TWO GRAMMARS OF A'INGAE GLOTTALIZATION: A CASE FOR COPHONOLOGIES BY PHASE

MAKSYMILIAN DĄBKOWSKI
UNIVERSITY OF CALIFORNIA, BERKELEY
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ABSTRACT A'ingae (or Cofán, ISO 639-3: `con`) is an Amazonian isolate spoken in northeast Ecuador and southern Colombia. This paper describes and analyzes phonological processes pertinent to the glottal stop in A'ingae morphologically complex verbs. A'ingae verbal suffixes are organized in two morphophonological domains, or strata. Within the inner domain, glottal stops assign stress to the syllable which contains the second mora to the left of the glottal stop. In the outer domain, glottal stops do not have any effect on stress. In addition, some verbal suffixes delete stress (they are dominant). Dominance is unpredictable and independent of the suffix's morphophonological domain, but dominance and phonological stratification interact in a non-trivial way: Stress-deleting suffixes of the inner domain also delete glottalization, but stress-deleting suffixes of the outer domain leave glottalization intact.

The main theoretical import of the study resides in the architecture of the A'ingae grammar, which requires a phonological formalism capable of (i) modeling phonological stratification while (ii) allowing for morpheme-specific phonological idiosyncrasies which (iii) interact with the phonological grammar of their stratum. The formalism I adopt is Cophonologies by Phase (henceforth CbP; e. g. Sande, Jenks, and Inkelas, 2020). CbP fulfills the above desiderata by associating *cophonologies*, or morphologically-specific phonological grammars, with (i) phase heads as well as (ii) individual morphosyntactic features, which (iii) compile together to yield the phonological ranking applied at spell-out.

Secondary theoretical implications pertain to Goldsmith's (1990) notion of segmental licensing and Alderete's (1999, 2001) ANTIFAITHFULNESS. To model the relationship between glottalization and stress, I propose that within the inner (but not the outer) domain, the glottal stop is licensed by a metrical foot. I model stress deletion as antifaithfulness to input stress. Finally, I propose that antifaithfulness to a licenser entails antifaithfulness to its licensees, which captures the fact that only the inner dominant suffixes delete glottalization.

1 INTRODUCTION

In this paper, I describe and analyze the morphologically-conditioned phonology of the glottal stop in A'ingae (or Cofán, ISO 639-3: con), a language isolate of the Amazon. The glottal stop most often appears in syllabic rimes; onset glottal stops are rare. The presence of the glottal stop is contrastive in roots (1a-b) as well as functional morphemes (1c-d).[1] The position of glottalization is fully predictable in roots but contrastive in morphologically complex forms (1e-f). Stress is marked with the acute accent (´) and **boldface**.

(1) Glottal stop as a contrastive segment

a. ***sé**je*	b. ***séʔ**je*	c. ***tsá** =ma*	d. ***tsá** -ʔma*	e. ***séʔ**je -pa*	f. ***sé**je -ʔpa*
paint	cure	ANA =ACC	ANA -FRST	cure -SS	cure -N

The focus of my study are the phonological processes pertinent to the glottal stop in A'ingae morphologically complex verbs. In addition to the presence or absence of preglottalization (1c-d), A'ingae suffixes vary along two dimensions. First, there are two morphophonological domains, or strata, which I will refer to as *inner* (closer to the root) and *outer* (farther away from the root). Glottal stops in roots and suffixes of the inner domain assign stress to the syllable which contains the second mora to the left of the glottal stop. Glottal stops introduced in the outer domain do not have any effect on stress.

Second, A'ingae suffixes can be categorized as *recessive*, which preserve underlying stress, or *dominant*, which delete input stress (for more on dominance, see Alderete, 1999; Halle and Vergnaud, 1987; Inkelas, 1998; Rolle, 2018; Vaxman, 2016). Whether a suffix is recessive (i. e. stress-preserving) or dominant (i. e. stress-deleting) is unpredictable and independent of the morphophonological domain. This is to say, there are *inner recessive*, *outer recessive*, *inner dominant*, and *outer dominant* suffixes. Notably, the parameter of dominance interacts with the morphological domain in a non-trivial way: If there is an underlying glottal stop, the inner dominant suffixes delete the glottal stop along with stress, but the outer dominant suffixes leave the glottal stop intact.

The main theoretical import of this study resides in the architecture of the A'ingae morphophonological grammar as revealed by the phonological processes related to glottalization: Different phonological grammars within one language may correspond to ordered morphological domains or strata (as is the case with the effect A'ingae glottalization has on stress) but may also be unpredictably associated with individual morphemes (as is the case with A'ingae dominance effects), which further interact with the grammar of their stratum. Thus, a phonological formalism that does justice to the A'ingae data pattern must be able to fulfill the triple desideratum of (i) modeling phonological stratification while (ii) allowing for morpheme-specific phonological idiosyncrasies which (iii) interact with the phonological grammar of their stratum.

The formalism I adopt is Cophonologies by Phase (henceforth CbP; Sande, 2017, 2019; Sande and Jenks, 2018; Sande, Jenks, and Inkelas, 2020). CbP allows for associating *cophonologies*, or morphologically-specific phonological grammars, with phase heads as well as individual morphosyntactic features. In my proposal, lower phase heads are associated with a cophonology where glottalization triggers stress assignment and higher phase heads—with a cophonology where the glottalization has no effect on stress (i). Morphosyntactic features which are spelled out by dominant suffixes are associated with a cophonology which requires stress deletion (ii). Lastly, the cophonologies of the all the features within a phase jointly determine the phonological ranking at each spell-out, so phase head and morpheme-specific cophonologies may interact (iii). Thus, Cophonologies by Phase fulfils the above triple desideratum.

The secondary theoretical implications of the study pertain to two other formal tools necessary to model the A'ingae data. To capture the relationship between glottalization and stress, I adopt Goldsmith's (1990) notion

1 The following glossing abbreviations are used: 1 = first person, 2 = second person, 3 = third person, ACC = accusative, ACC2 = accusative 2, ANA = anaphoric, AND = andative, APPR = apprehensional, CAUS = causative, CNTR = contrastive topic, DS = different subject, FRST = frustrative, IF = conditional, IF2 = conditional 2, IMP = imperative, IMP2 = imperative 2, IMP3 = imperative 3, INF = infinitive, IPFV = imperfective, IRR = irrealis, LOC = locative, MANN = manner, N = nominalizer, NEG = negative, NEW = new topic, PASS = passive, PAUC = verbal paucal, PLS = plural subject, PRCM = precumulative, PRHB = prohibitive, RCPR = reciprocal, ROOT = verbal root, RPRT = reportative, SH.DLM = delimited space shape, SMFC = semelfactive, SS = same subject, VEN = venitive, VER = veridical, YNQ = polar interrogative.

of segmental licensing. Specifically, I propose that within the inner domain the glottal stop is licensed by the metrical foot. (In the outer morphological domain, glottalization is licensed by the syllabic node.) To capture the behavior of stress-deleting suffixes, I adopt Alderete's (1999, 2001) notion of AntiFaithfulness. This is to say, stress-deleting suffixes penalize retention of input stress. Finally, I propose that antifaithfulness to a licenser entails antifaithfulness to its licensees. This captures the fact that dominant suffixes delete glottalization only within the inner domain (where glottal stops are licensed by metrical structure). Thus, the study contributes new arguments in favor of segmental licensing as well as the controversial family of AntiFaithfulness constraints, and makes a novel proposal about the interaction between the two.

The rest of the paper is structured as follows. Section 2 gives background on the A'ingae language and its speakers. Section 3 describes the distribution of the A'ingae glottal stop and the morphophonological processes relevant to it. Section 4 presents a formal analysis of the data couched in Cophonologies by Phase (Sande, 2019; Sande, Jenks, and Inkelas, 2020; others). Section 5 considers and rejects alternative analyses. Section 6 concludes.

2 LANGUAGE BACKGROUND

A'ingae (or Cofán, ISO 639-3: `con`) is an Amazonian language isolate spoken by ca. 1,500 Cofán people in the province of Sucumbíos (northeast Ecuador) and the department of Putumayo (southern Colombia). The language is endangered and highly underdocumented. In Ecuador, A'ingae is spoken robustly and transmitted to children. Bilingualism with Spanish is prevalent, especially among younger generations. Despite economic, ecological, and political pressures experienced by the Cofán, their language attitudes towards A'ingae are uniformly positive (Dąbkowski, 2021a).

	LABIAL		ALVEOLAR		PALATAL		VELAR		GLOTTAL	
PLAIN STOPS	*p*	p	*t*	t			*k*	k	*ʔ*	ʔ
ASPIRATED STOPS	*ph*	pʰ	*th*	tʰ			*kh*	kʰ		
PRENASAL STOPS	*mb*	ᵐb	*nd*	ⁿd			*ng*	ᵑg		
NASAL SONORANTS	*m*	m	*n*	n	*ñ*	ɲ				
PLAIN FRICATIVES	*f*	f	*s*	s	*sh*	ʃ			*j*	h
PLAIN AFFRICATES			*ts*	ʦ	*ch*	ʧ				
ASPIRATED AFFRICATES			*tsh*	ʦʰ	*chh*	ʧʰ				
PRENASAL AFFRICATES			*nz*	ⁿʣ	*ndy*	ⁿʤ				
ORAL SONORANTS	*v*	ʋ	*r*	ɾ	*y*	j	*g*	ɰ		

Table 1: Consonantal inventory.

	ORAL				NASAL			
	FRONT		BACK		FRONT		BACK	
CLOSE	*i*	i	*û*	ɨ	*in*	ĩ	*ûn*	ɨ̃
ROUND			*u*	o			*un*	õ
OPEN	*e*	e	*a*	a	*en*	ẽ	*an*	ã

ORAL	*ua*	oa	*ia*	ia	*ui*	oi	*ue*	oe
	au	ao	*ai*	ai	*ûi*	ɨi	(*ae*	ae)
NASAL	*uan*	õã	*ian*	ĩã	*uin*	õĩ	*uen*	õẽ
	aun	ãõ	*ain*	ãĩ	*ûin*	ɨ̃ĩ		

Table 2: Vocalic inventory.

Previous work on the phonetics and phonology of A'ingae includes Borman's (1962) phonological sketch, Fischer and Hengeveld's (to appear) grammatical sketch, Repetti-Ludlow et al.'s (2019) phonetic study, Sanker and AnderBois's (2021) reconstruction of nasality, and Dąbkowski's (2021c) argument against a representational treatment of stress dominance. Some of the data and previous versions of the current analysis appear in in Dąbkowski (2019a,b, 2021b,d, to appear).

The phonemic inventory of A'ingae is moderately large, totaling twenty-seven consonants, five simple vowels, and seven diphthongs[2] (plus twelve nasal counterparts of the latter two).[3] It is given in Tables 1 and 2, with each phoneme listed to the right of its default grapheme.[4] This paper adopts the practical orthography with one exception: the glottal stop is represented as in the IPA (ʔ), and not with an apostrophe (as in the practical orthography). A'ingae syllable structure is (C)V(V)(ʔ). A'ingae has robust progressive nasalization, which gives rise to extensive nasal allomorphy (see Sanker and AnderBois, 2021).

All the data were collected by author between 2021 and 2022 and reflect the judgements reported by two native speaker consultants from the community of Dureno, Sucumbíos, Ecuador.

3 DESCRIPTION

This section describes the interaction of stress, glottalization, and stress deletion. A'ingae is a heavily agglutinating language, with many inflectional categories exponed with suffixes and enclitics on the verbal head. Within a complex verb, two morphophonological domains, or strata, can be distinguished: The inner domain includes the root and the exponents of voice, aspect, and associated motion. The outer domain includes exponents of subject plurality, reality, polarity, subject person, and others (2). The inner domain is delimited with square brackets [ ].

(2) STRATAL ORGANIZATION OF THE A'INGAE VERB
[***kufi*** ***-án*** *-ʔjen* *-ngi*] *-ʔfa* *-ya* *-mbi* *=tsû*
play -CAUS -IPFV -VEN -PLS -IRR -NEG =3
"they$_{3,\text{PLS}}$ will$_{\text{IRR}}$ not$_{\text{NEG}}$ come$_{\text{VEN}}$ to be$_{\text{IPFV}}$ making$_{\text{CAUS}}$ play"

The rest of this section is organized as follows. Section 3.1 focuses on the distribution of stress and glottalization in verbal roots. Section 3.2 focuses on the interaction of stress, glottalization, and stress deletion in forms suffixes of the inner domain. Section 3.3 focuses on the outer domain. Section 3.4 summarizes the central generalizations about the A'ingae data.

3.1 *Verbal roots*

The inner morphophonological domain consists of the verbal root and, optionally, suffixes exponing voice, aspect, and associated motion. In this section, I will focus on verbal roots, which fall in one of three categories: stressless (3-4), stressed (5-6), and glottalized (7-12).

Underlyingly stressless roots can be monosyllabic (3a-b), disyllabic (3c-d), or trisyllabic (3e-f). On the surface, penultimate stress is assigned to disyllabic and trisyllabic roots. This is the default stress assigned to underlyingly stressless forms, as evidenced by stress shift in the presence of inflectional morphology (4).

2 The phoneme inventory proposed here deviates from Repetti-Ludlow et al.'s (2019) in that it includes *ia* /ia/ (and *ian* /ĩã/) among the language's legal diphthongs. For further justification of this decision, see Dąbkowski (2021c).
3 The marginal diphthong *ae* transcribed broadly as /ae/ appears only in the manner case clitic *=ngae* MANN. Its phonetic realization is unstable and ranges from [əæ] to [ɛ].
4 The orthographic *n* and *m* between a vowel and a glottal stop play a double role: they represent both the nasality of the vowel and the prenasalization of the stop. E. g., the sequence *and* represents [ãⁿd]. Word initial prenasalization has shorter duration and lower intensity (Repetti-Ludlow et al., 2019). This is reflected orthographically with word-initial *b* [ᵐ̆b], *d* [ⁿ̆d], *z* [ⁿ̆dz], *dy* [ⁿ̆dʒ], and *g* [ᵑ̆g].

(3) Stressless roots

a.	b.	c.	d.	e.	f.
/ *phi* /	/ *tsun* /	/ *panza* /	/ *afe* /	/ *atapa* /	/ *utishi* /
[***phí***]	[***tsún***]	[*p**á**nza*]	[***á**fe*]	[*at**á**pa*]	[*ut**í**shi*]
sit	do	hunt	give	breed	wash

(4) Stressless roots with suffixes

a.	b.	c.	d.	e.	f.
/ *phi -ji -ʔfa* /	/ *tsun -ji -ʔfa* /	/ *panza -ji* /	/ *afe -ji* /	/ *atapa -ji* /	/ *utishi -ji* /
[*phi **-jí** -ʔfa*]	[*tsun **-jín** -ʔfa*]	[*panz**á** -ji*]	[*af**é** -ji*]	[*atap**á** -ji*]	[*utish**í** -ji*]
sit -PRCM -PLS	do -PRCM -PLS	hunt -PRCM	give -PRCM	breed -PRCM	wash -PRCM

Underlyingly stressed roots are mostly disyllabic (5a-d); a few are trisyllabic (5e-f). All underlyingly stressed roots have word-initial stress. This lexically-specified first-syllable stress does not shift when most inflectional suffixes are added (6).

(5) Stressed roots

a.	b.	c.	d.	e.	f.
/ ***á**fa* /	/ ***á**na* /	/ ***ká**ti* /	/ ***fû**ndu* /	/ ***á**fase* /	/ ***kú**ndase* /
[***á**fa*]	[***á**na*]	[***ká**ti*]	[***fû**ndu*]	[***á**fase*]	[***kú**ndase*]
speak	sleep	cast	shout	offend	tell

(6) Stressed roots with suffixes

a.	b.	c.	d.	e.	f.
/ ***á**fa -ji* /	/ ***á**na -ji* /	/ ***ká**ti -ji* /	/ ***fû**ndu -ji* /	/ ***á**fase -ji* /	/ ***kú**ndase -ji* /
[***á**fa -ji*]	[***á**na -jin*]	[***ká**ti -ji*]	[***fû**ndu -ji*]	[***á**fase -ji*]	[***kú**ndase -ji*]
speak -PRCM	sleep -PRCM	cast -PRCM	shout -PRCM	offend -PRCM	tell -PRCM

Finally, some roots have an underlying glottal stop. All underlyingly glottalized roots have word-initial stress. In disyllabic glottalized roots, the glottal stop surfaces in the rime of the first syllable (7a-c). (I remain agnostic whether the glottal stop is a feature of the syllabic nucleus or a coda.) In trisyllabic glottalized roots, the glottal stop surfaces in the rime of the second syllable (7d-f). Thus, within a glottalized root, the position of the glottal stop, the presence of stress, and the position of stress are entirely predictable. Glottalized roots do not undergo stress shift when when most inflectional suffixes are added (8). For more examples of stressless, stressed, and glottalized roots with and without affixes, see (107-120) in the Appendix.

(7) Glottalized roots

a.	b.	c.	d.	e.	f.
/ ***séʔ**je* /	/ ***íʔ**na* /	/ ***fíʔ**thi* /	/ ***á**kheʔpa* /	/ ***á**nsanʔge* /	/ ***á**khuʔsha* /
[***séʔ**je*]	[***íʔ**na*]	[***fíʔ**thi*]	[***á**kheʔpa*]	[***á**nsanʔge*]	[***á**khuʔsha*]
cure	cry	kill	forget	be shy	chop

(8) Glottalized roots with suffixes

a.	b.	c.	d.	e.	f.
/ ***séʔ**je -ji* /	/ ***íʔ**na -ji* /	/ ***fíʔ**thi -ji* /	/ ***á**kheʔpa -ji* /	/ ***á**nsaʔnge -ji* /	/ ***á**khuʔsha -ji* /
[***séʔ**je -ji*]	[***íʔ**na -jin*]	[***fíʔ**thi -ji*]	[***á**kheʔpa -ji*]	[***á**nsaʔnge -ji*]	[***á**khuʔsha -ji*]
cure -PRCM	cry -PRCM	kill -PRCM	forget -PRCM	be shy -PRCM	chop -PRCM

A few glottalized roots alternate between disyllabic (C)V.ʔV and monosyllabic (C)VVʔ, depending on the morphological context. The dot (.) represents syllable breaks. The disyllabic (C)V.ʔV forms of the alternating glottalized roots are the only cases of onset glottal stops in A'ingae. In most contexts, including uninflected forms (9) and forms with an inflectional suffix (10), these roots surface as disyllabic (C)V.ʔV. When followed by a derivational suffix (11) or the inner causative *-ña* CAUS (12), they surface as monosyllabic (C)VVʔ.

(9) Alternating glottalized roots

a.	b.	c.	d.	e.
***kû**.ʔi*	***tsá**.ʔu*	***á**.ʔi*	***tû**.ʔi*	***já**.ʔi*
drink	house	person	tomorrow	later

(10) Alternating glottalized roots with an inflectional suffix

a.	b.	c.	d.	e.
***kû**.ʔi -ji*	***tsá**.ʔu -mbi*	***á**.ʔi -mbi*	***tû**.ʔi -mbi*	***já**.ʔi -mbi*
drink -PRCM	house -NEG	person -NEG	tomorrow -NEG	later -NEG

(11) ALTERNATING GLOTTALIZED ROOTS WITH A DERIVATIONAL SUFFIX

a. ***kû̂iʔ***. *-khû*
drink -SH.DLM
"chucula"

b. ***tsáu*** *-ʔ.pa*
house -N
"nest"

c. ***áiʔ***. *-vu*
person -?
"body"

d. ***tû̂iʔ***. *-ve*
tomorrow -ACC2
"overmorrow"[5]

e. ***jáiʔ***. *-ngae*
later -MANN
"eventually"

(12) ALTERNATING GLOTTALIZED ROOTS WITH THE INNER *-ÑA* CAUS

a. ***kû̂iʔ***. *-ña*
drink -CAUS

b. ***tsáuʔ***. *-ña*
house -CAUS

3.2 *Inner suffixes*

The inner suffixes expone the categories of voice, aspect, and associated motion. There are three voice suffixes: the causative *-ña*/*-an*/*-en* CAUS, the reciprocal *-khu*$^{\emptyset}$ RCPR, and the passive *-ye*$^{\emptyset}$ PASS. The suffix which attaches the closest to the root is the causative. The causative has three phonologically-conditioned allomorphs: *-ña* CAUS attaches to monosyllabic roots (13a); *-an* CAUS attaches to polysyllabic roots which end in *e*, *a*, or *û* (13b-d); *-en* CAUS attaches to polysyllabic roots which end in *a* or *u* (13e-f). Root vowel alternations seen in the surface forms of (13b,d) are due to a regular phonological processed aimed at creating legal diphthongs. More more on A'ingae diphthongs, see Dąbkowski (in prep.).

(13) ALLOMORPHS OF *-ÑA*/*-AN*/*-EN* CAUS

a. ***phí***.*ña*
phí. *-ña*
sit -CAUS

b. ***á***.*thian*
á.*the -an*
see -CAUS

c. ***ká***.*tian*
ká.*ti -an*
cast -CAUS

d. ***áʔ***.*jian*
áʔ.*jû -an*
vomit -CAUS

e. ***pá***.*nzaen*
pá.*nza -en*
hunt -CAUS

f. ***bû̂***.*thuen*
bû̂.*thu -en*
run -CAUS

The causative suffix is recessive; it does not have any effect on stress (regardless of which allomorph is chosen): If the causative attaches to a stressless root, stress is assigned to the penultimate syllable by default (14). Lexically-listed stress and glottalization are preserved if present (15).

(14) STRESSLESS ROOTS WITH *-ÑA*/*-AN*/*-EN* CAUS

a. / *phi. -ña* /
[***phí***. *-ña*]
sit -CAUS

b. / *pa.nza -en* /
[***pá***.*nza -en*]
hunt -CAUS

c. / *a.ta.pa -en* /
[*a.**tá**.pa -en*]
breed -CAUS

d. / *u.ti.shi -an* /
[*u.**tí**.shi -an*]
wash -CAUS

(15) STRESSED AND GLOTTALIZED ROOTS WITH *-ÑA*/*-AN*/*-EN* CAUS

a. / ***á***.*fa -en* /
[***á***.*fa -en*]
speak -CAUS

b. / ***kú***.*nda.se -an* /
[***kú***.*nda.si -an*]
tell -CAUS

c. / ***séʔ***.*je -an* /
[***séʔ***.*ji -an*]
cure -CAUS

d. / ***á***.*kheʔ.pa -en* /
[***á***.*kheʔ.pa -en*]
forget -CAUS

The causative is followed by the reciprocal *-khu*$^{\emptyset}$ RCPR and the passive *-ye*$^{\emptyset}$ PASS. These two suffixes are dominant, which means that they delete input stress. Dominance is notated with the superscripted empty set ($^{\emptyset}$). When a dominant suffix attaches to a stressless root, stress deletion triggered by a dominant suffix is vacuous; the output surfaces with the expected default penultimate stress (16-17a). When *-khu*$^{\emptyset}$ RCPR or *-ye*$^{\emptyset}$ PASS attaches to a stressed root, the underlying stress is deleted, feeding penultimate stress assignment (16-17b). Finally, when *-khu*$^{\emptyset}$ RCPR or *-ye*$^{\emptyset}$ PASS attaches to a glottalized root, both stress and glottalization are deleted, again feeding penultimate stress assignment (16-17c-d). The same pattern of deletion of stress and glottalization followed by penultimate stress assignment is seen across the causative *-an* CAUS (18a-b) and with multiple dominant suffixes (18c-d).

(16) VARIOUS ROOTS WITH *-KHU*$^{\emptyset}$ RCPR

a. / *atapa -khu*$^{\emptyset}$ /
[*ata**pá** -khu*]
breed -RCPR

b. / ***á****fase -khu*$^{\emptyset}$ /
[*afa**sé** -khu*]
offend -RCPR

c. / ***íʔ****na -khu*$^{\emptyset}$ /
[*i**ná** -khu*]
cry -RCPR

d. / ***á****kheʔpa -khu*$^{\emptyset}$ /
[*akhe**pá** -khu*]
forget -RCPR

5 "the day after tomorrow"

(17) Various roots with *-ye*$^{\emptyset}$ pass

a. / *upathû -ye*$^{\emptyset}$ /
[*upath**û̂** -ye*]
cut -pass

b. / ***á**fase -ye*$^{\emptyset}$ /
[*afas**é** -ye*]
offend -pass

c. / ***éʔ**je -ye*$^{\emptyset}$ /
[*se**jé** -ye*]
cure -pass

d. / ***á**kheʔpa -ye*$^{\emptyset}$ /
[*akhe**pá** -ye*]
forget -pass

(18) Stressed and glottalized roots with combinations of *-an* caus, *-khu*$^{\emptyset}$ rcpr, and *-ye*$^{\emptyset}$ pass

a. / ***á**fase -an -ye*$^{\emptyset}$ /
[*afa**si** -**án** -ñe*]
offend -caus -pass

b. / ***séʔ**je -an -ye*$^{\emptyset}$ /
[*se**ji** -**án** -ñe*]
cure -caus -pass

c. / ***á**fa -khu*$^{\emptyset}$ *-ye*$^{\emptyset}$ /
[*afa -**khú** -ye*]
speak -rcpr -pass

d. / ***á**kheʔpa -en -khu*$^{\emptyset}$ *-ye*$^{\emptyset}$ /
[*akhepa -en -**khú** -ye*]
forget -caus -rcpr -pass

The voice suffixes are followed by aspectual suffixes. There are four aspectual suffixes: the precumulative *-ji* prcm, the paucal *-kha*$^{\emptyset}$ pauc, the imperfective *-ʔje*$^{\emptyset}$ ipfv, and the semelfactive *-ʔñakha*$^{\emptyset}$ smfc. When the precumulative *-ji* prcm attaches to a stressless base, default penultimate stress is assigned. Note that a base may be stressless because there is no stress (or glottalization) in the input (19a-c) or because input stress (and glottalization) have been deleted by a preceding dominant suffix (19d-e). If the underlying stress (and glottalization) have not been previously deleted, forms with *-ji* prcm retain them in the output (20). Thus, the precumulative *-ji* prcm is a recessive suffix.

(19) Stressless bases with *-ji* prcm

a. / *panza -ji* /
[*pan**zá** -ji*]
hunt -prcm

b. / *atapa -ji* /
[*ata**pá** -ji*]
breed -prcm

c. / *phi -ña -ji* /
[*phi -**ñá** -jin*]
sit -caus -prcm

d. / ***ká**ti -ye*$^{\emptyset}$ *-ji* /
[*kati -**yé** -ji*]
cast -pass -prcm

e. / ***séʔ**je -ye*$^{\emptyset}$ *-ji* /
[*seje -**yé** -ji*]
cure -pass -prcm

(20) Stressed and glottalized bases with *-ji* prcm

a. / ***ká**ti -ji* /
[***ká**ti -ji*]
cast -prcm

b. / ***á**fase -ji* /
[***á**fase -ji*]
offend -prcm

c. / ***séʔ**je -ji* /
[***séʔ**je -ji*]
cure -prcm

d. / ***á**kheʔpa -ji* /
[***á**kheʔpa -ji*]
forget -prcm

e. / ***á**kheʔpa -en -ji* /
[***á**kheʔpa -en -jin*]
forget -caus -prcm

The paucal *-kha*$^{\emptyset}$ pauc is dominant, so it deletes preceding stress and glottalization. The output surfaces with the default penultimate stress, regardless of whether the base is a stressless root (21a), a stressed root (21b), a glottalized root (21c-d), contains a recessive suffix (21e), or another dominant suffix (21f).

(21) Various bases with *-kha*$^{\emptyset}$ pauc

a. / *atapa -kha*$^{\emptyset}$ /
[*ata**pá** -kha*]
breed -pauc

b. / ***á**fase -kha*$^{\emptyset}$ /
[*afa**sé** -kha*]
offend -pauc

c. / ***séʔ**je -kha*$^{\emptyset}$ /
[*se**jé** -kha*]
cure -pauc

d. / ***á**kheʔpa -kha*$^{\emptyset}$ /
[*akhe**pá** -kha*]
forget -pauc

e. / ***á**kheʔpa -en -kha*$^{\emptyset}$ /
[*akhe**pá** -**en** -kha*]
forget -caus -pauc

f. / ***á**kheʔpa -ye*$^{\emptyset}$ *-kha*$^{\emptyset}$ /
[*akhepa -**yé** -kha*]
forget -pass -pauc

The aspectual suffixes are followed by associated motion suffixes: the venitive *-ʔngi*$^{\emptyset}$ ven and the andative *-ʔnga*$^{\emptyset}$ and. The aspectual suffixes *-ʔje*$^{\emptyset}$ ipfv and *-ʔñakha*$^{\emptyset}$ smfc and the associated motion suffixes *-ʔngi*$^{\emptyset}$ ven and *-ʔnga*$^{\emptyset}$ and begin with glottal stops (i. e. they are preglottalized). The preglottalized suffixes trigger special stress assignment: If the base to which they attach ends with a light syllable (a monophthong), stress falls two syllables to the left of the preglottalized suffix (22-25a-b). If the base ends with a heavy syllable (a diphthong), stress falls on the syllable which immediately precedes the preglottalized suffix (22-25c). This shows that in the presence of glottalization, stress assignment is weight-sensitive. Specifically, stress falls on the syllable which contains the second mora to the left of the glottal stop.

Weight-sensitive stress assignment with preglottalized suffixes

		fetha 'open'	*fûite* 'help'	*fûndûi* 'sweep'
(22)	*-ʔje*$^{\emptyset}$ ipfv	a. ***fé**tha-ʔje*	b. ***fû́i**te-ʔje*	c. *fûn**dûi**-ʔje*

(23) *-ʔñakha*$^{\emptyset}$ SMFC — a. *fétha-ʔñakha* b. ***fûi**te-ʔñakha* c. *fû**ndûi**-ʔñakha*

(24) *-ʔngi*$^{\emptyset}$ VEN — a. *fétha-ʔngi* b. ***fûi**te-ʔngi* c. *fû**ndûi**-ʔngi*

(25) *-ʔnga*$^{\emptyset}$ AND — a. *fétha-ʔnga* b. ***fûi**te-ʔnga* c. *fû**ndûi**-ʔnga*

The pregottalized suffixes are dominant, which means that they delete input stress and glottalization. In the output, the only glottal stop is the one introduced by the preglottalized suffix and stress is assigned to the syllable which contains the second mora to the left of the glottal stop, regardless of whether the base is a stressless root (26a), a stressed root (26b), a glottalized root (26c-d), contains a recessive suffix (26e), or another dominant suffix (26f).

(26) VARIOUS BASES WITH *-ʔJE*$^{\emptyset}$ IPFV, *-ʔÑAKHA*$^{\emptyset}$ SMFC, *-ʔNGI*$^{\emptyset}$ VEN, OR *-ʔNGA*$^{\emptyset}$ AND

a. / *atapa -ʔje*$^{\emptyset}$ /
[*a**tá**pa -ʔje*]
breed -IPFV

b. / ***á**fase -ʔñakha*$^{\emptyset}$ /
[*a**fá**se -ʔñakha*]
offend -SMFC

c. / ***séʔ**je -ʔngi*$^{\emptyset}$ /
[***sé**je -ʔngi*]
cure -VEN

d. / ***á**kheʔpa -ʔnga*$^{\emptyset}$ /
[*a**khé**pa -ʔnga*]
forget -AND

e. / ***á**kheʔpa -en -ʔje*$^{\emptyset}$ /
[*akhe**pá** **-en** -ʔjen*]
forget -CAUS -IPFV

f. / ***á**kheʔpa -ye*$^{\emptyset}$ *-ʔñakha*$^{\emptyset}$ /
[*akhe**pá** -ye -ʔñakha*]
forget -PASS -SMFC

The imperfective suffix *-ʔje*$^{\emptyset}$ IPFV may be followed by an associated motion suffix *-ʔngi*$^{\emptyset}$ VEN or *-ʔnga*$^{\emptyset}$ AND. In this configuration, the associated motion suffix looses its preglottalization and stress falls on the syllable which contains the second mora before the imperfective *-ʔje*$^{\emptyset}$ IPFV (27). For more examples with *-ʔje*$^{\emptyset}$ IPFV, *-ʔñakha*$^{\emptyset}$ SMFC, *-ʔngi*$^{\emptyset}$ VEN, and *-ʔnga*$^{\emptyset}$ AND, see (121-126) in the Appendix. A morphological template of the A'ingae verb listing all of the suffixes, their domain, and their dominance status is given in Table 3 (Section 4.2).

(27) VARIOUS ROOTS WITH *-ʔJE*$^{\emptyset}$ IPFV AND *-ʔNGI*$^{\emptyset}$ VEN OR *-ʔNGA*$^{\emptyset}$ AND

a. / *atapa -ʔje*$^{\emptyset}$ *-ʔngi*$^{\emptyset}$ /
[*a**tá**pa -ʔje -ngi*]
breed -IPFV -VEN

b. / ***á**fase -ʔje*$^{\emptyset}$ *-ʔnga*$^{\emptyset}$ /
[*a**fá**se -ʔje -nga*]
offend -IPFV -AND

c. / ***séʔ**je -ʔje*$^{\emptyset}$ *-ʔngi*$^{\emptyset}$ /
[***sé**je -ʔje -ngi*]
cure -IPFV -VEN

d. / ***á**kheʔpa -ʔje*$^{\emptyset}$ *-ʔnga*$^{\emptyset}$ /
[*a**khé**pa -ʔje -nga*]
forget -IPFV -AND

3.3 *Outer suffixes*

The outer suffixes (and clitics) expone predicate- and clause-level categories. Predicate-level categories include subject number (*-ʔfa* PLS), reality status (*-ya* IRR), polarity (*-mbi* NEG), and finiteness (*-ye* INF). Clause-level categories include clause type (subordinate: *-ʔta* IF.SS, *-ʔja* IF2.SS, *-ʔni* IF.DS, *-ʔma* FRST, *-saʔne* APPR, *-ni* LOC; cosubordinate: *-pa* SS, *-si* DS; and matrix: *-ja* IMP, *-kha*$^{\emptyset}$ IMP2, *-ʔse* IMP3, *-jama*$^{\emptyset}$ PRHB, *-ʔya* VER), information structure (*-ta* NEW, *-ja* CNTR), evidentiality (*=te* RPRT), polar questions (*=ti* YNQ), and subject person agreement (*=ngi* 1, *=ki* 2, *=tsû* 3).

If stress has not been determined within the inner domain (either due to the presence of lexical stress on the verb root or assigned because of a preglottalized suffix), and there is at least one outer recessive suffix, stress is assigned to the last syllable of the inner domain. The inner domain is delimited with square brackets [ ]. This stress might be confused for the default penultimate stress if there is only one monosyllabic outer suffix (28-29), but it is not penultimate if the outer suffix is polysyllabic (30a) or if there are multiple outer suffixes (30b-f). Crucially, unlike the stress assignment in the inner domain, this stress assignment is completely insensitive to the presence or absence of preglottalization on the suffix.

(28) STRESSLESS BASES WITH PLAIN OUTER SUFFIXES

a. / [*atapa*] *-ja* /
[*ata**pá** -ja*]
breed -IMP

b. / [*phi -ña*] *-si* /
[*phi **-ñá** -si*]
sit -CAUS -DS

c. / [*afe -ji*] *=ngi* /
[*afe **-jí** =ngi*]
give -PRCM =1

(29) STRESSLESS BASES WITH PREGLOTTALIZED OUTER SUFFIXES

a. / [atapa] -ʔfa /
[**atapá** -ʔfa]
breed -PLS

b. / [phi -ña] -ʔse /
[phi **-ñá** -ʔse]
sit -CAUS -IMP3

c. / [afe -ji] -ʔya /
[afe **-jí** -ʔya]
give -PRCM -VER

(30) STRESSLESS BASES WITH PLAIN AND PREGLOTTALIZED OUTER SUFFIXES

a. / [atapa] -saʔne /
[**atapá** -saʔne]
breed -APPR

b. / [phi -ña] -ya =tsû /
[phi **-ñá** -ña =tsû]
sit -CAUS -IRR =3

c. / [afe -ji] -mbi -ʔma /
[afe **-jí** -mbi -ʔma]
give -PRCM -NEG -FRST

d. / [atapa] -ʔfa =te /
[**atapá** -ʔfa =te]
breed -PLS =RPRT

e. / [phi -ña] -ʔfa -ʔta /
[phi **-ñá** -ʔfa -ʔta]
sit -CAUS -PLS -IF.SS

f. / [afe -ji] -ʔfa -ya -mbi /
[afe **-jí** -ʔfa -ya -mbi]
give -PRCM -PLS -IRR -NEG

Stress is assigned to the last syllable of the inner domain when the outer suffixes immediately follow the root (28-30a) as well as when inner suffixes intervene between the root and the outer suffixes (28-30b-c) Crucially, stress is assigned to the last syllable of the inner domain when the outer suffix is plain (i. e. non-preglottalized) (28), preglottalized (29), internally glottalized (30a), and with any combination of plain and (pre)glottalized suffixes (30b-f). To recapitulate, stress assignment in the outer domain is insensitive to glottalization.

Preexisting inner domain stress is retained. This is to say, if the verbal root has lexically specified stress (and glottalization) (31), or if stress has been assigned due to the presence of a preglottalized suffix within the inner domain (32), that stress (and glottalization) are preserved; stress is not reassigned to the last syllable of the inner domain.

(31) STRESSED ROOTS WITH OUTER SUFFIXES

a. / [**káti**] -ʔya /
[**káti** -ʔya]
cast -VER

b. / [**séʔje** -an] -mbi /
[**séʔji** -an -mbi]
cure -CAUS -NEG

c. / [**ákheʔpa** -ji] -ye /
[**ákheʔpa** -ji -ye]
forget -PRCM -INF

d. / [**káti**] -ya -mbi /
[**káti** -ya -mbi]
cast -IRR -NEG

e. / [**séʔje** -ji] -ʔfa -ye /
[**séʔje** -ji -ʔfa -ye]
cure -PRCM -PLS -INF

f. / [**ákheʔpa** -en] -ya -ʔya /
[**ákheʔpa** -en -ña -ʔña]
forget -CAUS -IRR -VER

(32) INNER PREGLOTTALIZED SUFFIXES WITH OUTER SUFFIXES

a. / [atapa -ʔngi$^{\emptyset}$] -ʔya /
[**atápa** -ʔngi -ʔya]
breed -VEN -VER

b. / [**séʔje** -ʔñakha$^{\emptyset}$] -mbi /
[**seje** -ʔñakha -mbi]
cure -SMFC -NEG

c. / [**ákheʔpa** -ʔnga$^{\emptyset}$] -ye /
[**akhépa** -ʔnga -ye]
forget -AND -INF

d. / [**áfase** -ʔje$^{\emptyset}$] -ya -mbi /
[**afáse** -ʔje -ya -mbi]
offend -IPFV -IRR -NEG

e. / [**séʔje** -khu$^{\emptyset}$ -ʔje$^{\emptyset}$] -ʔfa /
[**sejé** -khu -ʔje -ʔfa]
cast -RCPR -IPFV -PLS

f. / [**ákheʔpa** -en -ʔje$^{\emptyset}$] =tsû /
[**akhepá** **-en** -ʔjen =tsû]
forget -CAUS -IPFV =3

However, if stress (and glottalization) were deleted by a plain (i. e. non-preglottalized) dominant suffix within the inner domain, stress is assigned to the last syllable of the inner domain (33).

(33) INNER PLAIN DOMINANT SUFFIXES WITH OUTER SUFFIXES

a. / [**káti** -an -ye$^{\emptyset}$] =ki /
[kati -an **-ñé** =ki]
cast -CAUS -PASS =2

b. / [**séʔje** -khu$^{\emptyset}$ -ji] -ʔfa /
[seje -khu **-jí** -ʔfa]
cure -RCPR -PRCM -PLS

c. / [**ákheʔpa** -ye$^{\emptyset}$] -ye /
[akhepa **-yé** -ye]
forget -PASS -INF

d. / [**káti** -khu$^{\emptyset}$] -pa =ti /
[kati **-khú** -pa =ti]
cast -RCPR -SS =YNQ

e. / [**séʔje** -khu$^{\emptyset}$] -ʔfa -ya /
[seje **-khú** -ʔfa -ya]
cure -RCPR -PLS -IRR

f. / [**ákheʔpa** -ye$^{\emptyset}$ -ji] -ʔfa -saʔne /
[akhepa -ye **-jí** -ʔfa -saʔne]
forget -PASS -PRCM -PLS -APPR

Lastly, there are two dominant clause-level suffixes in the outer domain: the prohibitive *-jama*$^{\emptyset}$ PRHB and the imperative 2 *-kha*$^{\emptyset}$ IMP2. The outer dominant suffixes delete preexisting stress and reassign it to the syllable which immediately precedes them (34). Crucially, the stress deletion triggered by these two suffixes does not affect glottalization. Thus, despite the stress shift, glottal stops introduced by glottalized roots (35, 37), inner preglottalized suffixes (36, 38), and outer preglottalized suffixes (37-38) are retained. Observe that stress is reassigned to the syllable which immediately precedes the suffix and need not fall within the inner domain (37-38). For more examples with *-jama*$^{\emptyset}$ PRHB and *-kha*$^{\emptyset}$ IMP2, see (127-136) in the Appendix.

(34) STRESSLESS AND STRESSED BASES WITH -*JAMA*$^{\emptyset}$ PRHB OR -*KHA*$^{\emptyset}$ IMP2

a. / [*atapa*] *-jama*$^{\emptyset}$ /
[*ata**pá*** *-jama*]
breed -PRHB

b. / [***á**fase*] *-kha*$^{\emptyset}$ /
[*afa**sé*** *-kha*]
offend -IMP2

c. / [***á**fase* *-an*] *-jama*$^{\emptyset}$ /
[*afa**si*** ***-án*** *-jama*]
offend -CAUS -PRHB

(35) GLOTTALIZED ROOTS WITH -*JAMA*$^{\emptyset}$ PRHB OR -*KHA*$^{\emptyset}$ IMP2

a. / [***séʔ**je*] *-kha*$^{\emptyset}$ /
[*se**ʔjé*** *-kha*]
cure -IMP2

b. / [***á**kheʔpa*] *-jama*$^{\emptyset}$ /
[*ake**ʔpá*** *-jama*]
forget -PRHB

c. / [***á**kheʔpa* *-en*] *-kha*$^{\emptyset}$ /
[*akhe**ʔpá*** ***-en*** *-kha*]
forget -CAUS -IMP2

(36) INNER PREGLOTTALIZED SUFFIXES WITH -*JAMA*$^{\emptyset}$ PRHB OR -*KHA*$^{\emptyset}$ IMP2

a. / [***á**fase* *-ʔje*$^{\emptyset}$] *-jama*$^{\emptyset}$ /
[*afase* ***-ʔjé*** *-jama*]
offend -IPFV -PRHB

b. / [***séʔ**je* *-ʔje*$^{\emptyset}$] *-kha*$^{\emptyset}$ /
[*seje* ***-ʔjé*** *-kha*]
cure -IPFV -IMP2

c. / [***á**kheʔpa* *-ʔje*$^{\emptyset}$] *-jama*$^{\emptyset}$ /
[*akhepa* ***-ʔjé*** *-jama*]
forget -IPFV -PRHB

(37) (GLOTTALIZED ROOTS AND) OUTER PREGLOTTALIZED SUFFIXES WITH -*JAMA*$^{\emptyset}$ PRHB OR -*KHA*$^{\emptyset}$ IMP2

a. / [***á**fase*] *-ʔfa* *-kha*$^{\emptyset}$ /
[*afase* ***-ʔfá*** *-kha*]
offend -PLS -IMP2

b. / [***séʔ**je*] *-ʔfa* *-jama*$^{\emptyset}$ /
[*seʔje* ***-ʔfá*** *-jama*]
cure -PLS -PRHB

c. / [***á**kheʔpa*] *-ʔfa* *-kha*$^{\emptyset}$ /
[*akheʔpa* ***-ʔfá*** *-kha*]
forget -PLS -IMP2

(38) INNER AND OUTER PREGLOTTALIZED SUFFIXES WITH -*JAMA*$^{\emptyset}$ PRHB OR -*KHA*$^{\emptyset}$ IMP2

a. / [***á**fase* *-ʔje*$^{\emptyset}$] *-ʔfa* *-jama*$^{\emptyset}$ /
[*afase* *-ʔje* ***-ʔfá*** *-jama*]
offend -IPFV -PLS -PRHB

b. / [***séʔ**je* *-ʔje*$^{\emptyset}$] *-ʔfa* *-kha*$^{\emptyset}$ /
[*seje* *-ʔje* ***-ʔfá*** *-kha*]
cure -IPFV -PLS -IMP2

c. / [***á**kheʔpa* *-ʔje*$^{\emptyset}$] *-ʔfa* *-jama*$^{\emptyset}$ /
[*akhepa* *-ʔje* ***-ʔfá*** *-jama*]
forget -IPFV -PLS -PRHB

As a final comment, secondary stress in A'ingae falls on every other syllable counting from the primary stress (39a). Secondary stress is marked with the grave accent (\`) and **boldface**. If there is an odd number of posttonic syllables, stress clash is avoided in favor of a disyllabic immediately posttonic lapse (39b). Since secondary stress is entirely predictable and does not interact with the factors responsible for primary stress assignment, it will not be transcribed in the rest of the paper.

(39) SECONDARY STRESS

a. (***á**fa*) (*-**yà**-mbi*) (*=**tì**=ki*)
speak -IRR-NEG =YNQ=2

b. (***á**fa* *-ʔ*)*fa* (*-**yà**=mbi*)
speak -PLS -IRR=NEG

3.4 *Central generalizations*

From the data presented above emerge two central generalizations which need to be captured by any successful account of A'ingae glottalization. In the following section, I argue that the architecture of Cophonologies by Phase (Sande, Jenks, and Inkelas, 2020) rises to the task. A summary table of all the A'ingae suffixes, their morphophonological domain, and their dominance status is given in Table 3 (Section 4.2).

First, whether stress deletion triggered by a dominant suffix coincides with deleting glottalization correlates with whether glottalization triggers stress assignment. Within the inner domain, glottalization has an effect on stress, i. e. stress is assigned to the syllable containing the second mora to the left of the glottal stop (7-8d-f, 22-27), and stress-deleting suffixes introduced within the inner domain also delete glottalization (16-18, 21).

In the outer domain, glottalization has no effect on stress (28-33)—and neither does stress deletion have any effect on glottalization (34-38). This generalization is restated in (40).

(40) STRESS ASSIGNMENT/DELETION × GLOTTALIZATION INTERACTION
For a given morphophonological domain, glottalization introduced in that domain interacts with stress if and only if stress-deletion interacts with glottalization.

Second, upon controlling for preglottalization and the morphophonological domain, variation among the phonological processes triggered by particular suffixes reduces to the parameter of dominance (i. e. whether a suffix is stress-preserving or stress-deleting). This is to say, despite the fact the inner plain dominant suffixes, the inner preglottalized dominant suffixes, and the outer dominant suffixes all have different effects on stress and glottalization, only one property is needed to fully characterize their behavior: they delete stress. The differences in their effects on stress assignment (or lack thereof) and glottalization follow from independent factors (i. e. preglottalization and their morphophonological domain). This generalization is restated in (41).

(41) DOMINANCE AS THE ONLY LEXICAL PARAMETER
Upon controlling for preglottalization and the morphophonological domain, dominance is the only parameter needed to account for differences in the phonological processes triggered by particular suffixes.

If stress (and glottalization) are deleted by a plain dominant suffix introduced in the inner domain, the output form is stressless. Later, stress is assigned in accordance with a generalization independently attested in that domain, i. e. to the right edge of the inner domain if there are outer suffixes (33), or to the penultimate syllable of the word if there are no outer suffixes (16-18, 21). If stress (and glottalization) are deleted by a preglottalized dominant suffix introduced in the inner domain, stress is reassigned in accordance with a generalization independently attested in that domain, i. e. to the syllable which contains the second mora to the left of the glottal stop (in this case, of the preglottalized dominant suffix) (26-27). If stress is deleted by a dominant suffix introduced in the outer domain, stress is reassigned in accordance with a generalization independently attested in that domain, i. e. to the immediate left of the outer domain suffix (34-38).

Thus, the only morpheme-specific property of dominant suffixes is that they delete stress. Whether glottalization also undergoes deletion and whether and where stress is reassigned after it is deleted depends on the phonological grammar of their domain and the presence or absence of preglottalization.

4 ANALYSIS

In this section, I analyze the A'ingae data in Cophonologies by Phase (henceforth CbP; Sande, 2017, 2019; Sande and Jenks, 2018; Sande, Jenks, and Inkelas, 2020), a generative model of the phonology-syntax interface. Section 4.1 introduces the framework. Section 4.2 lays out the morphophonological structure of the A'ingae verb. Section 4.3 presents an analysis of the *inner* cophonology, which captures the phonological grammar of the A'ingae verbal roots and recessive suffixes in the inner morphological domain. Section 4.4 presents an analysis of the *dominant* cophonology and its interactions with the *inner* cophonology, which captures the phonological operations triggered by inner dominant suffixes, including the preglottalized ones. Section 4.5 presents an analysis of the *outer* cophonology and its interactions with the *dominant* cophonology, which captures the phonological grammar of the outer suffixes, both recessive and dominant.

4.1 *Cophonologies by Phase*

Cophonologies by Phase (Sande, 2017, 2019; Sande and Jenks, 2018; Sande, Jenks, and Inkelas, 2020) is a model of the phonology-syntax interface which combines *cophonologies*, or morpheme-specific phonological grammars (Anttila, 1997; Inkelas, 1998; Inkelas, Orgun, and Zoll, 1997; Orgun, 1996), with cyclic syntactic architecture (Abels, 2012; Bošković, 2014; Chomsky, 2001).

Following Distributed Morphology (Halle and Marantz, 1994), Cophonologies by Phase assumes that vocabulary items are mappings between morphosyntactic features and phonological features. Furthermore, CbP proposes an enriched representation of the phonological component: In addition to segmental content and prosodic subcategorization frame, vocabulary items may specify a subranking of constraints which partially overrides the language's default phonological grammar (Sande, Jenks, and Inkelas, 2020).

Cophonologies by Phrase proposes that phonological evaluation applies to morphological constituents, or phases. Thus, CbP departs from the assumptions of classic Cophonology Theory (Anttila, 1997; Inkelas, 1998; Inkelas, Orgun, and Zoll, 1997; Orgun, 1996), where every affix triggers a phonological cycle. The cophonologies of all the morphosyntactic features within a phase are compiled and added to the default phonology of the language (the *master* ranking), forming a cumulative ranking specific to that phase. Upon merging a phase head, spell-out is triggered and the phase is phonologically evaluated against that cumulative ranking. After spell-out, the phonology resets to the default (*master*) ranking. Thus, phonological rankings associated with morphosyntactic features scope at most over the phase in which they are introduced (Sande, Jenks, and Inkelas, 2020).

For example, the default (*master*) phonology of a toy language ranks the constraint A above B and B above C (42a). Phonological rankings are introduced with a fraktur font $\mathfrak{R}$. F, the head of the functional Feature Projection (FP), ranks B above A (42b). The imperfective morphosyntactic feature IPFV ranks C above A (42c). The precumulative feature PRCM does not call for a deviation from the *master* ranking (42d).

(42) PHONOLOGICAL RANKINGS IN A TOY LANGUAGE

a. *master* $\longleftrightarrow$ { $\mathfrak{R}$: A $\gg$ B $\gg$ C }

b. F $\longleftrightarrow$ { $\mathfrak{R}$: B $\gg$ A }

c. IPFV $\longleftrightarrow$ { $\mathfrak{R}$: C $\gg$ A }

d. PRCM $\longleftrightarrow$ { $\mathfrak{R}$: n/a }

Following Bošković (2016), I assume that phase heads are spelled-out together with their complements. In the toy language, F is a phase head. Thus, it triggers the spell-out and phonological evaluation of FP (43). Phonological evaluation is represented with arcs.

(43) CUMULATIVE RANKINGS WITH PHASE-BASED SPELL-OUT

The ranking of phonological constraints during the evaluation depends on the features present in that phase. I assume that when the default *master* ranking and a feature-specific ranking are in conflict, the feature-specific ranking overrides the *master* ranking. Thus, in (43a), the phase head F reranks B above A. The precumulative feature PRCM does not alter the phonological ranking in any way. Thus, the phonological ranking at the spell-out of (43a) is B $\gg$ A $\gg$ C. In (43b), the phase head F ranks B above A and the imperfective feature IPFV reranks C above A. Thus, the phonological ranking at the spell-out of (43b) is { B, C } $\gg$ A.[6]

6 In a ranked-constraint grammar, there may be more than one way to resolve two partial constraint rerankings. For example, given a *master* ranking A $\gg$ B $\gg$ C, the rerankings B $\gg$ A and C $\gg$ A could yield either B $\gg$ C $\gg$ A or C $\gg$ B $\gg$ A. The problem does not arise if one adopts a weighted-constraint model of the grammar instead, as in Sande, Jenks, and Inkelas (2020).
Since partial ranking indeterminacy does not affect the analysis proposed in this paper, I adopt ranked constraints for ease of exposition. If desired, the analysis could be straightforwardly recast with weighted constraints.

4.2 *The structure of a verb*

Cophonologies by Phase allows for the association of different phonological rankings to phase heads as well as individual morphosyntactic features. As such, CbP naturally captures the stratal organization of A'ingae morphophonological domains, while allowing for morpheme-specific dominance effects. I propose that the phonological grammar of the inner morphophonological domain is modeled by associating lower phrase heads with an *inner* cophonology. The phonological grammar of the outer morphophonological domain is modeled by associating higher phase heads with an *outer* cophonology. Finally, the deletion of stress (and glottalization) triggered by dominant suffixes is modeled by associating individual dominant suffixes with a *dominant* cophonology.

Specifically, I propose that there are four phase heads along the verbal spine which may be spelled out during the derivation. The first two are the verbal categorizing head *v* and a "feature" head F. The heads *v* and F are associated with the *inner* cophonology. The *v*P projection (the first phase) contains only the verbal root and optionally the causative suffix *-ña/-an/-en* CAUS (for analyses of *v* as a phase head, see Chomsky, 2001; Embick, 2010). I treat the causative *-ña/-an/-en* CAUS as a verbalizing head because it is the only A'ingae suffix capable of deriving verbs from nouns (and precategorial roots) (44).

(44) VERBS DERIVED WITH *-ÑA/-AN/-EN* CAUS

a. ***tsáuʔ**ña*	b. ***síña***	c. ***sá**pian*	d. ***tsáuʔ**paen*
***tsáuʔ** -ña*	***sín** -ña*	***sá**pe -an*	***tsáuʔ**pa -en*
house -CAUS	black -CAUS	flat -CAUS	nest -CAUS
"build a house"	"blacken"	"smash"	"nestle"

The FP projection constitutes the second phase—it contains all of the verbal inflectional morphology, including other voice suffixes, associated motion suffixes, and aspectual suffixes. Thus, FP contains what is commonly referred to as the "aspectual projection." The treatment of the aspectual projection as a phase is non-standard. However, aspect has been proposed to be a phase head in, for example, Nez Perce (Deal and Wolf, 2017) and Muskogee (Guekguezian, 2021). Furthermore, there is clear evidence for FP as a morphosyntactic constituent in the grammar of A'ingae: The suffixes within the FP can attach only to morphological verbs (45a-b), while suffixes outside of the FP (e. g. in TP) can also attach to nominal predicates (45c-d).

(45) VERBS AND NOUNS WITH FP AND TP SUFFIXES

a. *pan**zá** -ji*	b. ****tsá**ndie -ji*	c. *pan**zá** -ʔfa*	d. ***tsá**ndie -ʔfa*
hunt -PRCM	man -PRCM	hunt -PLS	man -PLS
"about to hunt"	intended: "about to be a man"	"(they) hunted"	"(they) are men"

The heads T and C are associated with the *outer* cophonology. The TP projection constitutes the third phase—it contains morphology typically associated with the inflected predicate, including subject plurality, reality status, polarity, and finiteness. The treatment of T as a phase head is non-standard. However, it has been argued for—again—in, e. g., Nez Perce (Deal, 2016).

The CP projection (the last phase) contains morphology typically associated with full clauses, including clause type, evidentiality, interrogative force, mood, etc. Across the four phases (*v*P, FP, TP, CP), certain suffixes are stress-deleting—these are associated with the *dominant* cophonology. Which suffixes are dominant has no predictor. The mappings between phase heads and morphosyntactic features on one hand, and cophonologies on the other, are summarized in (46). The complete morphological template of the A'ingae verb in given in Table 3. The verbal root is at the bottom; the closer a suffix is to the root, the lower it is in the template, mimicking the orientation of a syntactic tree.

(46) FEATURE-COPHONOLOGY MAPPINGS IN A'INGAE

a. v, F $\longleftrightarrow$ { $\mathfrak{R}$: *inner* }

b. T, C $\longleftrightarrow$ { $\mathfrak{R}$: *outer* }

c. RCPR, IPFV, PRHB, ... $\longleftrightarrow$ { $\mathfrak{R}$: *dominant* }

I assume that *v*P and CP are always spelled out. FP and TP undergo spell-out only when their content is not phonologically empty (*pruning* in Embick, 2015). In Table 3, this is represented by parenthesizing the FP and TP phases. Thus, at maximum, one verb may undergo up to four phonological evaluations. This happens when each of the four phases introduces new segmental material (47a). At minimum, each verb undergoes two phonological evaluations. This happens even if the verb consists only of a bare root (47b).

(47) a. AT MOST FOUR PHONOLOGICAL EVALUATIONS PER VERB

[[[[***kufi*** ***-án*** $]_{vP}$ *-khu* *-ʔje* *-ngi* $]_{FP}$ *-ʔfa* *-ya* $]_{TP}$ *-ʔni* *-nda* $]_{CP}$

play -CAUS -RCPR -IPFV -VEN -PLS -IRR -IF.DS -NEW

"if$_{\text{IF.DS,NEW}}$ (they$_{\text{PLS}}$) will$_{\text{IRR}}$ come$_{\text{VEN}}$ to be$_{\text{IPFV}}$ making$_{\text{CAUS}}$ each other$_{\text{RCPR}}$ play"

b. AT LEAST TWO PHONOLOGICAL EVALUATIONS PER VERB

[[***kúʔ****fe* $]_{vP}$ $]_{CP}$

play

"played"

CP $\longleftrightarrow$ { $\mathfrak{R}$: *outer* }

(xiii) SUBJECT PERSON: *=ngi* 1, *=ki* 2, *=tsû* 3

(xii) SENTENCE-LEVEL: *=te* RPRT, *=ti* YNQ

(xi) INFORMATION STRUCTURE: *-ta* NEW, *-ja* CNTR

(x) CLAUSE TYPE

SUBORDINATE: *-ʔta* IF.SS, *-ʔja* IF2.SS, *-ʔni* IF.DS, *-ʔma* FRST, *-saʔne* APPR, *-ni* LOC

COSUBORDINATE: *-pa* SS, *-si* DS

MATRIX: *-ja* IMP, *-kha*$^{\emptyset}$ IMP2, *-ʔse* IMP3, *-jama*$^{\emptyset}$ PRHB, *-ʔya* VER

(TP $\longleftrightarrow$ { $\mathfrak{R}$: *outer* })

(ix) FINITENESS: *-ye* INF

(viii) POLARITY: *-mbi* NEG

(vii) REALITY: *-ya* IRR

(vi) SUBJECT NUMBER: *-ʔfa* PLS

(FP $\longleftrightarrow$ { $\mathfrak{R}$: *inner* })

(v) ASSOCIATED MOTION: *-ʔngi*$^{\emptyset}$ VEN, *-ʔnga*$^{\emptyset}$ AND

(iv) ASPECT: *-ʔje*$^{\emptyset}$ IPFV, *-ji* PRCM, *-kha*$^{\emptyset}$ PAUC, *-ʔñakha*$^{\emptyset}$ SMFC

(iii) PASSIVE: *-ye*$^{\emptyset}$ PASS

(ii) RECIPROCAL: *-khu*$^{\emptyset}$ RCPR

*v*P $\longleftrightarrow$ { $\mathfrak{R}$: *inner* }

(i) CAUSATIVE: *-ña*/*-an*/*-en* CAUS

(0) VERBAL ROOT: √

LEGEND

$\emptyset$ $\longleftrightarrow$ { $\mathfrak{R}$: *dominant* }

Table 3: Morphophonological template of the A'ingae verb (building on Dąbkowski, 2021c).

I assume that morphologically complex verbs are created via head-movement. Thus, syntax and phonology must proceed cyclically: The verbal head of each phase undergoes phonological evaluation before further movement up the verbal spine. This marks a departure from the assumptions of Sande, Jenks, and Inkelas (2020), where head movement strictly precedes phonological evaluation.

Finally, for the purposes of this study, phases are construed morphophonologically—they may have distinct phonological grammar and undergo cyclic phonological evaluation. I remain agnostic whether morphophonological phases correspond to syntactic phases. For compatible treatments of phasehood, see d'Alessandro and Scheer (2015) and Marušič (2005a,b).

4.3 *The inner cophonology*

In this section, I analyze the *inner* cophonology, which captures the phonological grammar of the A'ingae verbal roots and and recessive suffixes in the inner morphological domain. The *inner* cophonology is active at the spell-out of *v*P, which contains the root and the causative suffix, as well as FP, which contains other voice, aspectual, and associated motion morphology.

Recall from Section 3.1 that A'ingae verb roots can be divided into three broad classes: stressed, glottalized, and stressless. I propose that the underlying form of stressed roots contains metrical structure. Faithfulness to input metrical structure is modeled with MAXIMALITY(FOOT) (48).

(48) MAXIMALITY(FOOT), or: MAXF
For every metrical foot in the input, there is a corresponding metrical foot in the output.

MAXIMALITY(FOOT) ensures that underlying metrical structure is retained in the output (49). Metrical feet are delimited with parentheses ( ). In the tableaux, the first row states which phase is being spelled out and lists the cophonologies present during its phonological evaluation. Roots are first subject to spell-out in the *v*P phase associated with the *inner* cophonology, hence *v*P : *inner*. MAXIMALITY(FOOT) outranks all constraints which favor candidates deviating from input stress (e. g. PHASEANTIMAXIMALITY(FOOT$_{\downarrow}$) (68) to be introduced in Section 4.4 and ALIGN(PHASE-R, STRESS-R) (78) in Section 4.5). In the tableaux below, these constraints are shown schematically with ellipsis (…). Finally, A'ingae footing is trochaic. Hence, the tableaux do not explicitly consider candidates with iambic feet.

(49) a.	(*á***fa*)	*v*P : *inner* MAXF ≫	…
i.	*afa*	*	
☞ ii.	(*á***fa*)		*
iii.	*a*(*fá*)	*	
	speak		

b.	(*kú***nda*)*se*	*v*P : *inner* MAXF ≫	…
i.	*kundase*	*	
☞ ii.	(*kú***nda*)*se*		*
iii.	*ku*(*ndáse*)	*	
	tell		

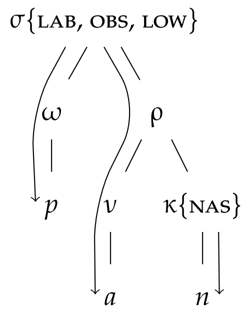
In glottalized roots, the position of glottalization is predictable. In disyllabic glottalized roots, glottalization surfaces in the rime of the first syllable. In trisyllabic glottalized roots, glottalization surfaces in the rime of the second syllable. Moreover, all glottalized roots have word-initial stress.

To model the A'ingae glottal stop data, I adopt Goldsmith's (1990) notion of prosodic licensing. In Goldsmith's original proposal, every segment needs to be licensed by a prosodic unit. In the toy example (50a), the syllable node licenses the features of the onset [*p*] (LAB, OBS) and the nucleus [*a*] (LOW). The coda node licenses the features of the coda [*n*] (NAS). Autosegments licensed by a given prosodic node are given in curly brackets { }. A licenser can license at most one occurrence of an autosegment. Thus, licensing can be represented as a non-branching path from a licenser to the licensed autosegment (Goldsmith, 1990, pp. 123–4).

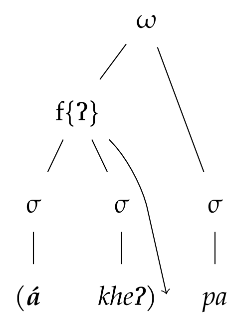
I adopt the notion of prosodic licensing and propose that in the inner morphophonological domain in A'ingae, the glottal stop [*ʔ*] is licensed by the metrical foot node (50b). The constraint which captures this licensing requirement is Foot{ʔ} (51). Foot{ʔ} captures the requirement that glottalization needs to appear within a metrical foot. Its exact position is determined through a ranking of different constraints.

(50) Prosodic licensing

a. in a toy language



b. of ʔ in the inner domain of A'ingae



(51) Foot{ʔ}, or: f{ʔ}
Glottal stops are licensed by metrical feet. Violated by every glottal stop not licensed by a metrical foot.

If glottalization is licensed by metrical structure, it will always coocur with stress. Thus, Foot{ʔ} captures the fact that all glottalized roots are stressed. Since stress and the position of glottalization are fully predictable in glottalized roots, I propose that neither need be underlyingly specified. In other words, the underlying glottalization of glottalized roots need not be linearized. Thus, the underlying forms of glottalized roots will be represented simply as /*root*,*ʔ*/.

The position of glottalization and stress in glottalized roots is derived through the interaction of several constraints: Maximality(ʔ) (52) ranks above Dependence(Foot) (53), which ensures that in order to comply with Foot{ʔ}, supplying feet in the output is preferred to deleting the glottal stop. Align(ʔ-R, Foot-R) (54) favors the right-alignment of metrical feet with glottal stops. However, Align(ʔ-R, Foot-R) is outranked by NonFinality(ʔ) (55), which ensures that glottal stops never appear word-finally.

(52) Maximality(ʔ), or: Maxʔ
For every glottal stop in the input, there is a corresponding glottal stop in the output.

(53) Dependence(Foot), or: DepF
For every metrical foot in the output, there is a metrical foot in the input.

(54) Align(ʔ-R, Foot-R), or: Alʔ
Every glottal stop is right-aligned with a metrical foot.

(55) NonFinality(ʔ), or: NFʔ
A glottal stop is not final in a prosodic word.

This ranking correctly derives the position of stress and glottalization in disyllabic (56) and trisyllabic (57) glottalized roots. In the tableaux, licensing is represented with an $\underbrace{\text{underbrace}}$ which spans the licenser and encloses the licensee. Thus, when glottalization is licensed by a metrical foot, the underbrace spans the entire foot which contains glottalization.

(56)	*seje,ʔ*	*v*P : *inner* f{ʔ},	Maxʔ,	NFʔ ⟫	Depf,	Alʔ)
i.	*seje*		*			
ii.	*seje,ʔ*	*				*
☞ iii.	(*séʔje*)				*	*
iv.	(*séjeʔ*)			*	*	

cure

(57)	*akhepa,ʔ*	*v*P : *inner* f{ʔ},	Maxʔ,	NFʔ ⟫	Depf,	Alʔ)
i.	*akhepa*		*			
ii.	*akhepa,ʔ*	*				*
iii.	(*áʔkhe*)*pa*				*	*
☞ iv.	(*ákheʔ*)*pa*				*	
v.	*a*(*khéʔpa*)				*	*
vi.	*a*(*khépaʔ*)			*	*	

forget

The position of glottalization in the glottalized roots which alternate between disyllabic (C)V.ʔV and monosyllabic (C)VVʔ is a matter of cyclic phonological evaluation. When an alternating root is uninflected, it undergoes phonological evaluation by itself. The output is a disyllabic (C)V.ʔV, which avoids violating the high-ranking NonFinality(ʔ) (58). The following tableaux are abbreviated, showing only the constraints and candidates relevant to the discussion at hand.[7]

(58)	*kûi,ʔ*	*v*P : *inner* f{ʔ},	NFʔ ⟫	Alʔ)
i.	*kûi,ʔ*	*		*
ii.	(*kûiʔ*)		*	
☞ iii.	(*kû.ʔi*)			*
iv.	(*kû.iʔ*)		*	

drink

A root is not spelled out before the attachment of derivational morphemes. For example, when the causative *-ña*/*-an*/*-en* caus undergoes phonological evaluation at *v*P spell-out, this is the first time that the root undergoes phonological evaluation as well. Since the root was not spelled out previously, the glottal stop in the input is not linearized. *Syllable (59) outranks Align(ʔ-R, Foot-R), favoring candidates with fewer syllables. Thus, the form of the root in the output, where the glottal stop is linearized, is the monosyllabic (C)VVʔ (60).

(59) *Syllable, or: *σ
Assign a violation mark for each syllable in the output.

7 This analysis builds on Repetti-Ludlow et al.'s (2019), who propose that glottalization is underlyingly word-final and undergoes metathesis to avoid non-finality, e. g. /*tsauʔ*/ → [*tsaʔu*] 'house.'

		*v*P : *inner*		
(60)	*kûi,ʔ-ña*	f{ʔ},	*σ ⟫	Alʔ)
i.	*kûi.ña,ʔ*	*	**	*
ii.	(***kû̂.ʔi***)*ña*		***	*
iii.	(***kû̂.iʔ***)*ña*		***	
☞ iv.	(***kûiʔ.ña***)		**	*

drink-CAUS

Other morphemes attach after the root has undergone a phonological evaluation at *v*P spell-out. Thus, their base contains glottalization which has previously been linearized. Previously spelled-out material in the input is represented with square brackets [ ]. Linearity(ʔ) (61) outranks *Syllable, preventing glottal metathesis.[8] Thus, alternating roots suffixed with *v*P-external morphology surface as disyllabic (C)V.ʔV (62).

(61) Linearity(ʔ), or: Linʔ
For every precedence relationship of a glottal stop in the input, there is corresponding precedence relationship of that glottal stop in the output.

		FP : *inner*			
(62)	[(***kû̂.ʔi***)]-*ji*	f{ʔ},	Linʔ ⟫	*σ ⟫	Alʔ)
i.	*kûi.ji,ʔ*	*	*	**	*
☞ ii.	(***kû̂.ʔi***)*ji*			***	*
iii.	(***kû̂.iʔ***)*ji*		*	***	
iv.	(***kûiʔ.ji***)		*	**	*

drink-PRCM

Finally, some A'ingae roots are stressless—they do not have underlying stress or glottalization. I propose that stress is not assigned to stressless roots within the inner morphophonological domain (63). Thus, stressless roots remain stressless even after spell-out. This is modeled with Dependence(Foot), which prevents the construction of new metrical structure. Dependence(Foot) outranks all constraints favoring candidates which innovate stress (elided below).

		*v*P : *inner*	
(63) a.	*afe*	Depf ⟫	...
☞ i.	*afe*		*
ii.	(*áfe*)	*	

give

		*v*P : *inner*	
b.	*atapa*	Depf ⟫	...
☞ i.	*atapa*		*
ii.	(*áta*)*pa*	*	

breed

Observe that the outputs of (63) are different from the surface forms given in Section 3, which showed that stressless bases have stress assigned to the right edge of the inner domain if there are outer suffixes, or to the penultimate syllable of the word if there are no outer suffixes. I propose that this stress assignment takes place in the outer domain, targeting the stressless outputs of the inner domain.

8 I assume that non-linearized glottal stops do not have precedence relationships. Thus, the winning candidate in (60) does not incur any violations of Linearity(ʔ).

Recessive suffixes introduced in the inner morphological domain are subject to the same phonological grammar as roots, including a high ranking of MAXIMALITY(FOOT), MAXIMALITY(ʔ) ≫ DEPENDENCE(FOOT). As such, when a stressless root is spelled out with a recessive suffix, the output is stressless (64-65a). When a stressed (or glottalized) root is spelled out with a recessive suffix, the output is stressed (and glottalized) (64-65b). This generalization holds true of suffixes introduced in *v*P (64) as well as FP (65).

		*v*P : *inner*		
(64) a.	*afe-an*	MAXf,	MAXʔ ≫	DEPf
☞ i.	*afian*			
ii.	(*áfian*)			*
	give-CAUS			

		*v*P : *inner*		
b.	*seje,ʔ-an*	MAXf,	MAXʔ ≫	DEPf
i.	*sejian*		*	
☞ ii.	(*séʔjian*)			*
	cure-CAUS			

		FP : *inner*		
(65) a.	[*atapa*]-*ji*	MAXf,	MAXʔ ≫	DEPf
☞ i.	*atapaji*			
ii.	(*áta*)*paji*			*
	breed-PRCM			

		FP : *inner*		
b.	[(*kúnda*)*se*]-*ji*	MAXf,	MAXʔ ≫	DEPf
i.	*kundaseji*	*		
☞ ii.	(*kúnda*)*seji*			
	tell-PRCM			

The constraint ranking seen in this section has been labeled *inner*. More precisely, it is a compilation of two rankings: *master* and *inner*. Unless there is positive evidence that the activity of a constraint is morphologically-restricted, I assume that it is part of the overarching (*master*) phonology of the language. Thus, the faithfulness constraints (MAXIMALITY, DEPENDENCE, LINEARITY) as well as the markedness constraints NONFINALITY(ʔ) and *SYLLABLE belong in the *master* ranking.[9] The licensing constraint FOOT{ʔ} and the alignment constraint ALIGN(ʔ-R, FOOT-R) are active only in the inner morphophonological domain. As such, they belong in the *inner* cophonology. The phonological rankings motivated so far are given in (66).

(66) PHONOLOGICAL RANKINGS IN A'INGAE, FIRST ITERATION

a. *master:* { MAXf, MAXʔ, LINʔ } ≫ { DEPf, *σ }, NFʔ

b. *inner:* f{ʔ}, { NFʔ, *σ } ≫ ALʔ)

The compilation of the *master* ranking and the *inner* ranking is given in (67). Ranking compilations are represented with a circled plus (⊕). Since the *master* ranking is a component of every phonological ranking in the language, *master* ⊕ *inner* is abbreviated as *inner* in the preceding tableaux. In the tableaux to follow, "*master* ⊕" will also be omitted from the ranking label.

(67) *MASTER* RANKING COMPILED WITH *INNER* RANKING

master ⊕ *inner:* f{ʔ}, { MAXf, MAXʔ, LINʔ } ≫ { DEPf, NFʔ, *σ } ≫ ALʔ)

4.4 *The dominant cophonology*

In this section, I analyze the *dominant* cophonology, which captures the phonological grammar of the A'ingae dominant suffixes, including preglottalized dominant suffixes. Here, I focus on the dominant suffixes intro-

9 Technically, all constraints are part of every cophonology. What differs among the cophonologies is the relative ranking of those constraints. Thus, the listing of various partial rankings should be understood as a convenient notation adopted for ease of exposition: When a constraint shows no activity, I do not explicitly represent it in a ranking. Formally, the constraint can still be thought of as present but ranked too low to influence the output.

duced in the inner morphological domain, i. e. on the interaction of the *inner* and *dominant* cophonologies. The analysis of the outer dominant suffixes is postponed until Section 4.5.

Dominant suffixes delete stress and—if introduced in the inner morphophonological domain—also glottalization. I model with an AntiFaithfulness constraint (Alderete, 1999, 2001). AntiFaithfulness constraints require that the input and and the output differ along a certain dimension. For A'ingae dominant suffixes, this dimension is the metrical structure, as modeled with PhaseAntiMaximality(Foot$_\downarrow$) (68), which ranks in the *dominant* cophonology above Maximality(Foot), Maximality(ʔ), and Linearity(ʔ).

(68) PhaseAntiMaximality(Foot$_\downarrow$), or: ¬Max[f$_\downarrow$]
For no metrical foot or segment in the previously spelled-out phase, is there a corresponding metrical foot or a segment licensed by a metrical foot in the output. Assign a violation for each input metrical foot (and each input glottal stop) that is also present (and metrically-licensed) in the output.

The basic function of PhaseAntiMaximality(Foot$_\downarrow$) is to delete metrical structure. To this extent, its mechanics are similar to those of the AntiFaithfulness constraints proposed by Alderete (1999, 2001). However, PhaseAntiMaximality(Foot$_\downarrow$) differs from Alderete's proposal in three ways.

First, I propose that the deletion of a licenser entails the deletion of its licensees. Thus, PhaseAntiMaximality(Foot$_\downarrow$) is violated not only by faithfulness to input metrical structure, but also by faithfulness to input glottalization—if glottalization is licensed by metrical structure in the output. In the name of the constraint, this is represented with a subscripted down arrow ($_\downarrow$).

Second, PhaseAntiMaximality(Foot$_\downarrow$) is sensitive only to the metrical structure (and glottalization) in the previously spelled-out phase. Thus, the glottalization of preglottalized dominant suffixes is exempt from PhaseAntiMaximality(Foot$_\downarrow$) in the phase in which those suffixes are introduced.

Third, PhaseAntiMaximality(Foot$_\downarrow$) involves universal, not existential, quantification. Thus, when both stress and glottalization are present in the previously spelled-out phase, it does not suffice to delete either in order to avoid a violation of PhaseAntiMaximality(Foot$_\downarrow$). Rather, both stress and glottalization must be deleted.

To put it prosaically, PhaseAntiMaximality(Foot$_\downarrow$) favors erasing metrical structure (and glottalization if metrically-licensed in the output) from the previously spelled-out phase.

Dominant suffixes are associated with the *dominant* cophonology. When introduced in the inner morphophonological domain, the phonological grammar at their spell-out combines the *inner* cophonology and the *dominant cophonology*. The output of the phonological evaluation is therefore determined by both.

When a dominant suffix attaches to a stressless base, stress deletion is vacuous. When a dominant suffix attaches to stressed base, stress deletion targets the previously spelled-out phase (69). The output form depends on the properties of the *dominant* and *inner* cophonologies. The fact the stress is deleted is due to the *dominant* cophonology. The fact that after stress deletion no stress is assigned is due to the *inner* cophonology. (In a later phonological cycle, stress is assigned to the right edge of the inner domain if there are outer suffixes, or to the penultimate syllable of the word if there are no outer suffixes.)

		FP : *inner* ⊕ *dominant*		
(69)	[(*á̱fa*)*se*]-*khu*	¬Max[f$_\downarrow$] ≫	Maxf,	Depf
☞ i.	*afasekhu*		*	
ii.	(*á̱fa*)*sekhu*	*		
iii.	*afa*(*sé̱khu*)		*	*

offend[10]-RCPR

Within the inner morphophonological domain, glottalization is licensed by metrical structure. Thus, it is targeted for deletion by PHASEANTIMAXIMALITY(FOOT$_{\downarrow}$) along with stress. As before, the output is stressless due to DEPENDENCE(FOOT) in the *inner* cophonology (70).

(70)	[(*ákheʔ*)*pa*]-*khu*	FP: *inner* ⊕ *dominant* f{ʔ},	¬MAX[f$_{\downarrow}$] ⟫	MAXf,	MAXʔ ⟫	DEPf
☞ i.	*akhepakhu*			*	*	
ii.	*akheʔpakhu*	*	*	*		
iii.	(*ákhe*)*pakhu*		*		*	
iv.	(*ákheʔ*)*pakhu*		**			
v.	*akhe*(*pákhu*)			*	*	*

forget-RCPR

In the inner domain, glottal stops are licensed by metrical structure. Thus, when a preglottalized suffix is attached, a metrical foot is constructed in order to license it. If the last syllable of the base to which a preglottalized dominant suffix attaches is light (monophthongal), ALIGN(ʔ-R, FOOT-R) yields stress two syllables to the left of the preglottalized suffix (71).

(71)	[*atapa*]-*ʔje*	FP: *inner* ⊕ *dominant* f{ʔ},	MAXʔ ⟫	DEPf,	ALʔ)
i.	*atapaje*		*		
ii.	*atapaʔje*	*			*
☞ iii.	*a*(*tápaʔ*)*je*			*	
iv.	*ata*(*páʔje*)			*	*

breed-IPFV

If the last syllable of the base to which a preglottalized dominant suffix attaches is heavy (diphthongal), the higher-ranking FOOTSHAPE=(×μ) (72) yields stress on the last syllable of the base (73). I assume that FOOTSHAPE=(×μ) is not limited to a morphological context, and therefore belongs in the *master* ranking.

(72) FOOTSHAPE=(×μ), or: (×μ)
The left branch of a foot is strong (i. e. feet are trochaic) and the right branch is a single mora (i. e. light; not a diphthong).

(73)	[*fûndûi*]-*ʔje*	FP: *inner* ⊕ *dominant* f{ʔ},	MAXʔ,	(×μ) ⟫	DEPf,	ALʔ)
i.	*fûndûije*		*			
ii.	*fûndûiʔje*	*				*
iii.	(*fû́ndûiʔ*)*je*			*	*	*
☞ iv.	*fû*(*ndû́iʔje*)				*	*

sweep-IPFV

10 The root (*áfa*)*se* 'offend' in the input of (69) has undergone *v*P spell-out. Thus, it can be targeted for stress deletion by the dominant -*khu*$^{\emptyset}$ RCPR.

All preglottalized suffixes introduced in the inner domain are dominant. Thus, they delete stress and glottalization of the previously spelled-out base. The preglottalization on the suffix itself is not targeted for deletion by PHASEANTIMAXIMALITY(FOOT$_{\downarrow}$) because it is external to the previously spelled-out phase. The preglottalization itself needs to be licensed by a metrical foot. Thus, a new metrical foot is constructed in the output (74). The candidate (74v) incurs one violation of FOOT{ʔ} because a metrical foot may license at most one glottal stop.

(74)	[(*ákheʔ*)*pa*]-*ʔje*	FP: *inner* ⊕ *dominant* f{ʔ},	¬MAX[f$_{\downarrow}$] ⟫	MAXf,	MAXʔ ⟫	DEPf,	ALʔ)
	i. *akhepaje*			*	**		
	ii. *akhepaʔje*	*		*	*		
	iii. *(ákheʔ)paje*		**		*		
☞	iv. *a(**khépaʔ**)je*			*	*	*	
	v. *a(**khéʔpaʔ**)je*	*	*	*	**	*	*
	vi. *akhe(**páʔje**)*			*	*	*	*

forget-IPFV

When two preglottalized dominant suffixes attach within one phase, stress is assigned to the syllable which contains the second mora to the left of the first suffix (76). I take this to reveal the emergence of the low-ranked ALIGN(FOOT-L, WORD-L) (75). ALIGN(FOOT-L, WORD-L) shows activity only in the *inner* cophonology. I assume that the effect of two dominant suffixes on the phonological ranking of the phase in which they are evaluated is the same as the effect of one dominant suffix.

(75) ALIGN(FOOT-L, WORD-L), or: AL[$_{\omega}$f
Every foot is aligned with the left edge of the word.

(76)	[*atapa*]-*ʔje*-*ʔngi*	FP: *inner* ⊕ *dominant* f{ʔ},	MAXʔ ⟫	DEPf,	ALʔ),	AL[$_{\omega}$f
	i. *atapajengi*		**			
	ii. *atapaʔjengi*	*	*			
☞	iii. *a(**tápaʔ**)jengi*		*	*		*
	iv. *a(**tápaʔ**)jeʔngi*	*		*		*
	v. *ata(**páʔje**)ngi*		*	*	*	**
	vi. *ata(**pájeʔ**)ngi*		*	*		**
	vii. *ata(**páʔjeʔ**)ngi*	*		*		**
	viii. *atapa(**jéʔngi**)*		*	*	*	***

breed-IPFV-VEN

In interim summary, by proposing that the deletion of a licenser entails the deletion of its licensees, the account captures the fact that in A'ingae the deletion of stress triggered within the inner domain also requires the deletion of glottalization. The *dominant* cophonology and the revised *master* and *inner* rankings are given in (77).

(77) PHONOLOGICAL RANKINGS IN A'INGAE, SECOND ITERATION

a. *master:* { MAXf, MAXʔ, LINʔ } ≫ { DEPf, *σ }, NFʔ, (×μ)

b. *inner:* f{ʔ}, { NFʔ, (×μ), *σ } ≫ { ALʔ), AL[$_\omega$f }

c. *dominant:* ¬MAX[f$_\downarrow$] ≫ { MAXf, MAXʔ, LINʔ }

4.5 *The outer cophonology*

In this section, I analyze the *outer* cophonology, which characterizes the outer morphological domain. The *outer* cophonology is active at the spell-out of TP, which contains morphology typically associated with the inflected predicate, as well as CP, which contains morphology associated with full clauses. First, I focus on the outer recessive suffixes, which are not associated with a suffix-specific cophonology. I conclude the analysis with outer dominant suffixes, which involve the interaction of the *outer* and *dominant* cophonologies.

When TP suffixes attach to a stressless base, stress is assigned to the last syllable of the inner domain (79). The base may be stressless because it originated as such or because its stress was deleted by a dominant suffix. The assignment of stress to the last syllable of the inner domain is modeled with ALIGN(PHASE-R, STRESS-R) (78). In the *outer* cophonology, ALIGN(PHASE-R, STRESS-R) ranks above DEPENDENCE(FOOT). I assume that ALIGN(PHASE-R, STRESS-R) is evaluated gradiently, incurring one violation for each syllable separating stress from the right edge of previously spelled-out phase. Thus, if stress is entirely absent from the output, as in (79i), ALIGN(PHASE-R, STRESS-R) incurs infinite violations.

(78) ALIGN(PHASE-R, STRESS-R), or: ALσ́]
The right edge of the previously spelled-out phase is right-aligned with the primary stress.

(79)	[*afaseye*]-*ya*	TP : *outer* ALσ́] ≫	DEPf
i.	*afaseyeya*	∞	
ii.	(***á****fa*)*seyeya*	***	*
iii.	*a*(***fá****se*)*yeya*	**	*
iv.	*afa*(***sé****ye*)*ya*	*	*
☞ v.	*afase*(***yé****ya*)		*
vi.	*afaseye*(***yá***)	*	*

offend-PASS[11]-IRR

I propose that the licensing of the glottal stop in A'ingae differs between the two morphophonological domains. In the inner morphophonological domain, the glottal stop is licensed by the metrical foot node (80a). In the outer morphophonological domain, the glottal stop is licensed like any regular segment, i. e. by the syllabic node (80b). The constraint which captures the syllabic licensing of glottalization in the *outer* cophonology is (81).

11 The previously spelled-out phase in the input of (79) consists of the stressed root (***á****fa*)*se* 'offend,' whose stress was deleted by the dominant suffix -*ye*$^\emptyset$ PASS, yielding stressless *afaseye* 'offend-PASS.'

(80) LICENSING OF THE GLOTTAL STOP

a. IN THE INNER DOMAIN

b. IN THE OUTER DOMAIN

(81) SYLLABLE{ʔ}, or: σ{ʔ}
Glottal stops are licensed by syllables. Violated by every glottal stop not licensed by a syllable.

Since glottalization is licensed by the syllabic node in the outer domain, it does not have any effect on stress. Stress is assigned in a regular fashion, i. e. to the last syllable of the previously spelled out domain (82). When glottalization is licensed by a syllable, the underbrace spans the syllable which contains glottalization. Candidates (82i-ii) and (82iii-iv) have the same phonetic realization, but contrast in the licensing of the glottal stop. In (82i,iii), the glottal stop is licensed by a metrical foot. In (82ii,iv), it is licensed by a syllable. Thus, candidates (82i,iii) violate SYLLABLE{ʔ}.

(82)	[*atapa*]-*ʔfa-ya*	TP: *outer* σ{ʔ},	ALσ́] ⟫	DEPf
i.	*a(**tápaʔ**)faya*	*	*	*
ii.	*a(**tápaʔ**)faya*		*	*
iii.	*ata(**páʔfa**)ya*	*		*
☞ iv.	*ata(**páʔfa**)ya*			*
v.	*atapaʔ(**fáya**)*		*	*

breed-PLS-IRR

MAXIMALITY(FOOT) ranks above ALIGN(PHASE-R, STRESS-R). Thus, stress from the previously spelled-out phase is retained. If glottalization is present, it is retained, but its licensing changes from metrical to syllabic (83).

(83)	[*a(**tápaʔ**)je*]-*ya-mbi*	TP: *outer* σ{ʔ},	MAXf,	MAXʔ ⟫	ALσ́]
i.	*a(**tápa**)jeyambi*		*	*	**
ii.	*a(**tápaʔ**)jeyambi*	*			**
☞ iii.	*a(**tápaʔ**)jeyambi*				**
iv.	*atapa(**jéya**)mbi*		*	*	
v.	*atapaʔ(**jéya**)mbi*		*		

breed-IPFV[12]-IRR-NEG

12 The spelled-out phase in the input of (83) consists of the stressless root *atapa* 'breed' and the preglottalized suffix -*ʔje*$^{\emptyset}$ IPFV, which in the previous cycle triggered stress assignment, yielding *a(**tápaʔ**)je* 'breed-IPFV.'

If there are no TP suffixes, TP does not undergo phonological evaluation. If there are CP suffixes and the previously spelled-out phase does not have stress, stress is assigned at CP spell-out to the last syllable of the of the previously spelled-out phase (i. e. FP or *v*P if no suffixes were introduced in FP) (84).

(84)	[*atapa*]-*saʔne*	CP: *outer* σ{ʔ},	Maxf,	Maxʔ ⟫	Alσ́]
i.	*a*(***tá**pa*)*saʔne*				*
☞ ii.	*ata*(***pá**saʔ*)*ne*				
iii.	*atapa*(***saʔ**ne*)				*
	breed-APPR				

If there are both TP and CP suffixes and the inner domain does not have stress, stress is assigned the last syllable of the previously spelled-out phase at TP spell-out (85a) and preserved at CP spell-out (85b).

(85) a.	[*atapa*]-*ʔfa*	TP: *outer* σ{ʔ},	Maxf ⟫	Alσ́]
i.	*a*(***tá**paʔ*)*fa*			*
☞ ii.	*ata*(***páʔ**fa*)			
iii.	*atapaʔ*(***fá***)			*
	breed-PLS			

b.	[*ata*(***páʔ**fa*)]-*ja*	CP: *outer* σ{ʔ},	Maxf ⟫	Alσ́]
☞ i.	*ata*(***páʔ**fa*)*ja*			*
ii.	*atapaʔ*(***fá**ja*)		*	
iii.	*atapaʔfa*(***já***)		*	*
	breed-PLS-IMP			

This derives the generalization that if the outer domain (TP and/or CP) suffixes are present and the inner domain was stressless, stress is assigned to the right edge of the inner domain.

If neither TP nor CP suffixes are present, TP does not undergo spell-out, but CP does. If the inner domain was stressless, stress is assigned to the penultimate syllable. Observe that stress in A'ingae is never final. To capture this fact, I propose that NonFinality(Stress) (87) is ranked above Align(Phase-R, Stress-R). Recall that Align(Phase-R, Stress-R) is evaluated gradiently, incurring one violation for each syllable separating stress from the right edge of previously spelled-out phase. This derives the "default" penultimate stress assignment (88).

(87) NonFinality(Stress), or: NFσ́
Primary stress is not final in a prosodic word.

(88)	[*akhepayeji*]	CP: *outer* σ{ʔ},	Maxf,	NFσ́ ⟫	Alσ́]
i.	*akhe*(***pá**ye*)*ji*				***
☞ ii.	*akhepa*(***yé**ji*)				**
iii.	*akhepaye*(***jí***)			*	*
	forget-PASS-PRCM[13]				

13 The spelled-out phase in the input of (88) consists of the stressed and glottalized root (*ákheʔ*)*pa* 'forget' and two suffixes -*ye*$^{\emptyset}$ PASS and -*ji* PRCM. In the earlier cycle, the inner dominant -*ye*$^{\emptyset}$ PASS deleted the stress and glottalization of (*ákheʔ*)*pa* 'forget,' and the inner recessive -*ji* PRCM did not assign any. Thus, the input to the late CP spell-out is the stressless *akhepayeji* 'forget-PASS-PRCM.'

Finally, there are two dominant CP suffixes: *-jama*$^{\emptyset}$ PRHB and *-kha*$^{\emptyset}$ IMP2.The outer dominant suffixes assign stress to the immediately preceding syllable regardless of preexisting stress but they keep preexisting glottal stops intact. These properties emerge from the interaction of the *outer* and *dominant* cophonologies. The *dominant* cophonology ranks PHASEANTIMAXIMALITY(FOOT$_{\downarrow}$) high, which results in the erasure of preexisting stress, allowing ALIGN(PHASE-R, STRESS-R) of the *outer* cophonology to assign stress to the right edge of the previously spelled-out phase (i. e. immediately before the outer dominant suffix). Even thought PHASEANTIMAXIMALITY(FOOT$_{\downarrow}$) is ranked high by the *dominant* cophonology, in the *outer* cophonology glottal stops are licensed by syllables, not metrical feet (SYLLABLE{ʔ}), so PHASEANTIMAXIMALITY(FOOT$_{\downarrow}$) is not violated by the glottalization retained in the output (89).

		TP : *outer* ⊕ *dominant*				
(89)	[*a(**tá**paʔ)je*]*-jama*	σ{ʔ},	¬MAX[f$_{\downarrow}$] ⟫	MAXf,	MAXʔ ⟫	ALσ́]
i.	*a(**tá**paʔ)jejama*	*	**			
ii.	*a(**tá**paʔ)jejama*		*			
iii.	*atapa(**jé**ja)ma*			*	*	
☞ iv.	*atapaʔ(**jé**ja)ma*			*		
v.	*atapaʔje(**já**ma)*			*		*

breed-IPFV[14]-PRHB

In summary, by proposing that the licensing of the A'ingae glottal stops differs between the inner and the outer domain (metrically licensed in the former, but not the latter), the account captures the fact that stress deletion in the inner domain also deletes glottal stops, but stress deletion in the outer domain does not. The final *master* ranking as well as the *inner*, *outer*, and *dominant* cophonologies are given in (90).

(90) PHONOLOGICAL RANKINGS IN A'INGAE, FINAL ITERATION
   a. *master:* { MAXf, MAXʔ, LINʔ } ⟫ { DEPf, *σ }, NFσ́, NFʔ, (×μ)
   b. *inner:* f{ʔ}, { NFʔ, (×μ), *σ } ⟫ { ALʔ), AL[$_{\omega}$f }
   c. *outer:* σ{ʔ}, { MAXf, NFσ́ } ⟫ ALσ́] ⟫ DEPf
   d. *dominant:* ¬MAX[f$_{\downarrow}$] ⟫ { MAXf, MAXʔ, LINʔ }

5 REJECTED ALTERNATIVES

The CbP account of A'ingae glottalization is couched in a relatively powerful framework and uses a variety of formal devices. Specifically, the analysis posits (i) different phonological grammars associated with different morphological strata (*inner* vs. *outer*), (ii) different phonological grammars associated with individual morphosyntactic features (*dominant*), (iii) licensing as the relation between metrical feet and glottalization within the inner stratum, and (iv) ANTIFAITHFULNESS as the mechanism for stress deletion. As such, one may reasonably wonder whether there is a less formally elaborate, but equally insightful, analysis available.

In this section, I examine three alternative accounts which do away with (i), (iii), and (iv). In Section 5.1, I consider a purely representational analysis where the preglottalized inner and outer suffixes have different underlying forms (i) and briefly comment on representational accounts of dominance. For an extended discussion of the latter, see Dąbkowski (2021c) (ii). In Section 5.2, I outline an analysis which retains cophonological rankings, but eschews the notion of licensing and models glottalization's effect on stress entirely as a matter of ALIGNMENT (iii). In Section 5.3, I sketch an analysis which dispenses with the PHASEANTIMAXIMALITY(FOOT$_{\downarrow}$),

14 The spelled-out phase in the input of (89) consists of the stressless root *atapa* 'breed' and the preglottalized suffix *-ʔje*$^{\emptyset}$ IPFV, which in the previous cycle triggered assignment of stress to the syllable with the second mora to the left of the glottal stop, yielding *a(**tá**paʔ)je* 'breed-IPFV.'

a member of the controversial family of AntiFaithfulness constraints, in favor of *Structure (iv). I conclude that the alternative analyses make incorrect predictions or fall short of capturing the central generalizations about the A'ingae morphophonology stated in Section 3.4. Lastly, in Section 5.4, I bring explicit attention to two recalcitrant corners of the data (the alternating glottalized roots and forms with multiple inner preglottalized suffixes) which naturally fall out of CbP's architectural assumption of phase-based spell-out but are problematic for fully parallel and fully cyclical frameworks.

5.1 *Representational analyses*

Preglottalized suffixes introduced in the inner domain assign stress to the syllable which contains the second mora to the left of the glottal stop, while preglottalized suffixes of the outer domain have no such effect. To capture this pattern, the analysis presented in Section 4 posits two different phonological grammars for the inner and outer domains. In a purely representational account, where the phonological grammar of a language is taken to be fully uniform, this difference must be attributed to differing underlying forms.

A plausible proposal might model the difference between the inner and outer suffixes with partial metrical structure. Under this analysis, the glottal stop of the preglottalized inner suffixes is immediately followed by the right edge of metrical foot (91a). The outer suffixes do not have underlying metrical structure (91b).

(91) Representational analysis
  a. *inner: -ʔ)je* ipfv, *-ʔ)ngi* ven, *-ʔ)nga* and, ...
  b. *outer: -ʔfa* pls, *-ya* irr, *-ʔta* if.ss, *-ja* imp, ...

When a suffix comes with a partial metrical foot, the rest of the foot is supplied in the output (92a-b). When a suffix has no underlying metrical structure, regular stress assignment takes place (92c-d). This captures the basic difference with respect to stress assignment between the preglottalized inner and outer suffixes.

(92) Preglottalized inner or outer suffixes, representational analysis

a. / *atapa -ʔ)je* /	b. / *atapa -ʔ)ngi* /	c. / *atapa -ʔfa* /	d. / *atapa -ya* /
[*a(**tá**pa -ʔ)je*]	[*a(**tá**pa -ʔ)ngi*]	[*ata(**pá** -ʔfa)*]	[*ata(**pá** -ya)*]
breed -ipfv	breed -ven	breed -pls	breed -irr

Nevertheless, the representational analysis is not adopted for four reasons. First, it predicts that the left edge of a preglottalized inner suffix is always aligned with the right edge of a metrical foot, even if it results in the construction of a degenerate head foot (e. g. on monosyllabic roots). This is unlike the CbP analysis, where the glottal stop of an inner suffix is always contained within a metrical foot, but is not required to be aligned with it (i. e. Align(ʔ-R, Foot-R) is a violable constraint). Assuming that A'ingae words are footed exhaustively (barring the construction of non-head degenerate feet, see 39), the representational analysis predicts that secondary stress should immediately follow the degenerate head foot if there is an even number of syllables to its right (93a). CbP predicts no secondary stress in the same position (93b). Given that the second syllable of (93b) is no greater in prominence than the second syllable of (93c), the prediction of the representational analysis (93a) is incorrect.

(93) Exhaustive footing

a. with ʔ) in repr. an.	b. with *inner* ʔ in CbP	c. without ʔ
/ *i -ʔ)je -ya* /	/ *i -ʔje*$^{\emptyset}$ *-ya* /	/ *(**á**fa) -ya* /
*[*(**í** -ʔ)(**jè** -ya)*]	[*(**í** -ʔje) -ya*]	[*(**á**fa) -ya*]
bring -ipfv -irr	bring -ipfv -irr	speak -irr

Second, the representational analysis has no way of capturing the generalization that the preglottalized suffixes which assign stress to the syllable which contains the second mora to the left of the glottal stop all precede the preglottalized suffixes which have no effect on stress. In other words, under the representational analysis, nothing prevents the existence of suffixes such as *-ʔ)*ta* IF.SSwhich follows -*ʔfa* PLS, or *-*ʔje* IPFV which precedes -ʔ)*ngi* VEN. Under the CbP analysis, such orderings are ruled out by the phonological grammars of the suffixes' respective domains.

Third, the glottalization/stress generalization which holds of the inner suffixes (i. e. stress is assigned to the syllable which contains the second mora to the left of the glottal stop), also holds in roots. The CbP analysis reflects this by subjecting both roots and inner suffixes to the same *inner* cophonology. The representational analysis offers no insight into this patterning. For example, it provides no reason as to why glottalized but stressless roots such as **akheʔpa* 'forget' do not exist in A'ingae.

Fourth and last, the inner dominant suffixes delete stress and glottalization but the outer dominant suffixes delete only stress. So far, stress deletion deletion has been left out of the discussion since deletion is not straightforwardly implemented using representational means. However, regardless of which account of deletion one might eventually adopt, the purely representational analysis does not capture the stratal (*inner* vs. *outer*) organization of the A'ingae grammar (see the second and third arguments) and does not posit a formal link between glottalization and metrical structure (unlike CbP, where metrical structure is the licenser of glottalization in the inner domain). Thus, it is difficult to imagine a non-stipulative representational account of why the inner, but not the outer, dominant suffixes delete glottalization. In brief, the representational analysis fails to capture the first central generalization about the A'ingae morphophonology (40).

Alternatively, one could abandon a representational analysis of the A'ingae morphophonological domains but retain and flesh out a representational analysis of the A'ingae dominance. This would bring the A'ingae system into the fold of Stratal OT (Bermúdez-Otero, 1999, 2012; Jaker and Kiparsky, 2020; Kiparsky, 2000, 2008; others), where the inner and outer domain are modeled essentially as in CbP (i. e. with different phonological rankings for the *inner* and *outer* strata), but the unpredictable suffix-specific dominance effects are attributed to the underlying representations of the dominant morphemes. However, A'ingae dominance involves genuine stress deletion, not stress overriding. As such, modeling it representationally poses serious challenges. For an extensive argument against representational treatments of A'ingae dominance, including explicit discussion of Stratal OT, Gradient Symbolic Representations (Rosen, 2016; Smolensky and Goldrick, 2016; Zimmermann, 2018a,b), floating metrical structure (cf. floating negative tone in Kushnir, 2019), and empty prosodic nodes (Trommer and Zimmermann, 2014), see Dąbkowski (2021c).

5.2 *ALIGNMENT-only analysis*

Under the CbP analysis, there are two high-ranked constraints in the grammar of the inner phonological domain which relate metrical structure and glottalization: FOOT{ʔ}, which penalizes glottal stops unlicensed by a metrical foot, and ALIGN(ʔ-R, FOOT-R), which favors right-alignment of the metrical foot with the glottal stop. The functions of the two constraints are partially overlapping: Assuming that MAXIMALITY(ʔ) and ALIGN(ʔ-R, FOOT-R) rank above DEPENDENCE(FOOT), these two constraints are by themselves sufficient to trigger the construction of a metrical foot given an input glottal stop, making a recourse to licensing (FOOT{ʔ}) ostensibly unnecessary (94).

		FP : *inner*		
(94)	[*atapa*]-*ʔje*	MAXʔ,	ALʔ) ⟫	DEPF
	i. *atapaje*	*		
	ii. *atapaʔje*		*	
☞	iii. *a(**tá**paʔ)je*			*
	iv. *ata(**páʔ**je)*		*	*
	forget-IPFV			

The above observation might lead one to propose an Alignment-only analysis, where the inner and the outer morphological domains differ in the ranking of Align(ʔ-R, Foot-R), but the mechanism of licensing is never invoked (95).

(95) Alignment-only analysis, first iteration
   a. *master:* NFσ́, NFʔ, Maxf, Maxʔ ⟫ Depf, (×μ)
   b. *inner:* { NFʔ, Maxʔ, Alʔ) } ⟫ { Depf, (×μ) } ⟫ Al[$_\omega$f
   c. *outer:* { Maxf, NFσ́ } ⟫ Alσ́] ⟫ { Depf, Alʔ) }
   d. *dominant:* ¬Max[f] ⟫ { Maxf, Maxʔ }

Nonetheless, the Alignment-only analysis is not adopted for two reasons. First, despite their partial functional overlap, the motivations for Foot{ʔ} and Align(ʔ-R, Foot-R) in the the CbP analysis of Section 4 are fundamentally distinct: Foot{ʔ} captures the fact that inner glottal stops trigger the construction of a metrical foot and Align(ʔ-R, Foot-R) determines the position of that foot with respect to the glottal stop. Foot{ʔ} is undominated, which means that glottalization always triggers foot construction. Align(ʔ-R, Foot-R), on the other hand, is dominated by FootShape = (×μ), which means the alignment of the foot with glottalization is subject to the A'ingae optimal foot structure. The interaction of the three constraints means that when glottalization is present in the inner domain, a metrical foot will always be created, but it need not be right-aligned with the glottal stop.

In the Alignment-only analysis, there is no licensing constraint (Foot{ʔ}); the construction of metrical structure in the presence of inner glottal stops is modeled with Align(ʔ-R, Foot-R). This means that Align(ʔ-R, Foot-R) must rank above FootShape = (×μ). As a result, in cases where the glottalization-triggered stress falls on the glottalized syllable, the head foot is degenerate (96).

		*v*P : *inner*				
(96)	*seje,ʔ*	NFʔ,	Maxʔ,	Alʔ) ⟫	Depf,	(×μ)
i.	*seje*		*			
ii.	*seje,ʔ*			*		
💣 iii.	(***séʔ***)*je*				*	*
☹ iv.	(***séʔ****je*)			*	*	
v.	(***séje****ʔ*)	*			*	
	cure					

Therefore, assuming again that A'ingae words are footed exhaustively whenever possible, the Alignment-only analysis suffers from the same problem as the purely representational account: It incorrectly predicts that secondary stress should immediately follow the degenerate head foot if there is an even number of syllables to its right (93a).

Second, the Alignment-only analysis struggles with capturing the fact that the inner dominant suffixes also delete glottalization. If the analysis dispenses with the notion of licensing, the PhaseAntiMaximality(Foot$_\downarrow$) constraint cannot reference it and must be reformulated as PhaseAntiMaximality(Foot) (97).

(97) PhaseAntiMaximality(Foot), or: ¬Max[f]
   For no metrical foot in the previously spelled-out phase is there a corresponding metrical foot in the output. Assign a violation for each input metrical foot that is also present in the output.

The reformulated constraint triggers stress deletion, but it does not target the glottal stops. Given that Maximality(ʔ) outranks Dependence(Foot), as motivated above, the Alignment-only analysis predicts that the deleted metrical structure will be recreated in the output (98), even if PhaseAntiMaximality(Foot) ranks above both Maximality(Foot) and Maximality(ʔ) (95d). Metrical feet in the input and output are subscripted ($_{i,\,j}$) to indicate whether they are in a correspondence relation (McCarthy and Prince, 1995).

		FP : *inner* ⊕ *dominant*				
(98)	[(*áḱheʔ*)$_i$*pa*]-*khu*	¬Max[f] ⟫	Maxf,	Maxʔ,	Alʔ) ⟫	Depf
☹ i.	*akhepakhu*		*	*		
ii.	*akheʔpakhu*		*		*	
iii.	(*áḱhe*)$_i$*pakhu*	*		*		
iv.	(*áḱheʔ*)$_i$*pakhu*	*				
💣 v.	(*áḱheʔ*)$_j$*pakhu*		*			*
	forget-rcpr					

One solution to the above problem would be to say that dominant suffixes reverse the ranking of Maximality(ʔ) and Dependence(Foot) (99d). However, this solution has two major downsides. First, it is stipulative. Under this analysis, it just so happens that the suffixes which delete stress also reverse rerank the two faithfulness constraints. Thus, it fails to capture the first central generalization about the A'ingae morphophonology (40).

(99) Alignment-only analysis, second iteration

d. *dominant:* ¬Max[f] ⟫ { Maxf, Maxʔ }, Depf ⟫ Maxʔ

Second, postulating that the dominant suffixes rank Dependence(Foot) above Maximality(ʔ) incorrectly predicts the deletion of glottalization from inner preglottalized dominant suffixes (100).

		FP : *inner* ⊕ *dominant*				
(100)	[*atapa*]-*ʔje*	¬Max[f] ⟫	Maxf,	Alʔ),	Depf ⟫	Maxʔ
💣 i.	*atapaje*					*
ii.	*atapaʔje*			*		
☹ iii.	*a*(***tá**paʔ*)*je*				*	
iv.	*ata*(***páʔ**je*)			*	*	
	breed-ipfv					

To remedy this, one could posit special faithfulness to the glottal stops introduced by preglottalized suffixes. To formalize this analysis, one would need to formulate a morphologically-indexed Maximality($ʔ_{sfx}$) constraint (101), which is violated specifically by the deletion of suffix glottal stops and which ranks above Dependence(Foot) (102a).

(101) Maximality($ʔ_{sfx}$), or: Max$ʔ_{sfx}$
For every glottal stop in an input suffix, there is a corresponding glottal stop in the output.

(102) Alignment-only analysis, third iteration

a. *master:* NFσ́, NFʔ, Maxf, { Maxʔ, Max$ʔ_{sfx}$ } ⟫ Depf, (×μ)

Cophonologies by Phase is a strictly modular model of the grammar where the phonological and morphosyntactic components cannot access each other (morpheme-specific phonology is captured by means of indirect reference). This restriction imposed on the grammatical architecture aims to model the robust empirical generalizations known as phonology-free syntax (Pullum and Zwicky, 1988) and bracket erasure (morphosyntax-free phonology). The adoption of morphologically-indexed constraints such as MAXIMALITY(ʔ$_{sfx}$) weakens the predictive power of a theory by permitting a variety of empirically unattested phenomena. Thus, the ALIGNMENT-only analysis is not adopted. For a survey of arguments against indexed-constraint approaches, see e. g. Inkelas and Zoll (2007), Orgun (1996), Orgun and Inkelas (2002), and Scheer (2012).

5.3 **STRUCTURE analysis*

The second central insight about the A'ingae morphology states that stress deletion is the only unpredictable suffix-triggered phonological process (41). The deletion of stress may be accompanied by stress reassignment to the syllable which contains the second mora to the left of the suffix (if the stress-deleting suffix is inner and preglottalized), to the last syllable of the previously spelled-out domain (if the stress-deleting suffix is outer), or no stress reassignment (if the stress-deleting suffix is inner and plain, i. e. not preglottalized). Importantly, whether and where stress is reassigned is determined by the phonological grammar of the domain in which the stress-deleting suffix is introduced. As such, it need not be stipulated as an idiosyncratic property of the dominant suffix.

The Cophonologies by Phases analysis of Section 4 formalizes this insight by associating the stress-deleting suffixes with the *dominant* cophonology. The *dominant* cophonology is characterized by a high ranking of PHASEANTIMAXIMALITY(FOOT$_{\downarrow}$), which ensures that the output will not be faithful to input stress. Stress reassignment (or its lack) follows from the *inner* and *outer* cophonologies which characterize the two respective morphophonological domains of A'ingae.

In an analysis which does not make a recourse to PHASEANTIMAXIMALITY(FOOT$_{\downarrow}$), stress deletion must be captured via different means. A natural candidate is the *FOOT constraint (103), a member of the *STRUCTURE family of constraints, which penalizes metrical structure present in the output.

(103) *FOOT, or: *f
Assign a violation mark for each metrical foot in the output.

A high ranking of *FOOT ensures that the output will be stressless. Thus, *FOOT is unlike PHASEANTIMAXIMALITY(FOOT$_{\downarrow}$), which demands only that the output stress be different from the input stress, but does not by itself penalize stressed outputs. Since the plain inner dominant suffixes yield stressless outputs, an *inner dominant* cophonology which ranks *FOOT above both MAXIMALITY(FOOT) and MAXIMALITY(ʔ) correctly models their behavior (104c). However, it does not model the behavior of preglottalized inner dominant or outer dominant suffixes, which reassign stress in the output. The preglottalized inner dominant suffixes can be modeled by having MAXIMALITY(ʔ$_{sfx}$) dominate MAXIMALITY(ʔ) in the *master* ranking (104a). The outer dominant suffixes can be modeled by ranking ALIGN(PHASE-R, STRESS-R) above MAXIMALITY(FOOT) in the *outer cophonology* (104e).

(104) *STRUCTURE ANALYSIS
a. *master:* MAXʔ$_{sfx}$ ≫ { MAXf, MAXʔ } ≫ DEPf, NFσ́, NFʔ, (×μ)
b. *inner:* f{ʔ}, { NFʔ, (×μ) } ≫ { ALʔ), AL[$_{\omega}$f }
c. *inner dominant:* *f ≫ { MAXf, MAXʔ }, f{ʔ}, { NFʔ, (×μ) } ≫ { ALʔ), AL[$_{\omega}$f }
d. *outer:* σ{ʔ}, { MAXf, NFσ́ } ≫ ALσ́] ≫ DEPf
e. *outer dominant:* σ{ʔ}, ALσ́] ≫ { MAXf, NFσ́ } ≫ DEPf

An analysis along these lines is pursued by Dąbkowski (2021c). However, the *STRUCTURE analysis is not adopted here for two reasons. First, it requires invoking the morphologically-indexed constraint MAXIMALITY(ʔ$_{sfx}$). Second, it fails to formally relate the phonological properties of (i) the *inner dominant* suffixes to the *inner* cophonology, (ii) the *outer dominant* suffixes to the *outer* cophonology, and (iii) the *inner dominant* suffixes to the *outer dominant* suffixes, and instead posits four unrelated cophonological rankings. Thus, the *STRUCTURE analysis misses the second central generalization about the A'ingae morphophonology (41).

5.4 *Phase-based spell-out*

Finally, I would like to bring explicit attention to CbP's postulate of phase-based spell-out. Cophonologies by Phase proposes that phonological evaluation is cyclical and proceeds phase-by-phase. However, the morphosyntactic features present within one phrase are spelled out all at once and evaluated in parallel. This distinguishes CbP from other models of the phonology-morphosyntax interface, and naturally captures the behavior of alternating glottalized roots and forms with multiple inner preglottalized suffixes, which pose challenges for fully parallel (e. g. McCarthy and Prince, 1993a,b; Pater, 2009; Prince and Smolensky, 1993) and fully cyclic frameworks (e. g. Bobaljik, 2000; Caballero, 2011; Inkelas, 2008; Matushansky, 2006).

First, recall that a few glottalized roots alternate between monosyllabic (C)VVʔ and disyllabic (C)V.ʔV, depending on the morphological context. When followed by the derivational suffix *-ña* CAUS, they surface as monosyllabic (12). When by themselves (9) or followed by an inflectional suffix, such as *-ji* PRCM (10), they surface as disyllabic (C)V.ʔV. In the CbP analysis of Section 4, this falls out directly from phase-based spell-out: The first phase to undergo phonological evaluation is *v*P, which includes the root (58) and the causative *-ña* CAUS (60), but excludes all other suffixes (62). This pattern is difficult to capture in a fully parallel framework. Any constraint ranking which correctly predicts (105a) and (105b) will fail to predict (105c), and vice versa.

(105) a. drink

	kûi,ʔ	X ≫	Y
i.	(***kûiʔ***)	*	
☞ ii.	(***kû***.*ʔi*)		*

b. drink-PRCM

	kûi,ʔ-ji	X ≫	Y
i.	(***kûiʔ****ji*)	*	
☞ ii.	(***kû***.*ʔi*)*ji*		*

c. drink-CAUS

	kûi,ʔ-ña	X ≫	Y
💣 i.	(***kûiʔ****ña*)	*	
☹ ii.	(***kû***.*ʔi*)*ña*		*

Likewise, the pattern is difficult to capture in a fully cyclical framework. If the root undergoes phonological evaluation by itself (before any suffixation), it is not clear why it surfaces either as monosyllabic (C)VVʔ or as disyllabic (C)V.ʔV, depending on the morphological context.

Second, recall that stress in forms with two inner preglottalized dominant suffixes is assigned to the syllable which contains the second mora to the left of the first of those suffixes (27). If both suffixes are introduced in the same phase, they both contribute the same *dominant* cophonology to the phonological ranking of their phase, which deletes stress from the previous phase. The assignment of stress to the syllable which contains the second mora to the left of the first suffix's glottal stop is taken to reveal the activity of the low ranked ALIGN(FOOT-L, WORD-L) (76). Importantly, there is no step in the derivation where the first suffix has undergone phonological evaluation but the second one has not.

In this way, CbP differs from classic Cophonology Theory, where it is often assumed that each suffix associated with its own cophonological grammar undergoes phonological evaluation immediately upon combining with its base, before any further morphology takes place (Caballero, 2011; Inkelas, 2008). This fully cyclic model incorrectly predicts that the stress assigned by the first preglottalized suffixes will be erased by the second preglottalized suffix (106).

(106) CYCLIC EVALUATION OF PREGLOTTALIZED FP SUFFIXES

**ata*(*páje*ʔ)*ngi*

a(*tápa*ʔ)*je* -ʔ*ngi*$^{\emptyset}$ -VEN

atapa -ʔ*je*$^{\emptyset}$

breed -IPFV

The same prediction is made by Alderete's (1999, 2001) Transderivational Anti-Faithfulness, where given two dominant suffixes in a structure such as /*root-sfx*$^{\emptyset}$*-sfx*$^{\emptyset}$/, the second suffix always wins over the first one (Alderete, 1999, p. 181). Both frameworks predict that dominance effects are strictly cyclic, with the outermost dominant suffix dominating over all previous suffixes. The prediction is falsified by the A'ingae forms with multiple preglottalized inner dominant suffixes.

6 CONCLUSIONS

I formulated two generalization about A'ingae glottalization. First, the relationship of glottalization to stress depends on the morphophonological domain. In the inner domain, glottalization triggers stress assignment and undergoes deletion along with stress. In the outer domain, glottalization does not trigger assignment and is not affected by stress deletion. Second, when controlled for the morphophonological domain and segmental content, the variability in the phonological process triggered by A'ingae suffixes reduces to one parameter: some suffixes preserve metrical structure, while others delete it.

To capture the first generalization, I proposed that glottalization is licensed by metrical structure within the inner domain and that the deletion of a licenser entails the deletion if its licensees. To capture the second generalization, I proposed that the division between two morphophonological domains crosscuts a distinction between recessive and dominant suffixes. I formalized this proposal by associating the two morphophonological domains with the *inner* and *outer* cophonologies and the dominant suffixes with the *dominant*. The interactions among the three cophonologies, summarized in Table 4, capture the characteristics of the phonological processes triggered by A'ingae suffixes.

	inner	*inner* ⊕ *dominant*	*outer*	*outer* ⊕ *dominant*
STRESS	preserved	deleted	preserved	deleted
GLOTTALIZATION	preserved	deleted	preserved	preserved
IF ABSENT OR DELETED, STRESS (RE)ASSIGNED	only due to glottalization: (×μʔ)		to the R-edge of spelled-out phrase	

Table 4: Interactions of the *inner*, *outer*, and *dominant* cophonologies.

The organization of the A'ingae phonological grammar shows that stratally organized morphological domains may be characterized by different phonological grammars (*inner* vs. *outer*), but also that individual affixes might be associated with phonological grammars of their own (*dominant*). This shows a need for a framework capable of capturing stratal morphophonology as well as morpheme-specific phonological effects.

I implemented my analysis in Cophonologies by Phase (Sande, 2019; Sande, Jenks, and Inkelas, 2020; others). CbP captures the organization of the A'ingae grammar, as it allows to associate different phonological grammars to phase heads as well as individual morphosyntactic features. The first property models the stratal organization of the *inner* and *outer* cophonologies. The second property models the fact that individual morphemes may be unpredictably associated with the *dominant* cophonology. Thus, Cophonologies by Phase succeeds at fully capturing the generalizations about the phonology of the A'ingae glottal stop.

Significantly, an affix-specific cophonology may interact with the cophonology of its domain in a non-trivial way: A dominant suffix deletes stress and glottalization if it is introduced in the inner domain (*inner* $\oplus$ *dominant*), but only deletes stress if it is introduced in the outer domain (*outer* $\oplus$ *dominant*). This is reminiscent of Sande's (2020) *morphologically-conditioned phonology with two triggers*, where a single phonological process is triggered by the presence of two morpheme-specific phonologies in the same phase. In the case of A'ingae, however, the two relevant cophonologies (phase head-specific *inner* or *outer* and morpheme-specific *dominant*) do not gang up to trigger a single process, but rather jointly define the characteristics of the process (deletion of stress and glottalization vs. deletion of stress alone). Thus, that A'ingae data show a new kind of phonological process with multiple triggers, bearing out yet another prediction of Cophonologies by Phase.

Finally, the typological profile of A'ingae and the phonological phenomena it exhibits are unlike those presented in previous CbP literature. The only two major case studies motivating the framework's architectural assumptions to date come from Guébie (Sande, 2019) and Somali (Green and Lampitelli, in prep.). Sande (2019) leverages CbP to account for root-controlled ATR harmony, vowel replacement, and scalar tone shift phenomena across Guébie's often monomorphemic words. Green and Lampitelli (in prep.) use CbP to model Somali subject marking, exponed with subtractive tone, segmental content, both, or neither. The present study deals with stress assignment, stress deletion, and prosodic licensing within subword domains of A'ingae's highly agglutinative verbs. Thus, it contributes a new line of evidence for CbP by demonstrating the insight the framework affords and the utility it has in modeling formally different phenomena in typologically dissimilar languages.

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A APPENDIX

(107) STRESSLESS MONOSYLLABIC ROOTS

a. / *phi* / [***phí***] sit
b. / *tsun* / [***tsún***] do
c. / *dyai* / [***dyái***] sit
d. / *kuen* / [***kuén***] grow

(108) STRESSLESS MONOSYLLABIC ROOTS WITH SUFFIXES

a. / *phi -ji -ʔfa* / [*phi **-jí** -ʔfa*] sit -PRCM -PLS
b. / *tsun -ji -ʔfa* / [*tsun **-jín** -ʔfa*] do -PRCM -PLS
c. / *dyai -ji -ʔfa* / [*dyai **-jí** -ʔfa*] sit -PRCM -PLS
d. / *kuen -ji -ʔfa* / [*kuen **-jín** -ʔfa*] grow -PRCM -PLS

(109) STRESSLESS DISYLLABIC ROOTS

a. / *panza* / [***pán**za*] hunt
b. / *afe* / [***á**fe*] give
c. / *sema* / [***sé**ma*] work
d. / *fetha* / [***fé**tha*] open
e. / *fûite* / [***fûi**te*] help
f. / *fûndûi* / [***fûn**dûi*] sweep

(110) STRESSLESS DISYLLABIC ROOTS WITH SUFFIXES

a. / *panza -ji* / [***panzá** -ji*] hunt -PRCM
b. / *afe -ji* / [***afé** -ji*] give -PRCM
c. / *sema -ji* / [***semá** -jin*] work -PRCM
d. / *fetha -ji* / [***fethá** -ji*] open -PRCM
e. / *fûite -ji* / [***fûité** -ji*] help -PRCM
f. / *fûndûi -ji* / [***fûndûi** -ji*] sweep -PRCM

(111) Stressless trisyllabic roots

a.	b.	c.	d.	e.
/ *atapa* /	/ *utishi* /	/ *shukendi* /	/ *upathû* /	/ *avûja* /
[*a**tá**pa*]	[*u**tí**shi*]	[*shu**ké**ndi*]	[***upá**thû*]	[*a**vû́**ja*]
breed	wash	turn	cut	rejoice

(112) Stressless trisyllabic roots with suffixes

a.	b.	c.	d.	e.
/ *atapa -ji* /	/ *utishi -ji* /	/ *shukendi -ji* /	/ *upathû -ji* /	/ *avûja -ji* /
[*ata**pá** -ji*]	[*uti**shí** -ji*]	[*shuke**ndí** -ji*]	[*upa**thû́** -ji*]	[*avû**já** -ji*]
breed -PRCM	wash -PRCM	turn -PRCM	cut -PRCM	rejoice -PRCM

(113) Stressed disyllabic roots

a.	b.	c.	d.	e.	f.
/ ***á**fa* /	/ ***á**na* /	/ ***ká**ti* /	/ ***fû́**ndu* /	/ ***í**tsa* /	/ ***á**the* /
[***á**fa*]	[***á**na*]	[***ká**ti*]	[***fû́**ndu*]	[***í**tsa*]	[***á**the*]
speak	sleep	cast	shout	remove	see

(114) Stressed disyllabic roots with suffixes

a.	b.	c.	d.	e.	f.
/ ***á**fa -ji* /	/ ***á**na -ji* /	/ ***ká**ti -ji* /	/ ***fû́**ndu -ji* /	/ ***í**tsa -ji* /	/ ***á**the -ji* /
[***á**fa -ji*]	[***á**na -jin*]	[***ká**ti -ji*]	[***fû́**ndu -ji*]	[***í**tsa -ji*]	[***á**the -ji*]
speak -PRCM	sleep -PRCM	cast -PRCM	shout -PRCM	remove -PRCM	see -PRCM

(115) Stressed trisyllabic roots

a.	b.
/ ***á**fase* /	/ ***kú**ndase* /
[***á**fase*]	[***kú**ndase*]
offend	tell

(116) Stressed trisyllabic roots with suffixes

a.	b.
/ ***á**fase -ji* /	/ ***kú**ndase -ji* /
[***á**fase -ji*]	[***kú**ndase -ji*]
offend -PRCM	tell -PRCM

(117) Glottalized disyllabic roots

a.	b.	c.	d.	e.	f.
/ ***séʔ**je* /	/ ***íʔ**na* /	/ ***fíʔ**thi* /	* / *σʔσ* /	* / ***ʔσ́**σ* /	* / ***σ́**σ**ʔ*** /
[***séʔ**je*]	[***íʔ**na*]	[***fíʔ**thi*]	[***σ́ʔ**σ*]	[***ʔσ́**σ*]	[***σ́**σ**ʔ***]
cure	cry	kill	ROOT	ROOT	ROOT

(118) Glottalized disyllabic roots with suffixes

a.	b.	c.	d.	e.	f.
/ ***séʔ**je -ji* /	/ ***íʔ**na -ji* /	/ ***fíʔ**thi -ji* /	* / *σʔσ -ji* /	* / ***ʔσ́**σ -ji* /	* / ***σ́**σ**ʔ** -ji* /
[***séʔ**je -ji*]	[***íʔ**na -jin*]	[***fíʔ**thi -ji*]	[*σʔ**σ́** -ji*]	[***ʔσ́**σ -ji*]	[***σ́**σ**ʔ** -ji*]
cure -PRCM	cry -PRCM	kill -PRCM	ROOT -PRCM	ROOT -PRCM	ROOT -PRCM

(119) Glottalized trisyllabic roots

a.	b.	c.	d.	e.
/ ***á**kheʔpa* /	/ ***á**nsanʔge* /	/ ***á**khuʔsha* /	* / *σσʔσ* /	* / ***σ́ʔ**σσ* /
[***á**kheʔpa*]	[***á**nsanʔge*]	[***á**khuʔsha*]	[*σ**σ́ʔ**σ*]	[***σ́ʔ**σσ*]
forget	be shy	chop	ROOT	ROOT

(120) Glottalized trisyllabic roots with suffixes

a.	b.	c.	d.	e.
/ ***á**kheʔpa -ji* /	/ ***á**nsaʔnge -ji* /	/ ***á**khuʔsha -ji* /	* / *σσʔσ -ji* /	* / ***σ́ʔ**σσ -ji* /
[***á**kheʔpa -ji*]	[***á**nsaʔnge -ji*]	[***á**khuʔsha -ji*]	[*σσʔ**σ́** -ji*]	[***σ́ʔ**σσ -ji*]
forget -PRCM	be shy -PRCM	chop -PRCM	ROOT -PRCM	ROOT -PRCM

(121) Various bases with -ʔje$^{\emptyset}$ IPFV

a.	b.	c.
/ *atapa -ʔje*$^{\emptyset}$ /	/ ***á**fase -ʔje*$^{\emptyset}$ /	/ ***séʔ**je -ʔje*$^{\emptyset}$ /
[*a**tá**pa -ʔje*]	[*a**fá**se -ʔje*]	[***sé**je -ʔje*]
breed -IPFV	offend -IPFV	cure -IPFV

d.	e.	f.
/ ***á**kheʔpa -ʔje*$^{\emptyset}$ /	/ ***á**kheʔpa -en -ʔje*$^{\emptyset}$ /	/ ***á**kheʔpa -ye*$^{\emptyset}$ *-ʔje*$^{\emptyset}$ /
[*a**khé**pa -ʔje*]	[*ake**pá** **-en** -ʔjen*]	[*akhe**pá** -ye -ʔje*]
forget -IPFV	forget -CAUS -IPFV	forget -PASS -IPFV

(122) VARIOUS BASES WITH -ʔÑAKHA$^{\emptyset}$ SMFC

a. / atapa -ʔñakha$^{\emptyset}$ /
[at**á**pa -ʔñakha]
breed -SMFC

b. / **á**fase -ʔñakha$^{\emptyset}$ /
[af**á**se -ʔñakha]
offend -SMFC

c. / **séʔ**je -ʔñakha$^{\emptyset}$ /
[**sé**je -ʔñakha]
cure -SMFC

d. / **á**kheʔpa -ʔñakha$^{\emptyset}$ /
[a**khé**pa -ʔñakha]
forget -SMFC

e. / **á**kheʔpa -en -ʔñakha$^{\emptyset}$ /
[akhe**pá** **-en** -ʔñakha]
forget -CAUS -SMFC

f. / **á**kheʔpa -ye$^{\emptyset}$ -ʔñakha$^{\emptyset}$ /
[akhe**pá** -ye -ʔñakha]
forget -PASS -SMFC

(123) VARIOUS BASES WITH -ʔNGI$^{\emptyset}$ VEN

a. / atapa -ʔngi$^{\emptyset}$ /
[at**á**pa -ʔngi]
breed -VEN

b. / **á**fase -ʔngi$^{\emptyset}$ /
[af**á**se -ʔngi]
offend -VEN

c. / **séʔ**je -ʔngi$^{\emptyset}$ /
[**sé**je -ʔngi]
cure -VEN

d. / **á**kheʔpa -ʔngi$^{\emptyset}$ /
[a**khé**pa -ʔngi]
forget -VEN

e. / **á**kheʔpa -en -ʔngi$^{\emptyset}$ /
[akhe**pá** **-en** -ʔngi]
forget -CAUS -VEN

f. / **á**kheʔpa -ye$^{\emptyset}$ -ʔngi$^{\emptyset}$ /
[akhe**pá** -ye -ʔngi]
forget -PASS -VEN

(124) VARIOUS BASES WITH -ʔNGA$^{\emptyset}$ AND

a. / atapa -ʔnga$^{\emptyset}$ /
[at**á**pa -ʔnga]
breed -AND

b. / **á**fase -ʔnga$^{\emptyset}$ /
[af**á**se -ʔnga]
offend -AND

c. / **séʔ**je -ʔnga$^{\emptyset}$ /
[**sé**je -ʔnga]
cure -AND

d. / **á**kheʔpa -ʔnga$^{\emptyset}$ /
[a**khé**pa -ʔnga]
forget -AND

e. / **á**kheʔpa -en -ʔnga$^{\emptyset}$ /
[akhe**pá** **-en** -ʔnga]
forget -CAUS -AND

f. / **á**kheʔpa -ye$^{\emptyset}$ -ʔnga$^{\emptyset}$ /
[akhe**pá** -ye -ʔnga]
forget -PASS -AND

(125) VARIOUS ROOTS WITH -ʔJE$^{\emptyset}$ IPFV AND -ʔNGI$^{\emptyset}$ VEN

a. / atapa -ʔje$^{\emptyset}$ -ʔngi$^{\emptyset}$ /
[at**á**pa -ʔje -ngi]
breed -IPFV -VEN

b. / **á**fase -ʔje$^{\emptyset}$ -ʔngi$^{\emptyset}$ /
[af**á**se -ʔje -ngi]
offend -IPFV -VEN

c. / **séʔ**je -ʔje$^{\emptyset}$ -ʔngi$^{\emptyset}$ /
[**sé**je -ʔje -ngi]
cure -IPFV -VEN

d. / **á**kheʔpa -ʔje$^{\emptyset}$ -ʔngi$^{\emptyset}$ /
[a**khé**pa -ʔje -ngi]
forget -IPFV -VEN

(126) VARIOUS ROOTS WITH -ʔJE$^{\emptyset}$ IPFV AND -ʔNGA$^{\emptyset}$ AND

a. / atapa -ʔje$^{\emptyset}$ -ʔnga$^{\emptyset}$ /
[at**á**pa -ʔje -nga]
breed -IPFV -AND

b. / **á**fase -ʔje$^{\emptyset}$ -ʔnga$^{\emptyset}$ /
[af**á**se -ʔje -nga]
offend -IPFV -AND

c. / **séʔ**je -ʔje$^{\emptyset}$ -ʔnga$^{\emptyset}$ /
[**sé**je -ʔje -nga]
cure -IPFV -AND

d. / **á**kheʔpa -ʔje$^{\emptyset}$ -ʔnga$^{\emptyset}$ /
[a**khé**pa -ʔje -nga]
forget -IPFV -AND

(127) STRESSLESS AND STRESSED BASES WITH -JAMA$^{\emptyset}$ PRHB

a. / [atapa] -jama$^{\emptyset}$ /
[ata**pá** -jama]
breed -PRHB

b. / [**á**fase] -jama$^{\emptyset}$ /
[afa**sé** -jama]
offend -PRHB

c. / [**á**fase -an] -jama$^{\emptyset}$ /
[afa**si** **-án** -jama]
offend -CAUS -PRHB

(128) GLOTTALIZED ROOTS WITH -JAMA$^{\emptyset}$ PRHB

a. / [**séʔ**je] -jama$^{\emptyset}$ /
[seʔ**jé** -jama]
cure -PRHB

b. / [**á**kheʔpa] -jama$^{\emptyset}$ /
[akhe**ʔpá** -jama]
forget -PRHB

c. / [**á**kheʔpa -en] -jama$^{\emptyset}$ /
[akhe**ʔpá** **-en** -jama]
forget -CAUS -PRHB

(129) INNER PREGLOTTALIZED SUFFIXES WITH -JAMA$^{\emptyset}$ PRHB

a. / [**á**fase -ʔje$^{\emptyset}$] -jama$^{\emptyset}$ /
[afase **-ʔjé** -jama]
offend -IPFV -PRHB

b. / [**séʔ**je -ʔje$^{\emptyset}$] -jama$^{\emptyset}$ /
[seje **-ʔjé** -jama]
cure -IPFV -PRHB

c. / [**á**kheʔpa -ʔje$^{\emptyset}$] -jama$^{\emptyset}$ /
[akhepa **-ʔjé** -jama]
forget -IPFV -PRHB

(130) (GLOTTALIZED ROOTS AND) OUTER PREGLOTTALIZED SUFFIXES WITH -JAMA$^{\emptyset}$ PRHB

a. / [**á**fase] -ʔfa -jama$^{\emptyset}$ /
[afase **-ʔfá** -jama]
offend -PLS -PRHB

b. / [**séʔ**je] -ʔfa -jama$^{\emptyset}$ /
[seʔje **-ʔfá** -jama]
cure -PLS -PRHB

c. / [**á**kheʔpa] -ʔfa -jama$^{\emptyset}$ /
[akheʔpa **-ʔfá** -jama]
forget -PLS -PRHB

(131) Inner and outer preglottalized suffixes with -*jama*$^{\emptyset}$ PRHB

a. / [***á**fase* -*ʔje*$^{\emptyset}$] -*ʔfa* -*jama*$^{\emptyset}$ /
[*afase* -*ʔje* -***ʔfá*** -*jama*]
offend -IPFV -PLS -PRHB

b. / [***séʔ**je* -*ʔje*$^{\emptyset}$] -*ʔfa* -*jama*$^{\emptyset}$ /
[*seje* -*ʔje* -***ʔfá*** -*jama*]
cure -IPFV -PLS -PRHB

c. / [***á**kheʔpa* -*ʔje*$^{\emptyset}$] -*ʔfa* -*jama*$^{\emptyset}$ /
[*akhepa* -*ʔje* -***ʔfá*** -*jama*]
forget -IPFV -PLS -PRHB

(132) Stressless and stressed bases with -*kha*$^{\emptyset}$ IMP2

a. / [*atapa*] -*kha*$^{\emptyset}$ /
[*ata**pá*** -*kha*]
breed -IMP2

b. / [***á**fase*] -*kha*$^{\emptyset}$ /
[*afa**sé*** -*kha*]
offend -IMP2

c. / [***á**fase* -*an*] -*kha*$^{\emptyset}$ /
[*afa**si*** -***án*** -*kha*]
offend -CAUS -IMP2

(133) Glottalized roots with -*kha*$^{\emptyset}$ IMP2

a. / [***séʔ**je*] -*kha*$^{\emptyset}$ /
[*se**ʔjé*** -*kha*]
cure -IMP2

b. / [***á**kheʔpa*] -*kha*$^{\emptyset}$ /
[*akhe**ʔpá*** -*kha*]
forget -IMP2

c. / [***á**kheʔpa* -*en*] -*kha*$^{\emptyset}$ /
[*akhe**ʔpá*** -***en*** -*kha*]
forget -CAUS -IMP2

(134) Inner preglottalized suffixes with -*kha*$^{\emptyset}$ IMP2

a. / [***á**fase* -*ʔje*$^{\emptyset}$] -*kha*$^{\emptyset}$ /
[*afase* -***ʔjé*** -*kha*]
offend -IPFV -IMP2

b. / [***séʔ**je* -*ʔje*$^{\emptyset}$] -*kha*$^{\emptyset}$ /
[*seje* -***ʔjé*** -*kha*]
cure -IPFV -IMP2

c. / [***á**kheʔpa* -*ʔje*$^{\emptyset}$] -*kha*$^{\emptyset}$ /
[*akhepa* -***ʔjé*** -*kha*]
forget -IPFV -IMP2

(135) (Glottalized roots and) outer preglottalized suffixes with -*kha*$^{\emptyset}$ IMP2

a. / [***á**fase*] -*ʔfa* -*kha*$^{\emptyset}$ /
[*afase* -***ʔfá*** -*kha*]
offend -PLS -IMP2

b. / [***séʔ**je*] -*ʔfa* -*kha*$^{\emptyset}$ /
[*seʔje* -***ʔfá*** -*kha*]
cure -PLS -IMP2

c. / [***á**kheʔpa*] -*ʔfa* -*kha*$^{\emptyset}$ /
[*akheʔpa* -***ʔfá*** -*kha*]
forget -PLS -IMP2

(136) Inner and outer preglottalized suffixes with -*kha*$^{\emptyset}$ IMP2

a. / [***á**fase* -*ʔje*$^{\emptyset}$] -*ʔfa* -*kha*$^{\emptyset}$ /
[*afase* -*ʔje* -***ʔfá*** -*kha*]
offend -IPFV -PLS -IMP2

b. / [***séʔ**je* -*ʔje*$^{\emptyset}$] -*ʔfa* -*kha*$^{\emptyset}$ /
[*seje* -*ʔje* -***ʔfá*** -*kha*]
cure -IPFV -PLS -IMP2

c. / [***á**kheʔpa* -*ʔje*$^{\emptyset}$] -*ʔfa* -*kha*$^{\emptyset}$ /
[*akhepa* -*ʔje* -***ʔfá*** -*kha*]
forget -IPFV -PLS -IMP2