is in the highest category, with a score of 10.73 in Table 11. Table 15 shows pairs of forms shared by Somahai and Mek. In this table, I give a form from a Mek language that most resembles a Somahai form with that meaning, plus the name of the language that the form comes from, plus the score in terms of how widely the form is found in the Mek group[22].

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[22] There is no column labeled 'Language' for Somahai since all the Somahai forms come from Momuna. The notation *1/x* in the columns labeled 'Score' means that similar forms are found in only one of the groups,

Somahai		Mek			Gloss
Form	Score	Form	Language	Score	
na	1	na	Kosarek Yale	1	'I'
ami	1	ami	Kosarek Yale	1	'louse'
mown	1	mowm	Eipomek	1	'breast'
si	1	si	Nalca	1	'name'
de	1/2	de	Nalca	1/2	'eat'
ini	1	ni	Kosarek Yale	1	'all'
mu	1	mo	Una	1	'rain'
doku	1	dok	Nalca	1	'egg'
kun	1	kan	Una	1/2	'you'
ane	1	ano	Kosarek Yale	1	'that'
te	1	ate	Una	1	'hand'
bu	1	buk	Nalca	1	'sit'
ka	1	kal	Kosarek Yale	1/2	'tree'
ɲa	1/2	ɲi	Una	1	'person'
ma	1	maka	Una	1/2	'bird'
bou	1	bobo	Kosarek Yale	1/2	'hot'
mi	1	mun	Eipomek	1	'belly'
menei	1/2	me	Una	1	'water'
ke	1	keyl	una	1	'stone'
kukwa	1	ukwe	Eipomek	1	'fire'
tɛkitikiti	1/2	tegen	Ketangban	1	'one'
kɛ	1	kala	Una	1/2	'skin'
ebe	1/2	amwe	Eipomek	1	'tail'
toko	1	usok	Kosarek Yale	1	'head'
kwɛ	1	ue	Una	1	'nose'
meima	1	mab	Kosarek Yale	1	'sleep'
take	1	tekman	Eipomek	1	'stand'
eke	1	heŋ	Nalca	1/2	'sun'
de	1/2	doa	Kosarek Yale	1	'cloud'
yamu	1/2	ʔama	Kosarek Yale	1/6	'ashes'

Table 15
Similar forms in Somahai and Mek

The available data for Somahai that I am aware of is incomplete and lacks data for 26 of the meanings in the Swadesh-100. Excluding words for 'dog' as explained above, this means that I have data for 73 of the meanings in the Swadesh 100. Since Table 15 contains pairs for 30 meanings in the Swadesh 100, this means that there are similar pairs for 30 out

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while *1* means that it is found in at least two subgroups. The scores of *1/2* for Somahai reflect cases where my Momuna data includes two distinct forms for a given meaning, only one of which resembles a form in Mek. The score of *1/6* for the Mek form *ʔama* 'ashes' arises because this form is found in only one of the two main branches of Mek and is found in only one of the three languages in that branch for which I have data.

of 73 or 41% of the available meanings in the Swadesh 100. As with Foe and Fasu, it would be unusual to find this many similar pairs due only to borrowing. Additional evidence for a subgroup containing Somahai and Mek is provided by Usher (2022a).

9.3. Mailuan, Manubaran, Kwalean, and Mulaha

The next set of groups that can be argued to belong to TNG on the basis of similarities to groups in the highest category involve a possible Southeast Papuan subgroup originally proposed by Dutton (1969: 4).[23] Fig. 1 shows a set of connections among groups that may belong to this Southeast Papuan group; each pair of groups connected by a line is one where the probability of their sharing the amount of basic vocabulary they do by chance, compared to other TNG groups, is less than .001.
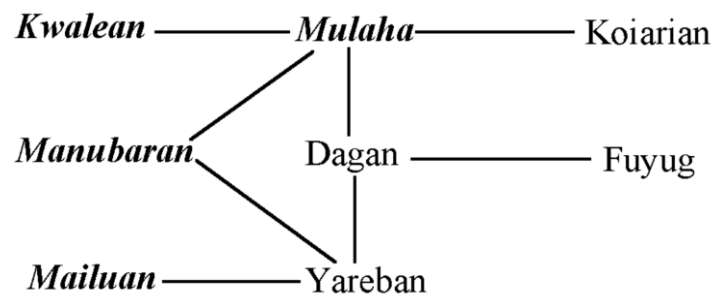

Fig. 1
Pairs of groups in a putative Southeast Papuan subgroup of TNG that show significant amounts of shared basic vocabulary

As above, in making these calculations, I compared these pairs of groups to pairs involving these and groups that Pawley and Hammarström classify as ones for which there is relatively strong evidence that they belong to TNG. But I excluded forms that look like possible reflexes of Pawley's protoforms for TNG, so that the result provides evidence for a subgrouping within TNG. The four groups whose names are in bold italics are groups that are in either the intermediate or the lowest category, while the groups whose names are in normal font are ones in the highest category.[24] For the majority of pairs of groups in this possible Southeast Papuan group, the amount of shared vocabulary falls short of the .001 cutoff and in many cases is no better than chance.

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[23] Dutton (1969) simply described a number of groups in the area as distantly related, including Koiarian, Kwalean, Manubaran, and Yareban, though he specifically excludes Mulaha, but also includes Goilalan and Binanderean, neither of which I find evidence for in the data examined for this paper. Wurm (1971) labels the group the South-East New Guinea phylum. The term Southeast Papuan is that used by Ross (2005), though Ross describes it only as a possible subgroup of TNG. Dutton and Ross include Goilalan, while Wurm (1971) does not; as just noted, the data examined for this paper do not show evidence of Goilalan belonging to this group.

[24] Manubaran is in the intermediate category, the other three in the lowest category.

As mentioned above, two of the groups in Fig. 1 are single languages that on the standard classification belong to other groups, but where the evidence in my data do not support this. One of these is Mulaha, which on the standard classification is Kwalean, but in my data Mulaha actually shares more basic vocabulary with Dagan, Koiarian, and Manubaran than it does with Kwalean.[25] The other is Fuyug, which on the standard classification is a Goilalan language, but which in my data shows more shared vocabulary with Dagan than it does with Goilalan.[26]

Of the four groups in bold italics in Fig. 1, perhaps the strongest evidence for membership in a Southeast Papuan group is Mailuan. Although I find it is linked significantly to only one group, Yareban, Mailuan actually shares far more vocabulary with Yareban than both Mailuan and Yareban share, not only with other TNG groups, but also with the other groups in Fig. 1. Hence, this evidence is not only possible evidence for Mailuan belonging to a Southeast Papuan subgroup of TNG, but also evidence for a Mailuan-Yareban subgroup within Southeast Papuan.[27]

The evidence for Mulaha being TNG is next strongest since Fig. 1 shows it sharing significant basic vocabulary with two groups in the highest category, namely Dagan and Koiarian, as well as two groups in the lowest category, Kwalean, and Manubaran.

The evidence for Manubaran being TNG is based on its sharing basic vocabulary with both Yareban and Mulaha. It also has more possible reflexes of Proto-TNG forms than the other three groups discussed in this section, falling in the intermediate category just short of the cutoff for the highest category. Although Mulaha is in the lowest category, the evidence for it being TNG means that any group sharing basic vocabulary with it, like Manubaran, is also likely to be TNG. The weakest case in Fig. 1 is Kwalean, since it is only with Mulaha that it shares a significant amount of basic vocabulary.

It must be conceded that the evidence for these four groups belonging to TNG is weaker than the evidence for Foe-Fasu and Mek-Somahai. The fact that we only find significant amounts of shared basic vocabulary with only certain pairs of possible Southeast Papuan groups suggests that some of this shared vocabulary may be borrowed. This is especially the case with Kwalean, since it only shares significant vocabulary with

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[25] The idea that Mulaha is not a Kwalean language in implicit in Dutton (1969), who describes Mulaha as a language isolate unrelated to other groups in the area, including Kwalean. The data examined for this paper does, however, suggest that it is related to the other groups in the area. Timothy Usher at his NewGuineaWorld web site says it is not clear whether Mulaha is Kwalean or co-ordinate to it, though if the latter, he proposes that it forms a subgroup with Kwalean, but the data I examined for this paper suggests that it is at best co-ordinate at the level of Southeast Papuan.

[26] Fuyug does share some basic vocabulary with Goilalan, more than it shares with other TNG groups and even more than a number of other putative Southeast Papuan groups, but still considerably less than it shares with Dagan and with an amount that falls considerably short of the .001 cutoff that characterizes each of the pairs of groups in Fig. 1. Whether the vocabulary shared by Fuyug and Goilalan is due to borrowing is unclear.

[27] In calculating the amount of vocabulary shared by Mailuan and Yareban, I excluded one Mailuan language, Bauwaki, since it is clear that it has borrowed considerably from Yareban. Wichmann (2012) proposes a family consisting of just Mailuan and Yareban.

one language, Mulaha, and the evidence for Mulaha being TNG is based on shared vocabulary with Koiarian and Dagan, and not on possible reflexes of Proto-TNG forms.

9.4. Greater Binanderean

The final group that I will discuss that falls short of the .001 cutoff defining the highest category is Greater Binanderean, which falls in the intermediate category. There is reason to believe that it is TNG, but for somewhat different reasons than the reasons given above for Fasu, Mek, and the putative Southeast Papuan groups. Namely, the argument is based on a difference within Greater Binanderean, which consists of two subgroups, a single language Guhu-Samane and a Binanderean (Proper) group. The larger group Greater Binanderean has a score of 9.83, just shy of the cutoff point of 9.9 But when we compute the scores for Binanderean and Guhu-Samane separately, we find a significant difference. Namely Binanderean has a score of 13.92, while Guhu-Samane has a score of only 5. Binanderean's score of 13.92 not only places it in the highest category, but is higher than the majority of groups in the highest category (tied with Finisterre-Huon for sixth place). On the basis of this, I classify Greater Binanderean as TNG.

10. Other possible subgroups of TNG

In this section, I provide data on the groups that Pawley and Hammarström classify as ones for which the evidence for membership in TNG is relatively weak. As noted above, two of these groups, Bayono-Awbono and Damal, have scores that place them in the highest category. Table 16 gives the scores for the other groups that Pawley and Hammarström classify as ones for which the evidence for membership in TNG is relatively weak, with their scores. One group, Nuclear South Bird's Head, has a score that places it in the intermediate category, while the others all fall into the lowest category, thus supporting Pawley and Hammarström's classifying these groups as ones for which the evidence for membership in TNG is relatively weak (although all of these groups exhibit scores higher than the median value for non-TNG groups in Table 9 above).[28]

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[28] Note that Table 16 separates Nuclear South Bird's Head from Inanwatan and Konda-Yahadian, following the Glottolog classification. While the data examined here does not provide a basis for considering any of these three groups as TNG, the data examined for this study does provide evidence that these three groups are probably related. Pawley and Hammarström treat these three groups as forming a single South Bird's Head group, though they classify this group as one for which the evidence for membership in TNG is relatively weak.

Nuclear South Bird's Head	8.50
Timor-Alor-Pantar	7.75
Tanahmerah	7.67
Pauwasi	7.25
Teberan	7.01
Komolom	6.50
Mairasic	5.77
Sentanic	5.25
Inanwatan	5.00
Konda-Yahadian	5.00
Pawaian	4.15

Table 16
Number of possible reflexes of Proto-TNG forms in other groups that Pawley and Hammarström classify as ones for which the evidence for membership in TNG is relatively weak.

Note that there is evidence that some of the groups in Table 16 are related either to each other or to groups that Pawley and Hammarström classify as groups for which there is relatively strong evidence for membership in TNG, but which fall in my lowest category. First, Usher and Schapper (2022) provide evidence that Timor-Alor-Pantar is related to West Bomberai (shown in Table 10 above). Second, Pawley and Hammarström treat Nuclear South Bird's Head, Inanwatan, and Konda-Yahadian as falling in a South Bird's Head group. And third, Usher and Suter (2020) provide evidence that Komolom is related to Asmat - Kamerau Bay. The data and methodology used for this paper supports all three of these groupings.

Pawley and Hammarström have a third category, of groups that some others have suggested are TNG but for which they claim there is little evidence to this. Table 17 shows the scores for these groups in this study, showing that all seven exhibit scores that are no better than chance.[29]

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[29] Pawley and Hammarström actually list Kaire-Narau rather than Kaire-Kosare, which is just one branch of Kaire-Kosare, arguing that there is insufficient evidence for grouping Kosare with Kaire-Narau. However, Glottolog now treats Kaire-Kosare as a family, based on evidence from Palmer (2020). Pawley and Hammarström include an eighth group in the category of groups for which there is little evidence for membership in TNG, namely Kamula, but this is included in a Kamula-Elevala group in Table 10 above.

Kaure-Kosare	6.50
Kaki Ae	5.19
Eleman	4.07
Dem	3.37
Purari	3.00
Mor	2.00
Porome	1.10

Table 17

Number of possible reflexes of Proto-TNG forms in groups that Pawley and Hammarström classify as ones that are sometimes claimed to be TNG, but for which they say there is little evidence for membership in TNG

The fact that these groups all have scores less than that found for the non-TNG group Abun supports Pawley and Hammarström's claim that there is little evidence for their being TNG.

11. Scores if we include pronouns and forms for 'louse'

For reasons discussed above, I have excluded pronouns and forms for 'louse' in determining the likelihood of a group belonging to TNG. I argued above that while inclusion of these forms might provide a basis for saying that a group was either TNG or related to TNG, they do not provide a basis for saying that a group is specifically TNG. However, it is worth examining the groups for which I found insufficient evidence for membership in TNG to see whether there is evidence for their being at least related to TNG. To do this, I performed a test similar to the one described above, comparing the scores for various groups for which I found insufficient evidence for membership in TNG with scores for non-TNG groups, but this time including forms for pronouns and 'louse'. Table 18 lists scores for groups that Pawley and Hammarström classify as groups for which the evidence for membership in TNG is relatively strong but for which I found insufficient evidence for membership in TNG, falling into either the intermediate or lowest categories (although I argued that some of these are TNG on the basis of evidence of subgrouping with groups in the highest category).

Manubaran	11.90
Bogaya	11.19
Greater Binanderean	10.83
Kolopom	10.68
Duna	10.00
Asmat - Kamrau Bay	9.83
Fasu	9.32
West Bomberai	9.25
Moraori	9.25
Kamula-Elevala	9.00
Kayagaric	8.80
Mek	8.67
Mailuan	8.35
Kwalean	8.00
Mulaha	6.86

Table 18
Number of possible reflexes of Proto-TNG forms, including pronouns and forms for 'louse', for groups that Pawley and Hammarström classify as ones for which evidence for membership in TNG in relatively strong (excluding those groups which were in the highest category when excluding pronouns and forms for 'louse')

Again, the thick black lines distinguish the highest, intermediate, and lowest categories, though the cutoffs defining the division into the three categories are a bit different since the cutoffs are based on comparison with the 34 non-TNG groups and the scores for some of the non-TNG groups increase if they exhibit pronouns or forms for 'louse' that resembles Proto-TNG forms. The non-TNG group with the highest score is still Abun, but now with a slightly higher score of 8.43, so this is the cutoff point distinguishing the intermediate and lowest categories in Table 18. The cutoff distinguishing the highest and intermediate categories is now 10.09.

Table 18 shows four groups that move into the highest category when we include pronouns and forms for 'louse'. Two of these are ones that I argued are TNG on the basis of arguments in §9, namely Manubaran and Greater Binanderean. But the other two groups, Bogaya and Kolopom, are groups that were in the lowest category when we do not include pronouns and forms for 'louse'. We can conclude that there is good evidence that these two groups are either TNG or at least related to TNG. Furthermore, there is evidence (some cited in §14 below) that Bogaya forms a subgroup with Duna, implying that Duna is also either TNG or a sister of TNG.[30]

There are eight groups in Table 18 in the intermediate category, all of which are in the lowest category if we exclude pronouns and forms for 'louse'. We can conclude that

[30] Usher (2022b) proposes that Kolopom forms a subgroup with Kayagaric. But apart from both having pronouns and forms for 'louse' resembling Proto-TNG forms, the data used for this paper show no sharing of basic vocabulary that is better than chance.

there is weak evidence that these groups are either TNG or related to TNG. The three groups in the lowest category in Table 18 are all ones that I argue in §9.3 are TNG on the basis of sharing significant amounts of basic vocabulary with groups in the highest category, in a possible Southeast Papuan subgroup of TNG. This means that there is at least weak evidence that all of the groups that Pawley and Hammarström classify as groups for which there is relatively strong evidence for their being TNG are either TNG or related to TNG.

Table 19 is similar to Table 18 in that the scores include possible reflexes of Proto-TNG pronouns and the form for 'louse'. However, it instead lists groups that Pawley and Hammarström classify as ones for there is relatively weak evidence for membership in TNG.

Nuclear South Bird's Head	10.50
Tanahmerah	10.04
Timor-Alor-Pantar	10.00
Pauwasi	9.25
Teberan	8.58
Komolom	8.00
Konda-Yahadian	7.50
Inanwatan	7.00
Pawaian	6.21
Mairasic	5.76
Sentanic	5.25

Table 19

Number of possible reflexes of Proto-TNG forms, including pronouns and forms for 'louse', for groups that Pawley and Hammarström classify as ones for which evidence for membership in TNG in relatively weak (excluding two groups which were in the highest category when excluding pronouns and forms for 'louse')

One group falls in the highest category in Table 19, namely Nuclear South Bird's Head. We can conclude that there is evidence that this group is either TNG or a sister of TNG. However, as previously mentioned, Pawley and Hammarström group Nuclear South Bird's Head along with Inanwatan and Konda-Yahadian, two groups in the lowest category in Table 19. Although I will not present the evidence here, the data used for this study does support the idea that these three groups are related. It therefore follows that Inanwatan and Konda-Yahadian are either TNG or related to TNG.

There are four groups in the intermediate category in Table 19. For these we can say that there is weak evidence for their being either TNG or related to TNG. Excluding Konda-Yahadian and Inanwatan, there are four groups in the lowest category in Table 19. Although Pawley and Hammarström classify these groups as ones for which there is relatively weak evidence for membership in TNG, the data used for this study finds no evidence for their even being related to TNG.

Finally, Table 20 provides similar data for the groups that Pawley and Hammarström classify as ones for which there is no evidence for membership in TNG.

Kaki Ae	8.28
Kaure-Kosare	8.00
Dem	5.57
Eleman	5.09
Purari	5.00
Mor	4.00
Porome	1.11

Table 20
Number of possible reflexes of Proto-TNG forms, including pronouns and forms for 'louse', for groups that Pawley and Hammarström classify as ones for which there is no evidence for membership in TNG

The scores in Table 20 are all less than the score for the non-TNG language Abun, so the data here support Pawley and Hammarström's claim that there is no evidence for these groups being TNG. And given the inclusion of pronouns and forms for 'louse', this implies no evidence for these groups even being related to TNG.

12. The issue of Arafundi

Arafundi is a small family of languages spoken in the eastern part of East Sepik Province, close to the juncture of East Sepik, Enga and Madang provinces. It was long considered a single language, though it is now deemed to consist of four or five languages, none of which is well documented. It was once considered a member of the Ramu branch of the Ramu-Lower Sepik family, though Ethnologue now treats it as a separate family and Foley (2018: 232) treats it along with Piawi as a separate family.

It was stated above that of the various non-TNG families that formed the basis of a standard against which possible TNG groups could be compared in terms of the number of possible reflexes of Proto-TNG forms, the highest score was found in Abun. I treated this as simply reflecting the range of possible scores we would expect due to chance. However, Arafundi actually displays a higher score (12.67) than Abun (8.30), in fact much higher, so much higher that there is reason to think that it might belong to TNG. The goal of this section is not to argue that Arafundi belongs to TNG, but that there is a good case that it might belong, a strong enough case to justify my excluding it from the set of non-TNG groups. In fact, its score of 12.67 is higher than the score for more than three quarters of the groups that Pawley and Hammarström treats as ones for which the evidence for membership in TNG is relatively strong.

Although I am not aware of anyone having claimed to date that Arafundi is TNG, there are two claims that have been made that, when conjoined, would entail that Arafundi is TNG. One of these claims is the widely-held claim, supported by the evidence of this

study, that Madang is a subgroup of TNG. But Usher (2022c) has proposed that Madang is not TNG, but forms a separate family with Arafundi and Piawi. If Usher is right that Arafundi is related to Madang and the widely-held view that Madang is TNG is also correct, it follows that Arafundi is TNG.

The evidence presented in this section falls into two categories. One is presenting the evidence of the Arafundi forms that look like possible reflexes of Proto-TNG forms. The second is presenting possible evidence that Arafundi is not only TNG, but bears a special relationship to Madang, possibly forming a subgroup of TNG with Madang.[31]

Table 21 shows the basis of assigning Arafundi a score of 12.67. The first column lists one of the Arafundi forms that looks most like Proto-TNG forms. The second column identifies the particular Arafundi language that that form comes from. The last column lists the score assigned to that particular protoform for Arafundi. The sum of those scores is 13.67, but this includes the form for 'louse', which I have excluded in computing scores, as discussed above.

Arafundi	Lg	Proto-TNG	Gloss	Score
maŋga	Andai	*maŋgV	'seed'	1
kundək	Nanubae	*kand(i,e)k[V]	'ear'	1
kundəpam	Nanubae	*k(o,u)t(u,i)p	'long'	1/6
ma	Nanubae	*mV	'give'	1/6
mbia	Nanubae	*imbi	'name'	1
kyom	Andai	*kemali	'sun'	1
kaba	Andai	*kV(mb,p)utu	'head'	1
kon	Tapei	*maka[n]	'earth'	1
kak	Tapei	*kVtak	'new'	1
(tal)mala	Andai	*me(l,n)e	'tongue'	1
mulaŋ	Nanubae	*kambu-la(ŋg,k)a	'smoke'	1
(gi)ɲɛ	Nanubae	*n[e]i	'bird'	1
yimwin	Nanubae	*niman	'louse'	1
ʔɛt	Nanubae	*inda	'tree'	1
munda	Andai	*mun(a,e,i)ka	'egg'	1
kumbwik	Tapei	*kuma(n,ŋ)[V]	'neck'	1/3

Table 21
Possible reflexes in Arafundi of Proto-TNG forms

As discussed above, in computing scores, I exclude a third of Pawley's protoforms because I found possible reflexes of these protoforms in fewer than one third of the groups that Pawley and Hammarström treat as ones for which the evidence for membership in

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[31] Various people, including Timothy Usher, Bill Foley, and Malcolm Ross, have suggested that Arafundi forms a group with Piawi, a small family consisting of two languages. The data examined here do not find resemblances between Arafundi and Piawi that are better than chance. I leave it to future research to investigate possible relationships involving Piawi.

TNG is relatively strong. However, if we do include these particular protoforms, we do find seven additional possible reflexes in Arafundi, listed in Table 22.

Arafundi	Lg	Proto-TNG	Gloss	Score
koda	Tapei	*k(a,o)nd(a,o)	'foot'	1/3
tuma	Nanubae	*(nd,s)umu(n,t)[V]	'hair'	1
kundaraka	Andai	*kindil	'root'	1
nəmana	Tapei	*nVpV	'eye'	1
mundumbwa	Andai	*(mb,p)(i,u)tiuC	'claw'	1
nəba	Andai	*kin(i,u)[m]	'sleep'	1/3
namgun	Andai	*[na]muna	'stone'	1

Table 22
Possible reflexes in Arafundi of Pawley's Proto-TNG forms found in fewer than three groups

In fact, when we include all of Pawley's protoforms and compute the scores for all groups under consideration, Arafundi has a score that is higher than all but three of possible TNG groups. Table 23 gives the scores for the groups exhibiting the highest scores when we include all of Pawley's protoforms; Arafundi comes fourth on this list.

Madang	25.00
Awyu-Ok	23.75
Chimbu-Wahgi	23.68
Arafundi	***18.33***
Enga-Kewa-Huli	17.50
Finisterre-Huon	16.83
Kiwaian	15.13
Dagan	14.95
...	

Table 23
Number of possible reflexes of Proto-TNG forms if we include Pawley's Proto-TNG forms found in fewer than three groups

In examining the possibility of a special relationship of Arafundi to Madang, I restrict here attention to the pronouns, although I believe that there is lexical evidence as well. Table 24 lists the first and second person singular and plural pronouns in the three Arafundi languages followed by the forms in Proto-Madang cited by Pawley and Hammarström. The hyphen in the plural forms represents a morpheme boundary between the pronoun root and a plural suffix *-ga*.[32]

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[32] Pawley and Hammarström also cite an alternative plural suffix *-na* and an alternative 2PL root *ta-.

	1SG	2SG	1PL	2PL
Andai	miŋ	nan	aŋ	noŋ
Nanubae	nəŋg, ɲiŋ, niŋ	nan	aŋ(g)	nuŋ
Tapei	niŋ	nan	aŋ	noŋ
Proto-Madang	*ya	*na	*i-ga	*ni-ga

Table 24
Pronouns in Arafundi languages compared to Proto-Madang

The similarities between the Arafundi pronouns and the Proto-Madang pronouns can be summarized as follows. (1) The 2SG forms *nan* strongly resemble the Proto-Madang form *na*. (2) Both the 1PL and 2PL forms end in a velar consonant, similar to the plural suffix *-ga* in Proto-Madang. (3) The only forms beginning with a vowel are the 1PL forms, as in Proto-Madang. (4) The 2PL forms are like the 2SG forms in beginning with *n*, as in Proto-Madang. (5) The 2PL forms differ from the 2SG forms, not only in ending in a velar, but also in having a nonlow vowel in contrast to the *a* in the 2SG; we find the same in Proto-Madang. Whether Arafundi forms a group with Madang, I leave to future research.[33]

13. What do the highest scores mean?

I have so far not discussed the different scores within the highest category, which in Table 11 above range from a score of 22.67 for Madang down to a score of 10 for Anim. Table 25 lists the top ten groups in Table 11.

Madang	22.67
Chimbu-Wahgi	20.83
Awyu-Ok	20.25
Enga-Kewa-Huli	16.00
Kiwaian	14.73
Dagan	14.55
Yareban	14.17
Finisterre-Huon	13.92
Kainantu-Goroka	13.50
Bayono-Awbono	***12.83***

Table 25
Ten groups with highest number of possible reflexes of Proto-TNG forms

How are we to interpret the fact that these ten groups have higher scores than other groups? And more specifically, how are we to interpret the fact that Madang exhibits the highest score of all groups. I suspect that the answer to this second question may be that it reflects no more than the fact that the language which Pawley has done the most work on, namely Kalam, is a Madang language and that he noticed similar forms in non-Madang

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[33] Note that geographically, the Arafundi languages are not adjacent for the Madang languages, though they are to the Enga-Kewa-Huli languages.

groups more often when they were similar to Kalam forms. If this is true, it suggests that there are similarities among forms in some groups that Pawley did not notice or at least see as significant and that future work may uncover other possible Proto-TNG forms.

But it is not clear how to interpret the high scores for the other groups with high scores. It could be that these groups (or some of them) fall into an unidentified subgroup that contains Madang. It is possible that some of Pawley's reconstructions actually reflect some subgroup of TNG rather than TNG itself. But the groups in Table 25 are not contiguous geographically. It could be that some of these groups are ones that Pawley examined more carefully and was more likely to see forms resembling Madang forms as a result. Or it could be that these groups are simply more conservative, retaining more Proto-TNG forms. I leave the answer to this question to future research.

14. The issue of borrowing

None of the results in this paper (so far) distinguish common inheritance from borrowing. The philosophy in this paper is that borrowing of basic vocabulary is not uncommon but that borrowing large amounts of basic vocabulary, while possible, is much less common. Since the goal of this paper has been to identify which groups are most likely to be TNG, the default assumption in any particular case is that where we find extensive shared basic vocabulary, the most likely explanation is shared inheritance. On the other hand, while in any particular case the most likely explanation is shared inheritance, the number of groups examined in this paper is sufficiently large that it is more than possible that at least one group that I have classified as TNG actually is not and that the evidence I have given is due to extensive borrowing of basic vocabulary.

But it is worth mentioning two instances in the languages I examined where there does appear to be extensive borrowing of basic vocabulary. One is the Mailuan language Bauwaki, which appears to have borrowed extensively form Yareban languages. In fact Dutton (1975: 640) says

> Bauwaki is a kind of bridge language between the Mailuan and Yareban Families. It shows just slightly greater basic vocabulary agreements with Domu (66%), of the former, than with Abia (54-59%), of the latter. Grammatically it appears to be a mixture of both Mailuan and Yareban elements.

The second case of apparent extensive borrowing of basic vocabulary involves Duna. Duna is one of the languages for which I found insufficient evidence for it being TNG. But it does share an amount of basic vocabulary with Enga-Kewa-Huli languages, especially Huli. Table 26 lists similar forms shared by Duna and Huli (some of which are probably coincidental resemblances), as well as similar forms in Engan or Kewa (where I have picked a resemblant form from one language in each group).[34]

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[34] In addition to the similarities in Table 27, the word *pini* 'bark' in Duna is identical to the form for 'root' in Huli.

Duna	Huli	Kewa	Engan	Gloss
ho	ogo	go		'this'
ay	ai			'who'
aki	agi	aki	aki	'what'
na	na	na	na	'not'
roka			nuga	'many'
yapa		yapo	lapo	'two'
wena		wena		'fish'
heka	ega		heka	'bird'
ɛkɛ	egane			'seed'
hini	yuni			'leaf'
kuni	kuni	kuli		'bone'
hapa	haba	apa	epa	'egg'
rana	erene			'tail'
re	de	le	le	'eye'
ne	ne		ne	'tooth'
ki	gi	ki	gi	'hand'
ma	ma	ma	mane	'neck'
na	na	na	na	'eat'
kono		kone sia		'know'
ipa	iba	ipa	ipa	'water'
ralua	dalu			'rain'
kana		kana	kana	'stone'
rindi	dindi			'earth'
kari	hari	ari	hadi	'mountain'
ambua	ambuabi		abua	'yellow'
peo	pele			'white'
mindu	mindibi			'black'
rakare	dagare			'cold'
paya	baya			'good'

Table 26
Similar forms in Duna and Enga-Kewa-Huli

There are a number of reasons for believing that the similarities in Table 26 (or at least many of them) reflect borrowing rather than shared inheritance. One is that many of the similarities in Table 26 involve identical or nearly-identical forms. That would suggest that if the similarities reflected shared inheritance, the relationship would be relatively close. But a cursory examination of the verb morphology in Duna (San Roque 2008) and Huli (Lomas 1988) does not find much similarity.[35]

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[35] San Roque (2008: 13) is explicit about the fact that there has probably been extensive borrowing of basic vocabulary from Huli into Duna. In addition, San Roque cites (p. 8) anthropological literature that documents close contact between the Duna and the Huli, cultural similarities between the Duna and the Huli, and the fact that the Duna traditionally looked up to the Huli, who are a much larger group than the Duna. This traditional attitude towards the Huli by the Duna is probably relevant to explaining why so much basic vocabulary was borrowed from Huli into Duna.

A second reason for believing that the similarities in Table 26 reflect borrowing is that Duna also shares basic vocabulary with another language, Bogaya, as shown in Table 27, but the similarities are by and large not identical or near-identical and Bogaya exhibits relatively little shared vocabulary with Huli.[36]

Duna	Bogaya	Gloss
no	no	'1sg'
ko	ko	'2sg'
inu	enu	'1pl'
ho	duhu	'this'
ima	ĩmya	'woman'
imanoa	əmĩ	'person'
rowa	towə	'tree'
yɛta	yesa	'blood'
konane	honən	'ear'
ŋgone	ikin	'tongue'
mokone	oməmukun	'knee'
sakane	səxən	'belly'
ini	eni	'liver'
na	nã	'eat'
ke	həxə	'see'
waki	wəkeysi	'hear'
kono	hown	'know'
hewa	owa	'sun'
yalekayi	yələgəyə	'star'
kana	hənə	'stone'
kari	kəryə	'mountain'
roro	toto	'hot'

Table 27
Similar forms in Duna and Bogaya

The similarities between Duna and Bogaya are of a sort that is more common with more distant genealogical relationships. Although the number of similar forms shared by Duna and Bogaya in Table 27 is not high (22 out of 94, once we exclude 'horn', 'dog' and gaps in the Bogaya data), the most likely explanation is shared inheritance, although they might reflect early borrowings. Given the lack of similarities shared by Bogaya and Enga-Kewa-Huli, the least likely possibility is that the similarities between Duna and these two other groups are both due to shared inheritance. And given the stronger similarity in the forms in Table 26 comparing Duna with Enga-Kewa-Huli, it also seems very unlikely that these similarities are due to shared inheritance while the similarities shared by Duna and Bogaya are due to borrowing. Thus, whether the similarities between Duna and Bogaya are due to shared inheritance or due to borrowing, it seems unlikely that the similarities shared

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[36] Tables 26 and 27 both contains similarities for 'this', 'eat', 'know', 'stone' and 'mountain'. The forms for 'eat' and 'stone' are possible reflexes of Proto-TNG forms and the other three here may involve coincidental resemblances with either Enga-Kewa-Huli or Bogaya.

by Duna and Enga-Kewa-Huli are due to shared inheritance. Therefore, the similarity of forms in Duna and Enga-Kewa-Huli seems to be a good candidate for extensive borrowing of basic vocabulary. Note that the percentage of similar pairs for Duna and Bogaya (22 out of 94 or about 23%) is less than the percentage of similar pairs for Duna and Enga-Kewa-Huli (29 out of 98 or about 30%) and also slightly less than the percentage of similar pairs specifically for Duna and Huli (24 out of 96 or 25%).[37]

What is significant here is that if Bogaya had not existed, the methodology used in §9 might have led me to the conclusion that Duna forms a subgroup with Enga-Kewa-Huli, which, given the data for Bogaya, would have been a mistake. This means that the arguments in §9 for including groups in TNG based on data suggesting that they form a subgroup with languages for which the evidence for membership in TNG is much greater at best show that these groups lacking better than chance possible reflexes of Proto-TNG forms are probably TNG, but the possibility of massive borrowing of basic vocabulary cannot be ruled out.

15. Conclusion

I have presented evidence in this paper for various groups belonging to TNG, comparing this to claims of Pawley and Hammarström (2018). I have argued that for a number of groups, the amount of shared basic vocabulary is no better than chance, that small sets of forms that look like possible reflexes of Proto-TNG forms are inconclusive, since we find small sets of what look like possible reflexes of Proto-TNG forms in many non-TNG languages, purely due to chance.[38] However, the data here supports Pawley and Hammarström's claims for the majority of groups that they classify as ones for which there is relatively strong evidence for membership in TNG.

The methodology used in this paper is admittedly limited and it is not clear how much further one can go using this methodology. As noted at the beginning of the paper, its goal is somewhat analogous to the goal of Ross (1995, 2005) on pronouns in Papuan languages, in getting a picture of the lay of the land. Data not examined here may ultimately provide evidence that some of the groups for which I did not find evidence of membership in TNG are indeed TNG. Apart from evidence from morphology, there may be sound correspondences of a sort that may be obscured in the data examined here.

What is needed now is more traditional comparative work, both reconstructing proto-languages for various groups and identifying subgroups that are intermediate between the uncontroversial groups and TNG itself. It seems unlikely that TNG would have over thirty immediate daughters, so work on identifying intermediate groups is, I

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[37] Note that for Huli, it is 24 out of 96 rather than 24 out of 98 due to gaps in the Huli data.

[38] Pawley proposes protoforms for meanings outside the Swadesh 100. It is possible that data underlying these protoforms would provide better evidence that some of these groups are TNG. Note, however, that increasing the set of meanings examined means that more possible reflexes are required for the number to be greater than chance. Without applying the same procedure to non-TNG groups, as done in this paper, we have no way of knowing whether possible reflexes for other protoforms proposed by Pawley are any better than chance.

believe, a priority. Examples of the kind of work that we need more of include Usher and Suter (2015) on Anim, Usher (2022a) on a group containing Mek and Somahai, Usher and Suter (2020) on a group containing Asmat-Kamrau Bay and Komolom, Suter and Usher (2017) on a group containing Kamula and Elevala, and Usher and Schapper (2022) for a group containing Timor-Alor-Pantar and West Bomberai. While the groups in these last three higher-level groups are all ones that I did not find evidence for membership in TNG, it would be the reconstruction of these groups that would provide evidence that they are TNG, if they are.

Appendix 1: Illustration of how scores for groups are calculated

In §3, I describe the method for computing scores for particular groups and particular proposed protoforms. Repeating what is said there, the method for computing these fractions is as follows. If a group is classified in Glottolog as involving n immediate daughters, then if plausible reflexes for a given protoform were found in two or more of those n daughters, then that group was assigned a value of 1 for that proposed protoform. If plausible reflexes were found in only one branch, then the group was assigned a value of $1/n$. This process was applied to the next level down in the sense that if plausible reflexes were found in only one out of n subgroups and in only one out of m subgroups of that subgroup, then the group was assigned a value $1/n * 1/m$. Values less than 1/7 were ignored.

Consider for example, possible reflexes of proposed Proto-TNG *mVna* for 'sit' among Kainantu-Goroka languages. Fig. 2 illustrates how a score of 1/2 for this group for this protoform is calculated. Languages with possible reflexes and groups containing languages with possible reflexes are shown in bold. The tree does not show daughters of groups, like Kainantu, which contain no reflexes.
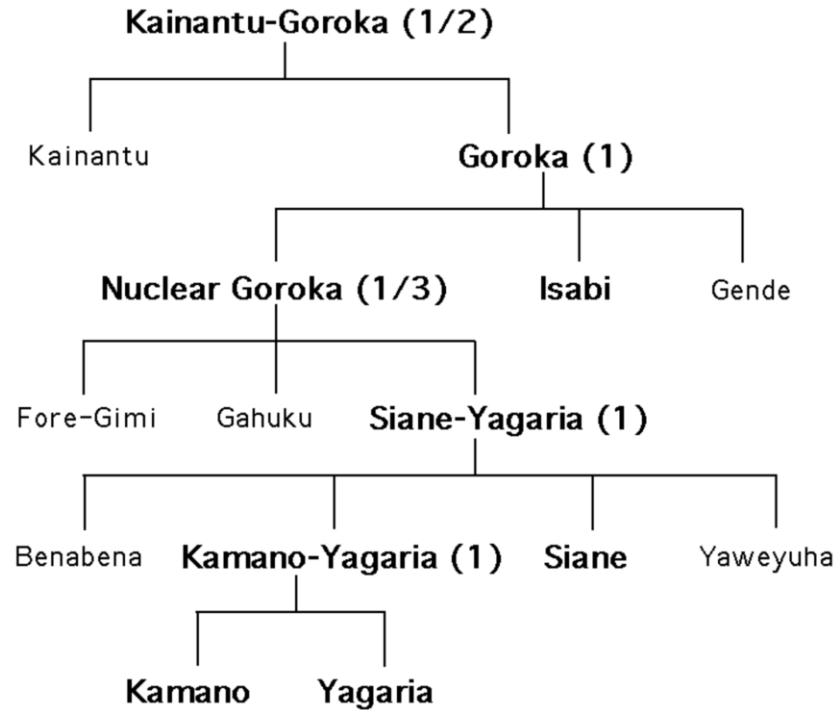
Fig. 2
Tree for Kainantu-Goroka showing how score for group is calculated

There are four languages in the data that have plausible reflexes of the protoform *mVna*: Kamano, Yagaria, Siane, and Isabi.[39] Starting at the bottom of the tree, the Kamano-Yagaria group is assigned the score 1 since it contains two languages with a possible reflex of *mVna*. Similarly, Siane-Yagaria is assigned a score of 1 since possible reflexes are found in two of the four subgroups. However, Nuclear Goroka is assigned a score of 1/3 since a possible reflex is found in only one of the three subgroups. But Goroka is assigned a score of 1 since possible reflexes are found in two of its subgroups, Nuclear Goroka and Isabi. Finally, Kainantu-Goroka is assigned a score of 1/2 since possible reflexes are found in only one of the two subgroups, Goroka.

By way of comparison, suppose that I had found possible reflexes in only one of the four subgroups of Siane-Yagaria. Then Siane-Yagaria would have been assigned the value 1/4 for this protoform. Since a reflex would have been found in only one of the three subgroups of Nuclear Goroka and the value 1/4 was assigned to that one subgroup, the value assigned to Nuclear Goroka would have been 1/3 x 1/4 or 1/12. Since that is less than 1/7, it would not have counted. As a result, a possible reflex would have been found in only one of the three subgroups of Goroka (namely Isabi), so Goroka would have been assigned the value 1/3 for this protoform. And since a possible reflex would have been found in only one of the two branches of Kainantu-Goroka, Kainantu-Goroka would have been assigned the value 1/2 x 1/3 or 1/6.

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[39] Strictly speaking, Glottolog treats Isabi as an unclassified Goroka language, but I treat it as a third subgroup. The data examined for this paper support treating it as a third subgroup.

Appendix 2: A complete list of the scores for all groups that have been suggested as members of TNG

The table below gives a complete list of all groups that have been suggested to be members of TNG, including those that Pawley and Hammarström (2018) classify as groups for which the evidence for membership in TNG is relatively weak and groups they classify as one for which there is little evidence for membership in TNG.

Madang	22.67	Asmat - Kamrau Bay	8.17
Chimbu-Wahgi	20.83	Bogaya	8.15
Awyu-Ok	20.25	Timor-Alor-Pantar	7.75
Enga-Kewa-Huli	16.00	Tanahmerah	7.67
Kiwaian	14.73	Mailuan	7.32
Dagan	14.55	Pauwasi	7.25
Yareban	14.17	Teberan	7.01
Finisterre-Huon	13.92	Duna	7.00
Kainantu-Goroka	13.50	Kwalean	7.00
Wiru	13.00	Kamula-Elevala	7.00
Bayono-Awbono	12.83	Kolopom	6.62
Angan	12.67	Komolom	6.50
Paniai Lakes	12.56	Kaure-Kosare	6.50
Turama-Kikorian	12.50	West Bomberai	6.25
Dani	11.93	Mairasic	5.77
East Strickland	11.90	Mek	5.67
Koiarian	11.59	Sentanic	5.25
Goilalan	11.42	Kaki Ae	5.19
Bosavi	11.00	Inanwatan	5.00
Somahai	10.73	Konda-Yahadian	5.00
Fuyug	10.38	Moraori	4.68
Foe	10.38	Kayagaric	4.67
Gogodala-Suki	10.25	Mulaha	4.23
Damal	10.10	Pawaian	4.15
Anim	10.00	Eleman	4.07
Manubaran	9.86	Dem	3.37
Greater Binanderean	9.83	Purari	3.00
Nuclear South Bird's Head	8.50	Mor	2.00
Fasu	8.30	Porome	1.10

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