

THE PHONOLOGY OF A'INGAE

MAKSYMILIAN DĄBKOWSKI

UNIVERSITY OF CALIFORNIA, BERKELEY

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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 in 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. [Section 7](#) places aspects of A'ingae phonology against a broader typological and areal background.

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 (Hammarström et al., 2020). 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 contrastive aspiration and the lack of tone. 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.

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, 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, though younger speakers (particularly those who leave the Cofán communities to go to school) use Spanish more often. 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).

There is little previous scholarship on the language. Phonetic and phonological works include Borman's (1962) early phonological description of A'ingae, Repetti-Ludlow et al.'s (2019) phonetic sketch, Dąbkowski's (2023b) diachronic account of A'ingae's postlabial raising, Sanker and AnderBois's (t.a.) internal reconstruction of A'ingae nasality, Dąbkowski's (2021b, 2023c, t.a.) work on morphophonology of stress and glottalization, and chapters in Dąbkowski's (in prep.) and Hengeveld and Fischer's (in prep.) monographs.

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 (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, although speakers sometimes remark that people from other communities speak differently.

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).

PLAIN STOPS	<i>p</i>	<i>t</i>	<i>ts</i>	<i>tʃ</i>	<i>k</i>	<i>ʔ</i>	<i>i, ĩ</i>	<i>ɨ, ɨ̃</i>	<i>o, ɔ̃</i>
ASPIRATED STOPS	<i>pʰ</i>	<i>tʰ</i>	<i>tsʰ</i>	<i>tʃʰ</i>	<i>kʰ</i>		<i>e, ẽ</i>	<i>a, ã</i>	
PRENASAL STOPS	<i>^mb</i>	<i>ⁿd</i>	<i>ⁿdz</i>	<i>ⁿdʒ</i>	<i>^ŋg</i>		<i>ie, iē</i>	<i>ii, ĩĩ</i>	<i>io, iō</i>
FRICATIVES	<i>f</i>		<i>s</i>	<i>ʃ</i>		<i>h</i>	<i>ei, ẽi</i>	<i>oe, oē</i>	<i>oi, õi</i>
ORAL SONORANTS	<i>v</i>	<i>r</i>		<i>j</i>	<i>ɥ</i>		<i>ia, iā</i>		<i>oa, oā</i>
NASAL SONORANTS	<i>m</i>	<i>n</i>		<i>ɲ</i>			<i>ai, aĩ</i>	<i>ae, aē</i>	<i>ao, aō</i>

Table 1: Phonemic inventory of A'ingae (based on 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 (*pʰ, tʰ, tsʰ, tʃʰ, kʰ*), and prenasalized voiced (*^mb, ⁿd, ⁿdz, ⁿdʒ, ^ŋg*). 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. The alveolar */s/* is sometimes realized as the aspirated [*sʰ*], under conditions that

remain unclear (Repetti-Ludlow et al., 2019). There are four oral sonorants, contrasting labial (*v*), alveolar (*r*), palatal (*j*), and velar (*ʉ*) articulations. The velar sonorant (*ʉ*) is rare, and does not appear word-initially or next to nasal vowels. The distribution and history of *ʉ* 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 6.2. 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) SIX PLAIN VOICELESS STOP PHONEMES
- | | | | | | |
|------------------|-----------------|-----------------|--------------------------------|-----------------|-------------------|
| a. <i>a'rapa</i> | b. <i>'kata</i> | c. <i>'atsa</i> | d. <i>'atʃaʔk^hi</i> | e. <i>'ʃaka</i> | f. <i>'mbiaʔa</i> |
| chicken | launch | avocado | saliva | fault | long |
- (2) FIVE ASPIRATED VOICELESS STOP PHONEMES
- | | | | | |
|---|--------------------------------|---|--|------------------------------|
| a. <i>p^ha'p^hak^ho</i> | b. <i>pa't^hauya</i> | c. <i>'ts^hats^ha</i> | d. <i>tʃ^ha'tʃ^hats^hi</i> | e. <i>ĩ'ɲāk^ha</i> |
| floor | smallpox | grate | resourceful | get hurt |
- (3) FIVE PRENASALIZED VOICED STOP PHONEMES
- | | | | | |
|-----------------------------|------------------------------|------------------------------|--|----------------------------|
| a. <i>'nã^mba</i> | b. <i>'tsãⁿda</i> | c. <i>'pãⁿdza</i> | d. <i>ⁿdʒãⁿdʒak^hi</i> | e. <i>'ã^ŋga</i> |
| get murky | thunder | hunt | headdress | carry |
- (4) FOUR VOICELESS FRICATIVE PHONEMES
- | | | | |
|----------------|-----------------|----------------|------------------|
| a. <i>'afa</i> | b. <i>'pasa</i> | c. <i>'afã</i> | d. <i>'tsaha</i> |
| speak | pass | half-finished | grape |
- (5) FOUR ORAL SONORANT PHONEMES
- | | | | |
|-------------------|-------------------|----------------|------------------------------|
| a. <i>jo'ʃava</i> | b. <i>sa'raro</i> | c. <i>'aja</i> | d. <i>a'ʉat^ho</i> |
| iron | giant otter | ghost | count |
- (6) THREE NASAL SONORANT STOP PHONEMES
- | | | |
|-----------------------------|----------------------------|-----------------------------|
| a. <i>'mã^mmã</i> | b. <i>'ãⁿnã</i> | c. <i>'pã^ɲnã</i> |
| mom | sleep | hear |

By processes of nasal spreading, a vowel is nasalized before a prenasalized stop (3) and both before and after a nasal consonant (6). Nevertheless, each of the three stop series is contrastive and none of them can be collapsed as a purely allophonic variant of another series (conditioned e. g. by adjacent nasality). For example, the plain *p* (2b), the aspirated *p^h* (2a), and the prenasalized *mb* (1f) can all appear word-initially before an oral vowel. The contrastive status of all the above series 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-, ⁿdʒ-, ⁿdʒ-, ^ŋg-/ are realized as [ᵐb-, ᵑd-, ᵑdʒ-, ᵑdʒ-, ᵑg-] (7c-e, cf. 7a-b).² The velar stops /k, k^h, ^ŋg/ palatalize to [c, c^h, ^jy] before the front vowels *e* (8a-b) and *i* (8c). Nonetheless, the palatalized velars do not neutralize to the postalveolar *tʃ, tʃ^h, ⁿdʒ* (8d, cf. 8a; 8e, cf. 8c). Since the word-initial partial denasalization and palatalization are non-contrastive phonetic details, they will not be reflected in the transcriptions throughout the rest of the paper.

- (7) PRENASALIZED STOPS, PARTIALLY DENASALIZED WORD-INITIALLY
- | | | | | |
|---|--------------------------|------------------------|------------------------|-------------------------|
| a. / k ^h ĩ ^m ba / | b. / a ⁿ de / | c. / ^m bo / | d. / ⁿ da / | e. / ⁿ dʒo / |
| [k ^h ĩ ^m ba] | ['ã ⁿ de] | ['ᵐbo] | ['ᵑda] | ['ᵑdʒo] |
| tobacco | land | meet | become | fear |

² Based on Dąbkowski's (2021b, 2023c, in prep. t.a.) 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. Contra Dąbkowski (2023c, in prep.), glottal stops are represented as underlyingly linearized. This convention has been adopted for expository ease, despite Dąbkowski's (2023c, in prep.) analysis of root glottal stops as underlyingly floating. Stress and glottalization are further discussed in Section 6.2.

- (8) VELAR STOPS PALATALIZED BEFORE FRONT VOWELS, BUT NOT NEUTRALIZED TO $tʃ, tʃʰ, ʰdʒ$
- | | | | | |
|------------------------|-------------------|---------------------|------------------------|-----------------------|
| a. / <i>fɛkeʔtʃo</i> / | b. / <i>kʰe</i> / | c. / <i>koʷgi</i> / | d. / <i>metʃeʔno</i> / | e. / <i>kʰoʰdʒi</i> / |
| [<i>'fɛceʔtʃo</i>] | [<i>'cʰe</i>] | [<i>'kɔʷʲi</i>] | [<i>'metʃeʔno</i>] | [<i>'kʰɔʰdʒi</i>] |
| loose pieces | get lost | ant sp. | squirrel cuckoo | small fish sp. |

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 *h-* (9-10).

- (9) FIVE ORAL VOWEL PHONEMES
- | | | | | |
|---------------|------------------|---------------|---------------|-----------------|
| a. <i>'ha</i> | b. <i>'heʔri</i> | c. <i>'hi</i> | d. <i>'hɨ</i> | e. <i>'hoʔe</i> |
| go | grimace | come | yes | those.INAN |
- (10) FIVE NASAL VOWEL PHONEMES
- | | | | | |
|--------------------|---------------|---------------|----------------|---------------|
| a. <i>'hãʔtʃʰĩ</i> | b. <i>'hẽ</i> | c. <i>'hĩ</i> | d. <i>'hĩ̃</i> | e. <i>'hõ</i> |
| flat (nose) | sound | be.INAN | yeah | 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* (Crothers, 1978). The A'ingae contrast between two non-low non-front vowels is based on roundedness, i. e. *ɨ* vs. *o*. Since the A'ingae /*o*/ does not contrast with /*u*/, its realization ranges quite widely [*o* ~ *u*], and is more extended than that of either front vowel /*e* vs. *i*/ (Brandt and AnderBois, t.a.). The stressed oral /*o*/ is typically realized as close ([*'u*]) and the stressed nasal /*õ*/ is more open ([*'õ*]). Unstressed /*o*/ and /*õ*/ are more variable but generally somewhat centralized (Brandt and AnderBois, t.a.). For the sake of consistency, the transcriptions presented in this paper do not reflect this phonetic detail and use *ɨ* and *o* throughout.

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 opening *ie, io, ia, oa*, the closing *ei, oi, ai, ao*, the height harmonic *oe, ii*, and the narrow *ae* (11).³ In rapid speech, the second vowel of /*ae*/ is often raised, approaching a merger with [*ai*]. In the manner case clitic =^ŋ*gae* MANN, the realization of /*ae*/ ranges from [*ɛæ*] to [*ɛ*] (i. e. [=^ŋ*gɛæ* ~ =^ŋ*gɛ*]). A'ingae diphthongs are relatively rare; as such, the examples below do not form a minimal set.

- (11) ELEVEN LICIT DIPHTHONGS
- | | | |
|-------------------------------|-------------------|--------------------------------|
| a. <i>'tsãⁿdie</i> | b. <i>'kʰɨi</i> | c. <i>'õ^mbio</i> |
| man | lie down | level |
| d. <i>'osei</i> | e. <i>'koeʔhe</i> | f. <i>'tʃʰoi</i> |
| fall | sun | row |
| g. <i>'ak^hia</i> | h. <i>'fae</i> | i. <i>'ŋgoaʔt^hi</i> |
| just because | one | boil |
| j. <i>'aiʔvo</i> | | k. <i>'tsaoʔpa</i> |
| body | | nest |

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.

³ The eleven diphthongs are identified based on phonological criteria, such as the position of stress discussed in Section 6.2. A different count is given by Repetti-Ludlow et al. (2019), who use phonetic measurements to identify only six diphthongs (*ai, oe, oa, oi, ii, ao*).

- (12) SELECT NASAL DIPHTHONGS
- | | | | | |
|-------------------------|--------|-----------|---------|------------|
| a. 'ãʔ ^m bĩã | b. 'ãĩ | c. 'tĩĩfa | d. 'kõẽ | e. 'kõãkõã |
| have | dog | chambira | mature | trickster |

4 PHONOTACTICS AND MARKEDNESS AVOIDANCE

The A'ingae syllable structure can be schematized as (C)V(V)(ʔ). The eight syllable types so abbreviated are exemplified in (13-14). 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. (Phrase-initially, 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.

- (13) PLAIN (NON-GLOTTALIZED) SYLLABLE TYPES
- | | | | |
|----------|------------|------------|--------------|
| a. V: 'i | b. VV: 'ãĩ | c. CV: 'se | d. CVV: 'tĩi |
| bring | dog | be spicy | rain |
- (14) GLOTTALIZED SYLLABLE TYPES
- | | | | |
|---------------|-----------------|-----------------|-------------------|
| a. Vʔ: 'ĩʔ.nã | b. VVʔ: 'aiʔ.vo | c. CVʔ: 'seʔ.he | d. CVVʔ: 'tĩiʔ.ve |
| cry | body | cure | overmorrow |

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 6.2](#).

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](#). In certain contexts, including the utterance-final position, vowels can be realized as creaky, devoiced, and/or heavily reduced, often to the point of seeming deletion.

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.⁴ The vast majority 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 \(2021b, 2023c, in prep. t.a.\)](#), [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) aimed at averting illicit vowel sequences. I then present the processes of diphthong rounding (§4.1.2) and raising (§4.1.3) observed after labial consonants. All phonological processes discussed in this section and throughout the rest of the paper are to be understood as categorical, unless explicitly identified as gradient.

⁴ The pluractional glottal stop infixation discussed in [Section 6.3](#) may be seen as a possible exception.

4.1.1 *Diphthong legalization*

Morphologically complex forms may give rise to underlying sequences of vowels that do not form a licit diphthong (cf. 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/ (15a-b) and /ia/ (15c-e) are converted to [ia]. The rule capturing illicit diphthong avoidance is stated in (16). This and other diphthongal processes discussed throughout this section apply to oral and nasal diphthongs alike.

- (15) ILLICIT DIPHTHONGS AVOIDED
- | | | | | |
|--|----------------|-----------------------------|---|----------------|
| a. / ⁿ dzeʔ ⁿ dze -ã / | b. /koʔfe -ã / | c. /i ⁿ dzi -a / | d. / ⁿ dek ^h i -a / | e. /hiʔri -ã / |
| [ⁿ dzeʔ ⁿ dziã] | [koʔfiã] | [i ⁿ dziã] | [ⁿ dek ^h ia] | [hiʔriã] |
| flecked -ADN | play -CAUS | green -ADN | PL.ANIM -ADN | burn -CAUS |

- (16) DIPHTHONG LEGALIZATION RULE
e, i → i / _a
The vowels e and i raise and front to i before a.

4.1.2 *Postlabial rounding*

The diphthong /ae/ often rounds to [oe] after the labial consonants *f, p, p^h, m^b, v, and m* (17). The process is optional 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 *a'tapōē*, but then correct it to *a'tapāē*. The categoricity of postlabial rounding is at present unclear.

- (17) DIPHTHONG *ae* ROUNDED POSTLABIALLY
- | | | | | |
|-------------|----------------|--|-------------|----------------|
| a. /faesi / | b. /atapa -ē / | c. /k ^h ap ^h oʔpa -ē / | d. /vaeji / | e. /siʔma -e / |
| [foesi] | [a'tapōē] | [k ^h ap ^h oʔpōē] | [voeji] | [siʔmōē] |
| other | breed -CAUS | landslide -CAUS | just | bruised -ADV |

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

4.1.3 *Postlabial raising*

Finally, A'ingae underwent a sequence of changes that resulted in the raising of **ai* to *ii* after labial consonants (Dąbkowski, 2023b). 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 *p^hāijā ~ p^hīijā* ‘incline.’) Additionally, morphologically complex forms where the underlying sequence **a+i* arises at a morpheme boundary after a labial consonant are reported with *ii* (19). The sound change of postlabial raising is restated in (20).

- (19) DIPHTHONG **a+i* RAISED POSTLABIALLY (Dąbkowski, 2023b, p. 6; based on Borman, 1976)
- | | | | |
|-----------------------|-------------------------|----------------------|----------------------|
| a. <i>*taʔva -ite</i> | b. <i>*koehefa -ite</i> | c. <i>*sāfā -ite</i> | d. <i>*oʔma -ite</i> |
| <i>ta'viite</i> | <i>koehe'fiite</i> | <i>sā'fiite</i> | <i>ō'mīite</i> |
| cotton -PRD | summer -PRD | San Juan -PRD | peach palm -PRD |

- (20) POSTLABIAL RAISING SOUND CHANGE (Dąbkowski, 2023b, p. 4)
**ai > ii / C[LABIAL] _*
*The diphthong *ai raised to ii after labial consonants.*

In modern productions, some instances of *ii* 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 ~ ii] 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. o'pɪpaʔtʃo | b. 'teʔta | c. te'tete | d. 'toto | e. ko'koja |
| shoulder | flower | Waorani | whiten | demon |
- (23) STOPS WITH MATCHING PLACE AND MANNER — ALL ASPIRATED
- | | | | | |
|-------------|-------------|--------------|-------------|-----------------|
| a. 'pʰiʔpʰi | b. 'tʰiʔtʰā | c. 'tsʰatsʰa | d. 'tʰeʔtʰo | e. 'kʰaikʰoʔtʃo |
| corn | lack flavor | grate | tooth | harpoon |
- (24) STOPS WITH MISMATCHED PLACE OR MANNER — NO AGREEMENT
- | | | | | |
|------------|-----------|------------|-------------|------------|
| a. 'paʔtʰa | b. 'pakʰo | c. 'tʰotsi | d. 'tsiʔtʰa | e. 'kʰoʔpa |
| wasp | streaked | black fly | bone | defecate |
| | prochilod | | | |

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. 'pʰi=pa | b. 'toe -ʔtʰi | c. 'tsʰori=tsi | d. 'tʰoi=ʔtʃo | e. 'kā -kʰa |
| sit =SS | same -PLC | old =3 | ROW =SBRD | 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. 'hi | b. 'va =pi | c. 'afa -hi |
| | come | DEM =TERM | speak -INGR |
| | | | d. 'va =ve |
| | | | DEM =ACC2 |
| (27) | NASAL SEGMENTS IN ROOTS | | AND IN FUNCTIONAL MORPHEMES |
| | a. 'hĩ | b. 'mã =pi | c. 'ndaro -ʔhĩ |
| | be.INAN | INDF.SEL =TERM | piranha -CORE |
| | | | d. 'vã =mã |
| | | | DEM =ACC |

While nasality may be contrastive, the nasality of a segment may also result from progressive (Section 5.1) and regressive nasalization (Section 5.2), whereby the nasal quality of one segment affects other adjacent segments. Both processes are word-bound, i. e. nasality does not spread beyond the edge of a prosodic word. 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, ĩ, õ, ð, ẽ* (28d-e). As an outcome, vowels right of the triggering segment become nasal.⁵

- | | | | | | |
|------|--|---------|---------|----------|----------|
| (28) | NASAL STOPS AND VOWELS AS TRIGGERS OF PROGRESSIVE NASALIZATION | | | | |
| | a. /mae/ | b. /na/ | c. /ɲa/ | d. /õho/ | e. /ĩhi/ |
| | ['mõẽ] | ['nã] | ['ɲã] | ['õhõ] | ['ĩhĩ] |
| | send | meat | 1SG | bathe | rain |

The glottals *h* (28d-e, 29a-d) and *ʔ* (29d-e) are completely permeable to 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 exceptionlessly within A'ingae roots (29) and across morpheme boundaries, including suffixes and clitics such as the contrastive topic *-ha* CNTR (30a), the flat classifier *-he* FLAT (30b), the adnominal *-(ʔ)a* ADN (30c), the same subject conditional antecedent marker *2 =ʔha* IF2.SS (30d), as well as the imperfective *-ʔhe* IPFV and the imperative *-ha* IMP (30e).

- | | | | | | |
|------|--|-------------|--------------|-----------------|-----------------|
| (29) | GLOTTALS PERMEABLE TO NASAL SPREAD IN ROOTS | | | | |
| | a. /noha/ | b. /kĩhi/ | c. /tõho/ | d. /ĩʔha/ | e. /naʔe/ |
| | ['nõhã] | ['kĩhĩ] | ['tõhõ] | ['ĩʔhã] | ['nãʔẽ] |
| | thorn | catfish | make sound | want | river |
| (30) | GLOTTALS PERMEABLE TO NASAL SPREAD IN FUNCTIONAL MORPHEMES | | | | |
| | a. /ɲa =ha/ | b. /na -he/ | c. /kõẽ -ʔa/ | d. /kãʔhe =ʔha/ | e. /ã -ʔhe -ha/ |
| | ['ɲãhã] | ['nãhẽ] | ['kõẽʔã] | ['kãʔhẽʔhã] | ['ãʔhẽhã] |
| | 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

⁵ 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 underlyingly oral and attribute their nasality to nasal spreading.

the section). For example, in (30e), the root \tilde{a} ‘eat’ nasalizes the imperfective suffix $-?he$ IPFV to $-?h\tilde{e}$. Then, nasality spreads further onto the imperative suffix $-ha$ IMP, turning it into $-h\tilde{a}$.

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) \tilde{V} CV, and (C) \tilde{V} C \tilde{V} are all attested root shapes, but (C)V \tilde{C} \tilde{V} 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 that 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 ($ts\tilde{a}^n da$) $vej\tilde{a}\tilde{e}$ ‘lightning strike,’ possibly from the no longer attested $*veja$ and the causative $-\tilde{e}$ CAUS.)

(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.

Nonetheless, permeability to nasal spreading varies with the target segment and morpheme, both root-internally and across morpheme boundaries. Throughout the rest of the section, I discuss progressive nasalization as a morphologically-conditioned phonological process. Yet, since the extent of nasal spreading is often morpheme-specific, the nasal forms of suffixes and clitics may alternatively be treated as phonologically-conditioned (weak) suppletion (Paster, 2007, 2009).

5.1.2 Approximants

A’ingae has four oral approximants: palatal (j), labial (v), alveolar (r), and velar ($ɥ$). 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 v often alternate with nasal stops matching their place of articulation: $ɲ$ and m , respectively. The alveolar r and the velar $ɥ$ never alternate with nasal stops.

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 $-?ja$ 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. / \tilde{a} -ja /	b. / \tilde{a} -?ja /	c. / $k\tilde{a}$ -je /	d. / \tilde{a} -je /	e. / $ɲa$ =ji /
[$\tilde{a}ɲ\tilde{a}$]	[$\tilde{a}ʔɲ\tilde{a}$]	[$k\tilde{a}ɲ\tilde{e}$]	[$\tilde{a}ɲ\tilde{e}$]	[$ɲ\tilde{a}ɲ\tilde{i}$]
eat -IRR	eat -ASSR	look -PASS	eat -INF	1SG =EXCL

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

(33) PASSIVE $-je$ (OPTIONALLY) NASALIZING TO $-ʎge$

a. $*^n daʎno$ -je	b. / $^n daʎno$ -je /	c. / $^p paɲa$ -je /	d. / $\tilde{a}p^hi$ - \tilde{a} -je /
$^n d\tilde{a}ʎn\tilde{o}ʎge$	[$^n d\tilde{a}ʎn\tilde{o}ɲ\tilde{e}$]	[$p\tilde{a}ʎ\tilde{a}ɲ\tilde{e} \sim p\tilde{a}ʎ\tilde{a}ʎge$]	[$\tilde{a}p^hi\tilde{a}ɲ\tilde{e} \sim \tilde{a}p^hi\tilde{a}ʎge$]
harm -PASS	harm -PASS	understand -PASS	fall -CAUS -PASS
“got hurt”	“was harmed”	“was understood”	“be made fall”

5.1.2.2 THE LABIAL APPROXIMANT Historically, the labial v has nasalized to m after nasal vowels. This can be seen e. g. in $s\tilde{i}m\tilde{i}ta$ ‘vanilla,’ a compound of $s\tilde{i}$ ‘black’ and $v\tilde{i}ta$ < Kichwa $wayta$ ‘flower’ (ALDP, 2018). (The change of Kichwa ay to ii shows postlabial raising, discussed in Section 4.1.3).

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

- (34) PALATAL APPROXIMANT *v* OPTIONALLY NASALIZING TO *m* IN FUNCTIONAL MORPHEMES
- | | | | |
|--|--|--|--|
| a. / <i>kiri</i> =ʔvi /
['kiriʔvi]
cat =DMN2 | b. / <i>tʃaʔk^hĩ</i> =ve /
['tʃaʔk ^h ĩve]
water =ACC2 | c. / <i>ãtiã</i> =ʔvi /
['ãtiãʔmĩ ~ 'ãtiãʔvi]
relative =DMN2 | d. / <i>k^homa</i> =ve /
['k ^h õmãmẽ ~ 'k ^h õmãve]
chili =ACC2 |
|--|--|--|--|

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

- (35) CORPOREAL -ʔvo NASALIZING TO -ʔ^ŋgo
- | | | | |
|---|---|--|--|
| a. / <i>aʔi</i> -ʔvo /
[aiʔvo]
person -CORP | b. / <i>poʔtãẽ</i> -ʔvo /
[po'tãẽʔ ^ŋ go]
shoot -CORP | c. / <i>kini</i> -ʔvo /
['kĩnĩʔ ^ŋ go]
stick -CORP | d. * <i>sĩ</i> -vo
'sĩ ^ŋ go
black -CORP |
|---|---|--|--|

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

- (36) DEVELOPMENTS OF VELAR APPROXIMANT **uɣ* (based on Sanker and AnderBois, t.a.)
- | | | | | |
|----------------|---------------|-------------|-------------|-----------------------|
| | - <i>e, i</i> | - <i>o</i> | elsw. | |
| i. PRE-A'INGAE | * <i>uɣ</i> | * <i>uɣ</i> | * <i>uɣ</i> | * <i>uĩ</i> |
| ii. A'INGAE | <i>j</i> | <i>v</i> | <i>uɣ</i> | ^ŋ <i>g</i> |

In Sanker and AnderBois's (t.a.) reconstruction, the corporeal -ʔvo CORP goes back to *-ʔuɣo; its postnasal counterpart -ʔ^ŋgo is simply a reflex of the regularly nasalized *-ʔuĩo. Likewise, the passive -*je* PASS goes back to *-*uɣe*, and -^ŋ*ge* is a reflex of *-*uĩe*. (Subsequently, -^ŋ*ge* has been partially replaced with -*ŋẽ* 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 *r* never occurs after nasal vowels in native roots. In the habitual subject nominalizer -*ri* HSN (37a), the alveolar *r* remains oral and blocks the spread of nasalization (37b-d). For a discussion of *r* in borrowings, see Dąbkowski (in prep.).

- (37) ALVEOLAR APPROXIMANT *r* NOT NASALIZING
- | | | | |
|---|--|--|---|
| a. / <i>koʔfe</i> -ri /
[ko'ʔeri]
play -HSN | b. / <i>sema</i> -ri /
[sɛ'mãri]
work -HSN | c. / 'ana -ri /
['ã'nãri]
sleep -HSN | d. / <i>ã</i> -ri /
['ãri]
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. 'tẽfẽ	b. 'tãĩĩ	c. 'mĩĩsã	d. 'pãĩfã	e. 'kĩĩfõ
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 $-foʔtfo$ DFFS (39b), the permissive suffix $-ʔse$ PERM (39c), the different subject $-si$ DS (39d), or the subject nominalizer $-ʔsĩ$ SN (39e).

(39) FRICATIVES BLOCKING NASAL SPREAD IN FUNCTIONAL MORPHEMES

a. /ã -ʔfa /	b. /ã -foʔtfo /	c. /ã -ʔse /	d. /ã -si /	e. /ã -ʔsĩ /
['ãʔfa]	['ãfoʔtfo]	['ãʔse]	['ãsi]	['ãʔsĩ]
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. $\tilde{V}T\tilde{V}$ (40).

(40) PLAIN STOPS PERMEABLE TO NASAL SPREAD IN ROOTS

a. 'sẽpẽ	b. 'ãtĩã	c. 'õtsĩã	d. 'ãtĩã	e. 'tsĩkõ
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, \tilde{V}^NDV). In fewer roots, prenasalized stops appear word-initially. In that position, they are also typically followed by oral vowels, i. e. NDV - (42).

(41) PRENASALIZED STOPS BLOCKING NASAL SPREAD IN ROOTS

a. 'k ^h ĩ ^m ba	b. 'ã ⁿ de	c. 'ĩ ⁿ dzi	d. 'mã ⁿ dzi	e. 'mã ⁿ gi
tobacco	land	green	squeeze	drag

(42) WORD-INITIAL PRENASALIZED STOPS FOLLOWED BY ORAL VOWELS

a. ^m bĩt ^h õ	b. ⁿ darõ	c. ⁿ dzija	d. ⁿ dzoõõ	e. ^ŋ ge ^h i
run	piranha	calm down	be afraid	divide

Morpheme-internal sequences of a prenasalized stop followed by a nasal vowel, i. e. $^ND\tilde{V}$, arise regularly due to regressive nasalization, i. e. when the vowel is nasalized by a following nasal stop, e. g. ^mbĩnĩ 'blind,' or a prenasalized stop, e. g. ^ŋgãⁿga 'scatter.' In addition, there are some exceptional $^ND\tilde{V}$ sequences that cannot be attributed to regressive nasalization. These include cases of seeming reduplication such as 'tãⁿdã 'tie' and 'kõⁿgõ 'rot' (Sanker and AnderBois, t.a.), apparently derived from the no longer independently attested *tã and *kõ.⁶ Other instances of $^ND\tilde{V}$ include the roots 'fĩⁿgĩ 'winnow,' 'mbĩfĩ 'flea,' plausible cases of lexicalized causatives with $-ã/-ẽ$ CAUS, such as 'ã^mbĩã 'have,' and borrowings. Finally, there are some exceptions where an unaspirated stop blocks nasal spreading without prenasalizing, i. e. $\tilde{V}TV$, including 'nẽpi 'disappear,' 'nãpi/'nẽpi '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 (\tilde{V}^NDV). Other morphemes block nasal spreading without stop

⁶ 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 6.3.

prenasalization ($\tilde{V}TV$). Many morphemes with the labial p and alveolar t prenasalize them, including the associative $-ʔpa$ ASSC (43a), the nominalizer $-ʔpa$ N (43b), the same subject marker $-pa$ SS (43c), the same subject conditional antecedent marker $-ʔta$ IF.SS (43d), and the reportative clitic $-te$ RPRT (43e).

- (43) LABIAL p AND ALVEOLAR t PRENASALIZED TO mb AND nd IN MANY FUNCTIONAL MORPHEMES
- | | | | | |
|---------------------------|-------------------------|------------------------|-------------------------|------------------------|
| a. / tʃã -ʔpa / | b. / ã -ʔpa / | c. / ã =pa / | d. / ã =ʔta / | e. / ã =te / |
| ['tʃãʔ ^m ba] | ['ãʔ ^m ba] | ['ã ^m ba] | ['ãʔ ⁿ da] | ['ã 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 (44a), the habitual subject nominalizer $-pari$ HSN (44b), the terminative case clitic $-pi$ TERM (44c), and the periodic classifier $-ite$ PRD (44d).

- (44) LABIAL p AND ALVEOLAR t NOT PRENASALIZED IN OTHER FUNCTIONAL MORPHEMES
- | | | | |
|----------------|---------------------------------|-----------------|----------------|
| a. / tʃã =pa / | b. / ⁿ daʔno -pari / | c. / naʔe =pi / | d. / na -ite / |
| ['tʃãpa] | [' ⁿ dãʔnõ'pari] | ['nãʔëpi] | ['nãĩte] |
| 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 $-tsi$ 3 (45a), the round classifier $-ʔtʃo$ RND (45b), the simulative marker $-ʔkã$ SML (45c), the second person subject clitic $-ki$ 2 (45d), the diurnal classifier $-(ʔ)ki$ DRN (45e), and others.

- (45) OTHER VOICELESS STOPS NEVER PRENASALIZED IN FUNCTIONAL MORPHEMES
- | | | | | |
|---------------|-----------------|----------------|--------------|----------------|
| a. / ã =tsi / | b. / kã -ʔtʃo / | c. / na =ʔkã / | d. / ã =ki / | e. / ma -ki / |
| ['ãtsi] | ['kãʔtʃo] | ['naʔkã] | ['ãki] | ['mãki] |
| eat =3 | look =RND | 1SG =SML | eat =2 | INDEF.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 $=^mbe$ BEN (46a), the negative $=^mbi$ NEG (46b), the animate plural $=^ndek^hi$ PL.ANIM (46c), the dative $=^nga$ DAT (46d), and the first person subject clitic $=^ngi$ 1 (46e). 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).

- (46) PRENASALIZED STOPS AS UNDERLYING IN FUNCTIONAL MORPHEMES
- | | | | | |
|-----------------------------|-----------------------------|---|-----------------------------|-----------------------------|
| a. / ke = ^m be / | b. / ha = ^m bi / | c. / aʔi = ⁿ dek ^{hi} / | d. / ke = ⁿ ga / | e. / ha = ⁿ gi / |
| ['kẽ ^m be] | ['hã ^m bi] | ['aʔi ⁿ dek ^{hi}] | ['kẽ ⁿ ga] | ['hã ⁿ gi] |
| 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 (47); in other cases, they block the progressive nasalization (48) (Sanker and AnderBois, t.a.). Note that positing independently specified nasal vowels in the second syllables of (47) would run afoul of the generalization in (31).

- (47) ASPIRATED STOPS PERMEABLE TO NASAL SPREAD IN ROOTS
- | | | | | |
|---------------------------------------|-----------------------|---------------------------------------|-------------------------|-----------------------|
| a. 'p ^h iʔp ^h i | b. 'ãt ^h ã | c. 'p ^h ĩts ^h ã | d. 'hãʔt ^h ĩ | e. 'õk ^h ã |
| calm down | ganoid fish | duck | flat (nose) | envelop |
- (48) ASPIRATED STOPS BLOCKING NASAL SPREAD IN ROOTS
- | | | | | |
|-----------------------|-------------------------|-----------------------|---------------------------|--------------------------|
| a. 'ãp ^h i | b. 'ʃiʔp ^h i | c. 'ãt ^h e | d. shĩ'k ^h apa | e. sã'k ^h opa |
| fall | younger sister | stop | coriander | wing |

In functional morphemes, aspirates always block nasal spreading (Sanker and AnderBois, *t.a.*), including the egressive $-ʔ^{h}e$ EGR (49a), the place classifier $-ʔ^{h}i$ PLC (49b), the adjectivizer $-ts^{h}i$ ADJ (49c), the attenuated imperative $-k^{h}a$ ATTN (49d), and the delimited space classifier $-k^{h}i$ DLM (49e).

(49) ASPIRATED STOPS BLOCKING NASAL SPREAD IN FUNCTIONAL MORPHEMES

a. / $naʔe =ʔ^{h}e$ /	b. / $hē -ʔ^{h}i$ /	c. / $sā -ts^{h}i$ /	d. / $ā -k^{h}a$ /	e. / $ʔgepo -k^{h}i$ /
[$'nāʔēʔ^{h}e$]	[$'hēʔ^{h}i$]	[$'sāts^{h}i$]	[$'āk^{h}a$]	[$'gēʔōk^{h}i$]
river =EGR	sound =PLC	dry =ADJ	eat =ATTN	banana =DLM

5.2 Regressive nasalization

Nasal stops (50b-c) and prenasalized voiced stops (50a,d-e) nasalize the vowel to their left, across a glottal stop if present (50b-c). The process is fully general and operates within roots (50a-b) and across morpheme boundaries (50c-e). Phonetically, regressive nasalization is partial—though velum lowering may begin near the start of the vowel, it is often delayed as late as the vowel's midpoint, and reaches full aperture before or at the triggering segment (Bennett et al., 2024). As such, the process is suggestive of extensive controlled coarticulation, and thus differs from the fully phonologized progressive nasalization. Nonetheless, the phonological distinction between nasal and oral vowels is neutralized before nasal and prenasalized stops. For example, $'iʔnā$ 'cry' (50b) may not contrast with a hypothetical $*iʔnā$.

(50) REGRESSIVE NASALIZATION

a. / $tsa^{n}da$ /	b. / $iʔna$ /	c. / $tsa =ʔma$ /	d. / $aʔi =^{m}bi$ /	e. / $jaja =^{n}ga$ /
[$'tsā^{n}da$]	[$'iʔnā$]	[$'tsāʔmā$]	[$'aʔ^{m}bi$]	[$'jajā^{n}ga$]
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 (50d), and preceding approximants do not turn into nasals (50e). 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, v, r, u) never appear before nasal vowels in native roots (Sanker and AnderBois, *t.a.*), i. e. morpheme-internally, $*R\tilde{V}$ sequences are banned. In borrowings, the $*R\tilde{V}$ ban may be obeyed (e. g. Sp. *lanza* > $'nāsaʔtʃo$ 'spear') or disobeyed (e. g. Sp. *grande* > $'rā^{n}de$ 'large'). For a further discussion of phonological patterns in borrowings, 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 typically followed by oral vowels. However, in words with suffixes and clitics, prenasalized stops (51a-b) and oral approximants (51c-d) often appear before nasal vowels due to regressive nasalization.

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

a. / $tsa^{n}da =ne$ /	b. / $si^{m}ba =^{m}bi$ /	c. / $va =ma$ /	d. / $^{n}daro =^{n}ga$ /
[$'tsā^{n}dānē$]	[$'sī^{m}bā^{m}bi$]	[$'vāmā$]	[$'^{n}darō^{n}ga$]
thunder =ELAT	fish =NEG	DEM =ACC	piranha =DAT

6 PROSODY AND GLOTTALIZATION

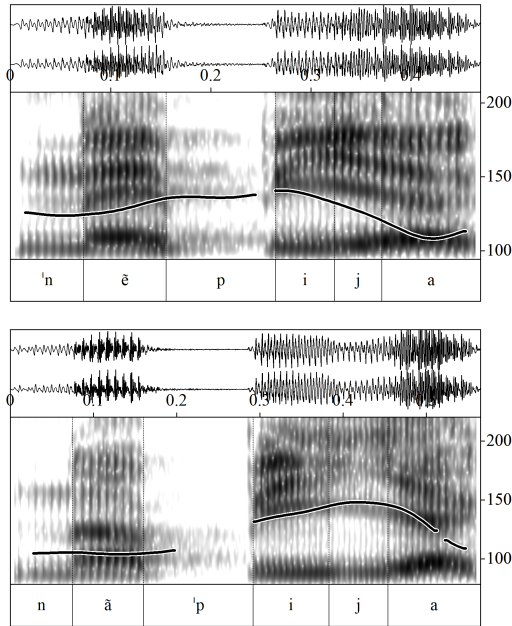
In A'ingae, at least three levels of the phonological hierarchy can be established: the prosodic word, the phonological phrase, and the intonational phrase. Section 6.1 presents phonetic evidence for stress and glottalization, contrastive at the level of the phonological word. Section 6.2 discusses the basic types of their morphophonological interactions. Section 6.3 describes the prosodic expressions of pluractionality via glottal stop insertion and reduplication. Section 6.4 touches on clause-level prosody and the discursive use of falsetto.

6.1 Realization of stress and glottalization

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 (52a-b) and in morphologically complex forms (52c-d) (Dąbkowski, 2021b). Corresponding spectrograms (Boersma and Weenink, 2023; Elvira García, 2022) are given below.

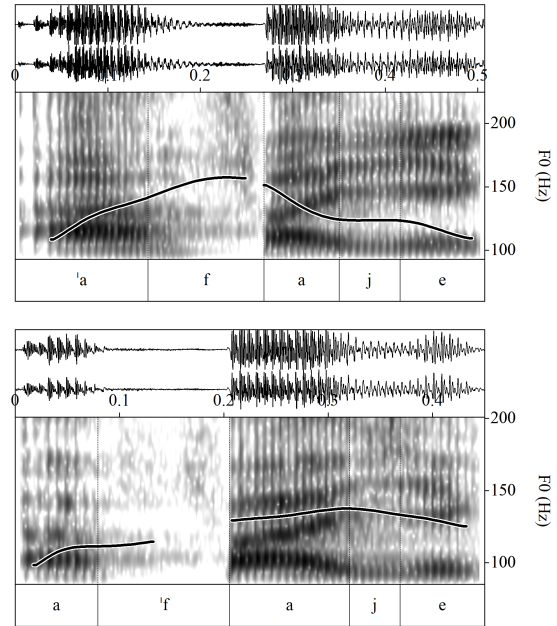
(52) STRESS CONTRASTIVE IN ROOTS

- a. 'nēpi -ja disappear -IRR b. nā'pi -ja arrive -IRR



AND INFLECTED FORMS

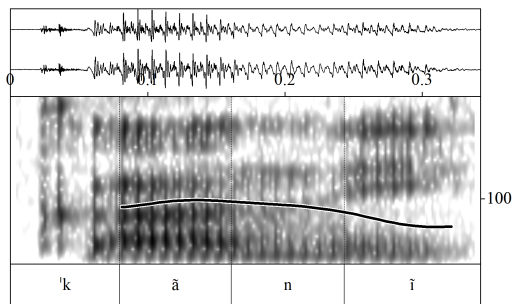
- c. 'afa -je speak -INF d. a'fa -je speak -PASS



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 (53a-b) (Borman, 1962; Fischer and Hengeveld, 2023; Repetti-Ludlow, 2021), and in morphologically complex forms, the position of glottalization is contrastive as well (53c-d) (Dąbkowski, 2023c).

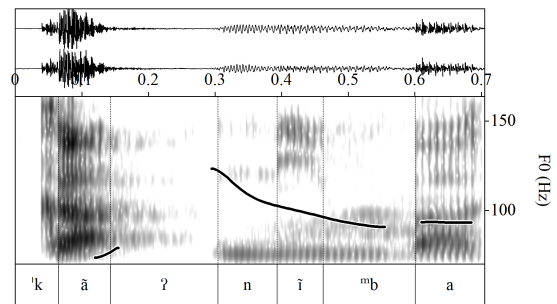
(53) GLOTTALIZATION CONTRASTIVE IN ROOTS

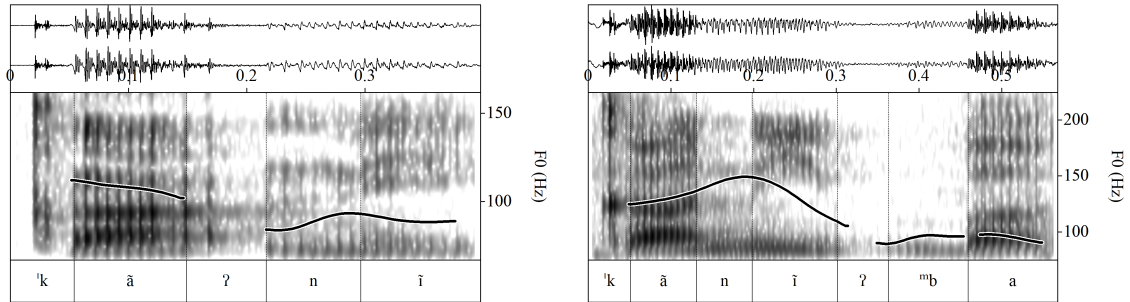
- a. 'kānī yesterday b. 'kāʔnī enter



AND INFLECTED FORMS

- c. 'kāʔnī -mba enter -ss d. 'kānī -ʔmba enter -N





6.2 Morphophonology of stress and glottalization

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 the interactions discussed in Dąbkowski (2023c) is illustrated in (54).

(54) STRESS–GLOTTAL INTERACTIONS	i. PLAIN	ii. STRESSED	iii. GLOTTALIZED
	/ kãtsĩ ^ŋ gĩã /	/ 'afase /	/ ak ^h eʔpa /
	stoke (fire)	offend	forget
a. BARE ROOT, i. e. -∅	i. kã'tsĩ ^ŋ gĩã	ii. 'afase	iii. 'ak ^h eʔpa
b. INNER RECESSIVE, e. g. -hi INGR	i. kãtsĩ ^ŋ gĩãhĩ	ii. 'afasehi	iii. 'ak ^h eʔpahi
c. INNER DOMINANT, e. g. -je PASS	i. kãtsĩ ^ŋ gĩãjẽ	ii. afa'seje	iii. ak ^h e'paje
d. INNER GLOTTALIZED, e. g. -ʔhe IPFV	i. kãtsĩ ^ŋ gĩãʔhẽ	ii. a'faseʔhe	iii. a'k ^h eʔpaʔhe
e. OUTER RECESSIVE, e. g. -ja IRR	i. kãtsĩ ^ŋ gĩãjã	ii. 'afaseja	iii. 'ak ^h eʔpaja
f. OUTER DOMINANT, e. g. -k ^h a ATTN	i. kãtsĩ ^ŋ gĩãk ^h a	ii. afa'sek ^h a	iii. ak ^h eʔ'pak ^h a

Roots can be classified as plain (54i), stressed (54ii), or glottalized (54iii) (Dąbkowski, 2023c). The first category consists of roots that do not have underlying stress. On the surface, underlyingly stressless forms receive default penultimate stress (54a.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 (54a.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 (54a.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 (54b.i). Underlying stress and glottalization surface faithfully (54b.ii-iii). *Inner dominant* suffixes delete underlying stress and glottalization. On the surface, the destressed forms receive regular penultimate stress (54c.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) (54d.i). Otherwise, stress is assigned to the syllable which precedes it (54d.ii-iii).

Outer recessive suffixes preserve preexisting stress and glottalization if present (54e.iii-iii). Otherwise, they assign stress to the syllable that immediately precedes them (54e.i). Note that although the surface forms with

inner recessive (54a) 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 (54f.iii) but always stress the syllable to their immediate left (54f.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, in prep. t.a.).

6.3 Expressions of pluractionality

In addition to regular subject plurality expressed with $-ʔfa$ PLS, A'ingae verbs can be marked for pluractionality via prosodic means. First, pluractionality may be expressed by inserting a glottal stop (55). 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 (55d-e) and to the glottalized syllable in disyllabic roots (55a-b).

- (55) GLOTTAL STOP EXPRESSING PLURACTIONALITY (based in part on Dąbkowski, 2023c, p. 7)
- | | | | | |
|----------------|-------------------------------|-----------------|---|---|
| a. / 'ana -ʔ / | b. / pa ⁿ dza -ʔ / | c. / atapa -ʔ / | d. / op ^h at ^h i -ʔ / | e. / o ⁿ dik ^h i -ʔ / |
| ['ãʔnã] | ['pãʔ ⁿ dza] | ['ataʔpa] | ['op ^h aʔt ^h i] | ['õ ⁿ diʔk ^h i] |
| sleep -PLA | hunt -PLA | breed -PLA | pick -PLA | don -PLA |

Additionally, pluractionality may also be expressed with reduplication. The A'ingae reduplicant is a verbal suffix of the form $-ʔσ$ PLA; the glottal stop is a fixed segment and the reduplicated syllable is copied from the right edge of the base (56) (Dąbkowski, 2023a). The reduplicant may attach to bare verbal roots or verbs derived with causative $-ã/-ẽ/-ʔna$ CAUS.

- (56) REDUPLICATION EXPRESSING PLURACTIONALITY ON DISYLLABIC ROOTS
- | | | | | |
|-----------------|------------------|--|--|------------------|
| a. / 'ana -ʔσ / | b. / koʔfe -ʔσ / | c. / fi ⁿ dii -ʔσ / | d. / etʃ ^h oẽ -ʔσ / | e. / pasia -ʔσ / |
| ['ãnãʔnã] | ['kofeʔfe] | ['fi ⁿ diiʔ ⁿ dii] | ['etʃ ^h oʔtʃ ^h õẽ] | ['pasiʔsia] |
| sleep -PLA | play -PLA | sweep -PLA | mix -PLA | stroll -PLA |

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 (56c-e), stressed (56a), and glottalized roots (56b). Underlying glottal stops are overridden (56b). 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 (56c-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).

6.4 Clause-level prosody and falsetto

In A'ingae, prosody does not distinguish between different illocutionary clause types. As such, declarative (57a-b), polar interrogative (57c), content interrogative, imperative (57d), 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 (57a) and temporal/conditional antecedents (57b), 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 (*kõẽ'hĩsi* in 57a; *kĩʔnãʔhẽʔnĩ* in 57b).

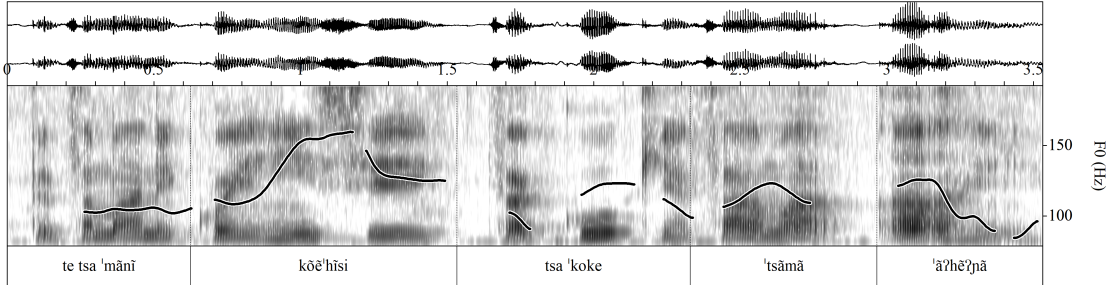
(57) PROSODIC CONTOURS

(data from AnderBois and Silva, 2018)

a. COSUBORDINATE CLAUSE + DECLARATIVE CLAUSE

=te tsa 'mānī kōē-hī-si | tsa 'koke 'tsā-mā 'ā-ʔhē-ʔnā
 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

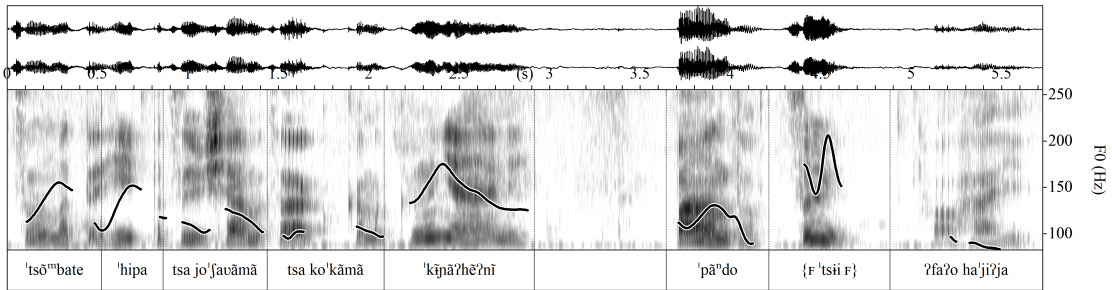
'tsō=^mba =te 'hī=pa tsa jo'ʔavā=mā tsa ko'kāmā 'kī-ʔnā-ʔhē-ʔnī | 'pāⁿdo {_F'tsi_F} =ʔfaʔo
 do=SS -RPRT COME=SS ANA iron=ACC ANA Spaniard red-CAUS-IPFV=IF.DS | fox walk=EVAL

ha-'ji-ʔja

go-PRSP-ASSR

“When the Spaniard came back and was heating the iron, the fox passed by.”

(20170804_kuke_chiste_FACQ)

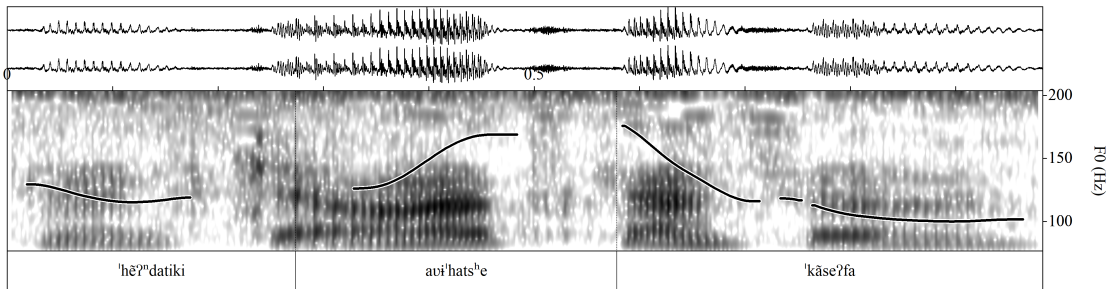


c. INTERROGATIVE CLAUSE

'hēʔⁿda =ti=ki avⁱ'ha=ts^h-e 'kāse-ʔfa
 then =YNQ=2 rejoice-ADJ-ADV live-PLS

“Do you live happily then?”

(20170801_escuela_CLC)

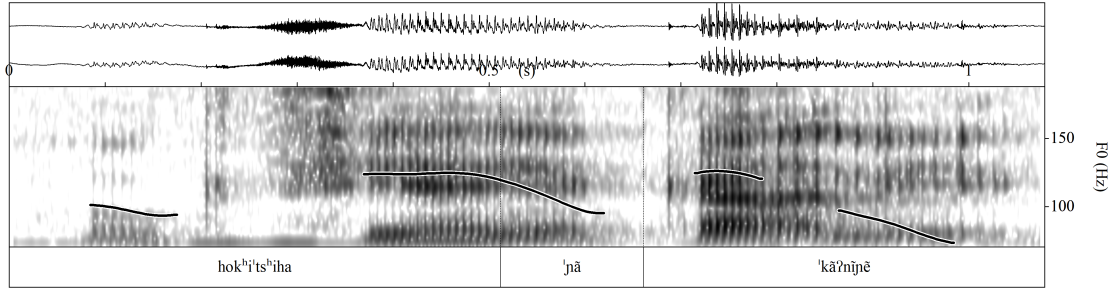


d. IMPERATIVE CLAUSE

hok^hi'ts^hi-ha 'na 'kāʔnī-ʔē
 get out-IMP 1SG enter-INF

“Get out of my way so I can enter!”

(20170804_kuke_chiste_FACQ)

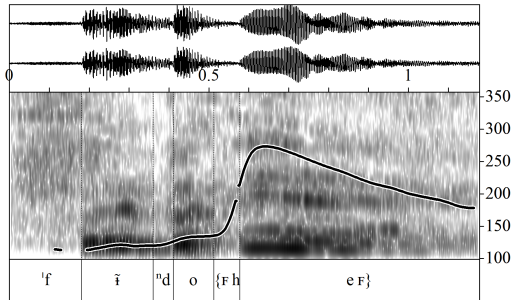


Finally, A'ingae has a discursive use of falsetto (a vocal register characterized primarily by a higher F0, as well as reduced harmonics-to-noise ratio, steeper spectral slope, and higher jitter; Childers and Lee, 1991; Keating, 2014; Neiman et al., 1997) (Sanker, Silva, et al., 2018). In A'ingae, falsetto 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 *'tsi* in (57b) and in (58).

(58) FALSETTO

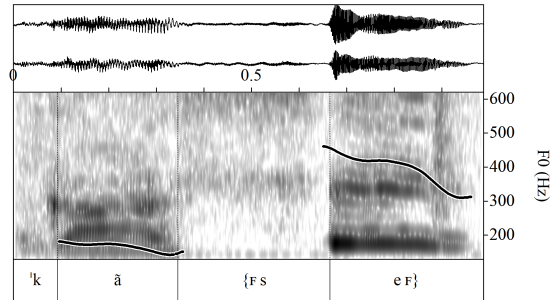
a. *'fɪ̃ⁿdo* {_F-ʎ_Fje_F}

scream-IPFV (20170804_kuke_chiste_FACQ)

b. *'kã* {_Fse_F}

live (20170803_dyandyaccu_LC)

(data from AnderBois and Silva, 2018)



7 DISCUSSION AND CONCLUSIONS

In conclusion, I have presented an overview of the core aspects of A'ingae phonology. A'ingae shows a number of processes whose broad strokes resemble patterns observed in Amazonia and beyond. Yet, a closer look reveals intricacies that often distinguish A'ingae from the previously described languages. For example, A'ingae has a process of postlabial rounding (§4.1.2). While labial consonants have been previously observed to round adjacent vowels (e.g. Galloway, 1990; Lakshmi, 1982; Lionnet, 2017), the A'ingae postlabial rounding targets uniquely diphthongs. Additionally, A'ingae diphthongs underwent the change of postlabial raising (§4.1.3). Vowel raising after labial consonants has been—to best of my knowledge—previously unreported.

A'ingae shows regressive (§5.2) and progressive (§5.1) nasalization. Thus, it falls squarely within the Amazonian sprachbund, where nasal spreading abounds (van Gijn, 2014). The two directionalities of A'ingae nasalization, however, are characterized by markedly different properties. Regressive nasalization is non-iterative, gradient, and exceptionless. Progressive nasalization is iterative, categorical, and morphologically conditioned. This suggests that the two processes are governed by different modules of the A'ingae grammar and underscores the care with which nasal spreading should be studied cross-linguistically.

Relatedly, A'ingae has two series of sonorants (oral and nasal) and three series of stops (plain, aspirated, and prenasalized). While the surface distribution of the five series is partially conditioned by the presence of nasality, and thus somewhat reminiscent of other languages in the region, neither series can be easily collapsed as a purely allophonic variant of another (§3.1, §5). This distinguishes A'ingae from neighbor-

ing languages, where at least one series is typically derived on the surface. For example, in Desano and Wanano (Eastern Tukanoan), voiced stops and the palatal glide are realized as nasal stops in nasal contexts (i. e. $b, d, j, g \rightarrow m, n, \eta, \eta / \sim _$) (Silva, 2016; Stenzel, 2007). In Panāra (Jê), nasal stops are realized as postoralized before oral vowels (e. g. $m \rightarrow m^p / _ V$) and oral stops as prenasalized after nasal vowels (e. g. $p \rightarrow m^p / \tilde{V} _$) (Lapierre, 2020).

Glottalization and stress are closely linked in the A'ingae phonology, and stress is often assigned to the syllable with the second mora to the left of the glottal stop (§6.2). Metrical restrictions on glottalization have been reported, for example, in Danish (North Germanic), where a glottal accent may only appear on “a sonorous second mora of a heavy syllable that is a monosyllabic foot” (Itô and Mester, 2015, p. 14), and Mixtec (Oto-Manguenan), where glottalization is “associated with the initial mora of the foot” (Penner, 2019, p. 257). In the previously reported cases, however, glottalization appears on the stressed syllable. In A'ingae, an unusual pattern is seen: glottalization surfaces preferentially in the unstressed syllable that immediately follows the prosodic peak of the word.

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