Allomorph selection precedes phonology:
Evidence from the Yindjibarndi locative*

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0. Abstract

Theories of the phonology-morphology interface differ by their claims regarding the timing of phonologically conditioned suppletive allomorphy (PCSA) and regular 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, with regular phonology. This paper discusses a case of optimizing PCSA in Yindjibarndi (Pama-Nyungan, Wordick 1982), proposes an analysis in which suppletive allomorphy precedes regular phonology, and shows that the alternative – an analysis in which PCSA occurs in the phonological component of the grammar – is likely unworkable.

1. Introduction

Phonologically conditioned suppletive allomorphy (PCSA; Carstairs 1988, term from Paster 2006) is a type of suppletion in which the factors deciding which allomorph appears are phonological in nature. 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 elsewhere in the language; these cases are often referred to as phonologically optimizing. One well-known example of a phonologically optimizing case of PCSA comes from the Moroccan Arabic 3rd singular masculine clitic (Harrell 1962, Mascaró 2007). Here, the /u/ allomorph occurs after consonant-final roots, and the /h/ allomorph occurs after vowel-final roots. The result is that syllable structure is optimized through avoidance of hiatus (1a) and avoidance of complex codas (1b).

(1) 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’
			[mʕa-h]	‘with him’
b.	/u/	/C_	[ktab-u]	‘his book’
			[ʃaf-u]	‘he saw him’
			[menn-u]	‘from him’

Not all cases of PCSA, however, are phonologically optimizing. A well-known example of non-optimizing PCSA comes from the Haitian Creole definite suffix (Klein 2003), where the /la/ allomorph occurs after consonant-final roots and the /a/ allomorph occurs after vowel-final roots. This distribution of allomorphs leads to apparently non-optimal syllables, as it results in the creation

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of both codas (2a) and hiatus (2b). (Depending on the vocalic environment, a glide is sometimes inserted to break hiatus; see [bato-wa].)

(2) 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'
			malad-la	'the sick (person)'
b.	/a/	/V_	papa-a	'the father'
			bujwa-a	'the kettle'
			bato-wa	'the boat'

The sometimes-optimizing nature of PCSA has led to a protracted debate as to whether the analysis of PCSA should be integrated with the analysis of regular phonology. Generalizing over approaches, there are two main answers to this question. Some authors (e.g. McCarthy & Prince 1993a,b; Kager 1996, Mascró 2007, Bonet et al. 2008, Smith 2015) argue that the analysis of PCSA and regular phonology can or should both be carried out in a single module of the grammar, noting that the same constraints often govern phonology and PCSA (in the case of (1), 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* of PCSA. Others (e.g. Paster 2006, Bye 2008, Embick 2010, Gouskova et al. 2015) argue that PCSA, regardless of whether it is optimizing or not, is a morphological process that precedes regular phonology. The idea is that despite the apparently optimizing nature of PCSA cases like Moroccan Arabic (1), the phonological grammar does not play a role in allomorph selection (though speakers may use their grammars to form generalizations over the lists of words that take a certain allomorph; see Gouskova et al. 2015). I refer to these as *morphological analyses*.

One of the likely reasons why there is so little agreement on this point is that most cases of PCSA, phonologically optimizing or no, can receive either phonological or morphological analysis. Take, for example, the case of Haitian Creole in (2). 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 must 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 (Bonet et al. 2008:912). 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 (though see Kalin 2020 for an argument that a case of PCSA in Turoyo cannot receive a phonological analysis).

Arguments for one type of analysis over the other are usually based on analytic principles or the fit of theories to data, rather than on the data itself. Proponents of phonological analyses, for example, might accuse a morphological analysis of the Moroccan Arabic facts in (1) of missing a generalization: the pattern of PCSA optimizes syllable structure, and 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 (2) is ad hoc: it incorporates constraints leading to phonotactically non-optimal structures, and in addition must include morphological constraints like PRIORITY. One of the most 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 shows 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 happen: one reason is certainly adoption of the wrong theory, but there is also the possibility of accidental gaps, or channel bias (e.g. Ohala 1981, Blevins 2004, Moreton 2008), 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 learn (Boersma 2003, Alderete 2008, Heinz 2009, Stanton 2016, *a.o.*). Thus the arguments for phonological analyses over morphological analyses, or vice versa, are often inconclusive.

This paper presents a case of optimizing PCSA in Yindjbarndi (Pama-Nyungan, Wordick 1982) that strongly argues in favor of morphological analyses. In Yindjibarndi, the form of the locative suffix for common nouns depends on phonological information: the distribution of two suppletive allomorphs, /la/ and /ŋka/, is phonologically determined. Complicating the picture is the fact that both /la/ and /ŋka/ have phonologically predictable allomorphs of their own (/la/ → [la ta ʈa ca a]; /ŋka/ → [ŋka wa a]). I argue that although both suppletive and predictable allomorphy reference the same phonological factors, they must reside in different components of the grammar. The proposed analysis, in sketch form, is that morphology determines the distribution of /la/ and /ŋka/, while phonology determines the distribution of [la ta ʈa ca a] and (separately) [ŋka wa a]. The argument for this position is that the alternative, a phonological analysis integrating suppletive and predictable 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.

1.1. Preliminaries

Before discussing allomorphy in the Yindjibarndi locative, it is first necessary to introduce the language's phonemic inventory as well as several assumptions regarding distinctive features.

1.1.1. Vowel inventory and distinctive features

The vowel inventory is provided in (3). 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 [a] and [u] in [uwa] sequences, though the word [loːpu] 'Friday' has no such origin and leads Wordick (p. 17) to posit that [oː] has phonemic status. Since the phonemic status of [oː] does not matter for present purposes, I follow Wordick here.

(3) Yindjibarndi vowel inventory

Short	
/i/	/u/
/a/	

Long	
/iː/	/uː/
/aː/	/oː/

The vowels in (3) are arranged according to the distinctive features 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 (4); I assume that vowels are [+syllabic] and consonants are [-syllabic]. Like many other Australian languages, Yindjibarndi's consonant inventory features a limited number of manner contrasts but a large number of place contrasts. Wordick's orthography is in brackets; I have converted the orthography to IPA following his description and categorization of the sounds (Wordick pp. 10-13).

(4) 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>	/ɾ/ <rr>	/ɻ/ <r>		

Focusing first on place of articulation, I assume that the coronal consonants (dental, alveolar, retroflex, and palatal) are [+coronal] and the non-coronal consonants (bilabial and velar) are [-coronal]. 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]. (The phenomena discussed here do not motivate a distinction between the bilabial and velar series.)

Focusing now on manner of articulation, I assume that several features are necessary to make the necessary distinctions. First, 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 [±consonantal], with liquids as [+consonantal] and glides as [-consonantal]. It is worth noting here that the glide /ɾ/ 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.

1.2. Roadmap

Section 2 of this paper 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 discusses a serial alternative, in which phonological and morphological operations are interleaved (following Wolf 2008) and shows how that fails as well. Section 6 briefly discusses other cases of PCSA in Yindjibarndi and concludes.

2. Allomorphy in the Yindjibarndi locative

The form of the Yindjibarndi locative depends on both lexical and phonological information. On the lexical side, the form of the locative depends on the class of the noun it attaches to. Yindjibarndi has five noun classes: common nouns, proper nouns, retroflex nouns, and two classes of directional nouns. The directional nouns that decline like *north* I will refer to as north-declining nouns, and the directional nouns that decline like *south* I will refer to as south-declining nouns. Among these, the common nouns form the largest class and the retroflex nouns the smallest; there is only one noun that falls into the retroflex class (Wordick 1982:46). Each noun class is associated with a distinct realization of the locative suffix (Table 1). 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/	[paɻkaɾa-la]	'plain-LOC'	(210)
		[piɻtaɾa-la]	'ceremonial feast-LOC'	(230)
	/ŋka/	[mutci-ŋka]	'hole-LOC'	(203)
		[malu-ŋka]	'shade-LOC'	(273)
Proper nouns	/la/	[kujupuju-la]	'Cooya Pooya-LOC'	(228)
		[minkala-la]	'Minkala-LOC'	(252)
Retroflex nouns	/ʈa/	[cuntaː-ʈa]	'that way-LOC'	(32)
North-declining nouns	/t/	[ciŋka-t]	'upstream-LOC'	(230)
		[jawu-t-pa]	'downstream-LOC-EMP'	(259)
South-declining nouns	/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/ attaches to bimoraic vowel-final stems, while /la/ attaches to consonant-final roots as well as those that are trimoraic or longer. Both /la/ and /ŋka/ have a number of phonologically predictable allomorphs (Table 2).

Table 2: locative allomorphs for common nouns are conditioned by phonological factors[1]

Morpheme	Seg. type	μ	NC?	Seg.	Morph	Example	Gloss	
/ŋka/	V	2μ	No		[ŋka]	malu-ŋka	'shade-LOC'	(149)
			Yes	[i a]	[a]	maɲci-a	'death adder-LOC'	(33)
						wanʈa-a	'stick-LOC'	(33)
				[u]	[wa]	wuntu-wa	'river-LOC'	(33)
/la/		3μ			[la]	paɻkaɾa-la	'plain-LOC'	(210)
	C			[n]	[ta]	majtan-ta	'my gum tree-LOC'	(22)
				[ɳ]	[ʈa]	kaɾwaɳ-ʈa	'summer-LOC'	(210)
				[ɲ]	[ca]	wiɻtaɲ-ca	'path-LOC'	(247)
				[t]	[a]	kunʈat-a	'daughter-LOC'	(23)
				[ʈ]		t̠uɾuʈ-a	'prescribed-LOC'	(23)
				[c]		kaɲkac-a	'loose-LOC'	(23)
				[ɾ]		maʈaɾ-a	'red ochre-LOC'	(23)

In Table 2, rows containing the allomorphs that arise from /la/ are shaded, while rows containing the allomorphs that arise from /ŋka/ are unshaded. Several phonological factors determine which allomorph surfaces. For the bimoraic, vowel-final stems that take /ŋka/, one of the major determining factors 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 root does contain

[1] The instrumental case in Yindjibarndi behaves identically, with the only difference that its allomorphs end in /u/ (so [ŋku u lu tu ʈu cu]). All of the analytical points I raise with respect to the locative apply equally to the instrumental. My reason for focusing this paper on the locative is that there is much more data available.

an immediately preceding nasal-stop cluster, then /ŋka/ surfaces as either [a] (as in [maɲci-a] and [waɳʈa-a]) or [wa] (as in [wuntu-wa]). Moving onto the consonant-final roots that take /la/: in these cases, 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 root-final nasal (as in [majtan-ta], [kaɾwaɳ-ʈa], [wiɻtaɲ-ca]). If the root ends in a stop or the glide [ɾ], the lateral in /la/ deletes. Note that the only licit final consonants in Yindjibarndi are [n ɳ ɲ t ʈ c ɾ], so what's recorded in Table 2 exhausts the space of possible allomorphs.

Evidence that all of these allomorphs are exponents of the same morpheme comes from patterns of case concord within the noun phrase (Wordick pp. 142-143). As is clear from (5), locative case concord occurs regardless of which allomorph is appropriate.

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

a.	ŋuɾa-ŋka	muʋumuʋu-la	(206)
	ground-LOC	cold-LOC	
	'in this cold ground'		
b.	kupica-la-ŋu	maɳʈa-a-ŋu	(214)
	small-LOC-ABL	rock-LOC-ABL	
	'onto a small rock'		
c.	kupica-la	t̪anpaʈan-ta	(229)
	small-LOC	bark basin-LOC	
	'in a small bark basin'		
d.	maɲcaɳ-ʈa-u	piʈit̪a-la-u	(247)
	bed-LOC-OBJ	dry leaf-LOC-OBJ	
	'on the bed of dry leaves'		
e.	wuntu-wa	ciŋka-t	(230)
	river-LOC	upstream-LOC	
	'up the river'		

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 regular phonology. The realizations of /ŋka/ as [wa a] follows from the interaction of two processes, both exceptionless in the language: nasal cluster dissimilation (term from McConvell 1988) and [w]-lenition. The realizations of /la/ as [ta ʈa ca a] occur to comply with restrictions on consonant cluster composition. The next section provides more detail on these phonological regularities and sketches analyses of how the phonology gives rise to the diverse set of allomorphs in Table 2.

3. Analysis of allomorphy in the Yindjibarndi locative

This section focuses first on the phonological part of the analysis. In Section 3.1, I show how the allomorphs [ŋka wa a] can be derived from /ŋka/; in Section 3.2, I show how the allomorphs [la ta ʈa ca a] can be derived from /la/. Following this (Section 3.3), I provide a morphological analysis that captures the distribution of the suppletive allomorphs /la/ and /ŋka/.

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

As a reminder, /ŋka/ attaches to bimoraic vowel-final stems, and its allomorphs [ŋka wa 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] (6).

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

a.	/malu+ŋka/	→	[malu-ŋka]	‘shade-LOC’	(236)
b.	/maɻa+ŋka/	→	[maɻa-ŋka]	‘hand-LOC’	(230)
c.	/yuɾa+ŋka/	→	[juɾa-ŋka]	‘day-LOC’	(149)

When /ŋka/ attaches to a stem that does contain an immediately preceding nasal-stop cluster, it appears as [wa] or [a]. Which of these surfaces depends on the identity of the stem-final vowel: if the stem-final vowel is [u] the suffix appears as [wa] (7a); if the stem-final vowel is [i] or [a] the suffix appears as [a] (7b,c).

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

a.	/wuntu+ŋka/	→	[wuntu-wa]	‘river-LOC’	(33)
b.	/waɳʈa+ŋka/	→	[waɳʈa-a]	‘stick-LOC’	(33)
c.	/maɲci+ŋka/	→	[maɳci-a]	‘death adder-LOC’	(33)

These alternations arise from the interaction of two distinct processes, both of which are entirely general in the language. The first is nasal cluster dissimilation; the second is intervocalic lenition.

3.1.1. Nasal cluster dissimilation

Yindjibarndi exhibits nasal cluster dissimilation (Wordick 1982, Stanton 2019; on the phenomena more generally see Herbert 1986, McConvell 1988, Alderete 1997, Jones 2000, Blust 2012, *a.o.*). 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 (8a,b); the examples in (8c,d) confirm that the clitic surfaces as /mpa/ when no preceding nasal-stop cluster is present.

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

a.	/munti+mpa/	→	[munti-pa]	‘really-TOP’	(34)
b.	/t̪aŋkaɾ+mpa/	→	[t̪aŋkaɾ-pa]	‘enough-TOP’	(34)
c.	/n̪ula+mpa/	→	[n̪ula-mpa]	‘at this-TOP’	(240)
d.	/paɾaː+mpa/	→	[paɾaː-mpa]	‘long time-TOP’	(273)

Nasal cluster dissimilation is exceptionless in Yindjibarndi, though with a few caveats. First, nasal cluster dissimilation only occurs if the second nasal-stop cluster is a homorganic labial or velar cluster, [mp] or [ŋk]. Second, nasal cluster dissimilation occurs only when the nasal-stop sequences are separated by vowels and an optional stem-final consonant (as in (6b), Wordick p. 33). Any other intervening material likely blocks nasal cluster dissimilation (though Wordick provides no illustrative examples). This restriction on co-occurring nasal-stop sequences holds as a static restriction on the lexicon; the only exceptional form is [jantimpuɾwa], a place name (see Wordick 1982:35 for discussion of this word).

For our purposes, only the generalization apparent from (8) is important: Yindjibarndi does not permit sequences of nasal-stop clusters. For discussion and analysis of more detailed facts regarding Yindjibarndi nasal cluster dissimilation, such as the restriction to labial and velar nasal-stop clusters, see Stanton (2019).

3.1.2. Intervocalic lenition

Yindjibarndi has productive intervocalic lenition, affecting most consonants (at least variably) in intervocalic position. We focus here on the behavior of /k/ and /w/ in this position, but see Section 6.1.1 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/ or /i/, /k/ lenites to [w] (9a). Given any other combination of vowels, /k/ deletes (9b-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 (9) – the possessive /kaɭaː/, the objective case clitic /ku/, and the direct allative suffix /kaʈa/ – illustrates that /k/ lenition is general and not limited to specific morphemes.

(9) /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.	/waɾapa+ku/	→	[waɾapa-u]	'grass-OBJ'	(188)
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.

3.1.3. Putting the pieces together

Wordick (1982:33) notes that these alternations 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 either results in lenition or deletion of /k/, depending on the vocalic context. Derivations visualizing this intuition are in (10).

(10) 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	wuntu-wa	waɳʈa-a	maɲci-a
SR	[wuntu-wa]	[waɳʈa-a]	[maɲci-a]

An analysis in Optimality Theory (Prince & Smokensky 1993/2004) requires five constraints: three markedness constraints and two faithfulness constraints. The markedness constraints include *VkV (11), which penalizes intervocalic [k]; *{i,a}wV (12), which penalizes [w] preceded by a [-back] vowel ([i] or [a]) and followed by another vowel; and *NCV(C)NC (13), which motivates nasal cluster dissimilation.[2]

(11) ***[+syll][-coronal, -son][+syll] (*VkV)**:
Assign one * for each non-coronal obstruent that is preceded and followed by a vowel.

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

[2] *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, see Stanton (2019).

(13) ***NCV(C)NC**:
Assign one * for each NCV(C)NC sequence in the input.

In addition to these three markedness constraints, the analysis also requires two faithfulness constraints: MAX (14), which penalizes deletion; and IDENT[±cont] (15), which penalizes lenition.

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

(15) **IDENT[±continuant]**:
Assign one * for each [αcont] input segment whose output correspondent is [-αcont].

The phenomena in Sections 3.1.1-3.1.2 provide us with enough information to establish several crucial rankings among these constraints. First, we know that *NCV(C)NC dominates MAX, because when the stem contains co-occurring nasal-stop sequences, deletion of the suffixal /ŋ/ (16b) is preferable to its retention (16a). (I do not consider candidates that satisfy *NCV(C)NC in other ways, e.g. *[wunu-ŋka] or *[wuntu-ŋa]. For the purposes of this analysis I assume that deletion of the suffixal nasal is the only licit repair; see Stanton 2017:160-167 on deriving different repairs.)

(16) *NCV(C)NC >> MAX: /wuntu+ŋka/ → [wuntu-wa] (*[wuntu-ŋka])

/wuntu+ŋka/	*NCV(C)NC	MAX
a. [wuntu-ŋka]	*!	
☞ b. [wuntu-wa]		*

Second, we know that MAX dominates IDENT[±continuant]. 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/ (17a) is preferable to deleting it (17b) when the surrounding context allows.

(17) MAX >> IDENT[±cont]: /wuntu+ŋka/ → [wuntu-wa] (*[wuntu-a])

/wuntu+ŋka/	MAX	IDENT[±continuant]
☞ a. [wuntu-wa]		*
b. [wuntu-a]	*!	

Third, we know that *{i,a}wV >> MAX, because in contexts where [w] is dispreferred (in all vowel contexts other than [u_a]), its deletion (18b) is preferable to its retention (18a).

(18) *{i,a}wV >> MAX: /maɲci+ŋka/ → [maɲci-a] (*[maɲci-wa])

/maɲci+ŋka/	*{i,a}wV	MAX
a. [maɲci-wa]	*!	
☞ b. [maɲci-a]		*

Fourth and finally, we know that *VkV dominates MAX, because deletion of an intervocalic /k/ (19b) is preferable to retaining it (19a), in contexts when lenition is not possible.

(19) *VkV >> MAX: /maɲci+ŋka/ → [maɲci-a] (*[maɲci-ka]).

/maɲci+ŋka/	*VkV	MAX
a. [maɲci-ka]	*!	
☞ b. [maɲci-a]		*

These ranking arguments are summarized in (20). The three top-ranked markedness constraints do not conflict and are not violated in the data, so we cannot rank them with respect to each other.

(20) Summary of analysis of nasal cluster dissimilation and lenition

*VkV *{i,a}wV *NCV(C)NC

MAX

IDENT[±continuant]

In sum, /ŋka/ has three allomorphs that are in complementary distribution: [ŋka wa a]. The observed alternations can be understood as resulting from the interaction of two processes, both exceptionless in the language: nasal cluster dissimilation and /k/ lenition.

3.2. Distribution of allomorphs of /la/: [la ta ʈa ca a]

The allomorph /la/ attaches to trimoraic and longer vowel-final roots as well as all consonant-final roots. Its allomorphs [la ta ʈa ca a] are in complementary distribution, their realization conditioned by the stem's final segment. When /la/ is suffixed to a vowel-final stem, it appears as [la] (21).

(21) /la/ surfaces as [la] when attached to a vowel-final stem
- a. /loːpu+la/ → [loːpu-la] 'Friday-LOC' (237)
- b. /paɻkaɾa+la/ → [paɻkaɾa-la] 'plain-LOC' (210)

When /-la/ attaches to a consonant-final stem, the suffix-initial [l] is modified or deleted. When /la/ attaches to a nasal-final stem, [l] hardens to a stop and place-assimilates to the preceding nasal (22). When /la/ attaches to a stop-final stem or a stem that ends in [ɾ], [l] deletes (23).

(22) /l/ hardens and place-assimilates when it attaches to a nasal-final stem
- a. /kaɾwaɳ+la/ → [kaɾwaɳ-ʈa] 'summer-LOC' (210)
- b. /majtan+la/ → [majtan-ta] 'my gum tree-LOC' (22)
- c. /wiʈaɲ+la/ → [wiʈaɲ-ca] 'path-LOC' (247)

(23) /l/ deletes when it attaches to a stop-final or [ɾ]-final stem
- a. /kuɳʈat+la/ → [kuɳʈat-a] 'daughter-LOC' (23)
- b. /t̪uɾuʈ+la/ → [t̪uɾuʈ-a] 'prescribed-LOC' (23)
- c. /kaŋkac+la/ → [kaŋkac-a] 'loose-LOC' (23)
- d. /maʈaɾ+la/ → [maʈaɾ-a] 'red ochre-LOC' (23)

These alternations are not predictable from regular phonology: there is no independent evidence from the regular phonology that, say, /l/ hardens when it occurs following 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 Wordick's lexicon (2100 words, entered by hand); I excluded only entries marked as affixes.

3.2.1. 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 (24) 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.)

(24) Cluster frequencies in Yindjibarndi

		C_2			
		Stop	Nasal	Liquid	Glide
C_1	Stop [p t̪ t ʈ c k]	38	1	1	0
	Nasal [m n̪ n ɳ ɲ ŋ]	717	35	0	0
	Liquid [l ɭ]	3	0	0	6
	Glide [w ɾ ɻ j]	104	6	0	38

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 (24), the only attested nasal-initial clusters are nasal-stop or nasal-nasal clusters. The nasal-stop clusters are far more frequent (n=717 vs. n=35), indicating that nasal-nasal clusters are marked relative to the nasal-stop clusters. Thus it makes phonotactic sense that the post-nasal /l/ is realized as a stop.

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 take a closer look at restrictions on the composition of nasal-stop clusters (25).

(25) Frequency of nasal-stop clusters in Yindjibarndi

			C_2					
				Coronal				
			Labial [p]	Dental [t̪]	Alveolar [t]	Retroflex [ʈ]	Palatal [c]	Velar [k]
C_1		Labial [m]	71					
	Coronal	Dental [n̪]		57				
		Alveolar [n]	25		96		19	59
		Retroflex [ɳ]	10			131	5	26
		Palatal [ɲ]	2				64	12
		Velar [ŋ]						140

One generalization clear from (25) is that homorganic nasal-stop clusters (n=559, in black) are more frequent than heterorganic nasal-stop clusters (n=158, in gray and white), even though both are licit. Another observation from (25) is that when a heterorganic nasal-stop cluster occurs, the nasal is usually coronal and the stop is usually labial or velar. Nasal-stop clusters that disagree in minor place (the shaded region in (22)) are limited in their distribution and, in all cases, the stop is palatal. Given the clear preference for homorganic nasal-stop clusters, as well as the prohibition on heterorganic coronal clusters with alveolar [t] as a second member, it makes sense that the alveolar lateral place-assimilates.

For an analysis of lateral hardening and place-assimilation, I assume three markedness constraints. *CL (26) penalizes consonant clusters with a liquid as the second consonant, *NN (27) penalizes nasal-nasal clusters, and *NP (28) penalizes heterorganic nasal-stop clusters. The analysis also includes three faithfulness constraints: IDENT[±continuant] (29), which penalizes the mapping from /l/ to a stop (among others); and IDENT[±anterior] (30) and IDENT[±distributed] (31), which together penalize changes in minor place like those observed in /wiʈaɲ+la/ → [wiʈaɲ-ca]. Note that this collection of constraints is only sufficient for analyzing the alternations found in (22). Analysis of the more detailed picture of cluster phonotactics in (24-25) would require additional constraints.

(26) ***[-syllabic][+continuant, +consonantal] (*CL)**:
Assign one * for each consonant cluster with an approximant as its second member

(27) ***[-continuant, +sonorant][-continuant, +sonorant] (*NN)**:
Assign one * for each nasal consonant that precedes a nasal consonant.

(28) ***[+nasal, αplace][-nasal, -continuant, βplace] (*NP)**:
Assign one * for each heterorganic nasal-stop cluster.

(29) **IDENT[±continuant]**:
Assign one * for each input [αcont] segment that has a [-αcont] output correspondent.

(30) **IDENT[±anterior]**:
Assign one * for each input [αant] segment that has a [-αant] output correspondent.

(31) **IDENT[±distributed]**:
Assign one * for each input [αdistrib] segment that has a [-αdistrib] output correspondent.

I begin by analyzing /l/ hardening in the form /majtan+la/ → [majtan-ta]. The mapping from input /l/ to output [t] violates IDENT[±continuant], so *CL must dominate IDENT[±continuant] (32). In addition, the realization of input /l/ as [t], instead of [n], shows that *NN is highly ranked. There is no evidence from these alternations that *CL and *NN conflict, so I leave them unranked. To keep the tableaux maximally simple, I do not include *NN or candidates that violate it.

(32) *CL >> IDENT[±continuant]: /majtan+la/ → [majtan-ta] (*[majtan-la])

/majtan-la/	*CL	IDENT[±continuant]
☞ a. [majtan-ta]		*
b. [majtan-la]	*!	

The mappings /kaɾwaɳ+la/ → [kaɾwaɳ-ʈa] and /wiʈaɲ+la/ → [wiʈaɲ-ca] demonstrate that *NP dominates the two faithfulness constraints that preserve minor place features, IDENT[±anterior] and IDENT[±distributed]. The mapping from alveolar /l/ to retroflex [ʈ] violates IDENT[±anterior] (33), and the mapping from alveolar /l/ to palatal [c] violates both IDENT[±anterior] and IDENT[±distributed] (34).

(33) *NP >> IDENT[±anterior]: /kaɾwaɳ-la/ → [kaɾwaɳ-ʈa] (*[kaɾwaɳ-ta])

/kaɾwaɳ-la/	*NP	IDENT[±anterior]	IDENT[±distributed]
☞ a. [kaɾwaɳ-ʈa]		*	
b. [kaɾwaɳ-ʈa]	*!		

(34) *NP >> IDENT[±distributed]: /wiʈaɲ-la/ → [wiʈaɲ-ca] (*[wiʈaɲ-ta])

/wiʈaɲ-la/	*NP	IDENT[±anterior]	IDENT[±distributed]
☞ a. [wiʈaɲ-ca]		*	*
b. [wiʈaɲ-ta]	*!		

To summarize, the alternations involving /l/ hardening and place assimilation can be derived by ranking three markedness constraints over three faithfulness constraints. The ranking arguments are visualized in (35).

(35) Interim summary of /la/ allomorph analysis

*NP   *CL   *NN

IDENT[±anterior]   IDENT[±distributed]   IDENT[±continuant]

3.2.1. Lateral deletion

I turn my attention now to understanding why [l] deletes after a stop or [ɾ]. 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 rather than mapping to another segment.

To understand why [l] deletes in words like [kuɳʈat-a], [t̪uɾuʈ-a], and [kaɲkac-a], rather than mapping to a stop (recall from (24) that stop-stop clusters are attested), we need to consider constraints on the composition of stop-stop clusters. Several such constraints are evident in (36).

(36) Frequency of stop-stop clusters in Yindjibarndi

			C_2					
				Coronal				
			Labial	Dental	Alveolar	Retroflex	Palatal	Velar
C_1		Labial [p]						
	Coronal	Dental [t̪]						
		Alveolar [t]	14				7	1
		Retroflex [ʈ]	1				1	1
		Palatal [c]	11					1
		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 apparent exceptions, which I do not treat here, come from clusters where the second consonant is a palatal). We can use this information to motivate several markedness constraints. The first, NOGEM ((e.g. Spaelti 1997), (37)), penalizes geminates. The second and third, *tʈ (38) and *tc (39), work together to penalize heterorganic coronal-coronal clusters by penalizing sequences that disagree in [±anterior] and [±distributed]. (For more on constraints that govern cluster composition in Australian languages, see Hamilton 1995.) For present purposes, I assume that (38-39) are undominated and do not include these constraints or candidates that violate them below.

(37) **NOGEMINATES (NOGEM)**:
Assign one * for each geminate consonant.

(38) **[αanterior][-αanterior] (*tʈ)**:
Assign one * for each coronal-coronal sequence that disagrees for the feature [±anterior].

(39) **[αdistributed][-αdistributed] (*tc)**:
Assign one * for each coronal-coronal sequence that disagrees for the feature [±distrib].

Two additional faithfulness constraints, in addition to (29-31), become relevant here. The first is MAX (14), which penalizes deletion. The second is IDENT[±coronal] (40), which penalizes changes in major place. IDENT[±coronal] is a necessary addition to the analysis because it helps explain why /l/ does not map to, say, [p], given that /kuɳʈat+la/ → [kuɳʈat-pa] would result in a licit [tp] cluster.

(40) **IDENT[±coronal]**:
Assign one * for each corresponding pair of consonants that disagrees for [±cor].

One crucial ranking in this dataset is between NOGEM and MAX: the preference to delete the suffix-initial consonant rather than realize it as a stop demonstrates that NOGEM >> MAX (41).

(41) NOGEM >> MAX: /kuɳʈat+la/ → [kuɳʈat-a] (*[kuɳʈat-ta]

/kuɳʈat+la/	NOGEM	MAX
☞ a. [kuɳʈat-a]		*
b. [kuɳʈat-ta]	*!	

In addition, the preference for deletion of the suffix-initial consonant in /kuɳʈat+la/ → [kuɳʈat-a], rather than a change in major place (e.g. /kuɳʈat+la/ → *[kuɳʈat-pa]), shows that IDENT[±coronal] dominates MAX: it is better to delete a coronal (42a) than it is to map that coronal to a labial (42b).

(42) IDENT[±coronal] >> MAX: /kuɳʈat+la/ → [kuɳʈat-a] (*[kuɳʈat-pa])

/kuɳʈat+la/	IDENT[±coronal]	MAX
☞ a. [kuɳʈat-a]		*
b. [kuɳʈat-pa]	*!	

I turn to explaining the deletion of /l/ following [ɾ] (e.g. /maʈaɾ+la/ → [maʈaɾ-a]). First, the combination cannot surface faithfully as consonant clusters cannot have a liquid as their second member. In addition, the combinatorial properties of [ɾ] 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 [ɾ] as a first member (43).

(43) Frequency of /ɾ/-initial clusters

		C2													
		[-coronal]					[+coronal]								
		/p/	/m/	/k/	/ŋ/	/w/	/t̪/	/n̪/	/t/	/n/	/ʈ/	/ɳ/	/c/	/ɲ/	/j/
C_1	/ɾ/	2	6	32		38							2		2

Most clusters that contain [ɾ] as a first member have a [-coronal] consonant as a second member, usually /k/ or /w/ (and less commonly [p] and [m]). I take this as evidence that there exists a markedness constraint, *ɾT (44), which penalizes each occurrence of [ɾ] that precedes another coronal consonant.

(44) ***[-consonantal, +anterior][+coronal] (*ɾT)**:
Assign one * for each sequence of [ɾ] followed by a [+coronal] consonant.

Deletion occurs in this context, so *ɾT dominates MAX. In addition, given the ranking IDENT[±coronal] >> MAX (as established in (42)), the analysis correctly predicts that deletion should be the preferred repair in this case. As /l/ cannot surface as any kind of coronal (due to *ɾT, (43b)), deleting it (45a) is preferable to realizing it as a non-coronal (45c).

(45) *ɾT >> MAX: /maʈaɾ+la/ → [maʈaɾ-a] (*[maʈaɾ-ta])

/maʈaɾ-la/	*ɾT	IDENT[±coronal]	MAX
☞ a. [maʈaɾ-a]			*
b. [maʈaɾ-ta]	*!		
c. [maʈaɾ-ka]		*!	

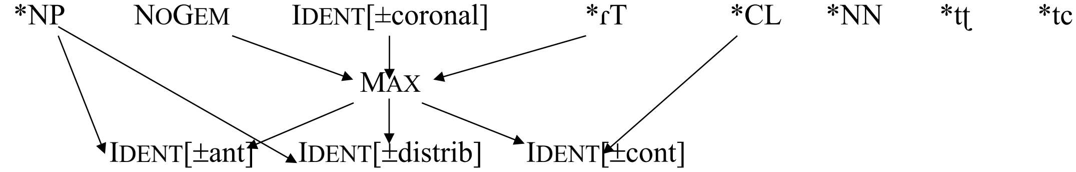
The rankings established in response to /l/ deletion are largely orthogonal to those established by /l/ hardening and assimilation, so integrating them into a single analysis is trivial. The only additional necessary ranking is between MAX, IDENT[±anterior], IDENT[±distributed], and IDENT[±continuant]. Since /l/ hardens and place-assimilates following a nasal, we know that MAX dominates IDENT[±anterior], IDENT[±distributed], and IDENT[±continuant]; modification of the /l/ is preferable to its deletion. The mapping /kaɾwaɳ+la/ > [kaɾwaɳ-ʈa] illustrates two rankings (46); the third, MAX >> IDENT[±distributed], is illustrated by /wiʈaɲ+la/ → [wiʈaɲ-ca] (*[wiʈaɲ-a]).

(46) MAX >> IDENT[±anterior], IDENT[±continuant]: /kaɾwaɳ-la/ → [kaɾwaɳ-ʈa] (*[kaɾwaɳ-a])

/kaɾwaɳ-la/	MAX	IDENT[±anterior]	IDENT[±continuant]
☞ a. [kaɾwaɳ-ʈa]		*	*
b. [kaɾwaɳ-a]	*!		

A Hasse diagram is provided as a summary in (47).

(47) Summary of analysis of allomorphy of /la/



In sum, /la/ has five allomorphs that are in complementary distribution: [la ta ʈa ca a]. These alternations can be understood as resulting from static constraints on cluster composition in Yindjibarndi, and I have shown that independent support for these static constraints comes from consideration of the lexicon. The reader can verify that the rankings summarized in (20), which account for the distribution of /ŋka/'s allomorphs, are consistent with the rankings necessary to account for the distribution of /la/'s allomorphs.

3.3. Distribution of suppletive allomorphs, /ŋka/ and /la/

So far, I have accounted for how /ŋka/ gives rise to allomorphs [ŋka wa a]; separately, I have accounted for how /la/ gives rise to allomorphs [la ta ʈa ca a]. All that remains is to 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.

I propose that the distribution of suppletive allomorphs is determined in the morphological component of the grammar and is perhaps implemented by Vocabulary Insertion rules (Halle & Marantz 1993; (48)). The rule in (48a) requires that the locative morpheme be realized as /ŋka/ given a preceding bimoraic vowel-final root, while the rule in (48b) requires that the locative morpheme be realized as /la/ in the general case. Adopting the common assumption that more specific rules apply first (Halle & Marantz 1993), these two rules work together to ensure that /ŋka/ is inserted in the listed contexts and /la/ is inserted elsewhere.

(48) Vocabulary insertion rules for locative suffix on common nouns

a. [LOC] ↔ /ŋka/ / C_0VC_0V__, C_0V: __

b. [LOC] ↔ /la/

The exact formalization does not matter here. The distribution could be captured with subcategorization frames (Paster 2006). It could also be captured by assuming that (48a) 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 the morphological component of the grammar, before regular phonology. The distribution of the suppletive allomorphs is determined by phonological properties, but the phonological grammar plays no direct role in their selection.

In sum, I assume the following analysis of Yindjibarndi locative allomorphy. The common noun's morpheme has two suppletive allomorphs, /la/ and /ŋka/, whose distribution is phonologically conditioned but governed by the morphology. Each of these suppletive allomorphs gives rise to a set of predictable allomorphs (/la/ → [la ta ʈa ca a]; /ŋka/ → [ŋka wa a]), whose distribution is governed by the regular phonology of the language. While I have proposed a specific formal analysis of these facts, few details of what has been presented above matter. What's important is the distinction between suppletive allomorphy (part of the morphology) and predictable allomorphy (part of the phonology).[3]

[3] One could also imagine an analysis in which all allomorphy is analyzed as suppletion. Vocabulary Insertion rules could require [ta] to be realized after [n]-final words; [ca] to be realized after [ɲ]-final stems; [a] to be realized after [ɾ]-final, stop-final, and NC{i,a}-final words; and so on. I have no argument against this position, except to note that it would introduce something of a duplication into the grammar: the analyses of nasal cluster dissimilation, /k/-lenition, and cluster phonotactics are independently necessary to account for aspects of the language's regular phonology.

4. An alternative: all allomorphy is phonology

A potential criticism of the analysis of locative suppletion (Section 3.3) is that it misses phonological generalizations that link suppletive and non-suppletive allomorphy. All locative allomorphy, suppletive or predictable, is phonologically conditioned. What's more, the same phonological generalizations that govern suppletive also govern predictable allomorphy. The [±syllabic] value of the stem's 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's 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 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's allomorph should be /la/ or /ngka/ requires us to take two independent factors into account: the stem's mora count (bimoraic vs. longer) and the identity of the stem's final segment (vowel vs. consonant). I analyze the role of each, in turn.

4.1.1. Mora count

One way to analyze the aspect of suppletion that depends on mora count is to assume a general preference for /ŋka/ over /la/ (49). This preference for /ŋka/ is enforced by PRIORITY ((50); Mascaró 2007:726).

(49) Preferred ordering of allomorphs
LOC = {/ngka/$_1$ > /la/$_2$}

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

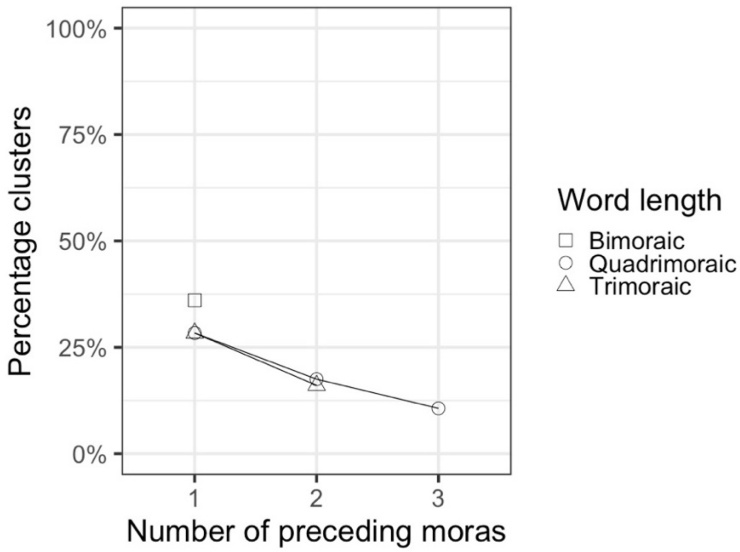
Given this preference for /ŋka/, why does /la/ attach to longer stems? One possible explanation comes from a language-wide dispreference for clusters that appear later, in longer words. An analysis of all bimoraic, trimoraic, and quadrimoraic forms in Wordick's lexicon (n=1951) reveals several trends regarding the distribution of clusters (Figure 1[4]). First, word length matters: clusters are more common in bimoraic words. This means that bimoraic words like (hypothetical) [ampa] are more common than trimoraic or quadrimoraic words like (hypothetical) [ampala] or [ampalarra]. 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 position where it would be dispreferred. I formalize this dispreference as *LATECC (51).

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

[4] Figure 1 was made with R's ggplot package (Wickham 2016).

Figure 1: distribution of clusters by word length and position



To take effect, *LATECC must dominate PRIORITY. It is also important to note that MAX, which played a central role in Sections 3.1-3.2, dominates PRIORITY; an alternative but unattested way to resolve the *LATECC violation would be to delete a consonant (e.g. /paɻkaɾa+ŋka/ → *[paɻkaɾa-ka][5]). These ranking arguments are illustrated in (52).

(52) *LATECC, MAX >> PRIORITY: /paɻkaɾa+LOC/ → [paɻkaɾa-la] (*[paɻkaɾa-(ŋk)a])

/paɻkaɾa+LOC/ LOC = {/ŋka/$_1$ > /la/$_2$}	*LATECC	MAX	PRIORITY
☞ a. [paɻkaɾa-la$_2$]			*
b. [paɻkaɾa-ŋka$_1$]	*!		
c. [paɻkaɾa-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 prohibited in Yindjibarndi. If /ŋka/ attached to a stem like /majtan/, the result would be illicit *[majtan-ŋka]. I formalize this dispreference as *CCC (53).

(53) ***CCC**:
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 (54), I do not analyze the hardening of suffix-initial /l/; see Section 3.2.1 for this aspect of the analysis.)

[5] Recall from Section 3.1.2 that deletion of the suffixal /ŋ/ results in deletion of the suffixal /k/ as well.

(54) *CCC, MAX >> PRIORITY: /majtan+LOC/ → [majtan-la] (*[majtan-ŋka], *[majtan-ka])

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

In light of the discussion that follows, it is worth asking if a ranking like M >> PRIORITY >> MAX could account for the results in (52) and (54), where M stands for an as yet unidentified markedness constraint. For (52), this could be a constraint stipulating that /ŋka/ may not be attached to trimoraic or longer forms. For (54), however, an equivalent move is likely not feasible. One could appeal to a restriction on heterorganic nasal-stop clusters, but recall from (25) that such clusters are attested within roots (e.g. [kanka] 'height, top' (288)), and they can also be created across stem-suffix boundaries, as in [ɲin-ku] 'you-OBJ' (219) and [puɽkuɳ-ku] 'close smoke-OBJ' (215). In addition, such an analysis would not be able to rule out a further candidate (d), [majtan-a], which poses no obvious phonotactic problem.

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

(55) Summary of the integrated analysis

*CCC MAX *LATECC

PRIORITY

4.2. Where the analysis fails

Recall that, for the analysis of nasal cluster dissimilation in Section 3.1.1, *NCV(C)NC must dominate MAX. This is because, given an input like /waɳʈa+ŋka/, the language satisfies *NCV(C)NC by deletion. The problem arises when we attempt to integrate the analysis of nasal cluster dissimilation with that of suppletion. If we add the ranking MAX >> PRIORITY, as established in (52,54), the grammar incorrectly predicts that *NCV(C)NC should be satisfied through suppletion, rather than deletion (56).

(56) MAX >> PRIORITY makes the wrong prediction for /waɳʈa+ŋka/

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

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 (57).

(57) *CCC, *LATECC, **MAX >> 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 (58).

(58) *NCV(C)NC, **PRIORITY >> 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: 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. A serial alternative

In this section 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.[6] 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 proceed 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. 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, PRIORITY, MAX, and REALIZEMORPHEME ((59), Kurisu 2001). This analysis does not take into account the mora-counting aspect of suppletive allomorphy; the successes and failures of the serial analysis are clear from considering the aspect of allomorphy that depends on the stem-final consonant.

(59) **REALIZEMORPHEME (REALIZEMORPH)**:
Assign one * for each input morpheme that does not have a correspondent in the output.

[6] Note that, by virtue of using Harmonic Serialism, the analysis in Section 5.1 differs from one that would come from Wolf (2008), who uses Optimality Theory with Candidate Chains (OT-CC, McCarthy 2006). I use Harmonic Serialism rather than OT-CC for two reasons. First, it is more familiar to current readers. Second, OT-CC fails to account for the Yindjibarndi locative because it runs into the same problem as does the parallel analysis: suppletion requires the ranking PRIORITY >> MAX, while predictable allomorphy requires the reverse. The analysis runs into this problem because, like the parallel analysis developed in Section 4, Markedness constraints evaluate only the final output form. There is no evaluation of the markedness of intermediate forms in OT-CC.

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 (60).

(60) REALIZEMORPH >> *CCC >> PRIORITY >> *NCV(C)NC >> MAX

This ranking ensures that morpheme insertion happens first, and that which morpheme is inserted depends on *CCC. As shown in (61), if insertion of the preferred allomorph /ŋka/ would result in a *CCC violation (*[majtan-ŋka]), /la/ is inserted instead.

(61) Step 1: MAX-M, *CCC >> PRIORITY prefers insertion of /la/ for /maytan/

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

In Step 2 of this derivation, [majtan-la$_2$] maps to [majtan-ta$_2$], in accordance with high-ranked *CL. I do not show this step of the analysis here.

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 (62), PRIORITY prefers the insertion of [ŋka]. Although insertion of [ŋka] results in a *NCV(C)NC violation, PRIORITY outranks *NCV(C)NC, so this violation is tolerated.

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

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

In Step 2, the ranking *NCV(C)NC >> MAX compels nasal cluster dissimilation. Deletion of the second nasal (63a) is preferable to leaving it intact (63b).

(63) Step 2: *NC…NC >> MAX compels nasal cluster dissimilation

/wuntu-ŋka/	REALIZE MORPH	*CCC	PRIORITY	*NCV(C)NC	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 morphological and phonological operations are serially interleaved, 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 >> MAX comes into effect after allomorph selection and ensures that potential violations of *NCV(C)NC are resolved through deletion.

5.2. The topicalizing /mpa/

As shown in Section 3.1.1, the topicalization clitic /mpa/ participates in nasal cluster dissimilation. Examples demonstrating deletion of the suffix-initial nasal (64a,b), as well as its retention when the stem does not contain a nasal-stop sequence (64c,d), are repeated from (8) below.

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

The ranking in (60) easily accounts for this data. In Step 1 of the derivation (65), /mpa/ is affixed to the stem. The fact that affixation is allowed in forms like (64b) shows that REALIZEMORPHEME dominates *CCC: it is better to realize the topicalization morpheme, even though this results in an unacceptable 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.)

(65) Step 1: REALIZEMORPHEME >> *CCC compels insertion of /mpa/ in /t̪aŋkaɾ+mpa/

/t̪aŋkaɾ+TOP/ TOP = /mpa₁/	REALIZE MORPH	*CCC	*NCV(C)NC	MAX
☞ a. [t̪aŋkaɾ-mpa₁]		*	*	
b. [t̪aŋkaɾ]	*!			

In Step 2 of the derivation (66), the rankings *CCC >> MAX and *NC…NC >> MAX compel deletion of the suffix-initial consonant.

(66) Step 1: *NC…NC >> MAX compels nasal cluster dissimilation/

/t̪aŋkaɾ-mpa/	REALIZE MORPH	*CCC	*NC…NC	MAX
a. [t̪aŋkaɾ-mpa]		*!	*	
☞ b. [t̪aŋkaɾ-pa]				*

The problem for this analysis comes from the observation that /mpa/ does not attach to a consonant-final root if it does not contain a preceding nasal-stop sequence. Wordick's description is extremely clear on this point. Apropos of the datapoint in (64b) (analyzed in (65-66)), 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."[7]

[7] The emphatic clitic is /pa/. How can we tell that it is really a different morpheme? Because the /p/ of emphatic /pa/ lenites, but the /p/ of topicalization /p/ does not (compare /munti+mpa/ > [munti-pa] 'truly-TOP' to /munti+pa/ > [munti-wa] 'truly-EMP'. In rule-based terms, /p/-lenition counterfeeds nasal cluster

I take Wordick's statement to mean that consonant deletion is a possible response to *NCV(C)NC, but that it is not a possible response to *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), 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 /maʈaɾ+TOP/, the current ranking predicts Step 1 of the derivation to involve morpheme insertion (67) and Step 2 to involve reduction of the triconsonantal cluster through deletion (68). But this, according to Wordick, is not what happens.

(67) Step 1: REALIZEMORPHEME >> *CCC compels insertion of /mpa/ in /maʈaɾ+LOC/

/maʈaɾ+TOP/ TOP = /mpa$_1$/	REALIZE MORPH	*CCC	*NCV(C)NC	MAX
☞ a. [maʈaɾ-mpa$_1$]		*		
b. [maʈaɾ]	*!			

(68) Step 2: *CCC >> MAX compels reduction of the triconsonantal cluster

/maʈaɾ-mpa/	REALIZEMORPH	*CCC	*NCV(C)NC	MAX
a. [maʈaɾ-mpa]		*!		
💣 b. [maʈaɾ-pa]				*

One way to account for the non-realization of forms like /maʈaɾ+mpa/ is to introduce MPARSE ((69), Prince & Smolensky 1993/2004) and rank it beneath *CCC.

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

This analysis predicts that the null output is optimal, given the input /maʈaɾ+mpa/ (70). But it also incorrectly predicts that the null output is optimal given input /ṯaŋkaɾ+mpa/ (71): non-realization has now become the preferred realization for NCVC-final words.

(70) Step 1: MPARSE, *CCC >> MAX results in the null output

/maʈaɾ+TOP/ TOP = /mpa$_1$/	REALIZE MORPH	*CCC	MPARSE	*NCV(C)NC	MAX
a. [maʈaɾ-mpa$_1$]		*!			
b. [maʈaɾ]	*!				
☞ c. ⊙			*		

(71) Step 1: MPARSE, *CCC >> MAX results in the null output

/ṯaŋkaɾ+TOP/ TOP = /mpa$_1$/	REALIZE MORPH	*CCC	MPARSE	*NCV(C)NC	MAX
☹ a. [maʈaɾ-mpa$_1$]		*!			
b. [maʈaɾ]	*!				
💣 c. ⊙			*		

dissimilation. I have not been able to find an example of the emphatic attaching to an [ɾ]-final word to confirm that the morpheme-initial /p/ lenites there too, but this is what's expected given Wordick's description.

The problem here is the ranking *CCC >> MAX. This analysis makes the prediction that CCC clusters, when not avoidable through suppletion (or, violation of PRIORITY), should be resolved through deletion. 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 (see Embick 2010: Ch. 5 on the importance of whole-language analysis). The related phenomena in the locative and the topicalization paradigms show us that no respectable phonological analysis of suppletive allomorphy is workable.

5.3. A morphological analysis

What, then, should be the analysis of the topicalization clitic? I propose that the distribution of the topicalization clitic could be governed by a Vocabulary Insertion rule. One possibility for how this rule could be written follows in (72): /mpa/ can be inserted given a vowel-final stem or consonant-final stem with an immediately preceding nasal-stop cluster.

(72) Vocabulary insertion rule for topicalization clitic
[TOP] ↔ /mpa/ / V__, NCVC __

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.

6. Discussion and conclusion

The major claim of this paper is been that PCSA in the Yindjibarndi locative suffix should receive a morphological analysis, even though the distribution of suppletive allomorphs appears to be optimizing. The evidence for this claim comes from the fact that an integrated analysis of suppletive and predictable allomorphy is not just undesirable, but likely unworkable. Further evidence consistent with this conclusion comes from the fact that other cases of PCSA in Yindjibarndi reference the same phonological factors (consonant-final vs. vowel-final words, mora count) but cannot be viewed as fully optimizing. I discuss these facts in Section 6.1, and Section 6.2 concludes.

6.1. Other cases of PCSA in Yindjibarndi

While the locative suffix constitutes one major and interesting case of PCSA in Yindjibarndi, there are several other affixes 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 (73).

(73) Visualization of suppletive allomorphy

<table>
<tr><td></td><td colspan="2">Final segment</td></tr>
<tr><td>Length</td><td>C</td><td>V</td></tr>
<tr><td>σ</td><td rowspan="3">/la/</td><td rowspan="2">/ŋka/</td></tr>
<tr><td>$\sigma_\mu\sigma_\mu$</td></tr>
<tr><td>Longer</td><td></td></tr>
</table>

In what follows, I discuss 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.) Allomorphy in the objective and vocative depends on the same factors as in (73), but neither case is fully optimizing.

6.1.1 The objective case clitic

The objective case clitic, when affixed to a common noun, can be realized as either /ji/ or /ku/. The preferred allomorph is /ji/ when the stem contains two syllables, each with a short vowel, and ends with /i/ or /a/ (74a,b). The preferred allomorph is /ku/ in all other cases: when the stem is consonant-final, monosyllabic or trimoraic and longer, or ends with /u/ (74c-f). Note that in many of these cases, lenition processes obscure the form of the morpheme. The lenition process affecting /ku/ (74d-f) is familiar from the discussion in Section 3.1.2. The alternation in (74a) 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/.

(74) Examples with the objective case clitic in Yindjibarndi

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

This distribution is visualized in (75); 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.

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

<table>
<tr><td rowspan="3">Length</td><td colspan="3">Final segment</td></tr>
<tr><td rowspan="2">C</td><td colspan="2">V</td></tr>
<tr><td>[+back]</td><td>[-back]</td></tr>
<tr><td>σ</td><td rowspan="3" colspan="2">/ku/</td><td></td></tr>
<tr><td>$\sigma_\mu\sigma_\mu$</td><td>/ji/</td></tr>
<tr><td>Longer</td><td></td></tr>
</table>

Is this distribution optimizing? Along the mora-counting dimension, the answer is pretty clearly no: there is no phonotactic reason why insertion of /yi/ should be preferred to /ku/ for a subset of bimoraic stems. Along the segmental dimension, however, the answer is potentially yes.

Consider what would happen if /ku/, clearly the default allomorph, were affixed to a bimoraic, disyllabic word that ends with /i/ or /a/. The prediction, given /k/ lenition, is that /k/ should delete in these cases; recall that the only environment in which /k/ lenites to [w] is between [u] and [a]. Thus we predict that hypothetical /paɾi+ku/ would be realized as [paɾi-u], and hypothetical /muɭa+ku/ would be realized as [muɭa-u]. Is there any a priori reason to believe that these vowel sequences are dispreferred? No: Wordick notes (p. 19) that both [au] and [iu] are licit vowel sequences, and that both occur within morphemes, as in [mau-] 'cut' and [ciuɾa] 'bony bream'.

But is there any quantitative evidence that [iː] is preferred to [iu], and [aji] to [au]? On this point, the data are more interesting. Counts for vowel sequences from Wordick's lexicon are in (76): it is clear that long vowels (in black) are more frequent than sequences of short vowels. Based on this, we might conclude that /ji/ attaches to /i/-final words because doing so allows for the creation of a long vowel (as in [paɾi-i]) rather than an [iu] sequence (as in hypothetical [paɾi-u]).

(76) Frequency of long vowels and short vowel sequences in Yindjibarndi

		V2		
		/a/	/i/	/u/
V1	/a/	276	5	39
	/i/	9	32	7
	/u/	1	4	53

(/o:/ 2)

In addition to this, [aji] is more common in Wordick's lexicon (n=78) than is [au] (n=39). Based on this, we might hypothesize that /ji/ attaches to /i/-final words because doing so allows an [aji] sequence to surface, instead of the less frequent [au].

With the variation according to [±back] accounted for, we need to ask why /ji/ can only attach to vowel-final stems. The likely answer is that /j/ appears only rarely after another consonant (there are six instances of [lj] in Wordick's lexicon), while /k/ appears more frequently and after a diverse set of segments (n=310; consonants that can precede [k] include [l ɾ ɻ j ɲ ɳ n ŋ t ʈ c]). It thus makes phonotactic sense that /ku/ attaches to consonant-final roots, as consonant clusters with [k] as the second member are generally more acceptable than are clusters with [j] as the second member.

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

6.1.2. 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 (77a-b), the /u/ allomorph attaches to monomoraic stems (77c), and both /ji/ and /u/ are both licit for stems that are trimoraic or longer (77d-e).

(77) Examples with 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.	/jinpiɾpa+ji/	→	[jinpiɾpa-ji]	'Long Mack-VOC'	(111)
e.	/jinpiɾpa+u/	→	[jinpiɾpa-u]	'Long Mack-VOC'	(111)

One limitation on the vocative's distribution is that it only attaches to 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 two vocative morphemes in (78).

(78) Distribution of the vocative allomorphs

Length	Final segment	
	C	V
σ	∅	/u/
$\sigma_\mu\sigma_\mu$		/yi/
Longer		/yi/, /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 interjections 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 pohibited. Counts from the lexicon show that there are 417 [u]-final words and 197 consonant-final words; if anything, realizing the vocative as [u] following a consonant-final stem would improve the phonotactic profile of that word. Third and finally, if the distribution of /u/ and /ji/ were truly optimizing, we might expect to see their distribution depend on the [±back] value of the word-final vowel, as is the case for the objective case clitic.

Allomorphy in the vocative, like the objective, has both optimizing and non-optimizing aspects. The failure to realize /ji/ on consonant-final stems makes phonotactic sense, but the variation between the two allomorphs, and the failure to realize /u/ on consonant-final stems, does not.

6.1.3. 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 make phonotactic sense, 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.

6.2. 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 argument for this analysis is not based on analytic principles or the fit of a theory to the typology. It is based on the fact that reasonable phonological analyses of locative suppletion fail. The broader point this paper makes is that even 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, the distribution of suppletive allomorphs does not always have a phonotactic motivation.

Abbreviations

LOC – locative case marker
EMP – emphatic clitic
ABL – ablative case marker
OBJ – objective case clitic
TOP – topicalization clitic
DIR.ALL – direct allative case marker

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