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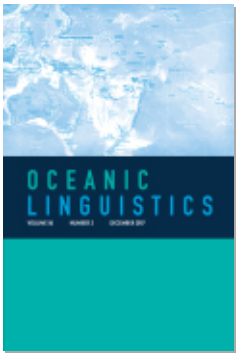

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I present an analysis of prevocalic initial glottal stops in Amarasi. A range of morphological and phonological evidence shows that a unitary analysis of such glottal stops is not possible: some morphemes occur with an epenthetic initial glottal stop, while other morphemes occur with a contrastive initial glottal stop. This is consistent with the historical data, which show that some glottal stops have developed from an earlier consonant while others are historic insertions. Despite the difference between epenthetic and contrastive glottal stops in Amarasi, there are only a few instances in which the data are unambiguous. In most cases, the status of a particular glottal stop has not yet been determined.

1. INTRODUCTION.[1] In this paper, I provide an analysis of initial glottal stops in Amarasi, spoken in western Timor. I show that some prevocalic word-initial glottal stops are automatic epenthetic insertions, while others are distinctive. However, despite this difference, only a handful of initial glottal stops in the language can be securely identified as either distinctive or automatic. In most cases, the status of any particular prevocalic word-initial glottal stop in Amarasi is ambiguous.

Within phonology, it is often the case that certain phonetic segments are not present in all environments. Instead, there can be an alternation between two forms of a morpheme: one form that occurs with a particular segment and another form in which this segment does not occur.

In spoken Kanniyakumari Tamil, for instance, there are a number of words that begin with one of the consonants [w], [ʔ], or [j] in isolation, but which are vowel-initial when they are the second member of a compound. Among the words that display such conso-

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Glosses are as follows (in alphabetical order): ACC, accusative; DAT, dative; DET, determiner; DEM, demonstrative; FRD, full reduplication; GEN, genitive; GVN.OBJ, given object; INTNS, intensive; NEG, negative; \M, M-form (≈ metathesized); PI, plural inclusive; PL, plural; PX, plural exclusive; REFL, reflexive; REL, relativizer; RECP, reciprocal; RL.LOC, realis locative; SET, scene setting particle; SG, singular; TR, transitive; \U, U-form (≈ unmetathesized); $\backslash U_c$, U-form before a consonant cluster.

Oceanic Linguistics, Volume 56, no. 2 (December 2017)

nant- or vowel- initial alterations, [j] occurs before front vowels, [w] before rounded vowels, and [ʔ] before the low vowel /a/. Examples are given in (1) below.[2]

(1) KANNIYAKUMARI TAMIL

/uutɕij/	[wuːsi]	‘needle’	/kuɳʈ-uutɕij/	[kuɳɖ-uːsi]	‘pin’
/oʈʈakam/	[woʈːɜxã]	‘camel’	/ponn-oʈʈakam/	[ponː-oʈːɜxã]	‘golden camel’
/aatɕaj/	[ʔaːsɜ]	‘desire, hope’	/peeɾ-aatɕaj/	[peːɾ-aːsɜ]	‘greed’
/erump/	[jeɾumbɯ]	‘ant’	/kaʈʈ-erump/	[kaʈː-eɾumbɯ]	‘k.o. ant’
/ɪɾuʈʈ/	[jɪɾuʈːɯ]	‘darkness’	/kuṯṯ-ɪɾuʈʈ/	[kuṯː-ɪɾɯʈːɯ]	‘pitch dark’

(Christdas 1988:164)

This is a process of consonant epenthesis, with the quality of the epenthetic consonant conditioned by the quality of the following vowel. That such data should not be analyzed as consonant deletion is shown by forms that are glide-initial in all environments, such as /jaanaj/ ‘elephant’, which when compounded occurs with initial [j]: thus, [kaːʈːɯ-**j**aːnɜ] ‘wild elephant’.

Similar processes of consonant insertion have received much discussion: see Ortmann (1998) and Lombardi (2002) for discussion of specific cases and their potential theoretical implications, Żygis (2010) for a typological profile of consonant insertion, and Blevins (2008) for the ways in which processes of consonant insertion develop with implications for their best synchronic analysis.

In Tamil, the glottal stop [ʔ] is only inserted before /a/. However, in many languages, the glottal stop is inserted before all vowels. One such language is German, in which a glottal stop is optionally inserted word-initially before all vowels. Some examples are given in (2).

(2) GERMAN

Atem	/aːtəm/	→	[ˈaːtm̩]	~	[ˈʔaːtm̩]	‘breath’
edel	/eːdəl/	→	[ˈeːdl̩]	~	[ˈʔeːdl̩]	‘noble’
Igel	/iːgəl/	→	[ˈiːgl̩]	~	[ˈʔiːgl̩]	‘hedgehog’
offen	/ɔfən/	→	[ˈɔfn̩]	~	[ˈʔɔfn̩]	‘open’
Opa	/oːpa/	→	[ˈoːpa]	~	[ˈʔoːpa]	‘grandpa’
Übung	/yːbʊŋ/	→	[ˈyːbʊŋ]	~	[ˈʔyːbʊŋ]	‘exercise’

(Wiese 1996:58)

Another example comes from Anejom̃ (Lynch 2000:17), in which all vowel-initial words begin with a glottal stop utterance-initially: thus, *aek* → [ˈʔaek] ‘you (SG)’, but *apam* + *aek* → [ˌʔabamˈaek] ‘come (SG)!’, as well as *et* + *apam* + *aen* → [ʔeḍˌabamˈaen] ‘he came’.

For languages such as Anejom̃ and German, we can formulate a rule like that in (3):[3]

(3) Ø → ʔ / #_V

Languages with a variation of rule (3) are extremely numerous and come from many language families all over the world. See Lombardi (2002:225ff.) and Blevins (2008:88f)

2. Tamil also has epenthesis of the vowel [ɯ] after consonant sequences not followed by a vowel.
3. In the case of German, the rule would be slightly different as glottal stop insertion is only optional and also occurs in some other environments. See Wiese (1996:58ff,173f) for a full analysis. For Anejom̃, the rule would have to specify that glottal stop epenthesis only occurs utterance-initially.

for an overview and discussion of a number of languages with a process of word-initial glottal stop insertion.

In this paper, I discuss the status of initial glottal stops in Amarasi. In Amarasi, some initial glottal stops are automatic insertions, while others are contrastive. Before other consonants, between vowels, and word-finally, the glottal stop clearly contrasts both with all other consonants as well as zero. This is shown in table 1, which gives near-minimal pairs showing the contrast between the phonetically similar segments *ʔ* : *k* : *h* : Ø in each of these word positions.

TABLE 1. CONTRASTS BETWEEN *ʔ* : *k* : *h* : Ø IN AMARASI

	V_V		V_#		#_C		#_V	
ʔ	baʔi	'grandfather'	tuaʔ	'lontar palm'	ʔbibi	'goat'	(ʔ)au	'1SG, I'
k	baki	'stacked rocks'	ʔsuak	'crowbar'	kbiti	'scorpion'	kaut	'papaya'
h	rahi	'body filth'	puah	'betel nut'			hau	'wood, tree'
Ø	fai	'night'	nua	'two'	biki	'scar'		

However, as can be seen from table 1, there are no contrasts between *ʔ* and Ø word-initially before vowels.[4] That is, there are no phonetically vowel-initial words. This is true in all speech positions, not just utterance-initially. Three analyses of these data are logically possible:

(i) All initial glottal stops before vowels are distinctive.
(ii) All initial glottal stops before vowels are automatic. (They are epenthetic.)
(iii) There is a difference between distinctive and automatic glottal stops word-initially before vowels. (The difference emerges in certain environments.)

In his analysis of the Miamafo variety of Uab Meto, Steinhauer (1993, 1996) follows analysis (i) and treats all prevocalic word-initial glottal stops as distinctive. In an earlier analysis of Amarasi, the variety of Uab Meto described in this paper (Edwards 2016a), I adopted analysis (ii) and posited that all prevocalic word-initial glottal stops are epenthetic.

In this paper, I provide evidence that the best analysis of the Amarasi data is, in fact, analysis (iii). Some prevocalic initial glottal stops are distinctive and some are automatic. The difference between these kinds of glottal stops is revealed after monoconsonantal prefixation. I also show that epenthetic glottal stops occur before initial vowels after syllabic prefixes.

Despite the existence of both epenthetic and contrastive prevocalic glottal stops, only a handful of glottal stops have so far been identified as one or the other. This is because many roots never occur with a prefix, which could adjudicate on the status of a glottal stop, while many other roots only ever occur with a prefix, thus rendering any root-initial glottal stop nonword-initial.

I have so far identified only about half a dozen vowel-initial roots that have also been attested with an automatic glottal stop, and a little over a dozen roots that begin with a contrastive glottal stop. This leaves the status of the initial glottal stop of more than 150 roots in my current database ambiguous.

4. There are also no contrasts between the glottal stop and /h/ word-initially before a consonant. This is due to a phonotactic restriction against such clusters in Amarasi. See Edwards (2016b:107f) for a full discussion of permissible Amarasi consonant clusters.

Throughout this paper, I transcribe epenthetic glottal stops in square brackets as [ʔ], distinctive glottal stops with no brackets, and ambiguous glottal stops in normal parentheses as (ʔ). These three transcription conventions can be seen in the words *ʔaʔa-t* 'poetry' with a distinctive glottal stop, *[ʔ]isa-t* 'most, completely' with an epenthetic glottal stop, and *(ʔ)okam* 'gourd, pumpkin' for which the evidence is ambiguous.

This paper is structured as follows. After a brief introduction to Amarasi and its essential phonological features in section 2, I present evidence for identifying (some) initial glottal stops as distinctive in section 3. Such glottal stops can be identified as distinctive, as they also surface word-medially after the application of a prefix consisting of a single consonant.

In section 4, I discuss the evidence for also identifying automatic glottal stops. Amarasi has a process of vowel epenthesis before certain consonant clusters, and a glottal stop also precedes such epenthetic vowels. Additionally, when vocalic prefixes attach to vowel-initial roots, a glottal stop is obligatorily inserted between the prefix and the stem.

In section 5, I discuss reduplication—a process that cannot ultimately decide the status of a particular glottal stop. I conclude my discussion in section 6 with an overview of the origins of prevocalic word-initial glottal stops in Amarasi. This shows that some glottal stops have developed from earlier consonants, while others have not. In most cases, initial glottal stops that have developed from an earlier consonant are distinctive in Amarasi.

2. PHONOLOGY ESSENTIALS. The speech variety that is the focus of this paper is the Amarasi variety of the Uab Meto language/dialect cluster. Amarasi is spoken at the southwestern end of the Uab Meto chain. Data are from the Kotos dialect of Amarasi, which is spoken roughly in the center of the Amarasi area. More specifically, it comes from the village (*desa*) of Nekmese' as spoken by inhabitants of the old hamlet (*kampung*) of Koro'oto. All data are from this variety unless labeled otherwise.

I describe here only the bare basics of Amarasi phonology as needed for understanding the analysis of initial glottal stops. A more complete description can be found in Edwards (2016a). Amarasi has thirteen consonants /p t k ʔ b ʤ ɡw f s h m n r/ and five vowels /i e a o u/.[5]

Phonetically, the glottal stop is sometimes realized as creaky voice on surrounding voiced segments. This is most common in rapid speech. Two examples from texts in which all glottal stops are realized as creak are given in (4) and (5) below.

(4) [ɛ̰ː ndɪɛʊk hi̪tʊ ŋkɔnɔ krɛ̰ɔ̰]
ʔee n-reuk hitu n-kono kreʔo
umm 3-pluck seven 3-pass little
'Umm, a little bit after it struck seven o'clock.'

(5) [rɛ̰ n̪sɔo̪ŋɛ nɛʊ ɓbi̪tɐn hɾɔmɐ]
reʔ n-sounʔ=e n-eu (ʔ)abitan roma
REL 3-send=3SG.ACC 3-DAT inhabitant Rome
'which he sent to the Romans'

5. The consonant /t/ is dental [t̪]. The mid vowels /e/ and /o/ are mid-low [ɛ] and [ɔ], respectively. They are usually raised to mid-high [e] and [o] before other high vowels. See section 5 for more discussion.

Amarasi words have a highly restricted phonotactic structure. Content words (as opposed to grammatical functors) are minimally composed of a disyllabic foot that is maximally CV(C)V(C). This foot can be optionally preceded by another consonant, another syllable, or another foot. Stress falls on the penultimate syllable of the foot, with secondary stress on every second syllable to the left. Examples of these word shapes are given in table 2.

TABLE 2. AMARASI WORD SHAPES

Structure	Phonemic			Phonetic	Gloss
Ft.	CVCVC	manas	→	[ˈmanɐs]	'sun'
	CVCV	fafi	→	[ˈfafi]	'pig'
	CVVC	puah	→	[ˈpʊ.ɐh]	'betel nut'
	CVV	hau	→	[ˈha.ʊ]	'wood, tree'
C + Ft.	C|CVCVC	psimat	→	[ˈpsimɐt̪]	'katydid'
	C|CVCV	bkaʔu	→	[ˈbˀkaʔʊ]	'fruit bat'
σ + Ft.	CV|CVCVC	mahataʔ	→	[mɐˈhɐt̪ɐ]	'itchy'
	CVC|CVCVC	bankofaʔ	→	[bɐŋˈkɔfɐʔ]	'caterpillar'
Ft. + Ft.	CVV|CVCVC	paumakaʔ	→	[pəwˈmakɐʔ]	'near'
	CVCVC|CVCV	(ʔ)ataʔraʔe	→	[ʔɐt̪ɐʔˈraʔɛ]	'praying mantis'

Words with the surface structure CVVCV(C) are assigned the same foot structure, with the initial vowel sequence being assigned a single vowel slot and usually forming a phonetic diphthong. This is relevant for the analysis of glottal stop insertion morpheme-initially after a vocalic prefix (see 4.2). A number of surface CVVCV(C) words are given in (6).

(6)

Phonemic		Phonetic	Gloss
(ʔ)aikaʔ	→	[ˈʔajkaʔ]	'thorn'
(ʔ)aina-f	→	[ˈʔajnɐf]	'mother'
kaunaʔ	→	[ˈkəwnɐʔ]	'snake; creature'
nautus	→	[ˈnəwt̪ʊs]	'beetle'
naunuʔ	→	[ˈnəwnʊʔ]	'bread-fruit'
(ʔ)uaba-ʔ	→	[ˈʔwɐbɐʔ] ~ [ˈʔʊɐbɐʔ]	'speech'

Independent evidence for this analysis comes from the fact that, in such words, stress falls on the antepenultimate vowel rather than the penultimate vowel. This can be explained by positing that stress falls on the penultimate *syllable* (rather than vowel), with stress realization showing that the vowel sequence is within one syllable.

Apart from such words, each vowel of the foot forms the peak of a single phonemic syllable, including both vowels of a vowel sequence. This means that onsetless syllables do occur, though only word-medially. Two examples are *puah* → [ˈpʊ.ɐh] 'betel nut' and *hau* → [ˈha.ʊ] 'wood, tree'.[6]

Two other phonological facts about Amarasi are relevant for different aspects of the analysis of initial glottal stops: first, Amarasi does not allow sequences of three vowels; and second, Amarasi does not usually allow clusters of more than two consonants.

6. In some unstressed positions, a sequence of two different vowels can phonetically coalesce into a single syllable. One example is in nominal phrases such as *hau noʔo* 'leaf of a tree' → [ha.ʊˈnɔʔɔ] ~ [hawˈnɔʔɔ].

Finally, Uab Meto varieties have a synchronic process of final CV → VC metathesis, as seen, for instance in *fatu* → *faut* 'stone, rock' and *nope* → *noep* 'cloud'. Metathesis in Amarasi is a morphological device marking a construct case (attributive phrase) in the syntax and a resolved state of affairs in the discourse. Edwards (2016b) provides a complete description of the forms and functions of metathesis in Amarasi, and Blevins and Garrett (1998) provide a discussion of the development of synchronic metathesis in both Uab Meto and many other languages.[7] Throughout this paper, words are cited in the unmetathesized form for clarity and ease of exposition.

3. DISTINCTIVE GLOTTAL STOPS. I begin my discussion with the evidence for distinctive glottal stops. There are two kinds of prefixes that allow us to distinguish between vowel-initial roots and roots that begin with a distinctive glottal stop. These prefixes are (i) monoconsonantal agreement prefixes, after which any root-initial consonant (including a glottal stop) surfaces, and (ii) the nominalizer *(ʔ)a-…-t*, which has different forms depending on whether it attaches to a vowel-initial or consonant-initial root.

3.1 AGREEMENT PREFIXES. Most verbs in Amarasi obligatorily agree with the subject by taking a prefix.[8] Agreement prefixes are drawn from one of two sets: the vocalic set or the consonantal set. Each of these two paradigms is given in table 3. The consonantal set consists of the first consonant of the vocalic set. Which set a particular root takes is mostly determined by the phonotactic structure of the stem (as summarized in table 4). Roots beginning with a consonant cluster take vocalic prefixes, while roots larger than a foot (= three or more syllables) and vowel-initial roots both take consonantal prefixes.

TABLE 3. AMARASI AGREEMENT PREFIXES

	1SG	2SG	1PX/2PL	3SG/PL	1PI
Vocalic	(ʔ)u-	mu-	mi-	na-	ta-
Consonantal	ʔ-	m-	m-	n-	t-

Among consonant-initial roots with a single foot, there is lexical variation. In my current corpus, 26 percent (127/482) of such roots take vocalic prefixes and 74 percent (355/482) take consonantal prefixes.[9] Roots that have both transitive and intransitive forms take the consonantal prefixes when intransitive, and vocalic prefixes when transitive. Loans (without a consonant cluster) take consonantal prefixes. This is all illustrated in table 4.

When these prefixes attach to roots, there is clearly a contrast between vowel-initial roots and glottal stop-initial roots. This is shown in table 5, which shows two vowel-ini-

7. Other Austronesian languages with superficially similar patterns of CV metathesis include Kwara'ae (Heinz 2004), Rotuman (Churchward 1940; Besnier 1987), and Leti (van Engelenhoven 2004). Edwards (2016b:14ff) provides a near-complete survey of Austronesian languages with productive CV metathesis.
8. The only verbs that do not take agreement prefixes are the auxiliaries *he* 'IRREALIS' and *bisa* 'can', as well as the location verbs *et* 'IMPERFECT LOCATIVE' and *on* 'IRREALIS LOCATIVE'. (Other location verbs, such as *n-bi* 'REALIS LOCATIVE' and *na-ʔko* 'from', take agreement prefixes in Amarasi.)
9. The bias in favor of consonantal prefixes for disyllabic roots is probably due to the preference in Amarasi for disyllables. In my current database, 84 percent (1,422/1,696) of roots are disyllabic.

TABLE 4. VERBAL AGREEMENT ACCORDING TO STEM SHAPE

Stem shape		Agreement Set	Example	
(σ)σ + Ft.	three or more syllables	consonantal	n-panatu	'rams'
#CC	cluster-initial foot	vocalic	na-bhaʔe	'swims'
#V	vowel-initial foot	consonantal	n-oʔen	'beckons'
#C	consonant-initial foot	74% consonantal 26% vocalic	n-sae na-sai	'goes up' 'flows'
#C	intransitive transitive	consonantal vocalic	n-tama na-tama	'enters' 'puts inside'
loans		consonantal	n-dukuŋ	'supports'

TABLE 5. CONTRAST BETWEEN VOWEL-INITIAL AND GLOTTAL STOP-INITIAL ROOTS

		#V √otu	#V √ani	#ʔ √ʔani	#ʔ √ʔote	#ʔ √ʔeka	#C √hani	#C √henu
1SG	au	ʔ-otu	ʔ-ani	ʔ-ʔani†	ʔ-ʔote†	(ʔ)u-ʔeka	ʔ-hani	(ʔ)u-henu
2SG	ho	m-otu	m-ani	m-ʔani	m-ʔote	mu-ʔeka	m-hani	mu-henu
3SG	in	n-otu	n-ani	n-ʔani	n-ʔote	na-ʔeka	n-hani	na-henu
1PX	hai	m-otu	m-ani	m-ʔani	m-ʔote	mi-ʔeka	m-hani	mi-henu
1PI	hit	t-otu	t-ani	t-ʔani	t-ʔote	ta-ʔeka	t-hani	ta-henu
2PL	hi	m-otu	m-ani	m-ʔani	m-ʔote	mi-ʔeka	m-hani	mi-henu
3PL	sin	n-otu=n	n-ani=n	n-ʔani=n	n-ʔote=n	na-ʔeka=n	n-hani=n	na-henu=n
		'burn'	'before'	'head to'	'cut'	'close'	'dig'	'full, fill'

† The contrast between vowel-initial roots and glottal stop-initial roots is neutralized after the 1SG agreement prefix *ʔ-* in my Amarasi data. Thus, the roots *√ani* 'before' and *√ʔani* 'head toward' are both realized as [ˈʔani] with a 1SG subject. This is analyzable as a result of a prohibition against a cluster of word-initial glottal stops: /ʔʔ/ → [ʔ] /#__.

tial roots, three glottal stop-initial roots, and two other consonant-initial roots. As expected, a glottal stop-initial root surfaces with a glottal stop after the agreement prefix, while vowel-initial roots do not.

The data in table 5 clearly show that there is a difference between vowel-initial and glottal stop-initial *roots*. However, they do not provide any evidence as to whether there is a contrast between vowel-initial and glottal stop-initial *words*. To establish this, we must examine roots that have been attested both with and without a prefix. If such a root surfaces with an initial glottal stop in both environments, then it is best to analyze both identically, as instances of a distinctive glottal stop. This is demonstrated in 3.2 below.

3.2 NOUN-VERB PAIRS. While many verbs in Amarasi have never been attested without a prefix, there are a number of roots that have been attested as both a noun (without a prefix) and as a verb (with a prefix). Amarasi has a number of strategies for deriving nouns from verbs and verbs from nouns. These include nominalization with a suffix *-t*, verbalization through deletion of a final consonant, and "zero derivation" (no morphological marking of the difference). A number of related noun/verb pairs in Amarasi are given in table 6, which also shows the likely direction of derivation.

Table 6 shows eleven verbs that have a glottal stop after the agreement prefix. The most straightforward analysis of such roots is that they begin with a distinctive glottal

TABLE 6. AMARASI NOUN-VERB PAIRS

	Noun		Verb	
'dry'	meto?	→	n-meto	'is/becomes dry'
'cold'	mainikin	→	n-mainiki	'is cold'
'deeds, practice'	mo?e-t	←	n-mo?e	'do, make'
'most, completely'	[?]isa-t	←	n-isa	'most, completely, win'
'cloth belt'	?aba?kena?	↔	n-?aba?kena?	'wears a cloth belt'
'clean, shaved, naked'	?afa?	↔	n-?afa?	'is clean, shaved, naked'
'Casuarina tree'	?aidʒo?o	↔	n-?aidʒo?o	'sways like a tall tree'
'pillow, head-rest'	?aka?nunu?	↔	n-?aka?nunu?	'uses as a pillow/head-rest'
'ancestral name'	?aku-f	↔	n-?aku	'calls by an ancestral name'
'healthy'	?aomina-f†	↔	n-?aomina?	'is healthy'
'poetry, ritual speech'	?a?a-t	←	n-?a?a	'speak in poetic/ritual language'
'dirty'	?oemetan‡	→	n-?oemeta	'is dirty/defiled'
'prayer'	?onen	↔	n-?onen	'prays'
'throat'	?oor (?)oe-f#	↔	n-?oro	'swallows'
'cutting'	?ote	↔	n-?ote	'cuts'
'pen, corral'	?o?of	↔	n-?o?of	'traps in a corral, detains'
'packet'	?amu	↔	n-?amu	'packs, envelops, covers'

† Historically from *(?)ao-f* 'body' and the root √*mina* 'comfortable, nice, delicious'.
‡ Historically from *(?)oe* 'water' and *metan* 'black'.
# Historically/synchronically from *?oro* 'swallow', *(?)oe* 'water', and *-f* 0GEN (≈ not possessed), with regular CV → VC metathesis of the first member of an attributive phrase.

stop. Given this, the most straightforward analysis of the word-initial glottal stop of their nominal counterparts is also that this glottal stop is distinctive.

Table 6 also shows the pair *[?]isa-t* 'most, completely' : *n-isa*, in which the verb does not begin with a glottal stop while the prefixless noun does. This root can be analyzed as vowel-initial and the glottal stop of the noun as an automatic glottal stop inserted word-initially before a vowel.

While such data reveal a difference between distinctive and epenthetic prevocalic word-initial glottal stops, the vowel-initial verb *n-isa* 'most, completely, win' and the thirteen glottal stop-initial verbs given in table 6 are the only roots in my current database that are either vowel- or glottal stop-initial and have been attested with prefixless nominal forms.[10]

An alternate analysis of these data would be to propose that all the initial glottal stops in the nouns in table 6 are automatic, and that the glottal stop before the final thirteen verbs is some kind of verbal prefix. Under this alternate analysis, a word such as *n-?onen* 'prays' would be analyzed as *n-?-onen*, while the verb *n-isa* 'most, completely, wins' would be analyzed as not occurring with this prefix.

In fact, (apart from the 1SG agreement prefix *?-*) Amarasi *does* have a verbal prefix that consists of only a single glottal stop. This prefix is an aspectual prefix that emphasizes the transition point at which the state/activity encoded by the verb begins to hold. Examples of transitional *?-* are given in table 7.[11]

10. Nominal forms for other vowel-initial or glottal stop-initial roots are either unattested or have an additional prefix attached. See 3.3 for details.
11. In some cases, the use of this transitional *?-* prefix overlaps with that of an inceptive or causative. There is currently limited evidence that the verb √*isa* 'most, completely, win' can also occur with this prefix. In my corpus, there is a single attestation of *n-?-iis* 'win' alongside 287 attestations of *-iis* or *-isa* with only an agreement prefix attached.

TABLE 7. AMARASI TRANSITIONAL *ʔ-*

	Base	Transitional	
‘new’	feʔu	na-ʔ-feʔu	‘renew’
‘bad’	reʔuf	na-ʔ-reʔuf	‘slander’
‘true, earnest’	tebe	na-ʔ-tebe	‘true, earnest’
‘capable, strong’	na-beʔi	na-ʔ-beʔi	‘make/become capable, strong’
‘shaken’	n-hasuʔ	na-ʔ-hasuʔ	‘shake’
‘pull, drag’	n-hera	na-ʔ-hera	‘tighten, strengthen’
‘die’	n-mate	na-ʔ-mate	‘kill’
‘grow’	n-nae	na-ʔ-nae	‘grow up (of a child)’
‘tight, taut’	n-pii	na-ʔ-pii	‘tighten, tauten’
‘lifted, raised’	n-rata	na-ʔ-rata	‘lift, raise’

This analysis cannot be extended to the glottal stop-initial verbs in table 6, as they do not correspond to the aspectual use of this prefix. Examples such as *n-ʔonen* ‘prays’ and *n-ʔoemeta* ‘is dirty’, in particular, have been frequently attested without any transitional meaning, as would be encoded by the transitional prefix *ʔ-*.

The behavior of glottal stop-initial words such as *ʔonen* ‘prayer’ → *n-ʔonen* ‘prays’ that retain their glottal stop after prefixation shows that we can identify some word-initial glottal stops as distinctive. Similarly, the behavior of roots such as *[ʔ]isa-t* ‘most, completely’ and *n-isa* that do not have a glottal stop after prefixation shows that we can identify some prevocalic word-initial glottal stops as automatic. Additional evidence for automatic prevocalic, but word-internal, glottal stops is given in section 4.

3.3 AN ADDITIONAL TEST FOR INITIAL GLOTTAL STOPS. The data from consonantal prefixes provide the clearest evidence for a difference between initial distinctive and automatic glottal stops in Amarasi. There is at least one other morphological process in Amarasi that allows us to test the status of initial glottal stops. This is nominalization with the circumfix *(ʔ)a-…-t*. This circumfix typically derives nouns referring to people who do or are associated with the base.

When this circumfix attaches to consonant-initial roots, it occurs with the form *(ʔ)a-…-t* as expected. However, when a vowel-initial root is nominalized with this circumfix, the prefixal part appears to have the allomorph *(ʔ)amn-*. Examples are given in table 8.

This apparent allomorph *(ʔ)amn-* can be analyzed as the stative circumfix *m-…-ʔ*, which itself attaches to the third person form of vowel-initial verbs. Examples include *√inu* ‘drink’ → *m-n-inu-ʔ* ‘drinking, drinkable’ and *√ita* ‘see’ → *m-n-ita-ʔ* ‘seen, visible’.[12] Nominalizations of vowel-initial roots with *(ʔ)a-…-t* take the derived stative form as the base.

Because the nominalizer *(ʔ)a-…-t* obligatorily cooccurs with the stative prefix before vowel-initial stems, when it occurs as plain *(ʔ)a-…-t* before a glottal stop, this is evidence that this particular glottal stop would not be epenthetic word-initially.

12. Evidence that the prefixal element of the stative circumfix *m-…-ʔ* attaches to the third person form of vowel-initial roots rather than having an allomorph *mn-* before vowels comes from the verb root *√Vma* ‘come’, which has a partially suppletive paradigm: 1SG/2SG *(ʔ)uma*, 3SG *nema*, 1PX/2PL *(ʔ)ima,* 3PL *nema=n*. The nominalization of this verb is *(ʔ)a-m-nema-t* ‘guest, one who comes, origin’ with the suppletive third person stem retained.

TABLE 8. NOMINALIZATION WITH *(ʔ)a-…-t*†

	Base	Nominalization	
‘is first’	na-hunu	(ʔ)a-hunu-t	‘the first one’
‘dies’	n-mate	(ʔ)a-mate-s	‘dead person’
‘old, aged’	mnasiʔ	(ʔ)a-mnasiʔ	‘old/aged person’
‘weak, soft’	n-ʔore	(ʔ)a-ʔore-t	‘weak/soft person’
‘dirty’	n-ʔoemeta	(ʔ)a-ʔoemeta-s	‘dirty/defiled person’
‘prayer’	ʔonen	(ʔ)a-ʔonen	‘one who prays’
‘unstable, shaky’	na-ʔoniʔ	(ʔ)a-ʔoniʔ	‘unstable person’
‘look for, search’	n-ami	(ʔ)a-m-n-ami-t	‘one who searches’
‘run, flee’	n-aena	(ʔ)a-m-n-aena-t	‘runner, one who flees’
‘eats’	n-eku	(ʔ)a-m-n-eku-t	‘eater’
‘most, completely, win’	n-isa	(ʔ)a-m-n-isa-t	‘winner’

† The final *-t* of this circumfix has the allomorph *-s* when the stem contains a /t/. When the stem ends in a final consonant, the suffixal element of *(ʔ)a-…-t* does not occur.

4. AUTOMATIC GLOTTAL STOPS. Prefixal morphology provides evidence that some word-initial glottal stops are distinctive and some are automatic. However, as discussed above, I have so far identified only one clear example of a vowel-initial root that also occurs without any additional prefix—the verb *n-isa* ‘most, completely, win’ with the nominalization *[ʔ]isa-t* ‘most, completely’. This nominalization attests the only unambiguously epenthetic word-initial glottal stop in my current database. It is, thus, tempting to dismiss this single example as irregular and identify all word-initial glottal stops as distinctive.

In this section, I discuss two processes in Amarasi that caution against taking this approach and provide additional evidence that in certain environments the glottal stop is indeed an epenthetic consonant in Amarasi. These processes are vowel epenthesis (4.1), before which a glottal stop occurs, and the obligatory insertion of a glottal stop after syllabic prefixes (4.2).

4.1 VOWEL EPENTHESIS. A cluster of two consonants is the maximum cluster usually permitted in Amarasi. When a word with an initial consonant cluster occurs after another consonant, epenthesis of the vowel [a] usually occurs between the two words to avoid the potential cluster of three consonants.[13] Epenthesis also optionally occurs phrase-initially. Epenthetic [a] before a consonant cluster is always preceded by a glottal stop.

Four examples extracted from natural texts of epenthesis between a word-final consonant and root-initial consonant cluster are given in (7)–(10) below. In all examples, a glottal stop also occurs before the epenthetic vowel.

(7) (ʔ)uma ʔ-tea =te, (ʔ)u-haku-b **[ʔa]**snuku Niuskore.
1/2SG\come 1SG-arrive =SET 1SG-force-TR trim N.
‘When I arrived, I forced myself to do the mowing at Niuskore.’

(8) n-bi nomer **[ʔa]**msaʔ reko
3-RL.LOC number also good
‘(writing) on the number is also fine’

13. While epenthesis usually occurs between clusters of three consonants created across a word boundary, there are occasional instances in which C#CC occurs without epenthesis.

(9) kuan **[ʔa]**ʔpina =m faof.
village below =and above
'There was a village down below and up above.'

(10) (ʔ)au ka= (ʔ)u-ʔrae =fa (ʔ)ur~(ʔ)uran =(ʔ)at **[ʔa]**kbiti.
1SG NEG=1SG-care =1SG INTNS~rain =SET scorpion
'If I don't take care, when it rains a lot, then (there are) scorpions.'

Three examples of epenthesis of [a] between a final consonant and a consonant cluster, of which the first consonant is a prefix, are given in (11)–(13) below. Again, an automatic glottal stop also occurs before each epenthetic vowel. The underlying forms of roots are given in the second line as a number of morphophonemic processes, such as CV metathesis, have occurred in these examples.

(11) (ʔ)uim ree**ʔ**gw=e msa**ʔ** **[ʔa]**n-pukai n-aandʒ=e, n-out.
(ʔ)umi re**ʔ**u=e msa**ʔ** n-pukai n-ani=e n-otu
house\M sacred=3DET also 3-destroy 3-before=3SG.ACC 3-burn
'The sacred house was also pulled down and then burnt.'

(12) sin n-baits=o-k **[ʔa]**n-bi kuan~kuan.
sin n-batis=o-k n-bi kuan~kuan
3PL 3-separate=REFL-3PL.GEN 3-RL.LOC FRD~village
'They separated themselves out into various villages.'

(13) ahh surat re**ʔ** nai**ʔ** Yohanis **[ʔa]**n-tuudʒ=e na-huun
surat re**ʔ** nai**ʔ** Yohanis n-tui=e na-hunu
umm paper REL Mr. John 3-write=3SG.ACC 3-first
'umm, the book/letter that John wrote first'

Epenthesis of [a] after a final consonant and before a CC-initial word is the usual strategy to resolve a potential cluster of three consonants. Phrase-initially before a consonant cluster, epenthesis of [a] also optionally occurs, though in this environment it is much less common.

Examples of phrase-initial epenthesis before a consonant cluster are given in table 9. This table gives the citation form of a number of consonant-initial verbs from a recorded wordlist. All were cited in the third person form with epenthesis of [a] before the initial consonant cluster. Vowel-final verbs were also cited in the M-form (≈ metathesized). As with the textual examples, an automatic glottal stop occurs before this epenthetic vowel.

TABLE 9. EPENTHETIC [a]

Root	Citation		Gloss
√dʒari	[ʔa]n-dʒair	[ʔaŋˈd̠ʒaer]	'becomes'
√hake	[ʔa]n-haek	[ʔanˈhaɛkʲ]	'stands'
√kisu	[ʔa]n-kius	[ʔanˈkiʉs]	'sees'
√mani	[ʔa]n-main	[ʔanˈmain]	'laughs'
√reruʔ	[ʔa]n-reruʔ	[ʔanˈdɾeɾʊʔ]	'is sleepy'
√roʔa	[ʔa]n-rooʔ	[ʔanˈdɾɔːʔ]	'spews'
√sii	[ʔa]n-sii	[ʔanˈsiː]	'sings'
√topu	[ʔa]n-toup	[ʔaŋ̟ˈt̠ɤ̞ʊp]	'receives'
√toti	[ʔa]n-toit	[ʔaŋ̟ˈt̠əɨt]	'asks'
√tupa	[ʔa]n-tuup	[ʔaŋ̟ˈt̠uːp]	'sleeps'

Epenthesis before a word-initial consonant cluster is an automatic process in Amarasi, being used to break up a cluster of three consonants and/or to prevent a cluster from surfacing phrase-initially. It is almost obligatory after another consonant, and optional phrase-initially. These two rules can be stated as (14a) and (14b) below.

(14) a. Ø → a ~ Ø / #_CC
b. Ø → a / C#_CC

Given that epenthesis is an automatic process, it would be extremely unusual for this epenthetic vowel to be accompanied by a distinctive, contrastive consonant. Instead, the glottal stop that precedes epenthetic [a] in Amarasi is best analyzed as a result of a rule that automatically inserts glottal stops word-initially before vowels. Both the initial segments in an example such as *[ʔa]nreruʔ* 'is sleepy' are automatic insertions; the vowel occurs because of the following consonant cluster and the glottal stop occurs because of the following word-initial vowel.

Epenthesis of [a] (with an automatic glottal stop) needs to be distinguished from one other phenomenon in Amarasi that is used to avoid a cluster of three consonants. Nearly all words in Amarasi have two forms; a U-form (≈ unmetathesized) and an M-form (≈ metathesized). In most cases, these forms are morphological and mark the construct case in the syntax, or a resolved state of affairs in the discourse (Edwards 2016b). However, before a consonant cluster, the U-form of vowel-final verbs is usually used. Examples are given in (15)–(17) below, in which such U-forms are glossed \U$_c$.

(15) (ʔ)u**ma** ʔ-tee =ma ʔ-ai**ti** **br**uuk.
1/2SG\come\U$_c$ 1SG-arrive =and 1SG-pick.up\U$_c$ pants
'I arrived (home) and picked up some pants.'

(16) (ʔ)onai=te, ho m-te**bi** ʔteta ʔ.
and.then 2SG 1PX/2-turn\U$_c$ different
'And then you turn it differently.'

(17) hai m-e**ki** **m-sanu** **m-b**i re ʔ ʔpinan (ʔ)ia =t, …
1PX 1PX/2-bring\U$_c$ 1PX/2-go.down\U$_c$ 1PX/2-RL.LOC GVN.OBJ below 1DEM =SET
'When we went down here, …'

Similarly, words with a final /a/ usually occur in the U-form before a consonant cluster. Two examples are given in (18) and (19) below.

(18) na, hai m-res**a** **m-m**ak-tun~tuina ʔ.
well 1PX 1PX/2-read\U$_c$ 1PX/2-RECP-INTNS~follow
'Well, we each read one after another.'

(19) (ʔ)oka=te sin n-seen n-an**a** ʔrean ʔ=es.
(ʔ)oke ʔ=te sin n-sena n-ana ʔreno ʔ=es
after.that 3PL 3-plant\M 3-RES\U$_c$ lemon=one
'After that they planted a lemon tree.'

There are a number of grammatical functors that derive the M-form by deleting a final vowel rather than undergoing the usual CV → VC metathesis. When such functors occur before a consonant cluster, they often also occur in the vowel-final U-form. When the final form of such a functor ends in /a/, the surface string bears a superficial resemblance

to epenthesis of [a]. However, the processes can be distinguished by the fact that when /a/ is the final vowel of a word, it does not begin with a glottal stop.

Examples of functors with a final /a/ that derive their M-form by deleting this vowel before initial consonant clusters and before a single consonant are given in table 10. These functors are the imperfective locative *et,* the verb *n-ok* 'with', and the two pronouns *in* 's/he, 3SG' as well as *sin* 'they, 3PL'.[14]

There are, thus, two phenomena that are used to avoid consonant clusters in Uab Meto: epenthesis of [a], and the use of the vowel-final U-forms. Whether a particular surface [a] is an epenthetic vowel or the final vowel of the previous word can be determined by the presence of an epenthetic glottal stop. If such a glottal stop is present, the vowel is also epenthetic.

The fact that an automatic glottal stop precedes an epenthetic vowel in Amarasi provides evidence that there is indeed a rule of word-initial glottal stop insertion before vowels in this language. Epenthesis of [a] is triggered by a consonant cluster, and insertion of this initial vowel in turn triggers insertion of an initial glottal stop.

TABLE 10. U-FORMS AND M-FORMS OF FUNCTORS BEFORE CLUSTERS

M-form		U-form	
(ʔ)et (ʔ)umi	'at home'	(ʔ)eta krei	'at church'
(ʔ)et rene	'at the field'	(ʔ)eta skoor	'at school'
(ʔ)et kuan	'at the village'	(ʔ)eta ʔtoʔef	'at a mountain'
n-ok Uisneno	'with God'	n-oka kbiti=n	'with scorpions'
(ʔ)in (ʔ)umi	'her/his house'	(ʔ)ina msaʔ	's/he also'
sin kana-k	'their name/clan'	sina msaʔ	'they also'

4.2 EPENTHETIC GLOTTAL STOPS AFTER VOCALIC PREFIXES. Amarasi inserts glottal stops not only word-initially before a vowel, but also morpheme-initially between two vowels. At morpheme boundaries, the hiatus between two vowels must be marked. This is achieved by glottal stop insertion.[15]

The strongest evidence for this comes from verbs with consonantal prefixes when intransitive, and vocalic prefixes when transitive (see 3.1). Among such verbs, the intransitive member of a pair occurs with a consonantal prefix while its transitive counterpart occurs with a vocalic prefix. When the verb is vowel-initial, a glottal stop always occurs to mark the hiatus between the prefix and the verb stem.

Examples are given in table 11, which shows nine intransitive-transitive verb pairs: five of these have vowel-initial roots and four have consonant-initial roots. The transitive counterpart of such verbs usually also takes one of the transitive suffixes *-ʔ* or *-b.*

I analyze such data as attesting glottal stop insertion at a morpheme boundary. An alternate analysis would be to propose that the initial glottal stop of the transitive counterpart of such verb pairs is a prefix—perhaps the transitional prefix *ʔ-* discussed in 3.2

14. In Edwards (2016b:136), I mistakenly identified the phrases *eta krei* 'at church', *eta skoor* 'at school', and *eta ʔtoʔef* 'at a/the mountain' as attesting epenthesis. This is despite the lack of a glottal stop in such phrases as well as the fact that I identified the possibility of *et* having a U-form *eta*. This misanalysis was influenced by the orthographic practices of some speakers who write forms such as /eta krei/ 'at church' as <*et akrei*>.

15. As discussed in 2.1, vowel sequences freely occur word-internally. One example is *hau* → [ˈha.ʊ] 'wood, tree'. Such examples show that hiatus resolution between vowels is different within and across morphemes.

TABLE 11. INTRANSITIVE/TRANSITIVE VERB PAIRS†

	Intransitive	Transitive	
'enters, goes in'	n-tama	na-tama	'makes enter, puts inside'
'goes up, ascends'	n-sae	na-sae-b	'puts up, gets up, lifts up'
'pushes down'	n-ʔai	na-ʔai-b	'pushes down'
'rises, gets up'	n-fena	na-fena-ʔ	'raises, gets (s.o.) up'
'runs, flees'	n-aena	na-[ʔ]aena-b	'chases away'
'picks up'	n-aiti	na-[ʔ]aiti-ʔ	'picks up'
'eats'	n-eku	na-[ʔ]eku-ʔ/-b	'feeds'
'sees'	n-ita	na-[ʔ]ita-b	'shows'
'drink'	n-inu	na-[ʔ]inu-ʔ	'gives a drink to'

† The distinction is not one of syntactic transitivity but of semantic transitivity, with the subject of the verb with vocalic prefixes explicitly encoded as a volitional AGENT.

above. This alternate analysis does not explain why this prefix is optional before consonants but obligatory before vowels.

The insertion of a glottal stop at morpheme boundaries to resolve the vowel hiatus means that roots that have been attested without a prefix and only with a vocalic prefix are ambiguous as to whether the initial glottal stop of the prefixless form is distinctive or automatic. Two such examples are *(ʔ)uran* : *na-(ʔ)ura* 'rain' and *(ʔ)uab* 'speech' : *na-(ʔ)uab* 'speaks'.

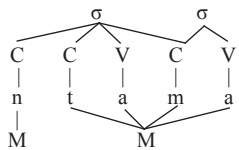
The insertion of a glottal stop to resolve vowel hiatus between morphemes can be analyzed as occurring because morphemes in Amarasi require an onset consonant. This is a very common cross-linguistic phenomenon (McCarthy and Prince 1993; Prince and Smolensky 2004:111f).

Within the rule-based analysis provisionally adopted in this paper, a rule inserting glottal stops between vowels at a morpheme boundary is given as (20) below, where $\#_M$ is used to represent a morpheme boundary.

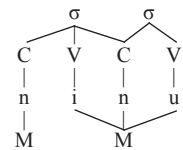
(20) $\emptyset \rightarrow$ ʔ / V-$\#_M$_V

In many cases, the initial C-slot of the first syllable of a morpheme is filled by a consonant. This initial consonant is often the root-initial consonant, as in examples such as *n-tama* 'enter', illustrated in (21) below. When a vowel-initial root occurs with a consonantal prefix, this prefix itself forms the onset for the first syllable of the second morpheme. This is illustrated in (22) below with the form *n-inu* 'drink'. In these autosegmental diagrams, M represents a morpheme.

(21)



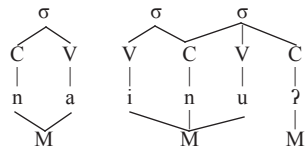
(22)



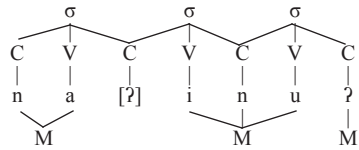
However, when a vocalic prefix attaches to a vowel-initial root, rule (20) operates and inserts a glottal stop between the two morphemes. The structure of a word such as *na-[ʔ]inu-ʔ* 'gives a drink to' before the operation of rule (20) would be as in (23a)

below; there is a vowel hiatus across a morpheme boundary. As a result, a glottal stop is inserted, yielding the structure shown in (23b).

(23) a.

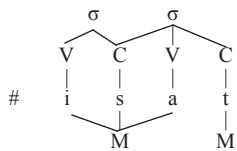


b.

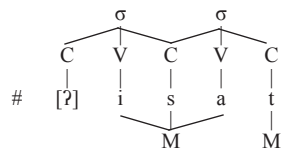


A requirement for morphemes to begin with an initial consonant can also account for glottal stop insertion word-initially in examples such as the root √*isa* 'most, completely, win' with the nominalization *[ʔ]isa-t*. Before glottal stop insertion, the first syllable of this word would be vowel-initial, as shown in (24a). Because this is not allowed, a glottal stop is inserted yielding the consonant-initial structure in (24b).

(24) a.



b.



Amarasi can, thus, be analyzed as having a productive process of glottal stop insertion. Such glottal stops are inserted word-initially and at morpheme boundaries to mark the hiatus between two vowels. Language-internal support for positing a rule of glottal stop insertion in Amarasi comes from another rule of consonant insertion in the language, in this case at the boundary of vowel-initial enclitics.

5. REDUPLICATION. The consonantal agreement prefixes discussed in section 3 provide evidence for both distinctive and epenthetic word-initial glottal stops. Similarly, epenthesis and vocalic prefixes discussed in section 4 provide evidence for automatic glottal stops in Amarasi. For the sake of completeness, I discuss here reduplication, which interacts with initial glottal stops, but cannot ultimately determine their status.

Partial reduplication is a productive morphological process in Amarasi used to mark an intensive. In partial reduplication, the penultimate CVC syllable of the stem is copied and placed to the left of the final foot. This means that when the stem consists only of a CV(C)V(C) foot, the reduplicant occurs as a prefix. When the stem is more than two syllables long or begins with a consonant cluster, the reduplicant occurs as a kind of infix between any pre-foot material and the foot. Any agreement prefix of a vowel-initial verb also occurs as the first consonant of the reduplicant. Examples are given in table 12.

TABLE 12. PARTIAL REDUPLICATION

#CVCVC				#(CVCVC)+CVCVC			
Base		**Reduplicated**	**gloss**	**Base**		**Reduplicated**	**gloss**
nenuk	→	**nen**~nenuk	'(take a) walk'	ʔnenuʔ	→	**ʔnen**~nenuʔ	'turn'
baʔuk	→	**baʔ**~baʔuk	'many'	kberoʔ	→	k**ber**~beroʔ	'move'
reko	→	**rek**~reko	'good'	msena	→	m**sen**~sena	'full, satiated'
koʔu	→	**koʔ**~koʔu	'big'	thoe	→	**tho**~hoe	'inundate, bless'
nao	→	**na**~nao	'go'	ʔroo	→	**ʔro**~roo	'far, distant'
nakan	→	**nak**~n-akan	'3-grumble'	maʔfenaʔ	→	maʔ**fen**~fenaʔ	'heavy'
m-ami	→	**mam**~m-ami	'2-look for'	taikobi	→	tai**kob**~kobi	'fall down'
t-eku	→	**tek**~t-eku	'1PL.INCL-eat'	paumakaʔ	→	pau**mak**~makaʔ	'near'

When the stem contains a vowel sequence and a consonant—that is, has the shape VVC#—the final consonant of the CVC reduplicant is usually taken from the final consonant of the stem. Examples include *fauk → fak~fauk* 'several', *buaʔ → buʔ~buaʔ* 'together', *na-tuin → na-tun~tuin* 'follows, because of', and *kais → kas~kais* 'don't, PROHIBITIVE'.[16]

For words with the surface structure CVVCV(C) that are also assigned a single foot, only the first vowel of the initial diphthong is copied in reduplication. One example is *n-aena → nan~naena* 'runs away, flees'.

When the stem begins with a vowel preceded by a glottal stop, both the reduplicant and the stem also begin with a glottal stop. Examples are given in table 13.

On initial inspection, such data appear to provide evidence that initial glottal stops are distinctive. If a word such as *(ʔ)uran* 'rain' begins with a distinctive glottal stop, then these data are unproblematic—reduplication simply copies the initial consonant of the root. However, there is evidence that reduplication in Amarasi occurs after the application of other rules and that the glottal stops in such examples can also be analyzed as automatic insertions.

The first piece of evidence that reduplication operates after the application of other rules comes from the fact that agreement prefixes are also copied into the reduplicant, yielding forms such as *t-eku* '1PL.INCL-eat' → *tek~t-eku*. Such forms show that reduplication operates after the application of other morphological processes.

There is also evidence that reduplication operates after the application of phonemic realization rules. This evidence comes from the way in which reduplication interacts with the rule of mid vowel raising in Amarasi.

TABLE 13. PARTIAL REDUPLICATION WITH INITIAL GLOTTAL STOPS

Base		**Reduplicated**	**gloss**
(ʔ)anaʔ	→	(ʔ)an~(ʔ)anaʔ	'small'
(ʔ)ar=ki	→	(ʔ)ar~(ʔ)ar=ki	'all of you'
(ʔ)okeʔ	→	(ʔ)ok~(ʔ)okeʔ	'all'
(ʔ)unuʔ	→	(ʔ)un~(ʔ)unuʔ	'past, days of yore'
(ʔ)uran	→	(ʔ)ur~(ʔ)uran	'rain'
na-(ʔ)uab	→	na-(ʔ)ub~(ʔ)uab	'speaks'

16. Two exceptions are *ʔnaef → ʔna~naef* 'old man' and *mfaun → mfa~faun* 'many'. In both cases, the final consonant is historically a distinct morpheme: the 0GEN suffix *-f* and the plural enclitic *=n*, respectively.

In Amarasi the mid vowels /e/ and /o/ are usually realized as mid-low [ɛ] and [ɔ]. Three examples are *kofaʔ* → [ˈkɔfɐ] 'boat', *mneas* → [ˈm͡nɛas] 'hulled rice', and *seo* → [ˈsɛɔ] 'nine'. However, before the high vowels /i/ or /u/, mid vowels are usually raised to mid-high. Examples include *n-reruʔ* → [ˈndɾeɾʊʔ] 'sleepy', *betiʔ* → [ˈβe̝t̪iʔ] 'fried', *koʔu* → [ˈkoʔʊ] 'big', and *(ʔ)ori-f* → [ˈʔoɾɪf] 'younger same sex sibling'.[17]

When such words are reduplicated, the reduplicated mid vowel of the reduplicant is also mid-high. Examples include: *koʔu* → *koʔ~koʔu* → [koʔˈkoʔʊ] 'big', *n-nesi* → *n-nes~nesi* → [nːesˈnesi] 'more' and *n-reruʔ* → *n-rer~reruʔ* [ndɾeˈrˑeɾʊʔ].

This provides evidence that reduplication occurs after the application of phonemic realization rules. The rule of mid vowel raising applies first. After this, reduplication occurs, resulting in the raised mid vowel being copied into the reduplicant.

This analysis can be extended to initial glottal stops. For putative vowel-initial words such as *anaʔ* 'small' and *okeʔ* 'all', rule (3) operates, inserting an initial glottal stop yielding the phonetic outputs [ˈʔanɐʔ] 'small' and [ˈʔɔkɛʔ] 'all', respectively. Reduplication then applies to these surface forms, yielding [ʔanˈʔanɐʔ] 'very small' and [ʔɔkˈʔɔkɛʔ] 'all', respectively.[18]

The evidence from reduplication regarding initial glottal stops is, thus, ambiguous. While there appears to be evidence for identifying word-initial glottal stops before vowels as distinctive, there is also evidence that reduplication occurs after the application of other rules. Balle (2017) proposes a comparable analysis for reduplication in Helong, the language spoken immediately to the west of Amarasi.

6. HISTORICAL EXPLANATIONS. The synchronic data show evidence for both distinctive and automatic glottal stops word-initially before vowels in Amarasi. This is consistent with the historical evidence, which shows that not all initial glottal stops have developed in the same way. Some initial glottal stops have developed from an earlier consonant, while others have been historically inserted.

Most varieties of Uab Meto, including Kotos Amarasi (the focus of this paper), have undergone a *k > *ʔ* sound change. Conservative *k* is preserved in the Ro'is dialect of Amarasi, which did not undergo this sound change. Examples are given in table 14. (This table also shows an *r* : *k* correspondence between Ro'is Amarasi and Kotos Amarasi.)

Whenever evidence from Kotos Amarasi is available, an initial distinctive glottal stop in Kotos Amarasi corresponds to an initial Ro'is Amarasi /k/. While in many cases the synchronic evidence from Kotos Amarasi is currently ambiguous, it would not be surprising to find that these glottal stops were also distinctive.

There are also many cases in which an initial glottal stop in Kotos Amarasi does not derive from a historic consonant. A number of examples are given in table 15, which shows the reflexes of vowel- or glide-initial Proto-Malayo-Polynesian (PMP) reconstruc-

17. While this is the most common realization of these phonemes in Amarasi, the mid allophones [ɛ] and [ɔ] are also sometimes heard before high vowels. In some varieties of Uab Meto, this difference in vowel height is becoming distinctive. This, for instance, is the case in Miamafo (Steinhauer 1993, 1996).

18. I do not currently have data on the reduplicated counterpart of *[ʔ]isa-t* 'most, completely'. If my analysis of reduplication in this section is correct, it predicts that the reduplicated form would be **[ʔ]is~[ʔ]isa-t.*

TABLE 14. RO'IS AMARASI *k>ʔ/_V

Ro'is Amarasi	Kotos Amarasi	gloss
kaidʒoʔo	ʔaidʒoʔo†	'Casuarina tree'
n-koro	n-ʔoro	'swallows'
n-kote	n-ʔote	'cuts'
maskeriʔ	masʔekiʔ	'slippery'
na-kera	na-(ʔ)eka	'closes'
na-kapuʔ	na-(ʔ)apuʔ (ʔ)apu-f	'pregnant' 'womb'
kaansao-n	(ʔ)ansao-f	'solar plexus, heart'
kabas	(ʔ)abas‡	'cotton'
kaisif	(ʔ)asik	'flea'
kanpupu	(ʔ)atpupu	'kind of flying insect'
kare-n	(ʔ)aki-f	'kidneys'
kari	(ʔ)aki	'whetstone'
ketuʔ	(ʔ)etuʔ	'bed-bug'
kunus	(ʔ)unus	'chili'
kuma	(ʔ)uma#	'1SG\come'
ka-…-t	(ʔ)a-…-t	NOMINALIZER
ku-	(ʔ)u-	1SG

† Compare Kotos *n-ʔaidʒoʔo* 'sways like a tall tree'.
‡ Ultimately from Sanskrit कार्पास*kārpāsa*.
# Compare both Ro'is and Kotos *(ʔ)uma* '2SG\come'.

TABLE 15. PMP VOWEL-INITIAL RECONSTRUCTIONS

PMP	Ro'is	Kotos	gloss
*aku	(ʔ)au	(ʔ)au	'1SG, I'
*ama	(ʔ)ama-f	(ʔ)ama-f	'father'
*anak	(ʔ)anaʔ	(ʔ)anaʔ	'small'
*asu	(ʔ)asu	(ʔ)asu	'dog'
*əsa	(ʔ)es	(ʔ)es	'one'
*əsuŋ	(ʔ)eusuk	(ʔ)esuk	'mortar'
*ia	(ʔ)ai	(ʔ)ia	'here, 1DEM'
*ikuR	(ʔ)iku-f	(ʔ)iku-f	'tail'
*ina	(ʔ)ina-f	(ʔ)aina-f	'mother'
*umpu	(ʔ)upu-f	(ʔ)upu-f	'grandchild'
*uRat	(ʔ)ua-f	(ʔ)ua-f	'palm lines'
*uRat		(ʔ)uat	'veins of a pigs liver (used for divination)'
*wani	(ʔ)oni	(ʔ)oni	'sugar, bee'
*wahiR	(ʔ)oe	(ʔ)oe	'water'
*huaji > *waji	(ʔ)ori-f	(ʔ)ori-f	'same sex younger sibling'
*alaq		n-ana	'gets, RESULTATIVE'
*inum	n-inu	n-inu	'drinks'
*inum		na-[ʔ]inu-ʔ	'gives a drink to'

tions that begin with a glottal stop in both Kotos Amarasi and Ro'is Amarasi. When the reflex is prefixless, it begins with a glottal stop. When the reflex is attested as a verb, the synchronic morphological evidence shows that this reflex is vowel-initial. Most reconstructions are taken from Blust and Trussel (ongoing).

The extent to which vowel-initial PMP reconstructions correspond to automatic glottal stops in Amarasi is hard to discern, due to the fact that only a handful of glottal stops have been securely identified as either automatic or distinctive.

There is, however, highly limited evidence that distinctive initial glottal stops do not always derive from a historic consonant. This evidence comes from the word *ʔoemetan* 'dirty', for which the initial glottal stop can be identified as distinctive, based on the verbal form *n-ʔoemeta*. This word is a (historic) compound of *(ʔ)oe* 'water' and *metan* 'black', with the initial part deriving from PMP *wahiR 'water', which began with a glide-vowel combination that developed into a monophthong in Uab Meto.

While the comparative data themselves cannot decide on the best synchronic analysis, they are consistent with an analysis in which some word-initial glottal stops are distinctive, while others are automatic insertions. The historical data show that some word-initial glottal stops have developed from an earlier consonant, while others have been historically inserted.

7. CONCLUSION. Insertion of an automatic glottal stop word-initially before vowels is a very common phenomenon cross-linguistically. Within the greater Timor region it is similarly common. To give but three examples, each of Bunak (Schapper 2009:53f), Leti (van Engelenhoven 2004:66), and Helong (Balle 2017:101f) has been described as inserting a glottal stop word-initially before vowels, with no instances of distinctive glottal stops in this position.

While this analysis may be correct for these languages, the data from Amarasi presented in this paper show that this cannot be assumed for all languages of this region. Instead, a thorough analysis of a number of morphological and phonological processes may be required to determine the status of prevocalic word-initial glottal stops in these languages.

In Amarasi, word-initial glottal stops resist a unitary analysis. The behavior of consonantal prefixes shows that some are distinctive while others are automatic insertions. Additional evidence for automatic glottal stops word-initially comes from the processes of vowel epenthesis and glottal stop insertion to resolve vowel hiatus at morpheme boundaries. Similarly, the mixed nature of prevocalic initial glottal stops in Amarasi is consistent with their history, which shows that some come from historic consonants while others are historic insertions.

While we can identify both distinctive and automatic glottal stops in Amarasi, we are left with the conundrum that in the vast majority of cases the status of a particular glottal stop is ambiguous. In this paper, I have identified a little over a dozen clear cases of distinctive prevocalic word-initial glottal stops (like *ʔaʔa-t* 'poetry', see table 6), one clear instance of an automatic word-initial glottal stop (*[ʔ]isa-t* 'completely'), and about half a dozen instances of an automatic glottal stop at a morpheme boundary (like *na-[ʔ]inu-ʔ* 'gives a drink to'; see table 11). This leaves a residue of more than 150 lexical items in my current database in which the status of the initial glottal stop is unknown—words such as *(ʔ)okam* 'melon, gourd', for which no derivations with a prefix have been so far identified.

On initial inspection, the Amarasi data do not seem to present many phonological difficulties. The language has a relatively simple segmental inventory, with thirteen consonants and five vowels. However, a thorough examination of a full range of processes in Amarasi reveals a number of phonological challenges.

REFERENCES

Balle, Misriani. 2017. Phonological sketch of Helong, an Austronesian language of Timor. *Journal of the Southeast Asian Linguistics Society* 10:91–103.

Besnier, Niko.1987. An autosegmental approach to metathesis in Rotuman. *Lingua* 73:201–23.

Blevins, Juliette. 2008. Consonant epenthesis: Natural and unnatural histories. In *Language universals and language change*, ed. by Jeff Good, 79–107. Oxford: Oxford University Press.

Blevins, Juliette, and Andrew Garrett. The origins of consonant-vowel metathesis. *Language* 74:508–56.

Blust, Robert, and Stephen Trussel. Ongoing. Austronesian comparative dictionary. (Online open access site at: www.trussel2.com/ACD.) [Accessed May 2, 2015.]

Churchward, Clerk Maxwell. 1940. *Rotuman grammar and dictionary.* Methodist Church of Australasia, Department of Overseas Missions.

Christdas, Prathima. 1988. The phonology and morphology of Tamil. PhD diss., Cornell University.

Edwards, Owen. 2016a. Amarasi. *Journal of the International Phonetic Association* 46:113–25.

———. 2016b. Metathesis and unmetathesis: Parallelism and complementarity in Amarasi, Timor. PhD thesis, Australian National University. http://hdl.handle.net/1885/114481.

Heinz, Jeffrey. 2004. CV metathesis in Kwara'ae. MA thesis, University of California at Los Angeles.

Lombardi, Linda. 2002. Coronal epenthesis and markedness. *Phonology* 19:219–51.

Lynch, John. 2000. *A grammar of* Anejom̃. Canberra: Pacific Linguistics.

McCarthy, John, and Alan Prince. 1993. Generalized alignment. In *Yearbook of morphology 1993*, ed. by Geert Booij and Jaap van Marle, 79–153. Dordrecht: Springer.

Ortmann, Albert. 1998. Consonant epenthesis: Its distribution and phonological specification. In *Phonology and morphology of the Germanic languages*, ed. by Wolfgang Kehrein and Richard Wiese, 51–76. Tübingen: Niemeyer.

Prince, Alan, and Paul Smolensky. 2004. *Optimality theory: Constraint interaction in generative grammar.* Malden: Blackwell Publishing.

Schapper, Antoinette. 2009. Bunaq: A Papuan language of central Timor. PhD thesis, Australian National University.

Staroverov, Peter. 2014. Splitting theory and consonant epenthesis. PhD diss., Rutgers University.

Steinhauer, Hein. 1993. Notes on verbs in Dawanese. In *Topics in descriptive Austronesian linguistics*, ed. by Ger Reesnik, 130–58. Leiden: Vakgroep Talen en Culturen van Zuidoost-Azië en Oceanië.

———. 1996. Synchronic metathesis and apocope in three Austronesian languages of the Timor area. In *Pan-Asiatic linguistics; Proceedings of the Fourth International Symposium on Language and Linguistics, 8–10 January*, ed. by Suwilai Premsrirat, vol. 2, 471–92. Thailand: Institute of Language and Culture for Rural Development, Mahidol University.

van Engelenhoven, Aone. 2004. *Leti, a language of Southwest Maluku*. Leiden: KITLV Press.

Wiese, Richard. 1996. *The phonology of German.* Oxford: Oxford University Press.

Żygis, Marzena. 2010. Typology of consonantal insertions. *ZAS Papers in Linguistics* 52:111–40.

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