Allomorph selection precedes phonology: Evidence from Yindjibarndi*

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August 16, 2021

Abstract

Theories of the phonology-morphology interface can be differentiated by their claims regarding the timing of phonologically conditioned suppletive allomorphy (PCSA) and phonology. Some (e.g. Paster 2006, Embick 2010) argue that PCSA occurs in a morphological component of the grammar that precedes phonology; others (e.g. Kager 1996, Mascaró 2007, Smith 2015) argue that at least phonologically optimizing PCSA occurs in the phonological component of the grammar, in parallel with phonology. This paper discusses a case of apparently optimizing PCSA in Yindjibarndi (Pama-Nyungan, Wordick 1982), proposes an analysis in which suppletive allomorphy precedes phonology, and shows that the alternative – an analysis in which PCSA occurs in the phonological component of the grammar – should be dispreferred.

1 Introduction

Phonologically conditioned suppletive allomorphy (PCSA; Carstairs 1988, term from Paster 2006; see Inkelas 2014: 9.1 for an overview) is a type of suppletion in which the factors deciding which of two or more distinct underlying forms of an affix is selected are phonological in nature. In Biri (Pama-Nyungan, Terrill 1998), for example, the form of the locative suffix depends on the syllabicity of the stem-final segment. If the stem ends in a vowel, the locative exponent is /ŋga/; if the stem ends in a consonant, the locative exponent is /da/ (1).

(1) Allomorphy in the Biri locative

	Allomorph	*Environment*	*Example*	*Gloss*
a.	/ŋga/	/V_	[buri-ŋga]	‘fire-LOC’
			[ŋugunda-ŋga]	‘night-LOC’
b.	/da/	/C_	[bidhal-da]	‘Woodhouse Station-LOC’
			[waɲal-da]	‘boomerang-LOC’

*My thanks to Adam Albright, Arto Anttila, Maria Gouskova, Kate Mooney, Donca Steriade, three anonymous reviewers, and audiences at NYU’s Morphbeer, LSA 93, and Berkeley’s Phorum for comments on and critical discussion of this material.

PCSA can be conditioned by prosodic factors as well. In Kaititj (Pama-Nyungan, Koch 1980), for example, the form of the ergative/instrumental/locative suffix is conditioned by the number of syllables in the stem. If the stem has two syllables, the exponent is /ŋ/; if the stem has three or more syllables, the exponent is /l/ (2). (The /l/ allomorph surfaces as [ɭ] following an apical consonant in the stem; this is not illustrated here.)

(2) Allomorphy in the Kaititj ergative/instrumental/locative

	Allomorph	*Environment*	*Example*	*Gloss*
a.	/ŋ/	/σσ_	[aki-ŋ]	‘head-ERG’
			[aynpi-ŋ]	‘pouch-ERG’
b.	/l/	/σσσ_	[aɣirki-l]	‘sun-ERG’
			[aʈuyi-l]	‘man-ERG’

These cases of allomorphy are characterized as suppletive because there are no known phonological processes that can derive the allomorphs from one another. Biri [ŋg] does not alternate with [d], and Kaititj [ŋ] does not alternate with [l]. They are classified as phonologically-conditioned because phonological properties of the stems determine their distribution: segment type in the case of Biri, and stem length in the case of Kaititj.

One aspect of PCSA that has received a lot of attention is the degree to which it is *phonologically optimizing*. In some cases, allomorph selection appears to respect general phonotactic constraints; these cases are often referred to as optimizing. The Biri case (1) can be characterized as optimizing: selection of /da/ following consonant-final stems prevents triconsonantal clusters from emerging (*[bidhal-ŋga], *[waɲal-ŋga]). As triconsonantal clusters are extremely rare in Biri (Terrill 1998:13), suppletion in this case acts to help satisfy a more general phonotactic constraint. A further, well-known example of phonologically optimizing PCSA comes from the Moroccan Arabic 3rd singular masculine clitic (Harrell 1962, Mascaró 2007). Here, /u/ is selected following consonant-final roots, and /h/ is selected following vowel-final roots. The result is that syllable structure is optimized through avoidance of hiatus (3a) and avoidance of complex codas (3b).

(3) Allomorphy in the Moroccan Arabic 3rd singular masculine pronoun (Mascaró 2007:717)

	Allomorph	*Environment*	*Example*	*Gloss*
a.	/h/	/V_	[xtˤa-h]	‘his error’
			[ʃafu-h]	‘they saw him’
b.	/u/	/C_	[ktab-u]	‘his book’
			[ʃaf-u]	‘he saw him’

Not all cases of PCSA, however, are phonologically optimizing. Some cases of PCSA have no clear phonological motivation: allomorphy in Kaititj (2) provides an example of this sort, as there is no phonological reason why /ŋ/ should be preferred at the ends of disyllabic words and /l/ at the ends of longer ones.[1] Furthermore, some cases of PCSA appear to result in the violation of phonotactic constraints: one example comes from the Haitian Creole definite suffix (Klein 2003), where the /la/ allomorph is selected following consonant-final stems and the /a/ allomorph is selected following vowel-final stems. This distribution of allomorphs leads to apparently non-optimal syllables, as it

[1] One might wonder if /ŋ/ contributes a mora to shorter words, allowing for the satisfaction of some minimal length requirement. This seems unlikely: stress in Biri appears to be quantity-insensitive (Terrill 1998:13), so there is no reason to think that [ŋ] (or [l]) is moraic.

results in the creation of both codas (4a) and hiatus (4b). (Depending on the vocalic environment, a glide is sometimes inserted to break hiatus; see [bato-wa].)

(4) Allomorphy in the Haitian Creole definite suffix (Klein 2003:2-3)

	Allomorph	*Environment*	*Example*	*Gloss*
a.	/la/	/C_	[liv-la]	'the book'
			[ʃat-la]	'the cat'
b.	/a/	/V_	[papa-a]	'the father'
			[bato-wa]	'the boat'

The inconsistently-optimizing nature of PCSA has led to a protracted debate as to whether its analysis belongs in the phonological grammar. Generalizing over approaches, there are two main answers to this question. Some (McCarthy & Prince 1993a,b; Kager 1996, Mascaró 2007, Smith 2015) argue that the analysis of PCSA can or should take place in the phonological component of the grammar, noting that the same constraints often govern phonology and PCSA (in the case of (3), for example, these constraints are ONSET, requiring syllables to have onsets, and *COMPLEXCODA, penalizing syllables with more than one coda consonant). I refer to these analyses of PCSA as *phonological analyses*. Others (Chomsky & Halle 1968, Paster 2006, Bye 2008, Embick 2010, Gouskova et al. 2015, Kalin 2020) argue that PCSA, optimizing or not, is a morphological process that derivationally precedes regular phonology. The idea is that despite the apparently optimizing nature of PCSA in cases like Biri (1) and Moroccan Arabic (3), the phonological grammar does not play a role in allomorph selection. I refer to these as *morphological analyses*.

One likely reason why there is so little agreement on this point is that most cases of PCSA, phonologically optimizing or not, can receive either phonological or morphological analyses. Take, for example, the Haitian Creole case in (4). Proponents of morphological analyses note that the case is obviously non-optimizing and treat this as a reason to give it a morphological analysis. Klein (2003), however, notes that it is possible to provide a phonological analysis of Haitian Creole by assuming that factors other than the optimization of syllable structure are in play (see also Bonet et al. 2007). The phonotactically non-optimal [liv.la] can be derived by assuming that the right edge of stems and syllables correspond; the constraint encoding this requirement, R-ALIGN-STEM-SYLL, would be violated by the more phonotactically optimal [li.v-a]. The occurrence of /a/ after vowel-final stems (as in [tu.a]) can be understood as the use of a default allomorph, its presence forced through the activity of a constraint like PRIORITY, which enforces a lexical priority (ordering) of allomorphs (Bonet et al. 2007:912). Thus even for cases of PCSA that appear to be non-optimizing, it is usually the case that both phonological and morphological analyses are possible.

Given that both types of analysis are usually possible, arguments for one type of analysis over the other are often based on analytic principles. Proponents of phonological analyses, for example, might accuse a morphological analysis of the Moroccan Arabic facts in (3) of missing a generalization. The pattern optimizes syllable structure; not acknowledging this directly results in a loss of explanatory power. Proponents of morphological analyses, in turn, might argue that the phonological analysis of the Haitian Creole data in (4) is ad hoc: it incorporates constraints leading to phonotactically non-optimal structures, and must include morphological constraints like PRIORITY. One of the the more influential arguments for morphological analyses of PCSA comes from Embick (2010), who argues for this type of analysis based on a comparison of the predictions of phonological analyses versus morphological analyses of PCSA. Embick claims that frameworks assuming phonological analyses of PCSA predict certain kinds of global interactions between PCSA and phonology that are not borne out cross-linguistically. While compelling, Embick's argument is an overgeneration argument: we should prefer morphological analyses because phonological analyses predict a superset of the cases of PCSA that actually exist. And overgeneration arguments are difficult to evaluate, because there are a number of reasons overgeneration might occur. One reason is certainly adoption of the wrong theory, but there is also the possibility of accidental gaps, the possibility that the historical precursors for a particular predicted system might not exist (e.g. Blevins 2004), or the reality that certain gaps in the typology exist because the relevant systems, while part of the learner's hypothesis space, would be difficult or impossible to acquire (e.g. Boersma 2003, Alderete 2008, Heinz 2009, Stanton 2016, O'Hara 2021). Thus arguments for phonological analyses over morphological analyses, or vice versa, are often inconclusive.

This paper presents a case of apparently optimizing PCSA in Yindjibarndi (Pama-Nyungan, Wordick 1982[2]). In Yindjibarndi, the form of the locative suffix for common nouns is either /ŋka/ or /la/; their distribution is phonologically determined. Enriching the picture is the fact that both /ŋka/ and /la/ have phonologically predictable allomorphs of their own (/ŋka/ → [ŋka], [wa], and [a]; /la/ → [la], [ta], [ʈa], [ca], and [a]). I argue that although both suppletive and predictable allomorphy reference the same phonological factors, they reside in different components of the grammar. The proposed analysis, in sketch form, is that morphology determines the distribution of /ŋka/ and /la/, while phonology determines the distribution of [ŋka], [wa], [a], and (separately) [la], [ta], [ʈa], [ca], [a]. The argument for this position is that the most plausible alternative, a phonological analysis integrating both types of allomorphy, predicts that suppletion should repair more phonotactic problems than it does. More specifically, the analysis incorrectly predicts that whenever the language has a choice between suppletion and consonant deletion, it should choose suppletion. The technical problem is that the rankings necessary for suppletive and non-suppletive allomorphy are at odds with one another. Attempting a unified analysis of the two types of allomorphy results in a ranking paradox. Other analyses that integrate phonology with morphology either require the use of stipulative constraints or cannot account for other facts about the language.

1.1 Preliminaries

Before discussing allomorphy in the Yindjibarndi locative, it is first necessary to introduce the language's inventory as well as several assumptions regarding distinctive features and word shape. These assumptions will be referenced in the analyses that follow.

1.1.1 Vowel inventory and distinctive features

The vowel inventory is provided in (5). Yindjibarndi has three short vowels /a i u/, and four long vowels /aː iː uː oː/. The fourth long vowel, /oː/, is usually created through the deletion of [w] and subsequent coalescence of [u] and [a] in [uwa] sequences: 'to(wards) Wickham', for example, can be pronounced as [wikamuwaʈa] or [wikamoːʈa] (Wordick pp. 37-38). The word [loːpu] 'Friday', however, does not vary with *[luwapu], and this fact leads Wordick to posit that [oː] is contrastive. Since the contrastive status of [oː] does not matter for the present purposes, I follow Wordick here.

[2]This paper relies on the grammatical description, text collection, and lexicon from Wordick (1982). I am grateful to the Yindjibarndi people who made his work possible. For another text collection, mixed with Ngarluma, see von Brandenstein (1970). For more wordlists, see (Bowern 2016) and (Maya Pilbara Aboriginal Language Centre 2003). For work on the acoustics of Yindjibarndi nasal and stop consonants, see Tabain (1994) and Tabain & Butcher (1999).

(5) Yindjibarndi vowel inventory

Short		*Long*	
/i/	/u/	/iː/	/uː/
/a/		/aː/	/oː/

The vowels in (5) are arranged according to the distinctive features that I assume. One relevant distinction for this paper is between [+back] /u uː oː/ and [−back] /i a iː aː/; another is the distinction between [+high] /i u iː uː/ and [−high] /a aː oː/.

1.1.2 Consonant inventory and distinctive features

The consonant inventory is provided in (6); I assume that vowels are [+syllabic] and consonants are [−syllabic]. Wordick's orthography is in brackets, and I have converted the orthography to IPA following his description and categorization of the sounds (Wordick pp. 10-13). Note that what I transcribe as /r/ varies between a tap ([ɾ]) and a trill, and I use /ɻ/ for the retroflex glide.

(6) Yindjibarndi consonant inventory

	Bilabial	*Dental*	*Alveolar*	*Retroflex*	*Palatal*	*Velar*
Stop	/p/ <p>	/t̪/ <th>	/t/ <t>	/ʈ/ <rt>	/c/ <ty>	/k/ <k>
Nasal	/m/ <m>	/n̪/ <nh>	/n/ <n>	/ɳ/ <rn>	/ɲ/ <ny>	/ŋ/ <ng>
Liquid			/l/ <l>	/ɭ/ <rl>		
Glide	/w/ <w>	/ʋ/ <yh>	/r/ <rr>	/ɻ/ <r>	/j/ <y>	

Focusing first on place of articulation, I assume that the coronal consonants (in gray) are [+coronal] and the non-coronal consonants are [−coronal].[3] Among the coronals, I assume that minor place distinctions are encoded by [±anterior] and [±distributed]. Dental and alveolar consonants are [+anterior], while retroflex and palatal consonants are [−anterior]; dental and palatal consonants are [+distributed], while alveolar and retroflex consonants are [−distributed]. Among the [−coronal] consonants, I assume velars are [+dorsal] and labials are [−dorsal].

Focusing now on manner of articulation, I assume that stops and nasals are [−continuant] while liquids and glides are [+continuant]. The distinction among the [−continuant] consonants is made by [±sonorant], with nasals as [+sonorant] and stops as [−sonorant]; the distinction among the [+continuant] consonants is made by [±lateral], with liquids as [+lateral] and glides as [−lateral]. The glide /ɻ/ often patterns with vowels, to the exclusion of other glides, in phenomena like (but not limited to) lenition and deletion; see Wordick pp. 20-40 for discussion of phonological processes in Yindjibarndi. This suggests that it forms a natural class with the vowels, to the exclusion of other glides. Since this issue is not central to the larger points of the paper, I do not address it here.

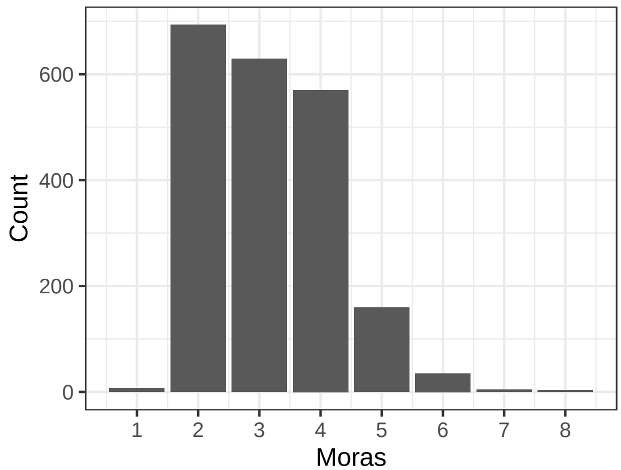
1.1.3 Syllable and word shape

The maximal syllable shape in Yindjibarndi is CVC; onsets are near-obligatory[4] while codas are optional. This restriction means that consonant clusters are limited to two members and must occur word-internally, as in [kaːrka] 'redwood' (Wordick p. 286). Following Wordick, I assume that nasal-

[3] I use binary place features here because it allows me to easily make a distinction between coronal and non-coronal consonants, which will become relevant later in the paper.

[4] Wordick's lexicon lists a total of 13 vowel-initial morphemes; seven are suffixes and the rest are English loans.

Figure 1: Distribution of word lengths in Yindjibarndi stems, by moras



stop sequences are consonant clusters and not prenasalized stops. This assumption is consistent with a lack of phonotactic generalizations that distinguish them from other clusters.

An examination of the stems in Wordick's lexicon (n=2,210 stems, entered by hand) reveals that most contain two, three, or four moras, with a steep drop-off for shorter and longer words (Figure 1). With Wordick, I assume that short vowels constitute one mora and long vowels two; consonants do not bear weight in this language (see Section 5.2 for brief discussion of the stress system). It is likely that Yindjibarndi has a strict bimoraic word minimum, as the six stems containing only one mora are all bound morphemes ([ka-] 'have, possess', [mi-] 'know', [ŋaɳ-] 'hang', [n̪a-] 'see, look', [t̪a-] 'stuck in(to), stuck under', and [-tu] 'one').

1.2 Roadmap

Section 2 details allomorphy in the Yindjibarndi locative. Section 3 proposes an analysis in which suppletion is analyzed as part of the morphology and predictable allomorphy is analyzed as part of the phonology. Section 4 discusses a potential alternative analysis, in which all allomorphy is analyzed as part of the phonology, and shows how the analysis fails. Section 5 briefly presents two alternative analyses and discusses their merits and drawbacks. Section 6 briefly discusses other cases of PCSA in Yindjibarndi, and Section 7 concludes.

2 Allomorphy in the Yindjibarndi locative

The form of the Yindjibarndi locative depends on both lexical and phonological information. On the lexical side, each noun class is associated with a distinct realization of the locative suffix (Table 1). Yindjibarndi has five noun classes: common, proper, retroflex, and two classes of directional nouns. Among these, the common nouns form the largest class and the retroflex nouns the smallest; there is only one noun in the retroflex class (Wordick 1982:46). Throughout this paper, numbers in parentheses refer to page numbers in Wordick's (1982) grammar.

Table 1: Locative allomorphs by noun class

Noun class	Locative allomorph	Example	Gloss	
Common nouns	/la/	[paɹkara-la]	'plain-LOC'	(210)
		[piɹtara-la]	'ceremonial feast-LOC'	(230)
	/ŋka/	[muci-ŋka]	'hole-LOC'	(203)
		[malu-ŋka]	'shade-LOC'	(273)
Proper nouns	/la/	[kujupuju-la]	'Cooya Puuya-LOC'	(228)
		[minkala-la]	'Minkala-LOC'	(252)
Retroflex nouns	/ʈa/	[cuntaː-ʈa]	'that way-LOC'	(32)
Directional nouns (1)	/t/	[ciŋka-t]	'upstream-LOC'	(230)
		[jawu-t-pa]	'downstream-LOC-EMP'	(259)
Directional nouns (2)	/ju/	[jaː-ju]	'east-LOC'	(213)
		[wulu-ju]	'west-LOC'	(230)

This paper focuses on the two locative allomorphs associated with the common nouns. Their distribution is phonologically predictable: /ŋka/ is selected following bimoraic vowel-final stems, while /la/ is selected following consonant-final stems as well as those that are trimoraic or longer. From the standpoint of the locative case, some pronouns behave like proper nouns: we find /la/ on [ŋaʋa-la] 'I-LOC' and [ɲinta-la] 'you-LOC', for example, despite their bimoraic length. Others behave like retroflex nouns, in that they take the locative suffix [-ʈa] ([walaː-ʈa] 'we-LOC', [ŋulaː-ʈa] 'they-LOC'). I do not further discuss pronouns in what follows; see Wordick p. 74 for the paradigms.

Both /la/ and /ŋka/ have a number of phonologically predictable allomorphs (Table 2). For the bimoraic vowel-final stems that take /ŋka/, one major determining factor in which allomorph surfaces is whether or not the stem contains an immediately preceding nasal-stop cluster. If it does not, /ŋka/ surfaces faithfully as [ŋka] (as in [malu-ŋka]). If the stem does contain an immediately preceding nasal-stop cluster, then /ŋka/ surfaces as either [a] (as in [maɲci-a]) or [wa] (as in [wuntu-wa]). For the consonant-final roots that take /la/, the allomorph that surfaces depends on the identity of the stem's final consonant. If the stem ends in a nasal, the lateral in /la/ hardens to a stop and place-assimilates to that stem-final nasal (as in [majtan-ta], [karwaɳ-ʈa], [wiɹtaɲ-ca]). If the stem ends in a stop or the trill/tap [r], the lateral in /la/ deletes. Note that the only licit final consonants in Yindjibarndi are [n ɳ ɲ t ʈ c r], so Table 2 exhausts the space of possible allomorphs.

Evidence that all of these allomorphs are exponents of locative case comes from patterns of case concord within the noun phrase (Wordick pp. 142-143). As is clear from (7), locative case concord occurs regardless of which allomorph is appropriate.

(7) Case concord in adjective-noun and noun-noun constructions

a. ŋura-ŋka muʋumuʋu-la
ground-LOC cold-LOC
'in this cold ground' (206)

b. kupica-la-ŋu maɳʈa-a-ŋu
small-LOC-ABL rock-LOC-ABL
'onto a small rock' (214)

c. kupica-la t̪anpaʈan-ta
small-LOC bark.basin-LOC

Table 2: Locative allomorphs for common nouns are conditioned by phonological factors

Morpheme	Final seg. type	μ	NC in stem?	Final seg.	Allomorph	Example Gloss (all -LOC)
/ŋka/	Vowel	2μ	No		[ŋka]	[malu-ŋka] 'shade' (149)
			Yes	[i] or [a]	[a]	[maɲci-a] 'death adder' (33)
						[waɳʈa-a] 'stick' (33)
				[u]	[wa]	[wuntu-wa] 'river' (33)
/la/		3μ			[la]	[paɹkara-la] 'plain' (210)
	Consonant			[n]	[ta]	[majtan-ta] 'my gum tree' (22)
				[ɳ]	[ʈa]	[karwaɳ-ʈa] 'summer' (210)
				[ɲ]	[ca]	[wiɹtaɲ-ca] 'path' (247)
				[t]	[a]	[kuɳʈat-a] 'daughter' (23)
				[ʈ]		[t̪uruʈ-a] 'prescribed' (23)
				[c]		[kaɲkac-a] 'loose' (23)
				[r]		[maʈar-a] 'red ochre' (23)

'in a small bark basin' (229)

d. maɲcaɳ-ʈa-u piʈit̪a-la-u
bed-LOC-OBJ dry.leaf-LOC-OBJ
'on the bed of dry leaves' (247)

e. wuntu-wa ciŋka-t
river-LOC upstream-LOC
'up the river' (230)

While the phonological factors that govern the realization of the common nouns' allomorphs may seem arbitrary, the variation in Table 2 can be shown to follow from aspects of the language's phonology. The realizations of /ŋka/ as [wa] and [a] follow from the interaction of two processes, both general in the language: nasal cluster dissimilation (term from McConvell 1988) and /k/ lenition. The realizations of /la/ as [ta], [ʈa], [ca], and [a] occur to comply with restrictions on consonant cluster composition. The next section provides more details on these phonological regularities and sketches an analysis of how phonology gives rise to the set of allomorphs in Table 2.

Before proceeding, it is worth noting that the instrumental case behaves identically, with the only difference that its allomorphs end in [u]. Parallel to the locative, the instrumental has allomorphs /ŋku/ and /lu/, with /ŋku/ appearing on bimoraic vowel final words (e.g. [t̺uɭa-ŋku] 'eye-INST', 263) and /lu/ appearing on trimoraic and all consonant-final words (e.g. [wanaŋkaː-lu] 'whirlwind-INST', 267). The allomorph /ŋku/ similarly has reduced allomorphs following a nasal-stop sequence (e.g. [waɳʈa-u] 'stick-INST', 33). All of the points I make in this paper with respect to the locative apply equally to the instrumental. My main reason for focusing this paper on the locative case suffix is that it is much more common; a complete paradigm is not available for the instrumental suffix.

3 Analysis of allomorphy in the Yindjibarndi locative

This section focuses first on the morphological part of the analysis (Section 3.1). Following this, I move on to the phonological part of the analysis and show how the allomorphs [ŋka], [wa], and [a] can be derived from /ŋka/ (Section 3.2). Then, I sketch an analysis of how the allomorphs [la], [ta], [ʈa], [ca], and [a] can be derived from /la/ (Section 3.3); as this part of the picture is not crucially relevant to the main arguments of this paper, however, I do not formalize the analysis here.

3.1 Distribution of suppletive allomorphs, /ŋka/ and /la/

I first account for the distribution of /ŋka/ and /la/. I assume that the relationship between these allomorphs is one of suppletion, as there is no phonological process in Yindjibarndi that maps /ŋk/ to [l] or vice versa. In addition, /ŋk/ and /l/ are in contrastive distribution, as shown by the minimal pairs [waŋka] 'speech, language' vs. [wala] 'not straightforward' (Wordick pp. 360-361) and [muŋku] 'termite mound' vs. [mulu] 'blade attached to the woomera handle' (Wordick p. 312). (For more on criteria distinguishing purely phonological from suppletive allomorphy, see Kiparsky 1996, Paster 2006: 2.1.1, and Paster 2014.)

I propose that the distribution of these suppletive allomorphs is determined in the morphological component of the grammar.[5] The architecture of the grammar that I assume follows Halle & Marantz (1993): the output of syntax of the grammar (SS) is fed to semantics (LF) and morphology (MS), the latter of which functions as an interface between syntax and phonology (PF) (8).

(8) Assumed architecture of the grammar (from Halle & Marantz 1993:114)

DS (D-Structure)
|
SS (S-Structure)
LF (Logical Form) — MS (Morphological Structure)
|
PF (Phonological Form)

One type of operation that takes place in MS are Vocabulary insertion rules (Halle & Marantz 1993), which provide phonological information to the different morphemes that occupy the syntactic tree. We can formalize the analysis of locative suppletion with two rules (9). The rule in (9a) requires

[5] Note that assuming this architecture of the grammar predicts that suppletive allomorphy cannot be conditioned by derived phonology. There are no such cases in Yindjibarndi that I am aware of.

that the locative morpheme inserted is /ŋka/ given a preceding bimoraic vowel-final root, while the rule in (9b) requires that the locative morpheme inserted in the general case is /la/. Adopting the common assumption that more specific rules apply first (Kiparsky 1973), these two rules work together to ensure that /ŋka/ is inserted in the listed contexts and /la/ is inserted elsewhere.

(9) Vocabulary insertion rules for locative suffix on common nouns[6]

a. [LOC] $\leftrightarrow$ ŋka / {C_0VC_0V __ , C_0Vː __}
b. [LOC] $\leftrightarrow$ la

This distribution could be captured with subcategorization frames (Paster 2006), or by assuming that (9a) refers not to phonological contexts, but rather to a list of forms, and that learners extract the phonological generalizations by phonotactic learning over this list of forms (Gouskova et al. 2015). All that is crucial is that the decision between /ŋka/ and /la/ is made in a component of the grammar that precedes phonology. Put differently, it is crucial that the input for [wuntu-wa] 'river' is /wunta+ŋka/, and that the input for [kuɳʈat-a] is /kuɳʈat+la/. While phonology has the power to modify the form of the exponent, it cannot change which one has been inserted.

It is potentially of interest that the Vocabulary insertion rules in (9) look a good deal like the rules that would be required to characterize locative suppletion in a number of other Pama-Nyungan languages (see Paster 2006: 4.2 for generalizations regarding suppletive allomorphy across various Pama-Nyungan languages, and Paster 2016 for a fuller historical account). In neighboring Martuthunira (Dench 1995), for example, the locative suffix had two suppletive allomorphs, /-ŋka/ and /-la/, which are distributed exactly according to the rules in (9) above. (Martuthunira also had an effector suffix with the allomorphs /-ŋku/ and /-lu/; this is parallel to Yindjibarndi's instrumental.) Many more distant relatives do not behave exactly like Yindjibarndi or Martuthunira, but do exhibit one of the conditioning factors. In the Biri locative (1), for example, the conditioning factor is the [±syllabic] value of the stem's final segment; in the Kaititj ergative/instrumental/locative (2), the conditioning factor is the length of the stem. Such patterns are widespread in Pama-Nyungan languages, with some (e.g. Sands 1996) arguing that the /-ŋk-/ and /-l-/ allomorphs were suppletive back to Proto-Pama-Nyungan. These cross-linguistic facts lend credence to the analysis of the Yindjibarndi allomorphy as suppletion.

3.2 Distribution of allomorphs of /ŋka/: [ŋka], [wa], and [a]

I now account for the variation in allomorph form that is summarized in Table 2. As a reminder, /ŋka/ attaches to bimoraic vowel-final stems, and its allomorphs [ŋka], [wa], and [a] are in complementary distribution. When /ŋka/ attaches to a stem that does not contain an immediately preceding nasal-stop cluster, it appears as [ŋka] (10).

(10) /ŋka/ realized as [ŋka] if not preceded by a nasal-stop cluster

a.	/malu+ŋka/	→	[malu-ŋka]	'shade-LOC'	(236)
b.	/maɹa+ŋka/	→	[maɹa-ŋka]	'hand-LOC'	(230)
c.	/jura+ŋka/	→	[jura-ŋka]	'day-LOC'	(149)

When /ŋka/ attaches to a stem that does contain an immediately preceding nasal-stop cluster, it

[6] The Vocabulary insertion rule in (9a) is what Kalin & Rolle (2020) refer to as a condition on insertion, in that it constrains when an exponent can be inserted. Another example of a condition on insertion in this paper comes from (56).

appears as [wa] or [a]. Whether [wa] or [a] surfaces depends on the identity of the stem-final vowel: if the stem-final vowel is [u] the suffix is realized as [wa] (11a); if the stem-final vowel is [i] or [a] the suffix is realized as [a] (11b,c).

(11) /ŋka/ realized as [wa] or [a] if preceded by a nasal-stop cluster

a.	/wuntu+ŋka/	→	[wuntu-wa]	'river-LOC'	(236)
b.	/waɳʈa+ŋka/	→	[waɳʈa-a]	'stick-LOC'	(230)
c.	/maɲci+ŋka/	→	[maɲci-a]	'death adder-LOC'	(149)

These alternations arise from the interaction of two distinct processes. The first is nasal cluster dissimilation (Section 3.2.1) and the second is intervocalic /k/ lenition (Section 3.2.2).

3.2.1 Nasal cluster dissimilation

Yindjibarndi exhibits nasal cluster dissimilation (Wordick 1982, Stanton 2019; on the phenomenon more generally see Herbert 1986, McConvell 1988, Alderete 1997, Jones 2000, Blust 2012, Stanton 2019). In a sequence of two nasal-stop clusters, NC_1 and NC_2, the N that belongs to NC_2 deletes. Examples of nasal cluster dissimilation involving the topicalization clitic /mpa/ follow in (12a,b); the examples in (12c,d) confirm that the clitic surfaces as /mpa/ in the general case.[7]

(12) Nasal cluster dissimilation with the topicalization clitic /mpa/

a.	/munti+mpa/	→	[munti-pa]	'really-TOP'	(34)
b.	/t̪aŋkar+mpa/	→	[t̪aŋkar-pa]	'enough-TOP'	(34)
c.	/n̪ula+mpa/	→	[n̪ula-mpa]	'at this-TOP'	(240)
d.	/paraː+mpa/	→	[paraː-mpa]	'long time-TOP'	(273)
e.	/naː+mpa/	→	[naː-mpa]	'this-TOP'	(205)
f.	/naː+tu+mpa/	→	[naː-tu-mpa]	'this-ONE-TOP'	(255)

Nasal cluster dissimilation is exceptionless in Yindjibarndi, though there are some limitations on its application. First, nasal cluster dissimilation only occurs if the second nasal-stop cluster is homorganic labial [mp] or velar [ŋk]. Thus while /munti+mpa/ must be realized as [munti-pa] (*[munti-mpa]), /kaŋkan+la/ ('in the fork', 35) must be realized as [kaŋkan-ta] (*[kaŋka-ta]). Similarly, /kaŋkan+kara/ ('forked', 35) must be realized as [kaŋkan-kara] (*[kaŋka-kara]). It is also crucial that NC_1 is composed of both a nasal and a stop: nasal-nasal clusters, unlike nasal-stop clusters, do not trigger nasal cluster dissimilation (/paɳɳa+ŋka/ → [paɳɳa-ŋka] 'bark-LOC', *[paɳɳa-ka]). Singleton consonants also do not trigger nasal cluster dissimilation (12c-f). Another limitation is that nasal cluster dissimilation occurs only when the nasal-stop sequences are separated by vowels and an optional stem-final consonant (as in (12b), Wordick p. 33). Any other intervening material likely blocks nasal cluster dissimilation, though Wordick does not provide any illustrative examples.

The restriction on co-occurring nasal-stop sequences also holds as a static restriction over the lexicon; the only exception in Wordick's lexicon is [jantimpurwa] (p. 35), a place name.

[7] An anonymous reviewer points out several words on the Yindjibarndi 50 Words site (https://50words.online/) that suggest cluster reduction from NC to C happens in other contexts, as well: /paŋgari/ 'where are you going' sounds like it is realized as [pagari], and /gurumun̪t̪u/ 'goanna' sounds like it is realized as [gurumat̪u]. Further investigation of a larger corpus of spoken Yindjibarndi is necessary to draw conclusions regarding additional contexts for nasal cluster reduction.

3.2.2 Intervocalic lenition

Yindjibarndi has productive intervocalic lenition, affecting most consonants (at least variably) in intervocalic position. I focus here on the behavior of /k/, but see Section 6.1 for brief discussion of /j/ and Wordick pp. 27-32 for the full set of facts.

In intervocalic position, a morpheme-initial /k/ either lenites or deletes, depending on the identity of the surrounding vowels. If the preceding vowel is /u/ and the following vowel is /a/, /k/ lenites to [w] (13a). Between any other set of vowels, /k/ deletes (13b-f). (The absence of the contexts [u_i], [i_i], and [a_i] is due to the lack of /ki/-initial suffixes in Yindjibarndi. Wordick's description predicts that /k/ should delete in these contexts.) The inclusion of three separate suffixes in (13) – the possessive /kaɭaː/, the objective case clitic /ku/, and the direct allative suffix /kaʈa/ – illustrates that /k/ lenition applies generally in morpheme-initial intervocalic position and is not limited to any one specific morpheme.

(13) /k/ lenition and deletion

a.	/paʈu+kaɭaː/	→	[paʈu-waɭaː]	'bird (feather-having)'	(28)
b.	/malu+ku/	→	[malu-u]	'shade-OBJ'	(208)
c.	/maja+kaʈa/	→	[maja-aʈa]	'house-DIR.ALL'	(30)
d.	/warapa+ku/	→	[warapa-u]	'grass-OBJ'	(70)
e.	/ŋamaji+ku/	→	[ŋamaji-u]	'tobacco-OBJ'	(188)
f.	/maɳi+kaɭaː/	→	[maɳi-aɭaː]	'striped (mark-having)'	(304)

When /k/ deletes, the newly adjacent vowels sometimes undergo modifications of their own. Identical short vowels obligatorily coalesce into a single long vowel (e.g. [a+a] → [aː]) (Wordick pp. 35-37), and certain combinations of short vowels can optionally coalesce into a long vowel (e.g. [i+u] → [iu] or [uː]). Coalescence of short vowels is not represented or analyzed in what follows.

3.2.3 Putting the pieces together

Wordick (p. 33) notes that the alternations in the locative (11) can be modeled as a feeding interaction between nasal cluster dissimilation and /k/ lenition. First, nasal cluster dissimilation results in the loss of suffixal /ŋ/ (e.g. /wuntu+ŋka/ → [wuntu-ka]). Then, /k/ lenition results in either deletion or lenition of /k/, depending on the vocalic context. Sample derivations are given in (14).

(14) Locative alternations as a result of nasal cluster dissimilation and lenition

UR	/wuntu+ŋka/	/waɳʈa+ŋka/	/maɲci+ŋka/
Nasal cluster dissimilation	wuntu-ka	waɳʈa-ka	maɲci-ka
/k/ lenition or deletion	wuntu-wa	waɳʈa-a	maɲci-a
SR	[wuntu-wa]	[waɳʈa-a]	[maɲci-a]

An Optimality Theoretic analysis (Prince & Smolensky 2004) of these data thus requires two components: one that regulates nasal cluster dissimilation, and a second that regulates intervocalic /k/ lenition and deletion. I introduce these in turn.

For present purposes, I assume that nasal cluster dissimilation is motivated by *NCV(C)$NC_{[-cor]}$, a markedness constraint that prohibits NCV(C)NC sequences from occurring when NC_2 is [−coronal].[8]

[8] I believe that *NCV(C)NC is shorthand for a phonetically motivated constraint that penalizes nasal-stop sequences that are followed by nasal or nasalized vowels. For motivation and formalization, as well as an analysis of the Yindjibarndi

(15) **$*$NCV(C)NC$_{[-\text{cor}]}$**:
Assign one * for each NCV(C)NC$_{[-\text{cor}]}$ sequence in the output.

The markedness constraint in (15) interacts with various faithfulness constraints to derive deletion of the second nasal. First, we know that *NCV(C)NC$_{[-\text{cor}]}$ dominates MAX (16), because deletion is the attested repair to *NCV(C)NC$_{[-\text{cor}]}$.

(16) **MAX**:
Assign one * for each input segment that does not have an output correspondent.

To ensure that the second nasal is deleted, two additional faithfulness constraints are necessary. First, MAX[stem] ensures that the segments in NC$_1$ are protected from deletion. Second, MAX[−sonorant] penalizes deletion of obstruents.

(17) **MAX[stem]**:
Assign one * for each stem-internal input segment that lacks an output correspondent.

(18) **MAX[−sonorant]**
Assign one * for each input [−sonorant] segment that lacks an output correspondent.

Given the ranking *NCV(C)NC$_{[-\text{cor}]} \gg$ MAX, these constraints predict deletion of the second nasal (19). (I leave MAX[stem] and MAX[−sonorant] in the top tier, but there is no argument that they dominate MAX.) I assume that further unattested repairs, like epenthesis or metathesis, are ruled out by high-ranked DEP, CONTIGUITY, etc.

(19) Deriving N$_2$ deletion in Yindjibarndi

/wuntu+ŋka/	*NCV(C)NC$_{[-\text{cor}]}$	MAX[stem]	MAX[−sonorant]	MAX
a. [wuntu-ŋka]	*!			
b. [wutu-ŋka]		*!		*
c. [wunu-ŋka]		*!	*	*
☞ d. [wuntu-ka]				*
e. [wuntu-ŋa]			*!	*

The constraint that I assume drives /k/ lenition and deletion is *VkV, a markedness constraint that penalizes intervocalic [k] (20).

(20) **$*$VkV ($*$[+syll][+dorsal, −son][+syll])**:
Assign one * for each intervocalic velar obstruent.

The constraint in (20) is satisfied by lenition to /w/ in one environment and deletion in the rest. Lenition to /w/ violates IDENT[±continuant] (21), so *VkV must dominate IDENT[±continuant].

(21) **IDENT[±continuant]**:
Assign one * for each corresponding pair of segments that disagrees for [±continuant].

To derive deletion, I assume that there are further constraints on the distribution of intervocalic [w]. Specifically, [w] is prohibited from occurring in this position unless it is preceded by [u] and followed by [a]. I formalize this restriction with two markedness constraints. *{i,a}wV (22)

facts along these lines, see Stanton (2019).

penalizes [w] preceded by a front vowel and followed by another vowel, and *uw{i,u} (23) penalizes [w] preceded by [u] and followed by a high vowel.[9]

(22) ***{i,a}wV (*[−back, +syll][−coronal, −cons][+syll]**:
Assign one * for each [w] preceded by a front vowel and followed by another vowel.

(23) ***uw{i,u} (*[+back][−coronal, −cons][+syll, +high]**:
Assign one * for each [w] preceded by [u] and followed by a high vowel.

Wordick does not posit a restriction on [w] occurring in these environments, but such restrictions can help us understand why /k/ deletes, rather than lenites, in most intervocalic environments.

Deriving /k/ deletion requires us to assume that *NCV(C)NC$_{[-\text{cor}]}$, *VkV, *{i,a}wV, and *uw{i,u} dominate MAX and MAX[−sonorant], as /k/ deletion (violating both) is preferable to violation of any of these high-ranked markedness constraints. I illustrate with a tableau for [maɲci-a] (24). (To keep the tableaux maximally simple, from this point forward I consider only candidates with deletion of the second nasal, i.e. those corresponding to (19d).)

(24) *{i,a}wV, *VkV ≫ MAX[−sonorant]: /maɲci+ŋka/ → [maɲci-a]

/maɲci+ŋ$_1$k$_2$a/	*{i,a}wV	*VkV	MAX[−sonorant]	MAX
a. [maɲci-k$_2$a]		*!		
b. [maɲci-w$_2$a]	*!			
☞ c. [maɲci-a]			*	*

In /k/ lenition, [w] surfaces in the one context where it is allowed: between [u] and [a]. I take this as evidence that leniting /k/ (25a) is preferable to deleting it (25b) when the surrounding context allows. To derive /k/ lenition, I assume that one of MAX or MAX[−sonorant] dominates IDENT[±continuant] (25), though it is not clear from these data which constraint is responsible.

(25) MAX[−sonorant] ≫ IDENT[±continuant]: /wuntu+ŋka/ → [wuntu-wa] (*[wuntu-a])

/wuntu+ŋ$_1$k$_2$a/	*VkV	MAX[−sonorant]	MAX	IDENT[±continuant]
a. [wuntu-ka]	*!			
☞ b. [wuntu-w$_2$a]				*
c. [wuntu-a]		*!	*!	

Unlike the restriction on multiple nasal clusters within a word, the restrictions on the distribution of [k] and [w] appear to hold categorically only in the suffixal domain.[10] An example of a stem-internal violation of *VkV comes from [kakuɭa] 'doubah, silky pear' (Wordick p. 287), an example of a stem-internal violation of *{i,a}wV comes from [mawaɳ] 'magic power' (p. 307), and an ex-

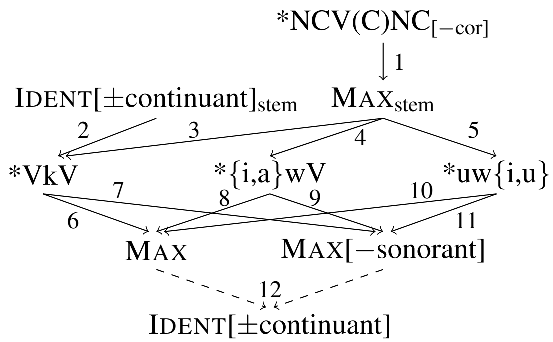
[9] Presumably, these constraints interact with other constraints on segment sequencing, for example markedness constraints against vocalic sequences. Nash (2017) has shown, for example, that iCu sequences are avoided in many Pama-Nyungan languages.

[10] Wordick characterizes /k/ lenition as applying only to morpheme-initial segments, but I was unable to find an intervocalic [k] or [w] in any of the suffixes in his lexicon. In addition, it is potentially worth noting that there is a broader dispreference for intervocalic /k/s in the language. /k/ is a frequent consonant in Yindjibarndi: of the 7,604 consonants in Wordick's lexicon (n=2,273 words, entered by hand), 714 of these, or 9.39%, are /k/. (The only more frequent consonants are /m/, with 723 occurrences, and /r/, with 799.) If all consonants were equally probable in all environments, we might then expect 9.39% of all VCV sequences to involve a /k/. But what we find is that only 2.05% (66/3218) do. Thus although /k/ is frequent, it is underattested between vowels; the observed/expected ratio in this environment is 0.21 (=66/3218*.0939); see Pierrehumbert 1992 on O/E). It is likely, then, that (20) reflects a broader trend in the language.

ample of a stem-internal violation of *uw{i,u} comes from [pujuwi] ‘singe and then scrape off the burnt hair’ (p. 345). To account for this distinction between the stem and the suffixal domains, I assume that a positional version of Ident[±continuant], Ident[±continuant]$_{\text{stem}}$, dominates *VkV. In addition, a positional version of Max, Max$_{\text{stem}}$, dominates *VkV, *uw{i,u}, and *{i,a}wV(see e.g. Beckman 1998 on positional faithfulness). *NCV(C)NC$_{[-\text{cor}]}$, in turn, dominates Max$_{\text{stem}}$; I assume that stem-internal violations of this markedness constraint are resolved through deletion.

Ranking arguments are summarized in Figure 2. Dashed lines indicate indeterminacy in the ranking (either Max or Max[−sonorant] dominates Ident[±continuant], but it is not clear which). In sum, /ŋka/ has three allomorphs in complementary distribution: [ŋka], [wa], and [a]. The observed alternations can be understood as resulting from the interaction of two processes, both general in the language: nasal cluster dissimilation and /k/ lenition.

Figure 2: Summary of nasal cluster dissimilation and lenition analysis



[1] /ampampa/ → [ampapa] (*[ampampa]) *hypothetical*
[2] /kakuɭa/ → [kakuɭa] (*[kawuɭa] ‘doubah, silky pear’ (287)
[3] /kakuɭa/ → [kakuɭa] (*[kauɭa] ‘doubah, silky pear’ (287)
[4] /mawaɳ/ → [mawaɳ] (*[maaɳ] ‘magic power’ (307)
[5] /pujuwi/ → [pujuwi] (*[pujui]) ‘singe and then scrape off the burnt hair’ (345)
[6] /maɲci+ŋka/ → [maɲci-a] ‘death adder-LOC’ (149)
[7] /maɲci+ŋka/ → [maɲci-a] ‘death adder-LOC’ (149)
[8] /maɲci+ŋka/ → [maɲci-a] ‘death adder-LOC’ (149)
[9] /maɲci+ŋka/ → [maɲci-a] ‘death adder-LOC’ (149)
[10] /malu+ku/ → [malu-u] (*[malu-wu]) ‘shade-OBJ’ (208)
[11] /malu+ku/ → [malu-u] (*[malu-wu]) ‘shade-OBJ’ (208)
[12] /wuntu+ŋka/ → [wuntu-wa] (*[wuntu-a]) ‘river-LOC’ (236)

3.3 Distribution of allomorphs of /la/: [la], [ta], [ʈa], [ca], and [a]

The allomorph /la/ is inserted following trimoraic and longer vowel-final stems as well as all consonant-final stems. Its allomorphs [la], [ta], [ʈa], [ca], and [a] are in complementary distribution, their realization conditioned by the stem-final segment. When /la/ is suffixed to a vowel-final stem, it appears as [la] (26).

(26) /la/ surfaces as [la] when suffixed to a vowel-final stem

a.	/loːpu+la/	→	[loːpu-la]	‘Friday-LOC’	(237)
b.	/paɹkara+la/	→	[paɹkara-la]	‘plain-LOC’	(210)

When /la/ is suffixed to a consonant-final stem, the suffix-initial /l/ is modified or deleted. When /la/ is suffixed to a nasal-final stem, /l/ hardens to a stop and place-assimilates to the preceding nasal (27). When /la/ attaches to a stop-final stem or a stem that ends in [r], /l/ deletes (28).

(27) /l/ hardens and place assimilates when /la/ attaches to a nasal-final stem

a.	/karwaɳ+la/	→	[karwaɳ-ʈa]	‘summer-LOC’	(210)
b.	/majtan+la/	→	[majtan-ta]	‘my gum tree-LOC’	(22)
c.	/wiʈaɲ+la/	→	[wiʈaɲ-ca]	‘path-LOC’	(247)

(28) /l/ deletes when /la/ attaches to stop-final or [r]-final stem

a.	/kuɳʈat+la/	→	[kuɳʈat-a]	‘daughter-LOC’	(23)
b.	/t̪uruʈ+la/	→	[t̪uruʈ-a]	‘prescribed-LOC’	(23)
c.	/kaŋkac+la/	→	[kaŋkac-a]	‘loose-LOC’	(23)
d.	/maʈar+la/	→	[maʈar-a]	‘red ochre-LOC’	(23)

These alternations are not instantiated elsewhere in the language: there is no independent evidence, for example, that /l/ hardens when it follows a nasal. The alternations do however appear to occur in response to, and in turn respect, constraints on cluster composition. The generalizations I discuss below are drawn in part from Wordick’s description (pp. 14-16) and in part through consideration of lexical statistics. The numbers I report come from my own analysis of Wordick’s lexicon.[11]

Note that I do not provide a formal analysis of the facts discussed above. This is because the full formal analysis is both complex and not entirely relevant to the discussion that follows in Section 4. The problem for a phonological analysis of Yindjibarndi locative allomorphy is established based on the distribution of /ŋka/ and its allomorphs alone; I provide this brief discussion below just to give the reader an idea as to how a formal analysis of /la/ allomorphy could proceed.

3.3.1 Lateral place assimilation and hardening

I focus first on understanding why laterals harden and place-assimilate following a nasal. These alternations are likely in response to a prohibition on liquids as the second member of a consonant cluster. The table in (29) makes this clear: while liquids occur (if rarely) as the first member of a cluster, they do not occur as the second. (The one exception, [wutli], is a Yindjibarndi adaptation of the English first name Woodley.)

(29) Cluster frequencies in Yindjibarndi

		C_2			
		Stop	Nasal	Liquid	Glide
C_1	Stop [p t̪ t ʈ c k]	37	1	1	
	Nasal [m n̪ n ɳ ɲ ŋ]	734	42		
	Liquid [l ɭ]	3			5
	Glide [w ʋ r ɹ j]	104	7		40

[11]For another resource that could be used to calculate lexical statistics in Yindjibarndi, see Chirila (Bowern 2016).

Given that clusters like [nl] cannot occur, we must ask why the /l/ is realized as a stop. This is likely due to the relative markedness of different cluster types in the language. As shown in (29), the only attested nasal-initial clusters are nasal-stop and nasal-nasal clusters. The nasal-stop clusters are far more frequent (n=734 vs. n=42), indicating that nasal-nasal clusters are marked relative to the nasal-stop clusters. It appears, then, that mapping /l/ to a stop in the post-nasal environment is preferable to mapping it to a nasal.

The next question is: why does the resulting stop place-assimilate? Why, for example, is the underlying cluster /ɳ+l/ realized as [ɳʈ], and not [ɳt]? To understand this, we need to look at restrictions on the composition of nasal-stop clusters (30).

(30) Frequency of nasal-stop clusters in Yindjibarndi

		C_2					
		Labial [p]	Dental [t̪]	Alveolar [t]	Retroflex [ʈ]	Palatal [c]	Velar [k]
C_1	Labial [m]	75					
	Dental [n̪]		63				
	Alveolar [n]	26		97		19	59
	Retroflex [ɳ]	11			132	5	26
	Palatal [ɲ]	2				66	12
	Velar [ŋ]						141

One generalization in (30) is that homorganic nasal-stop clusters (n=574, in black) are more frequent than heterorganic nasal-stop clusters (n=160, in gray and white), even though both are licit. Another observation from (30) is that when a heterorganic nasal-stop cluster occurs, the nasal is usually [+coronal] and the stop is usually [−coronal] (see Hamilton 1995 on the preference for coronal-non-coronal clusters in Australian languages more generally). Nasal-stop clusters that disagree in minor place ((30)'s shaded region) are limited in their distribution and the stop is always palatal. Given the clear preference for homorganic nasal-stop clusters, as well as the prohibition on heterorganic coronal clusters involving alveolar [t], it is not surprising that the alveolar lateral place-assimilates.

3.3.2 Lateral deletion

I turn my attention now to understanding why [l] deletes after a stop or [r]. The prohibition on liquids from occupying the second member of a cluster remains relevant here; what needs explanation is why /l/ deletes in these contexts instead of mapping to another segment.

To understand why [l] deletes in words like [kuɳʈat-a], [t̪uruʈ-a], and [kaŋkac-a], rather than mapping to a stop (recall from (29) that stop-stop clusters are attested), we need to consider limitations on the composition of stop-stop clusters. Several such constraints are evident in (31).

(31) Frequency of stop-stop clusters in Yindjibarndi

		C_2					
		Labial	Dental	Alveolar	Retroflex	Palatal	Velar
C_1	Labial [p]						
	Dental [t̪]						
	Alveolar [t]	14				6	1
	Retroflex [ʈ]	1				1	1
	Palatal [c]	11					2
	Velar [k]						

First, note that homorganic stop-stop clusters (in black) are unattested: geminates are prohibited in Yindjibarndi. Second, to the extent that heterorganic stop-stop clusters are attested, almost all have a coronal as the first consonant and a labial or velar as the second (the exceptions come from clusters where the second consonant is palatal). Given these limitations, deletion of the suffix-initial consonant is a sensible repair.

I move now to /l/ deletion following [r] (e.g. /maʈar+la/ → [maʈar-a]). First, the combination cannot surface faithfully since consonant clusters cannot have a liquid as their second member. In addition, the combinatorial properties of [r] are limited: glides can only precede stops and other glides (and, less frequently, nasals). To understand why deletion is preferable to an unfaithful mapping in this case, consider the clusters that contain [r] as a first member (32).

(32) Frequency of [ɾ]-initial clusters

		C_2													
		[-coronal]					[+coronal]								
		[p]	[m]	[k]	[ŋ]	[w]	[t̪]	[n̪]	[t]	[n]	[ʈ]	[ɳ]	[c]	[ɲ]	[j]
C_1	[r]	2	6	32		38							2	1	2

Most clusters that contain [r] as a first member have a [−coronal] consonant as a second member, usually [k] or [w] (and less commonly [p] or [m]). Rather than map unfaithfully to a [+coronal] consonant, it appears that the preference in Yindjibarndi is to just delete the suffix-initial /l/.

3.4 Local summary

Above, I have argued for the following analysis of Yindjibarndi locative allomorphy. The morpheme used with common nouns has two suppletive allomorphs, /la/ and /ŋka/, whose distribution is determined in the morphological component of the grammar. Each suppletive allomorph gives rise to a set of predictable allomorphs (/la/ → [la], [ta], [ʈa], [ca], and [a]; /ŋka/ → [ŋka], [wa], and [a]), whose distribution is governed by phonology.

4 An alternative: all allomorphy is phonology

A potential criticism of the analysis of locative suppletion (Section 3.1) is that it misses phonological generalizations that link suppletive and non-suppletive allomorphy. All locative allomorphy, suppletive or predictable, is phonologically conditioned. Furthermore, the same phonological generalizations that govern suppletive allomorphy also govern predictable allomorphy. The [±syllabic] value of the stem-final segment, for example, plays a role in suppletive allomorphy: it determines whether the locative allomorph is /ŋka/ (after a vowel) or /la/ (after a consonant). The [±syllabic] value of the stem-final segment also plays a role in predictable allomorphy: it determines whether /la/ is realized as [la] (after a vowel) or some other allomorph (after a consonant). Given that both suppletive and predictable allomorphy are governed by the same phonological factors, why not attempt to provide an integrated analysis in the phonology?

This section first develops an integrated, parallel analysis of suppletive and predictable allomorphy (an alternative to the analysis proposed in Section 3) and then shows how it fails. In short, the analysis fails because the rankings necessary to account for suppletive and predictable allomorphy are not compatible; there is a ranking paradox.

4.1 Analyzing suppletion

Determining whether the locative allomorph should be /la/ or /ŋka/ requires us to take two independent factors into account: the stem mora count (bimoraic vs. longer) and the identity of the stem-final segment (vowel vs. consonant). I analyze the role of each, in turn.

4.1.1 Mora count

One way to analyze the mora count-dependent aspect of suppletion is to assume a general preference for /ŋka/ over /la/ ((33); see Section 5.2 for discussion of the alternative assumption that there is a preference for /la/). This preference for /ŋka/ is enforced by PRIORITY ((34); Mascaró 2007:726).

(33) Preferred ordering of allomorphs:
LOC = $\{$/ŋka/$_1 >$ /la/$_2\}$

(34) **PRIORITY**:
Respect lexical priority (ordering) of allomorphs.

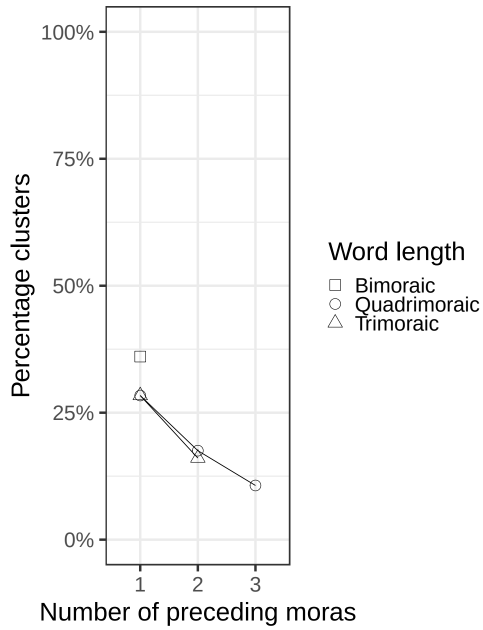
Given this preference for /ŋka/, why does /la/ attach to longer stems? One possible explanation could come from a language-wide dispreference for clusters that appear later, in longer words. An analysis of all bimoraic, trimoraic, and quadrimoraic stems in Wordick's lexicon (n=1951) reveals several trends regarding the distribution of clusters (Figure 3). First, word length matters: clusters are more common in bimoraic words. This means that words like (hypothetical) [ampa] are more common than words like (hypothetical) [ampala] or [ampalara]. Second, position in the word matters: in trimoraic and quadrimoraic words, clusters are more frequent after the first mora than they are after the second or third mora (so words like hypothetical [ampalarra] are more common than words like [alamparra]).

These trends suggest that attaching /la/ to trimoraic and longer stems may be a way to avoid placing /ŋk/, a cluster, in a dispreferred position. I formalize this dispreference as *LATECC (35).

(35) ***LATECC (*μ_2CC)**:
Assign a * for each consonant cluster preceded by two or more moras.

To take effect, *LATECC must dominate PRIORITY. It is also important to note that MAX, which played a central role in Sections 3.2-3.3, dominates PRIORITY; an alternative but unattested way to resolve the *LATECC violation would be to delete a consonant (e.g. /paɽkara+ŋka → *paɽkara-

Figure 3: Distribution of clusters by word length and position



a).[12] MAX must also dominate *LATECC, as CC clusters are found in dispreferred positions in the lexicon. These ranking arguments are illustrated in (36).

(36) *LATECC, MAX ≫ PRIORITY: /paɽkara+LOC/ → [paɽkara-la] (*[paɽkara-(ŋk)a]

	/paɹkara+LOC/ LOC = {/ŋka/$_1$ > /la/$_2$}	MAX	*LATECC	PRIORITY
☞	a. [paɹkara-la$_2$]			*
	b. [paɹkara-ŋka$_1$]		*!	
	c. [paɹkara-a$_1$]	*!*		

4.1.2 Syllabicity of the final segment

The preference to attach /ŋka/ to vowel-final stems and /la/ to consonant-final stems is easy to understand: triconsonantal clusters are forbidden in Yindjibarndi. If /ŋka/ attached to a stem like /majtan/, the result would be illicit *[majtan-ŋka]. I formalize this dispreference as *CCC (37).

(37) ***CCC (*[−syllabic][−syllabic][−syllabic])**:
Assign one * for each triconsonantal cluster.

To take effect, *CCC must dominate PRIORITY. As before, MAX must also dominate PRIORITY, as an alternative but unattested way to satisfy *CCC would be consonant deletion. (In (38), I do not

[12]Recall that three MAX constraints were actually employed in Section 3: MAX, MAX[stem], and MAX[-sonorant]. MAX[stem] is irrelevant because the only repairs I consider here affect the suffix. It does not matter whether the constraint I discuss is MAX or MAX[-sonorant]; all that is crucial for the present argument is that one of them dominates *LATECC.

analyze the hardening of suffix-initial /l/.)

(38) *CCC, MAX ≫ PRIORITY: /majtan+LOC/ → [majtan-ta] (*[majtan-(ŋ)ka])

/majtan+LOC/ LOC = {/ŋka/$_1$ > /la/$_2$}	*CCC	MAX	PRIORITY
☞ a. [majtan-ta$_2$]			*
b. [majtan-ŋka$_1$]	*!		
c. [majtan-ka$_1$]		*!*	

In sum, suppletive allomorphy of the locative suffix can be analyzed as the interaction of phonological constraints with an allomorph preference constraint. A summary of the analysis follows.

(39) Summary of the integrated analysis

$$\begin{tikzcd} \text{*CCC} \arrow[ddr] & \text{MAX} \arrow[d] \\ & \text{*LATECC} \arrow[d] \\ & \text{PRIORITY} \end{tikzcd}$$

4.2 Where the analysis fails

Recall that, for the analysis of nasal cluster dissimilation in Section 3.2.1, *NCV(C)NC$_{[-\text{cor}]}$ must dominate MAX. This is because, given an input like /waɳʈa+ŋka/, the language satisfies *NCV(C)NC$_{[-\text{cor}]}$ by deletion. The problem arises when we integrate the analysis of nasal cluster dissimilation with that of suppletion. If we add the ranking MAX ≫ PRIORITY, as established in (36,38), the grammar incorrectly predicts that *NCV(C)NC$_{[-\text{cor}]}$ should be satisfied through suppletion, not deletion (40).

(40) MAX ≫ PRIORITY makes the wrong prediction for /waɳʈa+ŋka/

/waɳʈa+LOC/ LOC = {/ŋka/$_1$ > /la/$_2$}	*NCV(C)NC$_{[-\text{cor}]}$	*VkV	MAX	PRIORITY
a. [waɳʈa-ŋka$_1$]	*!			
b. [waɳʈa-ka$_1$]		*!		
☹ b. [waɳʈa-a$_1$]			*!*	
💣 c. [waɳʈa-la$_2$]				*

Fixing this problem with the analysis of predictable allomorphy would require us to rank PRIORITY over MAX; this is in conflict with the ranking that is necessary for suppletive allomorphy.

The problem for an integrated analysis of suppletive and predictable allomorphy can be summarized as follows. The analysis of suppletion shows us that it is better to use the "wrong" allomorph than it is to delete a consonant, in order to satisfy *LATECC and *CCC (41).

(41) *CCC, *LATECC, $\boxed{\text{MAX} \gg \text{PRIORITY}}$

The analysis of predictable allomorphy, by contrast, shows us that it is better to delete a consonant than it is to use the "wrong" allomorph, in order to satisfy *NCV(C)NC$_{[\text{-cor}]}$ (42).

(42) *NCV(C)NC$_{[-\text{cor}]}$, $\boxed{\text{PRIORITY} \gg \text{MAX}}$

The integrated analysis thus runs into a ranking paradox, a fatal problem for any analysis. There is no solution that I am aware of. (Possible solutions that involve indexation of faithfulness constraints to morphemes are useless here, as the problem arises within a single morphological paradigm.)

The insight: if we allow the grammar to treat suppletion as a potential repair to a phonotactic problem that can be prioritized over other repairs, like deletion, then we expect the hierarchy among these possible repairs to hold in all cases where both repairs are in principle available. But this is not what happens in the Yindjibarndi locative: the integrated analysis shows us that suppletion solves some phonotactic problems, while deletion solves others. The analysis proposed in Section 3 avoids this problem entirely by depriving phonology of the option to use suppletion as a repair to phonotactic problems.

5 Alternatives

In this section I present two possible alternative integrated analyses of Yindjibarndi suppletion and nasal cluster deletion. The first, in which phonological and morphological operations are serially interleaved, fails because it cannot account for additional data coming from the topicalization clitic /mpa/. The second, in which /la/ is treated as the default analysis, should be dispreferred because it requires the use of an arbitrary and stipulative phonological constraint.

5.1 A serial approach

In this subsection I show that an analysis where phonological and morphological operations are serially interleaved (following Wolf 2008) can derive the locative facts but has trouble accounting for others. In Section 5.1 I develop a Harmonic Serialist analysis (McCarthy 2010 *et seq.*) of suppletive and predictable locative allomorphy.[13] In Section 5.2 I show how this analysis fails when we consider additional facts concerning the behavior of the topicalization clitic /mpa/.

A brief introduction to Harmonic Serialism is necessary. Harmonic Serialism (McCarthy 2010 *et seq.*) is a serial version of Optimality Theory in which GEN is limited to making one change at a time. For present purposes, I assume that one change includes operations like morpheme insertion or deletion (Wolf 2008), segment insertion or deletion (*pace* McCarthy 2008), and lenition or hardening. Because GEN is limited to making one change at a time, derivations precede in steps, with the output of each step functioning as the input to the next one. The derivation converges when it is no longer possible to improve on the input, given the assumed constraints and their ranking.

5.1.1 Deriving the locative facts

To derive the locative facts, I import from Section 4 the assumption that /ŋka/ is the preferred allomorph. In addition, I assume the following constraints: *CCC, *NCV(C)NC$_{[-\text{cor}]}$, PRIORITY, MAX, and REALIZEMORPHEME ((43), Kurisu 2001:37). This analysis does not take into account the mora-counting aspect of suppletive allomorphy; the successes and failures of the serial analysis are clear enough from the aspect of allomorphy that depends on the type of stem-final segment.

[13] Note that, by virtue of using Harmonic Serialism, the analysis in Section 4.1 differs from one that would come from Wolf (2008), who uses Optimality Theory with Candidate Chains (OT-CC, McCarthy 2007). All analytical points raised in this section also apply to an OT-CC-based analysis.

(If one wanted to incorporate the mora-counting aspect of locative allomorphy into the analysis, however, it would be sufficient to include *LATECC at the top of the hierarchy.)

(43) **REALIZEMORPHEME (REALIZEMORPH)**:
Every underlying morpheme must receive some phonological exponence.

In a serial analysis, we want the following order of operations to occur. First, the locative morpheme is inserted. Which morpheme is inserted depends on the constraint *CCC: if insertion of the preferred /ŋka/ would result in violation of *CCC, /la/ is inserted instead. Following insertion of the locative allomorph, predictable allomorphy occurs. The input /wuntu+ŋka/, for example, is realized as [wuntu-ka]. One ranking capable of deriving this order of operations follows in (44).

(44) REALIZEMORPH ≫ *CCC ≫ PRIORITY ≫ *NCV(C)NC$_{[-\text{COR}]}$ ≫ MAX

This ranking ensures that morpheme insertion happens first, and that which morpheme is inserted depends on *CCC. As shown in (45), if insertion of the preferred allomorph /ŋka/ would result in a *CCC violation (*[majtan-ŋka]), /la/ is inserted instead.

(45) Step 1: REALIZEMORPH ≫ *CCC ≫ PRIORITY prefers insertion of /la/ for /majtan/

/majtan+LOC/ LOC = {/ŋka/$_1$ > /la/$_2$}	REALIZE MORPH	*CCC	PRIORITY	*NCV(C)NC$_{[-\text{cor}]}$	MAX
☞ a. [majtan-la$_2$]			*		
b. [majtan-ŋka$_1$]		*!			
c. [majtan]	*!				

In Step 2 of this derivation, [majtan-la$_2$] maps to [majtan-ta$_2$]. I do not show this step of the analysis.

This same ranking predicts that a word like /wuntu/ should take the allomorph /ŋka/, and that nasal cluster dissimilation should follow allomorph selection. In Step 1 of the derivation (46), PRIORITY prefers the insertion of /ŋka/. Although insertion of /ŋka/ results in a *NCV(C)NC$_{[-\text{cor}]}$ violation, PRIORITY outranks *NCV(C)NC$_{[\text{-cor}]}$, so this violation is tolerated.

(46) Step 1: PRIORITY prefers insertion of /ŋka/ for /wuntu/

/wuntu+LOC/ LOC = {/ŋka/$_1$ > /la/$_2$}	REALIZE MORPH	*CCC	PRIORITY	*NCV(C)NC$_{[-\text{cor}]}$	MAX
a. [wuntu-la$_2$]			*!		
☞ b. [wuntu-ŋka$_1$]				*	
c. [wuntu]	*!				

In Step 2, the ranking *NCV(C)NC$_{[-\text{cor}]}$ ≫ MAX compels nasal cluster dissimilation. Deletion of the second nasal (47a) is preferable to leaving it intact (47b).

(47) Step 2: *NCV(C)NC$_{[-\text{cor}]}$ ≫ MAX compels nasal cluster dissimilation

/wuntu-ŋka/	REALIZE MORPH	*CCC	PRIORITY	*NCV(C)NC$_{[-\text{cor}]}$	MAX
a. [wuntu-ŋka]				*!	
☞ b. [wuntu-ka]					*

Step 3 of this analysis involves lenition of /k/ to [w], resulting in [wuntu-wa].

An analysis like this one, in which the analysis is serial, succeeds because it allows different markedness constraints to be satisfied in different ways, according to where in the derivation they become relevant. The ranking *CCC ≫ PRIORITY comes into effect first, and ensures that potential violations of *CCC are averted by using the "wrong" allomorph. The ranking *NCV(C)NC$_{[-\text{cor}]}$ ≫ MAX comes into effect after allomorph selection and ensures that potential violations of *NCV(C)NC$_{[-\text{cor}]}$ are resolved through deletion.

5.1.2 The topicalization clitic /mpa/

As shown in Section 3.2.1, the topicalization clitic /mpa/ participates in nasal cluster dissimilation. Examples demonstrating deletion of the suffix-initial nasal (48a,b), as well as its retention when the stem does not contain a nasal-stop sequence (48c,d), are repeated from (12) below.

(48) Nasal cluster dissimilation with the topicalization clitic /mpa/

a.	/munti+mpa/	→	[munti-pa]	'really-TOP'	(34)
b.	/t̪aŋkar+mpa/	→	[t̪aŋkar-pa]	'enough-TOP'	(34)
c.	/n̪ula+mpa/	→	[n̪ula-mpa]	'at this-TOP'	(240)
d.	/paraː+mpa/	→	[paraː-mpa]	'long time-TOP'	(273)

The ranking in (44) easily accounts for this data. In Step 1 of the derivation (49), /mpa/ is affixed to the stem. The fact that affixation is permitted in forms like (48b) shows that REALIZEMORPHEME dominates *CCC: it is better to realize the topicalization morpheme, even though this results in a marked triconsonantal cluster. (PRIORITY is no longer relevant, as the topicalization morpheme has only one basic allomorph, so I omit it from the tableaux that follow.)

(49) Step 1: REALIZEMORPHEME ≫ *CCC compels insertion of /mpa/ in /t̪aŋkar+TOP/

/t̪aŋkar+TOP/ TOP = /mpa/$_1$	REALIZE MORPH	*CCC	*NCV(C)NC$_{[-\text{cor}]}$	MAX
☞ a. [t̪aŋkar-mpa$_1$]		*	*	
b. [t̪aŋkar]	*!			

In Step 2 of the derivation (50), the rankings *CCC ≫ MAX and *NCV(C)NC$_{[-\text{cor}]}$ ≫ MAX compel deletion of the suffix-initial consonant.

(50) Step 2: *CCC ≫ *NCV(C)NC$_{[-\text{cor}]}$ ≫ MAX compels nasal cluster dissimilation

/t̪aŋkar-mpa/	REALIZE MORPH	*CCC	*NCV(C)NC$_{[-\text{cor}]}$	MAX
a. [t̪aŋkar-mpa]		*!	*	
☞ b. [t̪aŋkar-pa]				*

The problem for this analysis, as well as any other Optimality Theoretic analysis I'm aware of, comes from the observation that /mpa/ does not attach to a consonant-final root if that consonant-final root does not contain a preceding nasal-stop cluster. Wordick's description is extremely clear on this point. Apropos of (48b) (analyzed in (49-50)), he writes the following (p. 34):

> "The reader should understand that this is not simply a reduction of an impossible triconsonantal cluster to a disyllabic [sic] one: the topic clitic will just not fit on words

ending in a consonant with no immediately preceding nasal plus stop cluster [. . .] Gilbert Bobby [a native speaker] tells me that the only thing you can do in this case is to use the emphatic clitic in its place."[14]

I take Wordick's statement to mean that deletion is a possible way to satisfy *NCV(C)NC$_{[-\text{cor}]}$, but that it is not a possible way to satisfy *CCC. This is parallel to the facts for the locative suffix: suppletion, rather than deletion, is the attested response to *CCC. The difference here is that the topicalization clitic /mpa/ has no other allomorphs. If affixing /mpa/ would violate *CCC (and not *NCV(C)NC$_{[-\text{cor}]}$), the word is impossible, and speakers resort to other strategies.

The present analysis fails to make the necessary distinction between these two types of consonant-final word. Given hypothetical /maʈar+TOP/, the current ranking predicts Step 1 of the derivation to involve morpheme insertion (51) and Step 2 to involve reduction of the triconsonantal cluster through deletion (52). But this, according to Wordick, is not what happens.

(51) Step 1: REALIZEMORPHEME ≫ *CCC compels insertion of /mpa/ in /maʈaɾ+TOP/

/maʈar+TOP/ TOP = /mpa/$_1$	REALIZE MORPH	*CCC	*NCV(C)NC$_{[-\text{cor}]}$	MAX
☞ a. [maʈar-mpa$_1$]		*		
b. [maʈar]	*!			

(52) Step 2: *CCC ≫ MAX compels reduction of the triconsonantal cluster

/maʈar-mpa	REALIZE MORPH	*CCC	*NCV(C)NC$_{[-\text{cor}]}$	MAX
a. [maʈar-mpa]		*!		
💣 b. [maʈar-pa]				*

One way to account for the non-realization of forms like /maʈaɾ+mpa/ could be to introduce MPARSE ((53), Prince & Smolensky 2004) and rank it beneath MAX.

(53) **MPARSE**:
Assign one * to the null output.

This analysis correctly predicts that the null output is optimal given the input /maʈaɾ+LOC/ (54). But it also incorrectly predicts that the null output is optimal given the input /t̻aŋkaɾ+mpa/ (55): non-realization has now become the preferred realization for all C-final words. (Note that I assume the null parse violates only MPARSE and not, in addition, REALIZEMORPH.)

[14] The emphatic clitic is /pa/. We can tell that this is a different morpheme than /mpa/ because the /p/ of emphatic /pa/ lenites, but the /p/ of topicalization /mpa/ does not (compare /munti+mpa/ → [munti-pa] 'truly-TOP' to /munti+pa/ → [munti-wa] 'truly-EMP' (225)). For clarity, I assume that /mpa/ is a non-leniting suffix, like /puɲu/ 'user' (Wordick 1982:116). I have not been able to find an example of the emphatic attaching to a [r]-final word to confirm that the morpheme-initial /p/ lenites there too, but this is what is expected given Wordick's description.

(54) Step 1: MPARSE, *CCC ≫ MAX results in the null output for /maʈar+TOP/

/maʈar+TOP/ TOP = /mpa/$_1$	REALIZE MORPH	*CCC	*NCV(C)NC$_{[-\text{cor}]}$	MAX	MPARSE
a. [maʈar-mpa$_1$]		*!			
b. [maʈar-pa$_1$]				*!	
c. [maʈar]	*!				
☞ d. ⊙					*

(55) Step 2: MPARSE, *CCC ≫ MAX results in the null output for /t̪aŋkar+TOP/

/t̪aŋkar+TOP/ TOP = /mpa/$_1$	REALIZE MORPH	*CCC	*NCV(C)NC$_{[-\text{cor}]}$	MAX	MPARSE
a. [t̪aŋkar-mpa$_1$]		*!	*		
☹ b. [t̪aŋkar-pa$_1$]				*!	
c. [t̪aŋkar]	*!				
💣 d. ⊙					*

The problem here is the ranking *CCC ≫ MAX. This analysis makes the prediction that CCC clusters, when not avoidable through suppletion, should be resolved through deletion (or through the null parse, if MAX ≫ MPARSE). While *CCC ≫ MAX is necessary to account for the behavior of the locative forms, it is problematic for the topicalized forms. With *CCC ≫ MAX in place, there is no way to account for the behavior of /mpa/. Thus while a serialist analysis is capable of deriving the locative facts, it fails when we consider other cases of phonologically-conditioned morphology in the language. The related phenomena in the locative and the topicalization paradigms show us a serial analysis of these facts, if one is indeed available, is not straightforward.

5.1.3 A morphological analysis of /mpa/

What, then, should be the analysis of the topicalization clitic? One option is that the distribution of this topicalization clitic could be governed by a Vocabulary Insertion rule. A possibility for how this rule could be written follows in (56): /mpa/ can be inserted given a vowel-final stem or a stem with an immediately preceding nasal-stop cluster (regardless of whether or not it is consonant-final).

(56) Vocabulary insertion rule for topicalization clitic
[TOP] ↔ / {V __ , NCV(C) __}

Under this analysis, nasal cluster dissimilation remains a part of regular phonology, and does not play a role in determining whether or not /mpa/ is inserted. This analysis succeeds because it divorces regular phonology from the considerations that govern morpheme insertion.

5.2 Assuming that /la/ is the default allomorph

Let us assume, contrary to the assumption in Section 4, that /la/ is the default allomorph for the locative, and /ŋka/ appears only under special circumstances. This preference for /la/ can be encoded by assuming that PRIORITY enforces the ordering among allomorphs in (57).

(57) Preferred ordering of allomorphs: LOC = {/la/$_1$ > /ŋka/$_2$}

In order for this analysis to work, there needs to be a constraint forbidding /la/ from being affixed to bimoraic, vowel-final stems. The identity of such a constraint, however, is not obvious. We can't say, for example, that /la/ is forbidden from affixing to single feet, because /la/ can attach to trimoraic feet as in [(lóːpu)(-là)] 'Friday-LOC'. More generally, the division between /ŋka/ and /la/ does not track any obvious division in stress or footing, as is clear from (58). The schematics in (58) illustrate that stress in Yindjibarndi is weight-sensitive and variable: a long vowel can be realized as a single unit or two distinct short vowels in hiatus.

(58) Stress, footing, and allomorphy (stress and footing based on Wordick pp. 41-42)

Moras	Form	Footing	Stress profile	Allomorph
2	CVː-CV	(ˈCVː-CV)	(1-0)	/ŋka/
		(ˈCV.V)(-ˌCV)	(10)-(2)	
	CVCV-CV	(ˈCV.CV)(-ˌCV)	(10)-(2)	
3	CVːCV-CV	(ˈCVː.CV)(-ˌCV)	(10)-(2)	/la/
		(ˈCV.V)(ˌCV-CV)	(10)(2-0)	
	CVCVː-CV	(CV.ˈCVː)(-ˌCV)	(01)-(2)	
		(ˈCV.CV)(ˌV-CV)	(10)(2-0)	
	CVCVCV-CV	(ˈCV.CV)(ˌCV-CV)	(10)(2-0)	

One could try to claim that /la/ is forbidden from suffixing to a bimoraic stem, but this too is flawed, because consonants do not carry a mora in Yindjibarndi: /-ŋka/ attaches to the vowel-final bimoraic stems, as in [malu-ŋka], and /-la/ attaches to the consonant-final ones, as in [majtan-ta]. The only way I can see to make such an analysis work is to stipulate that /la/ is not allowed to attach to bimoraic, vowel-final stems with a constraint like *VV-[la] (59).[15]

(59) ***VV-[la]**:
Assign one * if /la/ attaches to a bimoraic, vowel-final stem.

Assuming that *VV-[la] dominates PRIORITY, the analysis of the distribution of /ŋka/ and /la/ is simple: /ŋka/ attaches to bimoraic vowel-final stems (where /la/ is specifically forbidden) and /la/ attaches elsewhere. This aspect of the analysis is demonstrated in (60-61).

(60) *VV-[la] prohibits /la/ from being attached to bimoraic, vowel-final stems

/malu+LOC/ LOC = {/la/$_1$ > /ŋka/$_2$}	*VV-[la]	PRIORITY
a. [malu-la$_1$]	*!	
☞ b. [malu-ŋka$_2$]		*

(61) /la/ attaches elsewhere

/paɽkara+LOC/ LOC = {/la/$_1$ > /ŋka/$_2$}	*VV-[la]	PRIORITY
☞ a. [paɽkara-la$_1$]		
b. [paɽkara-ŋka$_2$]		*!

Let's consider, now how the allomorphy facts interact with nasal cluster dissimilation. Recall

[15] The associate editor notes that the analysis could also be made to work by assuming that final consonants are not parsed into feet, and that the subcategorization requirements of /ŋka/ require an immediately preceding foot boundary.

that, in order to derive nasal cluster dissimilation, it is crucial to assume that *NCV(C)NC$_{[-\text{cor}]}$ dominates MAX. In addition, we have to assume that *VV-[la] dominates MAX; if the reverse were true, we would predict use of the suffix /la/ to avoid MAX violations (62).

(62) Deriving nasal cluster dissimilation

	/maɲci+LOC/ LOC = {/la/$_1$ > /ŋka/$_2$}	*NCV(C)NC$_{[-\text{cor}]}$	*VV-[la]	MAX	PRIORITY
	a. [maɲci-la$_1$]		*!		
	b. [maɲci-ŋka$_2$]	*!			*
☞	c. [maɲci-a$_2$]			**	*

This analysis, then, allows us to derive the alternation between /la/ and /ŋka/, as well as nasal cluster dissimilation, without any apparent technical problem. The drawback of this approach, however, is that it requires the use of an entirely stipulative constraint, *VV-[la]. There is no reason I have been able to identify as to why [la] should be dispreferred following bimoraic vowel-final stems, and in fact, the pattern that *VV-[la] enforces runs counter to the lexical trends discussed in Section 4.1.1. If anything, singleton consonants should be preferred to consonant clusters in this environment.

In sum, while this analysis can account for the facts, it requires the use of an arbitrary and stipulative constraint whose only use is to derive the correct pattern.

6 Some other cases of PCSA in Yindjibarndi

While the locative suffix constitutes one major and interesting case of PCSA in Yindjibarndi, there are several other suffixes that exhibit PCSA. All cases of PCSA in Yindjibarndi reference two phonological factors: length of the stem (monosyllabic vs. bimoraic vs. longer), and syllabicity of the final segment. We can represent the phonological space used for PCSA as a table, with two cross-cutting factors; an example for the locative morpheme, attached to common nouns, is in (63).

(63) Visualization of suppletive allomorphy in the locative

	Final segment	
Length	C	V
σ	/la/	/ŋka/
$\sigma_\mu\sigma_\mu$	/la/	/ŋka/
Longer	/la/	/la/

In what follows, I expand the scope of the paper by discussing two additional cases of PCSA: the objective case clitic when attached to common nouns, and the vocative. (A third case of PCSA in the inchoative verbalizer is discussed by Wordick pp. 86-89; due to its complexity, I do not discuss it here.) I show that allomorphy in the objective and vocative depends on the same factors as in (63), but neither case can be construed as fully optimizing. These facts lend further support to morphological analyses of PCSA, and suggest that the apparently-optimizing nature of locative allomorphy may be no more than a coincidence.

6.1 The objective case clitic

The objective case clitic, when affixed to a common noun, can be realized as either /ji/ or /ku/. The allomorph is /ji/ when the stem contains two syllables, each with a short vowel, and ends with /i/ or /a/ (64a,b). The allomorph is /ku/ in all other cases: when the stem is consonant-final, monosyllabic or trimoraic and longer, or ends with /u/ (64c-f). Note that in many of these cases, lenition processes obscure the form of the morpheme. The lenition process affecting /ku/ (64d-f) is familiar from the discussion in Section 3.2.2. The alternation in (64a) is reflective of a further lenition process affecting intervocalic /j/: it deletes when the preceding vowel is high (/i/ or /u/) and the following vowel is /i/.

(64) Examples of the objective case clitic

a.	/pari+ji/	→	[pari-i]	'devil-OBJ'	(27)
b.	/muɭa+ji/	→	[muɭa-ji]	'meat-OBJ'	(56)
c.	/purkuɳ+ku/	→	[purkuɳ-ku]	'close smoke-OBJ'	(66)
d.	/t̪aː+ku/	→	[t̪aː-u]	'mouth-OBJ'	(18)
e.	/warapa+ku/	→	[warapa-u]	'grass-OBJ'	(31)
f.	/waru+ku/	→	[waru-u]	'night-OBJ'	(32)

This distribution is visualized in (65); note that breaking down the category of V into [+back] and [-back], while not necessary to characterize suppletion in the locative, is necessary for the objective.

(65) Distribution of the objective case allomorphs, for common nouns

	Final segment		
Length	C	V	
		[+back]	[-back]
σ	/ku/	/ku/	/ku/
$\sigma_\mu\sigma_\mu$	/ku/	/ku/	/ji/
Longer	/ku/	/ku/	/ku/

Is this distribution optimizing? Along the mora-counting dimension, the answer is pretty clearly no: there is no phonotactic reason why insertion of /ji/ should be preferred to /ku/ for a subset of bimoraic stems (see Embick 2010: Ch. 5 for discussion of similar cases).

Along the segmental dimension, however, the answer is partially yes, partially no. First, observe that /ji/ only attaches to a subset of vowel-final stems. This is likely linked to the fact that /j/ appears only rarely after another consonant (there are six instances of [lj] in Wordick's lexicon), while /k/ appears far more frequently and after a diverse set of segments. The fact that /ji/ only occurs after [-back] vowels, however, has no link to the language's phonotactics that I am aware of: there is no reason why suffixation of /ku/ to an /i/ or /a/-final word should be dispreferred.

The objective case provides us with an example in which the distribution of allomorphs is partially optimizing. While the mora-counting aspect of suppletion receives no obvious explanation from a phonological standpoint, part of the aspect related to segmental factors could potentially be explained through reference to constraints on segment sequencing.

6.2 The vocative

The two suppletive allomorphs for the vocative suffix are /ji/ and /u/. The /ji/ allomorph attaches to stems that are bimoraic or longer (66a,b), the /u/ allomorph attaches to monomoraic stems (66c), and both /ji/ and /u/ are both licit for stems that are trimoraic or longer (66d,e).

(66) Examples of the vocative case marker

a.	/kuwa+ji/	→	[kuwa-ji]	'come here-VOC'	(111)
b.	/kaku+ji/	→	[kaku-i]	'Norman-VOC'	(111)
c.	/pa+u/	→	[pa-u]	'hey-VOC'	(111)
d.	/jinpirpa+ji/	→	[jinpirpa-i]	'Long Mack-VOC'	(111)
e.	/jinpirpa+u/	→	[jinpirpa-u]	'Long Mack-VOC'	(111)

One limitation on the vocative's distribution is that a segmental allomorph only surfaces on vowel-final stems. Given a consonant-final root, the vocative meaning is expressed only by intonation (Wordick p. 111). I summarize the distribution of the vocative morphemes in (67).

(67) Distribution of vocative allomorphs

	Final segment	
Length	C	V
σ_μ	(intonation)	/u/
$\sigma_\mu\sigma_\mu$	(intonation)	/ji/
Longer	(intonation)	/ji/, /u/

Some aspects of this distribution can be explained through reference to phonotactic restrictions. The failure of /ji/ to appear after consonant-final roots is not surprising; this same generalization was observed for the objective clitic and can be attributed to the general inability of /j/ to appear as the second member of a consonant cluster. But the distribution of /u/ and /ji/, and the failure of [u] to appear as an allomorph of the vocative following consonant-final roots, is more surprising.

First, there is no obvious phonotactic reason for /u/ to be the preferred allomorph for monosyllabic forms and /ji/ to be the preferred allomorph for bimoraic, disyllabic forms. Second, there is no obvious reason why suffixing /u/ to a consonant-final root should be prohibited.

Allomorphy in the vocative, like the objective, has both optimizing and non-optimizing aspects. The failure to realize /ji/ on consonant-final stems is understandable when we consider the language-wide phonotactics, but the variation between the two allomorphs, and the failure to realize /u/ on consonant-final stems, is not.

6.3 Local summary

By considering more cases of PCSA in Yindjibarndi, we see the same phonological factors (stem length and identity of the final segment) recur as conditioning factors in the distribution of suppletive allomorphs. It is not the case, however, that the distribution of suppletive allomorphs is always optimizing: while some aspects of suppletive allomorphy in the objective and vocative appear to follow general phonotactic patterns, others do not. One possible conclusion to draw from this is that the apparently optimizing distribution of allomorphs in the locative may be no more than a coincidence; another possibility is that at some point in the past, there was a phonologically derivable difference between the synchronically suppletive allomorphs, which has been obscured over time. (See Paster 2016 on possible diachronic origins of Pama-Nyungan ergative allomorphy, which resembles patterns of locative allomorphy.)

7 Conclusion

In summary, Yindjibarndi locative allomorphy supports analyses of phonologically conditioned suppletion as a morphological process (Paster 2006, Embick 2010, *a.o.*). The distribution of allomorphs receives a simple analysis if we treat suppletive allomorphy and predictable allomorphy as separate processes, one implemented in the morphological component of the grammar and the other implemented in the phonological component of the grammar. The broader point this paper makes is that even apparently optimizing cases of PCSA ought to receive morphological analyses (following authors such as Paster 2006, Embick 2010, Gouskova et al. 2015).

A secondary point coming out of this paper, echoing a point raised by Embick (2010: Ch. 5), is that it is necessary to consider cases of PCSA as part of an overall system of suppletive allomorphy, and to not analyze them in isolation. This is particularly important in Yindjibarndi, where all cases of suppletive allomorphy depend on the same two phonological factors: length of the stem and identity of the final segment. While the majority of this paper focused on locative suppletion, consideration of the topicalization clitic /mpa/ led to rejection of the serial analysis, and consideration of the objective and vocative paradigms allowed us to see that while all cases of PCSA refer to the same two phonological factors – stem length and identity of the final segment – the distribution of suppletive allomorphs does not always have a phonotactic motivation.

Abbreviations

ABL	ablative case marker
DIR.ALL	direct allative case marker
EMP	emphatic clitic
ERG	ergative case marker
INST	instrumental case marker
LOC	locative case marker
OBJ	objective case marker
ONE	one
TOP	topic clitic
VOC	vocative suffix

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