THE PHONOLOGY OF A'INGAE

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MANUSCRIPT *as of* JANUARY 12, 2024

ABSTRACT A'ingae (or Cofán, ISO 639-3: con) is an indigenous language isolate spoken in northeast Ecuador and southern Colombia. This paper presents the first comprehensive overview of the A'ingae phonology, including descriptions of (i) the language's phonemic inventory, (ii) phonotactics and a number of related phonological rules, (iii) nasality and nasal spreading, as well as (iv) stress, glottalization, their morphophonology, and aspects of clause-level prosody.

1 INTRODUCTION

This article constitutes the first comprehensive phonological sketch of A'ingae (or Cofán, ISO 639-3: con), an underdocumented and endangered language isolate spoken by about 1,500 native speakers the northeast Ecuadorian province of Sucumbíos and the southern Colombian department of Putumayo. The endonym *A'ingae* consists of *aʔi* '(indigenous) person' and the manner clitic *=ŋgae* MANN.[1] Thus, to speak A'ingae is to speak like a member of the in-group. The exonym *Cofán* may derive from the name of the river *Río Cofanes*, which is where the Cofán people and European settlers first came in contact (Cepek, 2012). Section 2 gives background on the language, its speakers, previous literature, and data collection.

The topics discussed in the rest of the paper include a basic description of the A'ingae segmental inventory (Section 3) and an overview of the language's most prominent phonological phenomena. Section 4 discusses the language's phonotactic restrictions, long-distance laryngeal agreement, and other phonological processes. Section 5 explores the processes of iterative progressive and local regressive nasal spreading. Section 6 summarizes the morphophonology of stress and glottalization and touches on A'ingae clause-level prosody.

2 BACKGROUND

A'ingae is currently spoken in the eastern Andean foothills, which is a very linguistically diverse region. Despite previous unsubstantiated claims of genetic affiliation with other languages (e. g. Rivet, 1924, 1952; Ruhlen, 1987), A'ingae remains classified as a language isolate. Before inhabiting their present territory in the Amazon Basin, A'ingae speakers used to live in the Eastern Andean Cordilleras (ca. 16th c). As a consequence of the Cofán migration, A'ingae shows properties typical of both Andean and Amazonian languages. For example, Andean phonological features include palatal sonorants and contrastive aspiration. Amazonian features include contrastive vowel nasality, nasal spreading, and vowel glottalization (AnderBois, Emlen, et al., 2019; Dąbkowski, 2021a). The morphological profile of A'ingae is highly agglutinating and exclusively suffixing. The language has a flexible, predominantly subject–object–verb (SOV) word order.

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1 The following glossing abbreviations have been used: 1 = first person, 2 = second person, 3 = third person, ACC = accusative, ACC2 = accusative 2, ADJ = adjectivizer, ADN = adnominal, ADV = adverbializer, ANA = anaphoric, ANIM = animate, ASSC = associative, ASSR = assertive, ATTN = attenuated imperative, BEN = benefactive, CAUS = causative, CNTR = contrastive topic, CORE = core, CORP = corporeal, DAT = dative, DEM = demonstrative, DFFS = diffused, DLM = delimited, DMN2 = diminutive 2, DRN = diurnal, DS = different subject, EGR = egressive, ELAT = elative, EVAL = evaluative, EXCL = exclusive, FLAT = flat, FRST = frustrative, GPL = greater plurality, HSN = habitual subject nominalizer, IF = conditional, IF2 = conditional 2, IMP = imperative, INAN = inanimate, INDF = indefinite, INF = infinitive, INGR = ingressive, IPFV = imperfective, IRR = irrealis, MANN = manner, N = nominalizer, NEG = negative, ON = owner nominalizer, PASS = passive, PERM = permissive, PL = plural, PLA = pluractional, PLC = place, PLS = plural subject, PRD = periodic, PRSP = prospective, RND = round, RPRT = reportative, SBRD = subordinator, SEL = selection, SG = singular, SML = similative, SN = subject nominalizer, SS = same subject, TERM = terminative, YNQ = polar interrogative.

In the Ecuadorian communities, A'ingae is acquired by children and spoken on a daily basis. In the Colombian communities, the language is considerably more endangered. In recent centuries and decades, the Cofán people have experienced exploitation at the hands of the colonial government, poachers, and oil companies, disrupting language transmission and putting their traditional way of life in danger. Outside of A'ingae-speaking community-lead primary schools, the language does not receive much institutional support. Despite the challenges, the Cofán people take pride in their cultural and linguistic heritage, and see A'ingae as one of the cornerstones of their ethnic identity (Cepek, 2012; Dąbkowski, 2021a).

The data presented in this paper comes from the author's original fieldwork, as well as prior publications on A'ingae and unpublished databases. All uncited data has been collected by the author in the course of in-person and remote fieldwork since the spring of 2017. Elicitation tasks included translation and grammaticality judgments. All the fieldwork data has been deposited in the California Language Archive (CLA) as Dąbkowski, Aguinda, and Quenamá (2020). All the data drawn from previous publications and databases are cited as such. A dialectal split has been anecdotally reported between the language's Ecuadorian and Colombian varieties (Dąbkowski, 2021a; Repetti-Ludlow et al., 2019). All data presented in this paper reflects the Ecuadorian language variety, with no further dialectal variation observed within Ecuador.

3 SEGMENTAL PHONOLOGY

The phonemic inventory of A'ingae is moderately large (Table 1), totaling twenty-seven consonants, five simple vowels (Borman, 1962; Repetti-Ludlow et al., 2019), and eleven diphthongs (plus sixteen nasal counterparts of the latter two).

f		*s*	*ʃ*		*h*
p^{h}	t^{h}	ts^{h}	$tʃ^{h}$	k^{h}	
p	*t*	*ts*	*tʃ*	*k*	*ʔ*
^{m}b	^{n}d	^{n}dz	$^{n}dʒ$	^{ŋ}g	
m	*n*		*ɲ*		
ʋ	*ɾ*		*j*	*ɰ*	

i, ĩ	*ɨ, ɨ̃*	*o, õ*
e, ẽ	*a, ã*	
ie, ĩẽ	*ɨi, ɨ̃ĩ*	*io, ĩõ*
ei, ẽĩ	*oe, õẽ*	*oi, õĩ*
ia, ĩã	*ae, ãẽ*	*oa, õã*
ai, ãĩ		*ao, ãõ*

Table 1: Phonemic inventory of A'ingae (reproduced from Dąbkowski, 2023b).

3.1 *Consonantal phonemes*

Starting with the language's consonantal inventory, A notable feature of A'ingae is the existence of three stop series: plain voiceless (*p, t, ts, tʃ, k*), voiceless aspirated (p^{h}, t^{h}, ts^{h}, $tʃ^{h}$, k^{h}), and prenasalized voiced (^{m}b, ^{n}d, ^{n}dz, $^{n}dʒ$, ^{ŋ}g). Within each series, there is a five-way contrast among labial stops, alveolar stops, alveolar fricatives, postalveolar fricatives, and velar stops. Since stops and affricates pattern together in many respects, I will use the term *stops* to collectively refer to all oral non-continuants.

There are four voiceless fricatives, contrasting labiodental (*f*), alveolar (*s*), postalveolar (*ʃ*), and glottal (*h*) places of articulation. Four oral sonorants contrast labial (*ʋ*), alveolar (*ɾ*), palatal (*j*), and velar (*ɰ*) articulations. The velar sonorant (*ɰ*) is rare, and does not appear word-initially or next to nasal vowels. The distribution and history of *ɰ* is further discussed in Paragraph 5.1.2.3. Three nasal sonorants contrast labial (*m*), alveolar (*n*), and palatal (*ɲ*) articulations.

Finally, A'ingae has contrastive glottalization. I present it here as a segmental glottal stop (*ʔ*), although it could alternatively be analyzed as a feature of the syllabic nucleus, and shows metrical properties discussed in Section 6.1. A'ingae glottalization does not contrast word-initially and never appears word-finally.

The phonemic status of each of the discussed consonants is demonstrated below in a quasi-minimal set, where each phone appears sandwiched between two instances of the vowel *a* or its nasalized counterpart *ã* (1-6).

(1) FOUR VOICELESS FRICATIVE PHONEMES
a. *ˈafa* speak
b. *ˈpasa* pass
c. *ˈaʃa* half-finished
d. *ˈtsaha* grape

(2) SIX PLAIN VOICELESS STOP PHONEMES
a. *aˈrapa* chicken
b. *ˈkata* launch
c. *ˈatsa* avocado
d. *ˈatʃaʔkʰɨ* saliva
e. *ˈʃaka* fault
f. *ˈᵐbiaʔa* long

(3) FIVE ASPIRATED VOICELESS STOP PHONEMES
a. *pʰaˈpʰakʰo* floor
b. *ˈatʰa* giant taro
c. *ˈtsʰatsʰa* grate
d. *tʃʰaˈtʃʰatsʰi* resourceful
e. *ĩˈɲãkʰa* get hurt

(4) FIVE PRENASALIZED VOICED STOP PHONEMES
a. *ˈnãᵐba* get murky
b. *ˈtsãⁿda* thunder
c. *ˈpãⁿdza* hunt
d. *ⁿdʒãˈⁿdʒakʰɨ* headdress
e. *ˈãᵑga* carry

(5) FOUR ORAL SONORANT PHONEMES
a. *joˈʃava* iron
b. *saˈraro* giant otter
c. *ˈaja* ghost
d. *aˈɰatʰo* count

(6) THREE NASAL SONORANT STOP PHONEMES
a. *ˈmãmã* mom
b. *ˈãnã* sleep
c. *ˈpãɲã* hear

By processes of nasal spreading, a vowel is nasalized before a prenasalized stop (4) and both before and after a nasal consonant (6). Neither stop series can be collapsed as a purely allophonic variant of another series conditioned by adjacent nasality. This is further demonstrated in Section 5.

Word-initially, the prenasalization of prenasalized stops has a shorter duration and lower intensity (Repetti-Ludlow et al., 2019), i. e. /*ᵐb-, ⁿd-, ⁿdz-, ⁿdʒ-, ᵑg-*/ are realized as [*m̆b-, n̆d-, n̆dz-, n̆dʒ-, ŋ̆g-*]. The velar stops /*k, kʰ, ᵑg*/ palatalize to [*c, cʰ, ᶮɟ*] before the front vowels *e* and *i*. Since the word-initial partial denasalization and palatalization are non-contrastive phonetic details, they will not be reflected in the provided transcriptions.

3.2 *Vocalic phonemes*

There are five contrastive vowel qualities: low (*a*), mid front (*e*), high front (*i*), high central/back (*ɨ*), and back rounded (*o*). Each of the five vowels has a nasal counterpart. Below, the contrastive status of every vowel is demonstrated with a quasi-minimal set, where each vocalic phoneme appears after a word-initial glottal fricative *h-* (7-8).

(7) FIVE ORAL VOWEL PHONEMES
a. *ˈha* go
b. *ˈheʔri* grimace
c. *ˈhi* come
d. *ˈhɨ* yes
e. *ˈhoʔe* those.INAN

(8) FIVE NASAL VOWEL PHONEMES
a. *ˈhãʔtʃʰĩ* flat (nose)
b. *ˈhẽ* sound
c. *ˈhĩ* be.INAN
d. *ˈhɨ̃* yeah
e. *ˈhõ* sow

Although five-vowel systems are very common, most of them feature a height-based contrast between two non-low non-front vowels, i. e. *o* vs. *u*. The A'ingae contrast between two non-low non-front vowels is based on roundedness, i. e. *ɨ* vs. *o*. Correspondingly, the realization of A'ingae's non-low non-front vowels ranges quite widely. Stressed oral /ˈ*o*/ is mostly realized as [ˈ*u*] and stressed nasal /ˈ*õ*/ is mostly realized as [ˈ*õ*]. Unstressed /*o*/ and /*õ*/ are more variable but generally somewhat centralized (Brandt, 2023). For the sake of consistency, the transcriptions presented in this paper do not reflect this phonetic detail and use *ɨ* and *o* throughout. The variation in the realization of /*ɨ*/ is not well understood.

3.3 *Licit diphthongs*

Finally, A'ingae has eleven distinct diphthongs, drawn from a proper subset of the logically possible combinations of two A'ingae vowels, including the rising *ie*, *ia*, *oi*, *oa*, the falling *ei*, *ai*, *io*, *ao*, the height harmonic *oe*, the narrow high *ɨi*, and the narrow low *ae* (9-11).[2] In rapid speech, the second vowel of /*ae*/ is often raised, approaching a merger with [*ai*]. In the manner case clitic =*ᵑgae* MANN, the realization of /*ae*/ ranges from [*əæ*] to [*ɛ*] (i. e. [=*ᵑgəæ* ∼ =*ᵑgɛ*]). A'ingae diphthongs are rare; as such, the examples below do not form a minimal set.

(9) DIPHTHONGS WITH *e*, *a*, *i*

a. *ˈtsãⁿdie* man	b. *ˈakʰia* just because	c. *ˈosei* fall	d. *ˈaiʔvo* body

(10) DIPHTHONGS WITH *i*, *a*, *o*

a. *ˈtʃʰoi* row	b. *ˈᵑgoaʔtʰi* boil	c. *ˈõᵐbio* level	d. *ˈtsaoʔpa* nest

(11) OTHER DIPHTHONGS

a. *ˈkoeʔhe* sun	b. *ˈkʰɨi* lie down	c. *ˈfae* one

A'ingae diphthongs are either wholly oral or wholly nasal. Some of the diphthongs have unambiguous underlyingly nasal counterparts (12). Other nasal diphthongs are attested only due to the spreading of nasalization from adjacent nasal and prenasalized segments. Nasal spreading is discussed in Section 5.

(12) SELECT NASAL DIPHTHONGS

a. *ˈãʔᵐbĩã* have	b. *ˈãĩ* dog	c. *ˈtɨ̃ĩfa* chambira	d. *ˈkõẽ* mature	e. *ˈkõãkõã* trickster

4 PHONOTACTICS AND MARKEDNESS AVOIDANCE

The A'ingae syllable structure can be schematized as (C)V(V)(ʔ). There are no onset clusters. All consonants can appear in the onset of a word-medial syllable. Word-initial onsets cannot host the velar approximant *ɰ* and the glottal stop *ʔ*. (An onset glottal stop is inserted in underlyingly vowel-initial words, but it is not contrastive in that position.) The glottal stop *ʔ* does not occur word-finally.

All A'ingae syllables are open or glottalized. Syllable-final glottalization can be analyzed as a feature of the nucleus or a segmental coda. Within an inner morphophonological domain, glottal stops interact with stress assignment and stress deletion phenomena, thus showing a close connection to metrical structure. The basic types of glottal-stress interactions are described and categorized in Section 6.1.

The nucleus must contain at least one vowel. If two vowel qualities are present, they must form one of the eleven licit diphthongs (§3.3). Except for certain morphophonological contexts discussed in Dąbkowski (in prep.), vowel hiatus in A'ingae is disallowed. Thus, when two (or more) vowels that do not form a licit diphthong appear adjacent to each other, (at least) one of them must be altered. Diphthongal processes, including processes aimed at illicit vowel sequence avoidance, are discussed in Section 4.1.

Additionally, A'ingae shows a form of long-distance phonological agreement, whereby stops having the same place of articulation within a root must all be either aspirated or unaspirated (Repetti-Ludlow, 2021). The A'ingae laryngeal co-occurrence constraint is discussed in Section 4.2.

Most A'ingae roots are disyllabic; fewer are mono- and trisyllabic. At the level of the root, glottalization is generally restricted to the rime of the penultimate syllable, giving rise to (C)VʔCV and (C)VCVʔCV as distinctive prosodic templates. A'ingae is an exclusively suffixing and encliticizing language. The vast majority

2 The eleven diphthongs are identified based on phonological criteria, such as the position of stress discussed in Section 6.1. A different count is given by Repetti-Ludlow et al. (2019), who use phonetic measurements to identify only six diphthongs (*ai*, *oe*, *oa*, *oi*, *iɨ*, *ao*).

of functional morphemes are monosyllabic -CV or -ʔCV, interspersed with the occasional -V, -ʔV, -VCV, -CVCV, -ʔCVCV, and -CVʔCV. While glottalization is contrastive at the level of the root, most glottal stop tokens are introduced by -ʔCV suffixes and enclitics. Aspects of A'ingae morphology receive treatment in Dąbkowski (2021b, 2023c, t.a. in prep.), Fischer and Hengeveld (2023), and Hengeveld and Fischer (in prep.).

4.1 *Diphthongal processes*

In this section, I discuss various phonological processes affecting the A'ingae diphthongs. First, I describe the processes of diphthong legalization (§4.1.1) and triphthong reduction (§4.1.2), both aimed at averting illicit vowel sequences. I then present the processes of diphthong rounding (§4.1.3) and raising (§4.1.4) observed after labial consonants.

4.1.1 *Diphthong legalization*

Morphologically complex forms may give rise to underlying sequences of vowels that do not form a licit diphthong (cf. 9-11). This is commonly in forms suffixed with vocalic (-V) suffixes, such as the adnominal *-a* ADN or the causative *-ã* CAUS. Underlying sequences of /*ea*/ (13a-b)[3] and /*ɨa*/ (13c-e) are converted to [*ia*]. The rule capturing illicit diphthong avoidance is stated in (14). This and other diphthongal processes discussed throughout this section apply to oral and nasal diphthongs alike.

(13) ILLICIT DIPHTHONGS AVOIDED

a.	b.	c.	d.	e.
/ *^{n}dzeʔ^{n}dze -ã* /	/ *koʔfe -ã* /	/ *i^{n}dzɨ -a* /	/ *=^{n}dek^{h}ɨ -a* /	/ *hɨʔrɨ -ã* /
[*ˈ^{n}dzẽʔ^{n}dzĩã*]	[*ˈkoʔfĩã*]	[*ˈĩ^{n}dzia*]	[*=^{n}dek^{h}ia*]	[*ˈhɨʔrĩã*]
flecked -ADN	play -CAUS	green -ADN	PL.ANIM -ADN	burn -CAUS

(14) DIPHTHONG LEGALIZATION RULE
e, ɨ → i / _ a
The vowels e and ɨ raise and front to i before a.

4.1.2 *Triphthong reduction*

Forms suffixed with the periodic vowel-initial *-ite* PRD are one morphological context where underlying sequences of three vowels may appear. In these configurations, the first vowel of the suffix deletes, revealing that triphthongs in A'ingae are disallowed (15). Triphthong avoidance is captured by the rule in (16).

(15) TRIPHTHONGS AVOIDED

a.	b.	c.	d.	e.
/ *katʃai -ite* /	/ *fɨ^{n}dɨi -ite* /	/ *afoʔpõẽ -ite* /	/ *ˈana -ẽ -ite* /	/ *õhõ -ẽ -ite* /
[*kaˈtʃaite*]	[*fɨ̃ˈ^{n}dɨite*]	[*afoˈpõẽte*]	[*ãˈnãẽte*]	[*õˈhõẽte*]
meet -PRD	sweep -PRD	lie -PRD	sleep -CAUS -PRD	bathe -CAUS -PRD

(16) TRIPHTHONG REDUCTION RULE
i → ∅ / VV _
The vowel i is deleted when preceded by two other vowels.

4.1.3 *Postlabial rounding*

The diphthong /*ae*/ often rounds to [*oe*] after labial consonants, including *f* (17a), *p* (17b), *p^h* (17c), *^{m}b* (17d), *ʋ* (17e), and *m* (17f). The process is optional, gradient, and most common in fast speech. The rule capturing postlabial rounding is given in (18). The rounding process is seen as prescriptively incorrect. For example, when asked to translate "made breed" (17b), a speaker may first produce *atapõẽ*, but then correct it to *atapãẽ*.

3 Based on Dąbkowski's (2021b, 2023c, t.a. in prep.) analyses, stress is shown as underlyingly present only if its position in morphologically related words is not predictable from the language's regular morphophonological rules. Glottal stops are represented as underlyingly linearized. This convention has been adopted for expository ease, contra Dąbkowski's (2023c, in prep.) analysis of root glottal stops as underlyingly floating. Stress and glottalization are further discussed in Section 6.1.

(17) DIPHTHONG *ae* ROUNDED POSTLABIALLY

a. / *faesɨ* /
[*'foesɨ*]
other

b. / *atapa -en* /
[*a'tapõẽ*]
breed -CAUS

c. / *kʰapʰoʔpa -ẽ* /
[*'kʰapʰoʔpõẽ*]
landslide -CAUS

d. / *naᵐba -ẽ* /
[*'nãᵐbõẽ*]
get murky -CAUS

e. / *vaeji* /
[*'voeji*]
just

f. / *siʔma -e* /
[*'sĩʔmõẽ*]
bruised -ADV

(18) POSTLABIAL ROUNDING RULE
ae → *ae* ~ *ạe* ~ *ọe* ~ *oe* / C[LABIAL] _ (gradient, optional, speech-rate dependent)
After labial consonants, the first vowel of the diphthong ae may round and raise partially (ạe ~ ọe) or completely (oe), especially in rapid speech.

4.1.4 *Postlabial raising*

Finally, A'ingae underwent a sequence of changes that resulted in the raising of **ai* to *ɨi* after labial consonants (Dąbkowski, 2022). Evidence for this claim comes from the data reported in Borman (1976), a dictionary that reflects A'ingae as spoken ca. 50–70 years ago. In Borman (1976), the diphthong *ai* does not occur after labials (Dąbkowski, 2023b, pp. 3–4). (One identified exception is the word *'pʰãĩɲã* ~ *'pʰɨ̃ĩɲã* 'incline.') Additionally, morphologically complex forms where the underlying sequence **a+i* arises at a morpheme boundary after a labial consonant are reported with *ɨi* (19). The sound change of postlabial raising is restated in (20).

(19) POSTLABLIAL **a+i* RAISED TO *ɨi* (based on Borman, 1976)

a. **taʔva -ite*
ta'vɨite
cotton -PRD

b. **koehefa -ite*
koehe'fɨite
summer -PRD

c. **sãfã -ite*
sã'fɨ̃ĩte
San Juan -PRD

d. **oʔma -ite*
õ'mɨ̃ĩte
peach palm -PRD

(20) POSTLABIAL RAISING SOUND CHANGE
**ai* > *ɨi* / C[LABIAL] _
*The diphthong *ai raised to ɨi after labial consonants.*

In modern productions, some instances of *ɨi* in morphologically complex forms have been leveled back to *ai* (Dąbkowski, 2023b, p. 6). The paradigmatic leveling is item- and speaker-dependent. Additionally, some speakers have acquired postlabial raising as an optional phonological rule, which can be applied productively to sequences of /*a+i*/ across morpheme boundaries, yielding [*ai* ~ *ɨi*] in derived environments (pp. 5–8). For more on postlabial raising, see Dąbkowski (2023b).

4.2 *Laryngeal agreement*

Repetti-Ludlow et al. (2019) and Repetti-Ludlow (2021) report a long-distance constraint on laryngeal co-occurrence: Within a given morpheme, all stops and affricates that share the same place and manner of articulation must also agree in aspiration. The constraint is restated in (21).

(21) LARYNGEAL CO-OCCURRENCE CONSTRAINT (based on Repetti-Ludlow, 2021)
All the stops and affricates within one morpheme that share the same place and manner of articulation must all be aspirated or unaspirated.

For example, forms such as *'teʔta* 'flower,' where the two alveolar stops are unaspirated (22), or *'tʰeʔtʰo* 'tooth,' where both alveolar stops are aspirated (23) are allowed. However, hypothetical roots such as **'tʰeʔta* or **'teʔtʰo*, where the two stops differ only in the value of aspiration, are predicted not to exist. (One identified exception is the word *'kʰake* 'leaf,' possibly from Chachi (Barbacoan) *haki*; ALDP, 2018.) If two obstruents mismatch in the place and/or manner of articulation, they may, but need not (24), have the same aspiration.

(22) STOPS WITH MATCHING PLACE AND MANNER — ALL UNASPIRATED
a. *oˈpipaʔtʃo* shoulder b. *ˈteʔta* flower c. *teˈtete* Waorani d. *ˈtoto* whiten e. *koˈkoja* demon

(23) STOPS WITH MATCHING PLACE AND MANNER — ALL ASPIRATED
a. *ˈpʰɨʔpʰɨ* corn b. *ˈtʰɨ̃tʰã* lack flavor c. *ˈtsʰatsʰa* grate d. *ˈtʰeʔtʰo* tooth e. *ˈkʰaikʰoʔtʃo* harpoon

(24) STOPS WITH MISMATCHED PLACE OR MANNER — NO AGREEMENT
a. *ˈpaʔtʰa* wasp b. *ˈpakʰo* streaked prochilod c. *ˈtʰotsɨ* black fly d. *ˈtsɨʔtʰa* bone e. *ˈkʰoʔpa* defecate

The laryngeal co-occurrence constraint (21) pertains only to tautomorphemic stops. Stops matching in place and manner across a morpheme boundary may, but need not (25), have the same value of aspiration (Repetti-Ludlow, 2021).

(25) DIFFERENT MORPHEMES — NO AGREEMENT
a. *ˈpʰi =pa* sit =SS b. *ˈtoe -ʔtʰi* same -PLC c. *ˈtsʰorɨ =tsɨ* old =3 d. *ˈtʃʰoi =ʔtʃo* row =SBRD e. *ˈkã -kʰa* look -ATTN

Prenasalized voiced stops pattern with the unaspirated ones in that one morpheme may host a prenasalized stop and an unaspirated one, but not an aspirated one. This is consistent with Sanker and AnderBois's (t.a.) reconstruction of prenasalized stops as originating in sequences of a nasal and an unaspirated stop, i. e. *NT > ᴺD. Finally, the vast majority of the roots with matching stops also have matching vowels (22c-e, 23a,c) or the second vowel is back, i. e. either *a* (22a-b, 23b) or *o* (23d-e). For further discussion of these patterns, see Repetti-Ludlow (2021). For a discussion of exceptions, see Dąbkowski (in prep.).

5 NASALITY AND NASAL SPREADING

A'ingae nasality is contrastive on both vowels (26-27a,c) and consonants (26-27b,d), in roots (26-27a-b) as well as functional morphemes (26-27c-d).

(26) ORAL SEGMENTS IN ROOTS — AND IN FUNCTIONAL MORPHEMES
a. *ˈhi* come b. *ˈva =pi* DEM =TERM c. *ˈafa -hi* speak -INGR d. *ˈva =ve* DEM =ACC2

(27) NASAL SEGMENTS IN ROOTS — AND IN FUNCTIONAL MORPHEMES
a. *ˈhĩ* be.INAN b. *ˈmã =pi* INDF.SEL =TERM c. *ˈⁿdaro -ʔhĩ* piranha -CORE d. *ˈvã =mã* DEM =ACC

While nasality may be contrastive, the nasality of a segment may also result from progressive nasalization (Section 5.1) and regressive nasalization (Section 5.2), whereby the nasal quality of one segment affects other adjacent segments. The generalizations drawn in the following subsections are based largely on native roots and morphologically complex forms. For discussion of nasal spreading patterns in borrowings, see Dąbkowski (in prep.) and Sanker and AnderBois (t.a.).

5.1 *Progressive nasalization*

A'ingae has a process of iterative progressive nasalization. The process is partly phonologically predictable, and partly morphologically and lexically conditioned. Progressive nasalization is triggered by nasal stops and nasal vowels, and spreads rightward until a blocking segment is encountered. Different phonological and morphological classes give rise to different outcomes and show different degrees of permeability to nasalization. The rest of this section is organized by the phonological class of the target of nasalization.

5.1.1 *Vowels and glottals*

Progressive nasalization is triggered by nasal stops *m*, *n*, *ɲ* (28a-c) and nasal vowels *ã*, *ẽ*, *ĩ*, *õ*, *ɨ̃* (28d-e). As an outcome, vowels right of the triggering segment become nasal.[4]

(28) Nasal stops and vowels as triggers of progressive nasalization

	a.	b.	c.	d.	e.
	/ *mae* /	/ *na* /	/ *ɲa* /	/ *õho* /	/ *ɨ̃hi* /
	[*ˈmõẽ*]	[*ˈnã*]	[*ˈɲã*]	[*ˈõhõ*]	[*ˈɨ̃hĩ*]
	send	meat	1sg	bathe	rain

The glottals *h* (28d-e, 29a-d) and *ʔ* (29c-e) are completely permeable to the progressive nasalization. This is to say, if *h* and *ʔ* are the only intervening segments between two vowels and the first vowel is nasal, the second vowel is also always nasal. These generalizations hold exceptionally within A'ingae roots (29) and across morpheme boundaries, including suffixes and clitics such as the contrastive topic *=ha* cntr (29a), the flat classifier *-he* flat (29b), the adnominal *-(ʔ)a* adn (29c), the same subject conditional antecedent marker 2 *=ʔha* if2.ss (29d), as well as the imperfective *-ʔhe* ipfv and the imperative *-ha* imp (29e).

(29) Glottals permeable to nasal spread in roots

	a.	b.	c.	d.	e.
	/ *noha* /	/ *kɨ̃hɨ* /	/ *ĩʔha* /	/ *tõho* /	/ *naʔe* /
	[*ˈnõhã*]	[*ˈkɨ̃hɨ̃*]	[*ˈĩʔhã*]	[*ˈtõhõ*]	[*ˈnãʔẽ*]
	thorn	catfish	want	make sound	river

(30) Glottals permeable to nasal spread in functional morphemes

	a.	b.	c.	d.	e.
	/ *ɲa =ha* /	/ *na -he* /	/ *kõẽ -ʔa* /	/ *kãʔhe =ʔha* /	/ *ã -ʔhe -ha* /
	[*ˈɲãhã*]	[*ˈñãhẽ*]	[*ˈkõẽʔã*]	[*ˈkãʔhẽʔhã*]	[*ˈãʔhẽhã*]
	1sg =cntr	fruit -flat	mature -adn	be.anim =if2.ss	eat -ipfv -imp

A'ingae progressive nasalization is iterative. This is to say, a nasalized segment further nasalizes segments to its right (until the spread is blocked by an impermeable consonant, as discussed throughout the rest of the section). For example, in (30e), the root *ã* 'eat' nasalizes the imperfective suffix *-ʔhe* ipfv to *-ʔhẽ*. Then, nasality spreads further onto the imperative suffix *-ha* imp, turning it into *-hã*.

Within a single morpheme, a non-initial vowel may only be nasal if it is immediately preceded by a nasal stop or if the vowel of the preceding syllable is nasal. Thus, for example, (C)VCV, (C)ṼCV, and (C)ṼCṼ are all attested root shapes, but (C)VCṼ is not. The generalization is restated in (31). This suggests that only the first vowel of a morpheme may be contrastively specified for nasality (which could be analyzed as a floating nasal feature which associates from the left) and, consequently, that the nasality of non-initial vowels is in fact always due to spreading. (Exceptions include apparently lexicalized causatives, such as (*ˈtsã^{n}da*) *ˈvejãẽ* 'lightning strike,' possibly from the no longer attested **veja* and the causative *-ẽ* caus.) Nevertheless, permeability to nasal spreading varies with target segment and morpheme. As such, the extent of nasal spreading is not fully predictable.

(31) Restricted distribution of vocalic nasality

Only the first vowel of a morpheme may be contrastively specified for nasality. I. e., a nasal vowel is always either (i) morpheme-initial, (ii) preceded by a nasal stop, or (iii) the vowel of the preceding syllable is nasal.

5.1.2 *Approximants*

A'ingae has four oral approximants: palatal (*j*), labial (*ʋ*), alveolar (*ɾ*), and velar (*ɰ*). In native roots, none of the approximants ever appear after (or before) nasal vowels. In morphologically complex words and borrowings, the palatal *j* and the labial *ʋ* often alternate with nasal stops matching their place of articulation: *ɲ* and *m*, respectively. The alveolar *ɾ* and the velar *ɰ* never alternate with nasal stops.

4 Alternatively, the vowels in (28a-c) could be specified as underlyingly nasal. Nonetheless, since the vowels right of a nasal stop are always nasal, I represent them as underlying oral and attribute their nasality to nasal spreading.

5.1.2.1 THE PALATAL APPROXIMANT After nasal vowels, the palatal *j* generally nasalizes to *ɲ*. This holds of most suffixes and clitics, including the irrealis *-ja* IRR (32a), the assertive *-ʔja* ASSR (32b), the passive *-je* PASS (32c), the segmentally identical infinitival *-je* INF (32d), and the exclusive focus *=ji* EXCL (32e). Recall that progressive nasalization is iterative (§5.1.1); as such, the resulting *ɲ* further nasalizes the following vowel.

(32) PALATAL APPROXIMANT *j* NASALIZING TO *ɲ* IN FUNCTIONAL MORPHEMES

a. / *ã -ja* /	b. / *ã -ʔja* /	c. / *kã -je* /	d. / *ã -je* /	e. / *ɲa =ji* /
[*ãɲã*]	[*ãʔɲã*]	[*kãɲẽ*]	[*ãɲẽ*]	[*ɲãɲĩ*]
eat -IRR	eat -ASSR	look -PASS	eat -INF	1SG =EXCL

The passive *-je* PASS is nasalized to *-ᵑge* in lexicalized historical passives. E. g., compare the intransitive (33a) with the synchronically detransitivized (33b). Additionally, *-ᵑge* varies with *-ɲe* as the realization of postnasal *-je* PASS for at least some speakers (33c-d).

(33) PASSIVE *-je* (OPTIONALLY) NASALIZING TO *-ᵑge*

a. / *ⁿdaʔɲo -je* /	b. / *ⁿdaʔɲo -je* /	c. / *ˈpaɲa -je* /	d. / *ãpʰi -ã -je* /
[*ⁿdãˈɲõᵑge*]	[*ⁿdãˈɲõɲe*]	[*pãˈɲãɲẽ* ~ *pãˈɲãᵑge*]	[*ãˈpʰĩãɲẽ* ~ *ãˈpʰĩãᵑge*]
harm -PASS	harm -PASS	understand -PASS	work -CAUS -PASS
"got hurt"	"was harmed"	"was understood"	"be made fall"

5.1.2.2 THE LABIAL APPROXIMANT Historically, the labial *ʋ* has nasalized to *m* after nasal vowels. This can be seen e. g. in *sĩˈmĩĩta* 'vanilla,' a compound of *sĩ* 'black' and *ʋɨita* < Kichwa *wayta* 'flower' (ALDP, 2018). (The change of Kichwa *ay* to *ɨi* shows postlabial raising, discussed in Section 4.1.4).

Functional morphemes, including the diminutive 2 *=ʔʋi* DMN2 and accusative 2 *=ʋe* ACC2 (34a-b), vacillate postnasally between nasal (*=ʔmĩ*, *=mẽ*) and non-nasal (*=ʔʋi*, *=ʋe*) realizations (34c-d). The non-nasalization of *ʋ* is innovative and shows that progressive nasalization is no longer fully phonologically productive.

(34) PALATAL APPROXIMANT *ʋ* OPTIONALLY NASALIZING TO *m* IN FUNCTIONAL MORPHEMES

a. / *kiri =ʔʋi* /	b. / *tsaʔkʰɨ =ʋe* /	c. / *ãtĩã =ʔʋi* /	d. / *kʰoma =ʋe* /
[*ˈkiriʔʋi*]	[*ˈtsaʔkʰɨʋe*]	[*ˈãtĩãʔmĩ* ~ *ˈãtĩãʔʋi*]	[*ˈkʰõmãmẽ* ~ *ˈkʰõmãʋe*]
cat =DMN2	water =ACC2	relative =DMN2	chili =ACC2

The corporeal classifying suffix *-ʔʋo* CORP (35a) nasalizes to *-ʔᵑgo* (as opposed to **-ʔmõ*) (35b-c). The diachrony of the exceptional *-je* (*-ᵑge*) PASS and *-ʔʋo* (*-ʔᵑgo*) CORP is further discussed in Paragraph 5.1.2.3.

(35) CORPOREAL *-ʔʋo* NASALIZING TO *-ʔᵑgo*

a. / *aʔi -ʔʋo* /	b. / *poʔtãẽ -ʔʋo* /	c. / *kini -ʔʋo* /	d. / *sĩ -ʋo* /
[*aiʔʋo*]	[*poˈtãẽʔᵑgo*]	[*ˈkĩnĩʔᵑgo*]	[*ˈsĩᵑgo*]
person -CORP	shoot -CORP	stick -CORP	black -CORP

5.1.2.3 THE VELAR APPROXIMANT The velar *ɰ* never appears after nasal vowels. It also never occurs in functional morphemes. As such, there is no evidence of an active phonological alternation with a nasal. (Notably, the A'ingae phonemic inventory lacks a velar nasal **ŋ* altogether.)

Overall, the velar approximant *ɰ* is very rare; it occurs only in 27 roots, almost always followed by a *a* or *ɨ* (Sanker and AnderBois, t.a.). To account for its limited distribution, Sanker and AnderBois (t.a.) propose that Pre-A'ingae **ɰ* underwent different mergers, depending on the following vowel and nasality. Before front vowels, **ɰ* palatalized to *j*. Before the back rounded *o*, **ɰ* labialized to *ʋ*. In other positions, **ɰ* remained unchanged. The reconstructed (though no longer attested) nasal counterpart to the velar approximant, which I represent as **ɰ̃*, occluded to *ᵑg*. These changes are restated in (36).

(36) DEVELOPMENTS OF VELAR APPROXIMANT *ɰ (based on Sanker and AnderBois, t.a.)

	_ e, i	_ o	elsw.	
a. PRE-A'INGAE	*ɰ	*ɰ	*ɰ	*ɰ̃
b. A'INGAE	j	ʋ	ɰ	ᵑg

In Sanker and AnderBois's (t.a.) reconstruction, the corporeal *-ʔʋo* CORP goes back to **-ʔɰo*; its postnasal counterpart *-ʔᵑgo* is simply a reflex of the regularly nasalized **-ʔɰ̃o*. Likewise, the passive *-je* PASS goes back to **-ɰe*, and *-ᵑge* is a reflex of **-ɰ̃e*. (Subsequently, *-ᵑge* has been partially replaced with *-ɲẽ* by analogical leveling.) Thus, the modern-day irregularities result from regular nasal spreading obscured by a primary split.

5.1.2.4 THE ALVEOLAR APPROXIMANT The alveolar approximant *ɾ* never occurs after nasal vowels in native roots. In the habitual subject nominalizer *-ɾi* HSN (37a), the alveolar *ɾ* remains oral and blocks the spread of nasalization (37b-d). For a discussion of *ɾ* in borrowings, see Dąbkowski (in prep.).

(37) ALVEOLAR APPROXIMANT *ɾ* NOT NASALIZING

a.	b.	c.	d.
/ *koʔfe -ɾi* /	/ *sema -ɾi* /	/ *ˈana -ɾi* /	/ *ã -ɾi* /
[*koˈfeɾi*]	[*sẽˈmãɾi*]	[*ãˈnãɾi*]	[*ˈãɾi*]
play -HSN	work -HSN	sleep -HSN	eat -HSN

5.1.3 *Fricatives*

A'ingae fricatives do not nasalize. However, in roots, they are largely permeable to nasal spreading (Sanker and AnderBois, t.a.). This is to say, if two vowels are separated by a fricative and the first vowel is nasal, the second vowel will almost always be nasal, too (38).

(38) FRICATIVES PERMEABLE TO NASAL SPREAD IN ROOTS

a.	b.	c.	d.	e.
ˈtẽfẽ	*ˈtãsĩ*	*ˈmɨ̃sã*	*ˈpãʃã*	*ˈkɨ̃ʃõ*
sulid	reconcile	make moldy	pass	fall in love

Fricatives do not allow for spreading across morpheme boundaries (Sanker and AnderBois, t.a.), as can be demonstrated with a variety of suffixes, including the plural subject marker *-ʔfa* PLS (39a), the diffused classifier *-foʔtʃo* DFFS (39b), the permissive suffix *-ʔse* PERM (39c), the different subject *=si* DS (39d), or the subject nominalizer *-ʔsɨ* SN (39e).

(39) FRICATIVES BLOCKING NASAL SPREAD IN FUNCTIONAL MORPHEMES

a.	b.	c.	d.	e.
/ *ã -ʔfa* /	/ *ã -foʔtʃo* /	/ *ã -ʔse* /	/ *ã =si* /	/ *ã -ʔsɨ* /
[*ˈãʔfa*]	[*ˈãfoʔtʃo*]	[*ˈãʔse*]	[*ˈãsi*]	[*ˈãʔsɨ*]
eat -PLS	eat -DFFS	eat -PERM	eat =DS	eat -SN

5.1.4 *Unaspirated stops*

Here, I discuss unaspirated stops, grouping voiceless stops and prenasalized voiced stops together. In native roots, two different behaviors are attested (Sanker and AnderBois, t.a.). First, some unaspirated stops are permeable to nasal spreading. This is to say, if two vowels are separated by an unaspirated stop and the first vowel is nasal, the second vowel will also often be nasal, i. e. ṼTṼ (40).

(40) PLAIN STOPS PERMEABLE TO NASAL SPREAD IN ROOTS

a.	b.	c.	d.	e.
ˈsẽpẽ	*ˈãtĩã*	*ˈõtsĩã*	*ˈãtʃã*	*ˈtsĩkõ*
stinging bee sp.	relative	put on one's head	mosquito	behave

Second, in many cases where two vowels are separated by an unaspirated stop, the first vowel is nasal, the stop is prenasalized, and the second vowel is oral (41). The vast majority of A'ingae prenasalized stops appear in this configuration (i. e. flanked by a nasal vowel to the left and an oral vowel to the right, Ṽ^{N}DV).

(41) Prenasalized stops blocking nasal spread in roots

a. *ˈk^{h}ɨ̃^{m}ba*	b. *ˈã^{n}de*	c. *ˈɨ̃^{n}dzɨ*	d. *ˈmã^{n}dʒi*	e. *ˈmã^{ŋ}gɨ*
tobacco	land	green	squeeze	drag

A third small category comprises items where a prenasalized stop is preceded and followed by a nasal vowel, i. e. Ṽ^{N}DṼ. These include cases of seeming reduplication such as *ˈtã^{n}dã* 'tie' and *ˈkõ^{ŋ}gõ* 'rot' (Sanker and AnderBois, t.a.), apparently derived from the roots **tã* and **kõ*.[5] Other instances of Ṽ^{N}DṼ include plausible cases of lexicalized causatives with *-ã/-ẽ* CAUS, such as *ˈfĩ^{ŋ}gĩã* 'be windy,' and borrowings. Finally, there are some exceptions, where an unaspirated stop blocks nasal spreading without prenasalizing, i. e. ṼTV, including *ˈnẽpi* 'disappear,' *ˈnãpi/ˈnẽpi* 'arrive' and many plausible borrowings (Dąbkowski, in prep. Sanker and AnderBois, t.a.).

Functional morphemes with unaspirated voiceless stops show split behavior. Some morphemes prenasalize the stop and block nasal spreading (Ṽ^{N}DV). Other morphemes block nasal spreading without stop prenasalization (ṼTV). Many morphemes with the labial *p* and alveolar *t* prenasalize the stops, including the associative *-ʔpa* ASSC (42a), the nominalizer *-ʔpa* N (42b), the same subject marker *=pa* SS (42c), the same subject conditional antecedent marker *=ʔta* IF.SS (42d), and the reportative clitic *=te* RPRT (42e).

(42) Labial *p* and alveolar *t* prenasalized to ^{m}*b* and ^{n}*d* in many functional morphemes

a. / *tʃã -ʔpa* /	b. / *ã -ʔpa* /	c. / *ã =pa* /	d. / *ã =ʔta* /	e. / *ã =te* /
[*ˈtʃãʔ^{m}ba*]	[*ˈãʔ^{m}ba*]	[*ˈã^{m}ba*]	[*ˈãʔ^{n}da*]	[*ˈã^{n}de*]
mother -ASSC	eat -N	eat =SS	eat =IF.SS	eat =RPRT

Nevertheless, the same stops *p* and *t* in other functional morphemes block the spread of nasalization without undergoing prenasalization. This class includes the owner nominalizer *=pa* ON (43a), the habitual subject nominalizer *-pari* HSN (43b), the terminative case clitic *=pi* TERM (43c), and the periodic classifier *-ite* PRD (43d).

(43) Labial *p* and alveolar *t* not prenasalized in other functional morphemes

a. / *tʃã =pa* /	b. / ^{n}*daʔɲo -pari* /	c. / *naʔe =pi* /	d. / *na -ite* /
[*ˈtʃãpa*]	[^{n}*dãɲõˈpari*]	[*ˈnãʔẽpi*]	[*ˈnãĩte*]
mother =ON	harm -HSN	river =TERM	fruit -PRD

Functional morphemes containing the other voiceless unaspirated stops (*ts, tʃ, k*) never prenasalize. This includes the third person subject clitic *=tsɨ* 3 (44a), the round classifier *-ʔtʃo* RND (44b), the similative marker *=ʔkã* SML (44c), the second person subject clitic *=ki* 2 (44d), the diurnal classifier *-(ʔ)ki* DRN (44e), and others.

(44) Other voiceless stops never prenasalized in functional morphemes

a. / *ã =tsɨ* /	b. / *kã -ʔtʃo* /	c. / *ɲa =ʔkã* /	d. / *ã =ki* /	e. / *ma -ki* /
[*ˈãtsɨ*]	[*ˈkãʔtʃo*]	[*ˈɲãʔkã*]	[*ˈãki*]	[*ˈmãki*]
eat =3	look -RND	1SG =SML	eat =2	INDF.SEL -DRN

Finally, there are functional morphemes that contain underlyingly prenasalized voiced stops, which do not alternate with voiceless unaspirated stops. These morphemes include, for example, the benefactive *=^{m}be* BEN (45a), the negative *-^{m}bi* NEG (45b), the animate plural *=^{n}dek^{h}ɨ* PL.ANIM (45c), the dative *=^{ŋ}ga* DAT (45d), and the first person subject clitic *=^{ŋ}gi* 1 (45e). The first vowel to the left of a prenasalized morpheme also becomes nasal due to regular regressive nasalization (to be discussed in Section 5.2).

5 Note, however, that neither root functions independently in contemporary A'ingae. Additionally, the reduplication of monosyllabic roots is not productive in A'ingae. For a description and analysis of A'ingae productive reduplication, see Section 6.2.

(45) PRENASALIZED STOPS AS UNDERLYING IN FUNCTIONAL MORPHEMES

a. / *ke =ᵐbe* /	b. / *ha -ᵐbi* /	c. / *aʔi =ⁿdekʰɨ* /	d. / *ke =ᵑga* /	e. / *ha =ᵑgi* /
[*ˈkẽᵐbe*]	[*ˈhãᵐbi*]	[*aʔˈĩⁿdekʰɨ*]	[*ˈkẽᵑga*]	[*ˈhãᵑgi*]
2SG =BEN	go -NEG	person =PL.ANIM	2SG =DAT	go =1

5.1.5 *Aspirated stops*

Most A'ingae aspirated stops occur in oral contexts. In roots, among the aspirated stops preceded by a nasal vowel, a split behavior is observed: in some instances, the aspirates are permeable to nasal spreading (46); in other cases, they block the progressive nasalization (47) (Sanker and AnderBois, t.a.).[6]

(46) ASPIRATED STOPS PERMEABLE TO NASAL SPREAD IN ROOTS

a. *ˈpʰĩpʰĩ*	b. *ˈãtʰã*	c. *ˈpɨ̃tsʰã*	d. *ˈhãʔtʃʰĩ*	e. *ˈõkʰã*
calm down	ganoid fish	duck	flat (nose)	envelop

(47) ASPIRATED STOPS BLOCKING NASAL SPREAD IN ROOTS

a. *ˈãpʰi*	b. *ˈʃĩʔpʰi*	c. *ˈãtʰe*	d. *shĩˈkʰapa*	e. *sãˈkʰopa*
fall	younger sister	stop	coriander	wing

In functional morphemes, aspirates always block nasal spreading (Sanker and AnderBois, t.a.), including the egressive *=ʔtʰe* EGR (48a), the place classifier *-ʔtʰi* PLC (48b), the adjectivizer *-tsʰi* ADJ (48c), the attenuated imperative *-kʰa* ATTN (48d), and the delimited space classifier *-kʰɨ* DLM (48e).

(48) ASPIRATED STOPS BLOCKING NASAL SPREAD IN FUNCTIONAL MORPHEMES

a. / *naʔe =ʔtʰe* /	b. / *hẽ -ʔtʰi* /	c. / *sã -tsʰi* /	d. / *ã -kʰa* /	e. / *ᵑgeɲo -kʰɨ* /
[*ˈnãʔẽʔtʰe*]	[*ˈhẽʔtʰi*]	[*ˈsãtsʰi*]	[*ˈãkʰa*]	[*ᵑgẽˈɲõkʰɨ*]
river =EGR	sound -PLC	dry -ADJ	eat -ATTN	banana -DLM

5.2 *Regressive nasalization*

Nasal stops (49b-c) and prenasalized voiced stops (49a,d-e) nasalize the vowel to their left, across a glottal stop if present (49b-c). The process is fully general and operates within roots (49a-b) and across morpheme boundaries (49c-e). Due to regressive nasalization, the distinction between nasal and oral vowels is neutralized before nasal and prenasalized stops. For example, *ˈĩʔnã* 'cry' (49b) may not contrast with a hypothetical **iʔnã*.

(49) REGRESSIVE NASALIZATION

a. / *tsaⁿda* /	b. / *iʔna* /	c. / *tsa =ʔma* /	d. / *aʔi =ᵐbi* /	e. / *jaja =ᵑga* /
[*ˈtsãⁿda*]	[*ˈĩʔnã*]	[*ˈtsãʔmã*]	[*ˈaʔĩᵐbi*]	[*ˈjajãᵑga*]
thunder	cry	ANA =FRST	person =NEG	dad =DAT

Regressive nasalization is not iterative. This is to say, only the first vowel to the left of a nasal or prenasalized stop is affected—farther vowels remain oral (49d), and preceding approximants do not turn into nasals (49e). Nonetheless, certain distributional patterns reveal a preference for morpheme-internal nasal agreement that goes beyond the nasal spreading as predicted solely by progressive (§5.1) and non-iterative regressive nasalization. For example, the oral approximants (*j, ʋ, r, ɰ*) never appear before nasal vowels in native roots (Sanker and AnderBois, t.a.), i. e. morpheme-internally, *RṼ sequences is banned. For a discussion of similar patterns in borrowings, which mirror the restrictions observed in native roots, see Dąbkowski (in prep.).

In morphologically complex forms, some of the root-level restrictions discussed throughout this section are obscured (Sanker and AnderBois, t.a.). E. g., in roots, prenasalized stops (§5.1.4) and oral approximants (§5.1.2) are almost always followed by oral vowels. However, in words with suffixes and clitics, prenasalized stops (50a-b) and oral approximants (50c-d) often appear before nasal vowels due to regressive nasalization. The extent to which regressive nasalization is categorical and phonologized or gradient and variable is presently unclear.

6 Note that positing independently specified nasal vowels in the second syllables of (46) would run afoul of the generalization in (31).

(50) PRE-NASAL APPROXIMANTS AND PRENASALIZED STOPS IN MORPHOLOGICALLY COMPLEX FORMS

a. / *tsa*^{n}*da* =*ne* /
 [*ˈtsã*^{n}*dãnẽ*]
 thunder =ELAT

b. / *si*^{m}*ba* -^{m}*bi* /
 [*sĩˈ*^{m}*bã*^{m}*bi*]
 fish -NEG

c. / *va* =*ma* /
 [*ˈvãmã*]
 DEM =ACC

d. / ^{n}*daro* =$^{\eta}$*ga* /
 [^{n}*darõ*$^{\eta}$*ga*]
 piranha =DAT

6 PROSODY AND GLOTTALIZATION

In A'ingae, the position of stress and glottalization are often interdependent and determined by a number of phonological and morphological factors. Section 6.1 discusses the basic types of their morphophonological interactions. Section 6.2 describes the prosodic expression of pluractionality and greater plurality reduplication. Section 6.3 touches on clause-level prosody and the discursive use of falsetto.

A'ingae stress correlates primarily with longer duration and often with a higher F0 (Repetti-Ludlow et al., 2019). Each phonological word has exactly one primary stress peak. The position of stress is contrastive in roots (51a-b) and in morphologically complex forms (51c-d) (Dąbkowski, 2021b). Corresponding spectrograms (Boersma and Weenink, 2023; Elvira García, 2022) are given below.

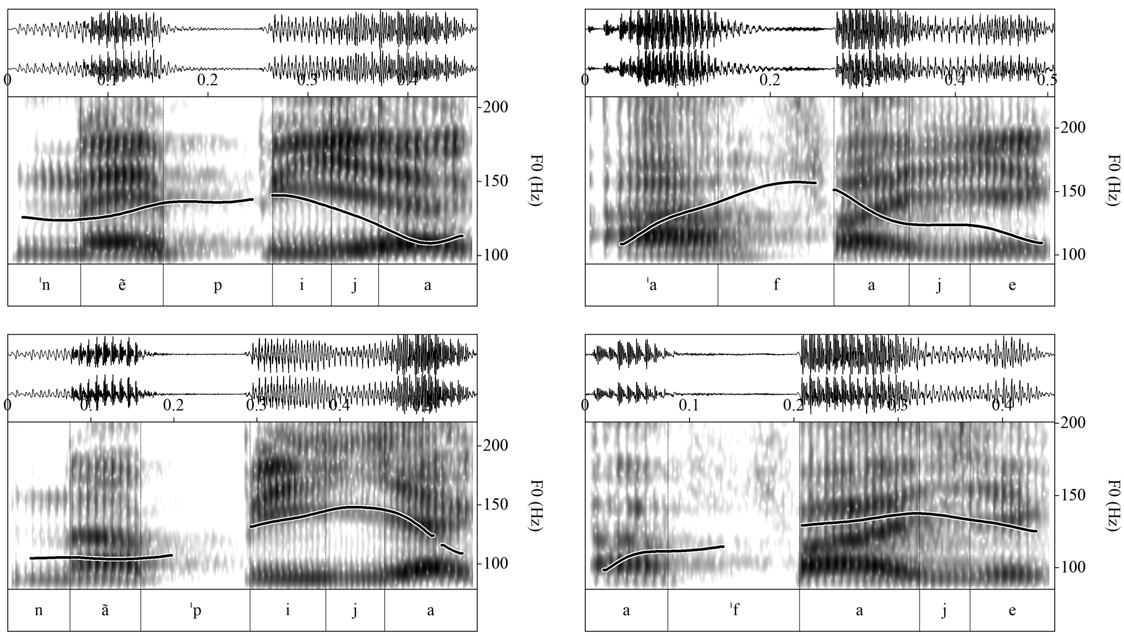
(51) STRESS CONTRASTIVE IN ROOTS AND INFLECTED FORMS

a. *ˈnẽpi* -*ja*
 disappear -IRR

b. *nãˈpi* -*ja*
 arrive -IRR

c. *ˈafa* -*je*
 speak -INF

d. *aˈfa* -*je*
 speak -PASS



Glottalization can be realized as a glottal stop, creakiness, or entirely deleted in rapid speech (Repetti-Ludlow et al., 2019). Nonetheless, in roots, the presence of glottalization is contrastive (52a-b) (Borman, 1962; Fischer and Hengeveld, 2023; Repetti-Ludlow, 2021), and in morphologically complex forms, the position of glottalization is contrastive as well (52c-d) (Dąbkowski, 2023c).

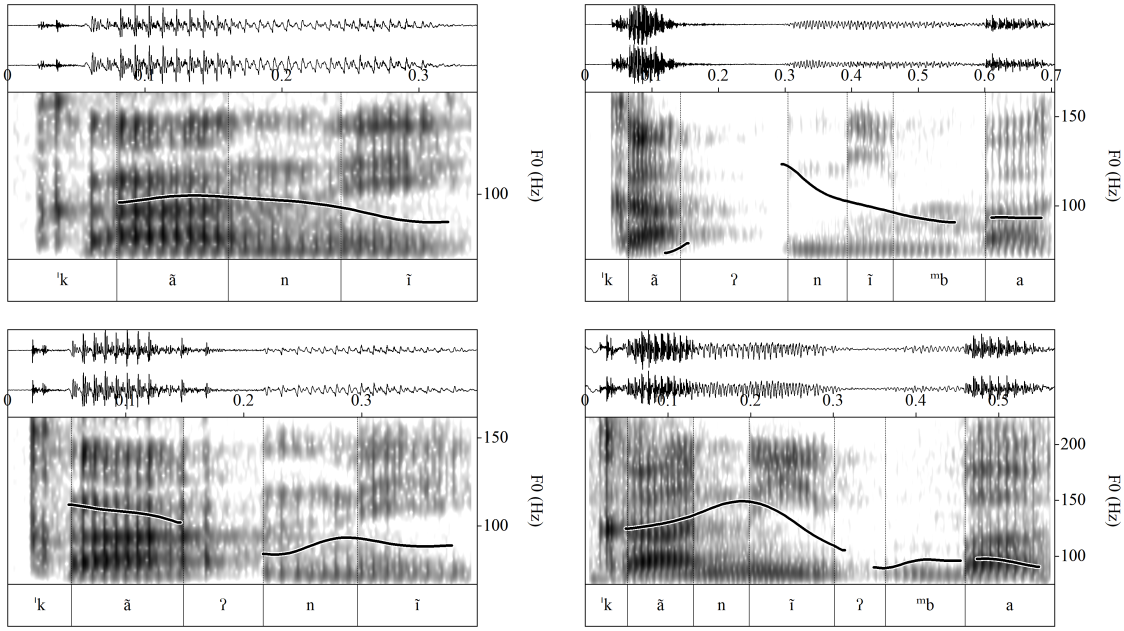
(52) GLOTTALIZATION CONTRASTIVE IN ROOTS AND INFLECTED FORMS

a. *ˈkãnĩ*
 yesterday

b. *ˈkãʔnĩ*
 enter

c. *ˈkãʔnĩ* -^{m}*ba*
 enter -SS

d. *ˈkãnĩ* -*ʔ*^{m}*ba*
 enter -N



6.1 *Morphophonological interactions*

Word stress and glottalization partake in a rich system of morphophonological interactions, where their presence and position depend on phonological factors, root class, and partly idiosyncratic (diacritic) properties of the suffixes and clitics attached to the root. A sample of interactions discussed in Dąbkowski (2023c) is illustrated in (53).

(53) STRESS–GLOTTAL INTERACTIONS

	i. PLAIN	ii. STRESSED	iii. GLOTTALIZED
	/ *kãtsĩᵑgĩã* /	/ *ˈafase* /	/ *akʰeʔpa* /
	stoke (fire)	offend	forget
a. BARE ROOT, i. e. -∅	i. *kãˈtsĩᵑgĩã*	ii. *ˈafase*	iii. *ˈakʰeʔpa*
b. INNER RECESSIVE, e. g. *-hi* INGR	i. *kãtsĩˈᵑgĩãhĩ*	ii. *ˈafasehi*	iii. *ˈakʰeʔpahi*
c. INNER DOMINANT, e. g. *-je* PASS	i. *kãtsĩˈᵑgĩãɲẽ*	ii. *afaˈseje*	iii. *akʰeˈpaje*
d. INNER GLOTTALIZED, e. g. *-ʔhe* IPFV	i. *kãtsĩˈᵑgĩãʔhẽ*	ii. *aˈfaseʔhe*	iii. *aˈkʰepaʔhe*
e. OUTER RECESSIVE, e. g. *-ja* IRR	i. *kãtsĩˈᵑgĩãɲã*	ii. *ˈafaseja*	iii. *ˈakʰeʔpaja*
f. OUTER DOMINANT, e. g. *-kʰa* ATTN	i. *kãtsĩˈᵑgĩãkʰa*	ii. *afaˈsekʰa*	iii. *akʰeʔˈpakʰa*

Roots can be classified as plain (53i), stressed (53ii), or glottalized (53iii) (Dąbkowski, 2023c). The first category consists of roots that do not have underlying stress. On the surface, underlyingly stressless forms receive default penultimate stress (53a.i). The second category contains roots that have underlying stress on the first syllable. Unless later overridden by a suffix, the underlying stress surfaces faithfully (53a.ii). The third category includes roots with a glottal stop. The glottal stop surfaces in the coda of the penultimate syllable. On the surface, stress is regularly assigned to the syllable which contains the second mora to the left of the glottal stop. As such, even though the stress of (53a.iii) is word-initial, there is no need to specify it as underlyingly present.

In morphologically complex forms, stress depends on the morphophonological class of the suffixes attached. Here, I adopt Dąbkowski's (2023c) terminology, categorizing suffixes as *inner* (templatically closer to the root), *outer* (farther away from the root), *recessive* (preserving prior metrical specification), *dominant* (deleting prior metrical specification), and *glottalized* (whose stress assignment patterns are due to the glottal stop).

Inner recessive suffixes preserve preexisting stress and glottalization, but do not assign stress themselves. Underlyingly stressless verbs with inner recessive suffixes receive penultimate stress (53b.i). Underlying stress and glottalization surface faithfully (53b.ii-iii). *Inner dominant* suffixes delete underlying stress and glottalization. On the surface, the destressed forms receive regular penultimate stress (53c.i-iii). *Inner glottalized* suffixes override underlying stress and glottalization. New stress is assigned to the syllable which contains the second mora to the left of the glottal stop. I. e., stress falls on the last syllable of the root if heavy (a diphthong) (53d.i). Otherwise, stress is assigned to the syllable which precedes it (53d.ii-iii).

Outer recessive suffixes preserve preexisting stress and glottalization if present (53e.iii-iii). Otherwise, they assign stress to the syllable that immediately precedes them (53e.i). Note that although the surface forms with inner recessive (53a) and outer recessive suffixes pattern identically, stress assignment proceeds via different mechanisms. The different origin of stress has consequences for more complex forms with additional suffixes. *Outer dominant* suffixes preserve preexisting glottalization (53f.iii) but always stress the syllable to their immediate left (53f.i-iii). In the outer domain, the presence of glottalization has no effect on stress. For further discussion and analyses of A'ingae stress and glottalization, see Dąbkowski (2021b, 2023c, t.a. in prep.).

6.2 *Expressions of plurality*

In addition to regular subject plurality expressed with *-ʔfa* PLS, A'ingae verbs can be marked for pluractionality or greater plurality via prosodic means. Pluractionality is expressed by inserting a glottal stop (54). The glottal stop surfaces in the coda of the penultimate syllable. Stress is assigned to the syllable with the second mora to the left of the glottal stop in trisyllabic roots (54d-e) and to the glottalized syllable in disyllabic roots (54a-b).

(54) GLOTTAL STOP EXPRESSING PLURACTIONALITY (Dąbkowski, 2023c, p. 7)

a.	b.	c.	d.	e.
/ *tʃava -ʔ* /	/ *pa^{n}dza -ʔ* /	/ *atapa -ʔ* /	/ *op^{h}at^{h}ɨ -ʔ* /	/ *o^{n}dik^{h}ɨ -ʔ* /
[*ˈtʃaʔva*]	[*ˈpãʔ^{n}dza*]	[*ˈataʔpa*]	[*ˈop^{h}aʔt^{h}ɨ*]	[*ˈõ^{n}diʔk^{h}ɨ*]
buy -PLA	hunt -PLA	breed -PLA	pick -PLA	don -PLA

A'ingae reduplication expresses the greater plurality of subject (Dąbkowski, 2023a) or object (Hengeveld and Fischer, in prep.). The A'ingae reduplicant is a verbal suffix of the form *-ʔσ* GPL, which attaches directly to the root. The glottal stop is a fixed segment and the reduplicated syllable is copied from the right edge of the base (55) (Dąbkowski, 2023a).

(55) REDUPLICATION EXPRESSING GREATER PLURALITY ON DISYLLABIC ROOTS

a.	b.	c.	d.	e.
/ *ˈana -ʔσ* /	/ *koʔfe -ʔσ* /	/ *fɨ^{n}dɨi -ʔσ* /	/ *etʃ^{h}oẽ -ʔσ* /	/ *pasia -ʔσ* /
[*ˈãnãʔnã*]	[*ˈkofeʔfe*]	[*ˈfɨ̃^{n}dɨ̃ʔ^{n}dɨi*]	[*ˈetʃ^{h}oʔtʃ^{h}õẽ*]	[*ˈpasiʔsia*]
sleep -GPL	play -GPL	sweep -GPL	mix -GPL	stroll -GPL

Productive reduplication is restricted to disyllabic roots. This is to say, while disyllabic roots reduplicate productively, reduplication of monosyllabic and trisyllabic roots is impossible. Among the disyllabic verbs, the reduplicant can attach to stressless (55c-e), stressed (55a), and glottalized roots (55b). Underlying glottal stops are overridden (55b). Stress is assigned to the first syllable. If the stem ends in a diphthong, the diphthong is truncated to its first component in the stem, but surfaces fully in the reduplicant (55c-e). For an analysis of the disyllabicity restriction on A'ingae reduplication and the prosodic shape of the reduplicated stem, as well as a discussion of non-productive reduplicative patterns, see Dąbkowski (2023a).

6.3 *Clause-level prosody and falsetto*

In A'ingae, prosody does not distinguish between different illocutionary clause types. As such, declarative (56a-b), polar interrogative (56c), content interrogative, imperative (56d), permissive, hortative, and prohibitive clauses all have the same falling pitch contour (Hengeveld and Fischer, in prep.). (This may be related to the fact that illocutionary force is conveyed by overt morphology; Hengeveld and Fischer, in prep.)

Cosubordinate and subordinate clauses, including non-final chained clauses (56a) and temporal/conditional antecedents (56b), are associated with a pitch rise (Hengeveld and Fischer, in prep.). Specifically, a high tone attaches to the stressed syllable of the last word of the (co)subordinate clause; a down-stepped high tone is maintained throughout the rest of the word (*kõẽˈhĩsi* in 56a; *ˈkĩɲãʔhẽʔnĩ* in 56b).

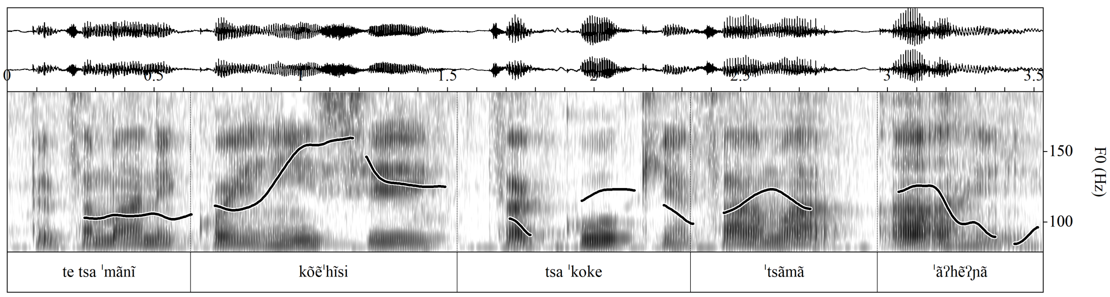
(56) PROSODIC CONTOURS (data from AnderBois and Silva, 2018)

a. COSUBORDINATE CLAUSE + DECLARATIVE CLAUSE

=te tsa ˈmãnĩ kõẽ-ˈhĩ=si | tsa ˈkoke ˈtsã=mã ˈã-ʔhẽ-ʔña

RPRT ANA groundnut mature-INGR=DS | ANA hare ANA=ACC eat-IPFV-ASSR

"When groundnut was ready for harvest, the hare would eat it." (`20170804_kuke_chiste_FACQ`)



b. TEMPORAL/CONDITIONAL CLAUSE + DECLARATIVE CLAUSE

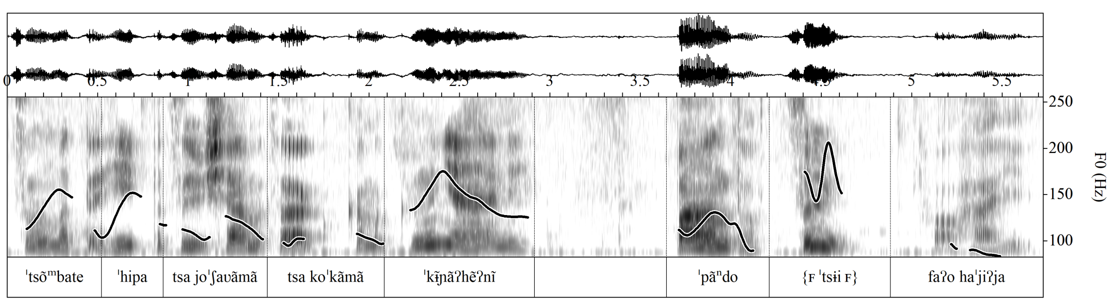
ˈtsõ=^{m}ba =te ˈhi=pa tsa joˈʃavã=mã tsa koˈkãmã ˈkĩ-ɲã-ʔhẽ=ʔnĩ | ˈpã^{n}do {$_{F}$ ˈtsɨi $_{F}$} =faʔo

do=SS =RPRT come=SS ANA iron=ACC ANA Spaniard red-CAUS-IPFV=IF.DS | fox walk=EVAL

ha-ˈji-ʔja

go-PRSP-ASSR

"When the Spaniard was heating the iron, the fox was walking towards him."
(`20170804_kuke_chiste_FACQ`)

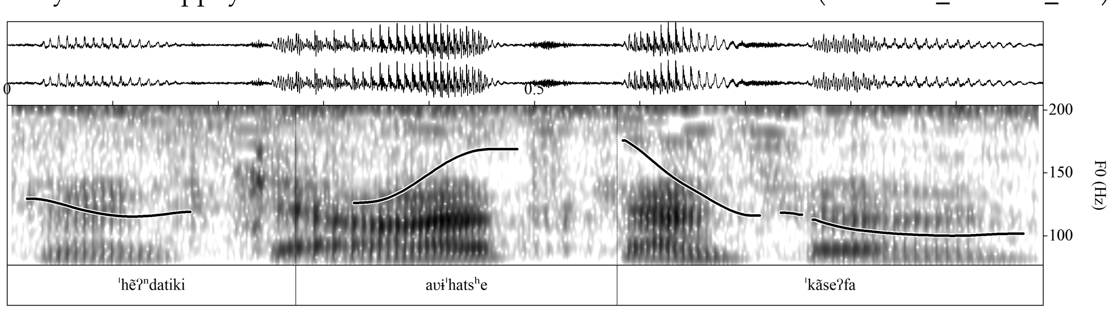


c. INTERROGATIVE CLAUSE

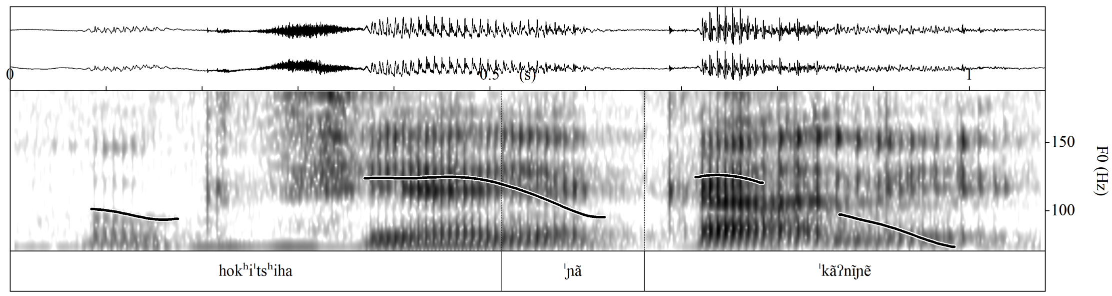
ˈhẽʔ^{n}da =ti=ki avɨ ˈha-ts^{h}-e ˈkãse-ʔfa

then =YNQ=2 rejoice-ADJ-ADV live-PLS

"Do you live happily then?" (`20170801_escuela_CLC`)



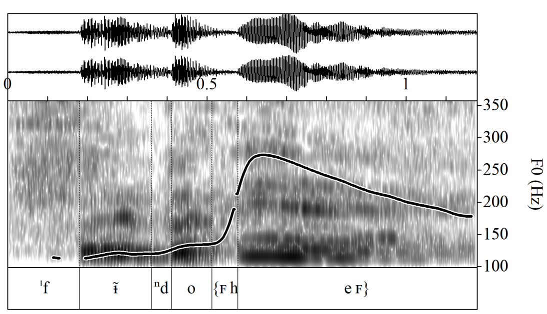
d. IMPERATIVE CLAUSE
hok^{h}iˈts^{h}i-ha ˈɲa ˈkãʔnĩ-ɲẽ
get out-IMP 1SG enter-INF
"Get out of my way so I can enter!" (20170804_kuke_chiste_FACQ)



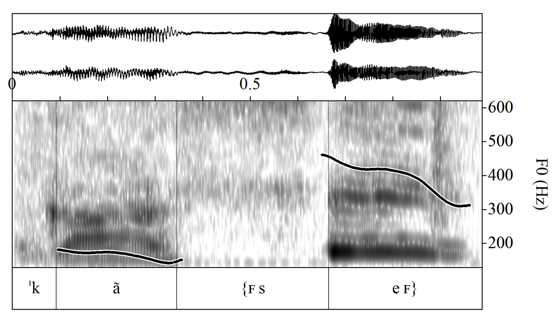
Finally, A'ingae has a discursive use of falsetto (a vocal register characterized primarily by a higher F0, as well as reduced harmonics-to-noise ratio, steeper spectral slope, and higher jitter; Childers and Lee, 1991; Keating, 2014; Neiman et al., 1997) (Sanker, Silva, et al., 2018). In A'ingae, falsetto consistently appears on a single syllable, which is typically stressed or phrase-final. Falsetto can be used to signal a shift between speakers or perspectives in a narrative, convey speaker excitement (Sanker, Silva, et al., 2018), or indicate that an event lasted for a long time. The realization of falsetto can be seen on *ˈtsɨi* in (56a) and in (57).

(57) FALSETTO (data from AnderBois and Silva, 2018)

a. *ˈfĩⁿdo {$_F$ -ʔje $_F$}*
scream-IPFV (20170804_kuke_chiste_FACQ)



b. *ˈkã {$_F$ se $_F$}*
live (20170803_dyandyaccu_LC)



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FUNDING INFORMATION My research was supported in part by an Oswalt Endangered Language Grant for the project *Documenting the A'ingae noun phrase* and the National Science Foundation 20-538 Linguistics Program's Doctoral Dissertation Research Improvement grant #2314344 for *Doctoral Dissertation Research: Nominal and deverbal morphology in an endangered language*.

ACKNOWLEDGEMENTS I would like to express my sincere gratitude to my Cofán collaborators who have shared their language with me. Thanks especially to Jorge Criollo and his family, who welcomed me to their home, and my primary consultants Jorge Mendúa, Shen Aguinda, and Raúl Quieta for their patience, kindness, and generosity. I would also like to thank Hannah Sande, Peter Jenks, Lev Michael, Darya Kavitskaya, Larry Hyman, Scott AnderBois, and Chelsea Sanker for the helpful discussions and their invaluable feedback.