

AN AFFIX-SPECIFIC PHONEME IN ARAMMBA¹

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ABSTRACT:

In Arammba, an under-studied language spoken in Papua New Guinea, the consonant /ð/ is a contrastive phoneme but appears only in a series of absolutive verbal prefixes marking agreement with third person, masculine, singular arguments. In this paper I describe the phonotactic facts of the language which are relevant to the limited distribution of this segment and discuss their theoretical significance. Since no permutation of all known constraints can adequately account for this unusual situation, it will be necessary to posit a new constraint. Given the standard OT assumption of Richness of the Base, I suggest that, due to languages like Arammba, we need faithfulness constraints which preserve phonological elements specifically in unmarked morphological and syntactic constituents such as masculine gender. I also note that analogous phenomena — phonemes restricted to particular affixes — have been reported in at least two other languages.

1 The problem

In Arammba the segment /ð/ (a voiced interdental fricative) is a contrastive phoneme but occurs only in verbal prefixes denoting ‘third person, masculine, singular’ arguments, both subjects and objects. The following sample forms illustrate this pattern of distribution, as well as the related fact that [ð] always appears in absolute word-initial position (Boevé and Boevé 1999).²

- | | | |
|-----|-------------------------|---------------------------------|
| (1) | [ðɔm] | ‘he lives’ |
| | [ðədʒibax] | ‘he threw it (one thing) away’ |
| | [ðanʝa ⁿ dʌ] | ‘he is coming (here)’ |
| | [ðam ⁿ dʌxə] | ‘(we) gave him (our passports)’ |
| | [ðraʝaw] | ‘he will go’ |
| | [ðru ⁿ grax] | ‘he slept’ |

My primary goal in this paper is twofold. First and foremost, I want to document this phenomenon with a robust corpus of actual Arammba data examples in order to adequately describe the phonological facts. Secondly, after that is accomplished I briefly reflect on a few of the theoretical implications of these findings, but without presenting a full formal analysis. Specifically, in the final discussion section I note why the distribution of /ð/ in Arammba is significant and why it should be of interest to those working in the model of Optimality Theory (OT: Prince and Smolensky 1993/2004). I suggest that the existence of this phoneme simultaneously falsifies two claims of the OT approach known as Positional Faithfulness (Beckman 1998): the commonly-attested root vs. affix asymmetry, by which lexical roots in particular languages exhibit more contrastive phonological material than affixes do (McCarthy and Prince 1995, Lombardi 1999, Urbanczyk 2006), and furthermore, the lesser known noun faithfulness pattern, by which certain phonological segments or structures appear only in nouns, but not in other lexical categories of words (Smith 1997, 2001). Arammba is thus unique in that it systematically restricts the consonant /ð/ to a specific affix, not to roots, and it does so in verbs, not in nouns. This language should therefore present an interesting challenge to test the principles and mechanisms of standard Optimality Theory. On the

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²In all of the Arammba data forms cited in this paper, square brackets ([]) around a word indicate that it is an output or surface form, i.e., it corresponds to the level of Phonetic Representation typical of the generative tradition.

other hand, Ken Olson (p.c.) notes that one could attempt to salvage the noun faithfulness hypothesis by arguing that the segment /ð/ occurs in a verbal prefix having *nominal* meaning (third person, masculine, singular). However, while this may be true, the roots of the respective Arammba forms — the lexical heads — are clearly verbal in nature, so I doubt that the problem can be solved this easily.

2 Data

2.1 Basic facts

Arammba is a Papuan (non-Austronesian) language spoken by about 967 persons in the Western Province and Morehead Subprovince of Papua New Guinea (2000 census). Its ISO 639-3 identification code is *stk*. Wurm (1971, 1975, 1982) establishes its more specific genetic classification as Trans-New Guinea phylum, Trans-Fly—Yelmek-Maklew super-stock, Trans-Fly stock, Morehead and Upper Maro Rivers family, Tonda sub-family. Gordon (2005) largely concurs with this and lists nine other languages in the Tonda sub-family. Previous unpublished works on Arammba include Hull and Hull (n.d.) and Boevé and Boevé (1999, 2005). The latter two papers are the source for all of the phonetic data presented here. The inventory of phonemic consonants consists of the following:

Table 1: Arammba consonant phonemes

	bilabial	interdental	alveolar	alveopalatal	palatal	velar	uvular
voiceless stop	(p)		t			k	
voiced stop	b		d			g	
voiced affricate				dʒ			
voiceless fricative	ɸ		s				χ
voiced fricative		ð					
prenasalized plosive	^m b		ⁿ d	ⁿ dʒ		^ŋ g	
nasal	m		n			ŋ	
trill			r				
glide	w				j	(w)	

Of these, /p/ occurs only in loanwords and /χ/ is a voiceless uvular fricative. /r/ is basically a voiced alveolar trill but is sometimes pronounced as a flap. The contrastive vowels are displayed in the following table:

Table 2: Arammba vowel phonemes

	front unrounded	front rounded	central unrounded	back unrounded	back rounded
high	i	y			u
mid close		ø	ə		
mid open	ɛ		ɜ	ʌ	ɔ
low close	æ				
low open	a				

Among the phonemic vowels in Table 2, /a/ is low front unrounded, more open than /æ/. /ɛ/ ranges between [ɛ] and [æ]. /y/ is high non-back rounded, fluctuating between front and central ([ɥ]), while /ø/ is mid front rounded. /ə/ is mid central unrounded and can also sound like a short [ɛ]. /ɜ/ is also mid central unrounded but more open than /ə/, and ranges between [ɜ], [ʌ], and [ɔ]. /ʌ/ is lower-mid back unrounded, fluctuating between [ʌ], [ɐ], and [a]. In addition, /æ/ and /a/ are relatively long in duration, and /ə/ and /ɜ/ are especially brief. The exact phonetic qualities of some of these vowels are difficult to pinpoint and merit further study, especially due to the extreme brevity of /ə/ and /ɜ/. Furthermore, these two shorter segments are often influenced by adjacent consonants. Nevertheless, since the focus of this paper is on

the consonant /ð/, no particulars relating to vowel quality are relevant to any crucial arguments or conclusions here.³

I now present more examples illustrating the occurrence of word-initial [ð], as well as its systematic contrast with all of the other coronal consonants of Arammba in this position, plus [j]. After that is accomplished, I will discuss more specific details of the phonology and morphology which are germane to the analysis. First I list several more tokens of [ð] in which this segment is immediately followed by different vowels, then examples containing other word-initial consonant phonemes also:

(2)	[ðəm ⁿ dΛ]	'(he) is living there; (they) live (on this earth)'
	[ðər ^m birəg]	'scrape it!'
	[ðər ^m biwərΛχə]	'we scraped it (the cassava)'
	[ðədʒənwΛwΛχə]	'we lit it (the oven); (we) made the fire'
	[ðəφbə ⁿ gə ⁿ dəg]	'he (God) showed them (things)'
	[ðəφridΛχə ⁿ dəg]	'(he) was translating (the language)'
	[ðəgənΛχərə]	'try it! (said to many people)'
	[ðədrənəg]	'I am pounding sago'
	[ðəmə ⁿ daχ]	'(God) saw'
	[ðəbən]	'take it out (of the fire)!'
	[ðə ^m bənΛχ]	'(the school) finished'
	[ðən ^m bənɛj]	'(they) finished this way'
	[ðəbrə]	'it happened; (it) was'
	[ðəgdʒaχ]	'he asked him'
	[ðərəməj]	'they are (not something else)'
	[ðənbəbax]	'(somebody) burned it'
	[ðəbənΛχɜχ]	'dip it (the cassava)!'
	[ðəgi ⁿ daχ]	'(I) put down (a stick)'
	[ðər ⁿ dʒən]	'squeeze (the coconut water) out!'
	[ðəbdʒiwaχ]	'(he) read them (our passports)'
	[ðədrjɛwΛχə]	'(we) cut the grass'
	[ðər ⁿ gyrΛχə]	'we sang (one song)'
	[ðənmə ⁿ dΛχə]	'(we) started (our trip)'
	[ðyrəg]	'(things) to do'
	[ðywə]	'(you) are doing (it)'
	[ðyraχ]	'(he) did (evil)'
	[ðənjΛwaχ]	'(he) went'
	[ðɜχəw]	'(he) put (first)'
	[ðənΛφɜs]	'tell him!'
	[ðɜrɜφ]	'take it off!'
	[ðɜrinəwaχ]	'(he) gave (all of them)'
	[ðɜφəmə ⁿ dəg]	'(a man) was living (there)'
	[ðɜsiφΛn]	'Cook it (the taro)!'
	[ðΛmir]	'hang it (the coconut)!'
	[ðΛmirΛχ]	'(he) hung it (a pig)'
	[ðΛφjuraχ]	'(the snake) swallowed (the man)'
	[ðΛm ⁿ dΛφaj]	'(they) stopped (the car)'
	[ðΛjΛ ⁿ dΛ]	'he is going'
	[ðΛχΛ]	'(you) become'
	[ðΛsərəχ]	'(I) dragged it (out of the mud)'
	[ðΛr ⁿ gΛnusax]	'(God) should destroy'

³A recent paper by Barry and Trouvain (2008) discusses some problems in the current IPA conventions for transcribing open (low) vowels. The fact that both /æ/ and /a/ are contrastive phonemes in Arammba has implications for this controversy. Thanks to Ken Olson (p.c.) for pointing this out to me.

[ðasiwaχə]	'(we) cooked (the food)'
[ðasiχ]	'cook them (bananas)!'
[ðΛχə]	'become (him)!'
[ðΛφrət]	'bite (the stick)!'
[ðΛm ⁿ daχ]	'(he) gave it (the yam)'
[ðΛnəraχ]	'he arrived'
[ðΛsΛχjΛraχ]	'(I) tied (the legs)'
[ðəwə]	'(you) are doing (it)'
[ðirybrΛχzχ]	'(I) would have chased (thieves)'
[#dV]	
[dər ^m bər]	'tall, long'
[dəbən]	'cause (noun)'
[dəbəbΛχə]	'we heated it (the oven)'
[dəgər]	'net'
[dəŋχΛ]	'far'
[dywəmirax]	'(he) hung (the intestines)'
[dywəφəsax]	'(he) told (her)'
[dəφəφ]	'(he) turned it'
[dənΛφsaj]	'(they) said to her'
[di]	'pain'
[dubΛ]	'lie (noun)'
[dəφ-dəφ]	'many'
[dəŋyŋΛr]	'writer'
[#tV]	
[taj]	'cassowary's nail'
[tajΛ]	'ancestors'
[tə]	'past tense marker'
[tus]	'plenty'
[tugədʒax]	'(she) asked me'
[tysy]	'rat'
[tΛrsΛ]	'life'
[tΛ ^m brimaj]	'(the geese) went back'
[tΛdʒiry]	'traditional dress on upper arm'
[təχwə]	'story, language, message, word, talk'
[təφ]	'first'
[təφjə]	'old'
[#rV]	
[ridʒər]	'dig'
[rə ⁿ g]	'fire'
[rΛχmΛdʒə]	'climbing (noun)'
[rətəχudʒəs]	'happiness'
[#sV]	
[sirərə]	'species of bush bird'
[səki]	'floor'
[sədʒibaχ]	'he threw them away (two things)'
[səm ⁿ dʒə]	'food'
[sΛ ^m bu]	'relative'
[sΛφΛφəχə]	'told you'
[sə ⁿ g]	'small bamboo'

[sə̀ɸomə̀ ⁿ də̀χ]	‘(they) lived’
[sàɸə̀ɸ]	‘(he) turned them (many things)’
[#dʒV]	
[dʒi]	‘eye’
[dʒir]	‘to see’
[dʒiry]	‘kind of wooden bracelet’
[dʒə̀rgiɸu]	‘rainbow’
[dʒə̀gi]	‘species of snake’
[dʒən]	‘taro’
[dʒø]	‘name’
[# ⁿ dV]	
[ⁿ dan]	‘for us’
[ⁿ dun]	‘for/to me’
[ⁿ dΛ ⁿ gu]	‘ashes’
[ⁿ dΛnΛɸəs]	‘(who) told you?’
[ⁿ dəmgy]	‘pool’
[ⁿ də̀ ⁿ d]	‘worm’
[#nV]	
[nur]	‘you (singular) do’
[nyr]	‘we do’
[nəm]	‘we live’
[ni]	‘we’
[nɛr]	‘stomach’
[nɛrjə̀]	‘(you) are’
[nə̀]	‘this’
[nə̀ru ⁿ grax]	‘we slept’
[nə̀nsΛχurΛχax]	‘(the car) left us’
[nə̀ ⁿ də̀]	‘like this’
[nΛɸə̀]	‘he’
[nΛwbən]	‘his son’
[nΛɸΛni]	‘their (genitive)’
[nəm ⁿ dΛ]	‘(you) are living’
[#jV]	
[jam]	‘custom, way, thing’
[jΛm]	‘cassowary’
[jΛ]	‘future tense marker’
[jər]	‘friend’
[jə̀ɸi]	‘feather’
[jə̀rbygənə̀rΛχə̀]	‘we wrapped it (the cassava)’
[jə̀dʒibraχ]	‘he threw them away (more than two)’
[jəm ⁿ dΛ]	‘(they) are living there’
[jɛm]	‘lice’
[jɛnbΛru]	‘two’

The data in (2) above establish the fact that the word-initial segment [ə̀] contrasts prevocally with each of the consonants [d t r s dʒ ⁿd n j] in Aramma. Thus, it is impossible to analyze [ə̀] as an allophone of some other phoneme. Furthermore, [ə̀] also contrasts with the alveolar stops [d] and [t] preceding the consonant [r] (see the examples in (1) as well):

(3)	[ðrəməχ]	'(he) went/came (from); it was; it became'
	[ðrənribənəg]	'(I) will let go (of this world) = I will say goodbye (to this world)'
	[ðrərə]	'it (the judgment) will be'
	[ðridΛχərə]	'(we) are translating it (the story)'
	[ðrΛjΛ ⁿ dΛ]	'(a man) will go'
	[ðrΛnmir]	'(a man) will hang'
	[ðrər]	'turn it over!'

[#dr]

[drjɛdʒər]	'to cut grass'
[drə ⁿ dʒø]	'the act of pounding'
[dridaχ]	'(he) (had) passed by (her)'

[#tr]

[trər]	'string, vine'
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Having provided enough concrete examples of actual Arammba forms to confirm the phonemic status of /ð/ as a contrastive segment of the language, I now briefly digress in order to sketch a few other more general facts that will be relevant to the discussion. The maximal syllable template in Arammba is normally [CCVC]. Tautosyllabic clusters consist of any obstruent (including /ð/ and pre-nasalized stops) followed by /r/. In addition, some obstruents and /r/ can be followed immediately by /j/ or /w/ in a complex onset, while /ð/ cannot. In some dialects there are also a few marginal verbal forms with triple onset clusters such as /ðrj/ and /brj/. All syllables must contain an onset except word-initially. Primary stress in the default case falls on the penultimate syllable of the prosodic word, but more sonorous vowels also tend to attract stress. The segment /ð/ can occur equally well in syllables bearing primary stress, secondary stress, or no stress at all, so stress placement does not crucially affect the occurrence of this phoneme and thus is not marked in the phonetic transcriptions cited in this paper. Syntactically, verbs exhibit a combination of ergative/absolutive case marking and nominative/accusative morphology. The basic constituent order is generally SOV.

In Arammba the segment /ð/ is normally pronounced as a voiced interdental fricative. However, a small number of speakers substitute /r/ for /ð/. Similarly, a few other people replace /ð/ with /d̪/. Nevertheless, all speakers of all dialects exclusively pronounce it as [ð] when in a cluster before /r/, and also when using a slow, careful speech register. Immediately following /ð/ this /r/ is realized as a trill in slow speech but as a flap in the faster register.

In Arammba /ð/ occurs only in a series of blended (portmanteau) verbal prefixes which agree with third person masculine singular objects or subjects, contrasting with the corresponding feminine inflections. In this language, verbs take a set of absolutive prefixes which indicate tense and aspect as well as the person, number, and gender (if third person singular) of various arguments. These prefixes are divided into two classes. The so-called weak varieties correspond to single or paucal patients (direct objects in general), while the strong allomorphs index patients that are high in number as well as all benefactive and recipient roles (indirect objects in general). Lexical roots (both nouns and verbs) are governed by a vowel harmony constraint which generally prohibits “back-like” vowels and “front-like” vowels from occurring in adjacent syllables. This restriction also applies to many grammatical affixes, including the third person masculine singular verbal prefixes. However, other functional morphemes, such as the corresponding third person feminine singular markers, are not subject to vowel harmony and thus have a single fixed form (for each category). The specific details of this vowel harmony process are otherwise irrelevant to the main topic of this paper and will hence be ignored. Arammba verbs are formally distinguished by one of five tense/aspect combinations, as shown in the following charts:

Table 3: third person, *masculine*, singular, absolutive verbal prefixes in Arammba

tense and aspect	strong forms		weak forms	
	with front vowels	with back vowels	with front vowels	with back vowels
imperfective	ðɛ-	ðʌ-	ðə-	ðɜ-
past completive	ðəϕɛ-	ðɜϕʌ-	ðəϕ-	ðɜϕ-
future (1 st and 3 rd person subjects)	ðrɛ-	ðrʌ-	ðrə-	ðrɜ-
future (2 nd person subjects)	ðɛ-	ðʌ-	ðə-	ðɜ-
perfect	ðɛ-	ðʌ-	ðə-	ðɜ-

Table 4: third person, *feminine*, singular, absolutive verbal prefixes in Arammba

tense and aspect	strong forms	weak forms
imperfective	wɛ-	wə-
past completive	gyϕɛ-	gɛϕ-
future (1 st and 3 rd person subjects)	gyrɛ-	dɛ-
future (2 nd person subjects)	gwɛ-	gɛ-
perfect	dwe-	dɛ-

In the masculine paradigm in Table 3 above, the prefix-initial /ð/ contrasts with eleven other consonants of the language which occur in this position in the remaining person, number, and gender inflections, rounding out these absolutive morphemes: /t d g s χ n ŋ ⁿd ⁿg j w/. Illustrative examples of most of these contrasts are provided in (1), (2), and (3) above. On the other hand, the corresponding feminine prefixes in Table 4 begin with one of the segments /d g w/. The masculine prefix series in fact is unique (among all persons, numbers, and genders) in that it is the only one which always begins with the same (consonant) phoneme. In Table 3, each of the four columns (strong vs. weak and front vs. back) is consistently characterized by a distinct vowel. Thus three of the tense/aspect rows have homophonous allomorphs: imperfective, future tense with second person subjects, and perfect. Nevertheless, the need to distinguish between these three categories in Arammba is independently established by the remaining person, number, and gender prefix paradigms. These are illustrated by the feminine forms in Table 4, which display more variability in their phonological segments and syllabic shape than their masculine counterparts do. For this reason it is best, and probably necessary, to lexically stipulate all consonants and vowels together for each category in all of these absolutive prefixes. (In the next section I consider an alternative parsing of these morphemes with /ð-/ by itself as a separate prefix, and show why this does not work.) It bears repeating that the terms “strong” and “weak,” which Boevé and Boevé (1999) use to describe the two sets of prefixal allomorphs in Tables 3 and 4 (and elsewhere), are based on a consideration of syntactic factors, not phonological ones.

In addition to the vowel harmony pattern mentioned above, a second process which also affects some prefixes is that their underlying vowel is deleted when an immediately following verb root begins with a vowel. The reason for this elision of the prefixal vowel is obviously to repair a potential onsetless syllable. This exemplifies a general morphophonemic alternation in Arammba which is strongly and independently motivated throughout the language. That is, various combinations of high, mid, and low vowels in hiatus are resolved by deleting the first segment. This happens not only when many different prefixes are attached to vowel-initial roots, but also at the juncture between roots and suffixes. As a result of this process, an initial [ð] by itself can surface unmodified as the only phonetic segment indicating masculine gender:

- (4) /ðə-igɛn-əɾən/ → [ðigenəɾən]
 3.m.sg.abs-carry-nom.2.pl.loc 'Take it away!'
- /ðɜ-ɔm/ → [ðɔm]
 3.m.sg.abs-live 'He lives.' (cf. (1))

Due to these two phonological processes which affect prefixes (vowel harmony and truncation), there are examples with word-initial /ð/’s followed by each of the eleven phonemic vowels of the Arammba language in output (phonetic) forms. In a phonotactic sense, then, the consonant /ð/ is completely unrestricted in terms of which vowels it may combine with. To finish the distribution of /ð/ in surface representations, when a masculine prefix contains one of the “short” segments /ɜ/ or /ə/, this vowel is also generally elided if the verb root begins with /r/:⁴

- (5) /ðɜ-rɪwəⁿg-ʌχə/ → [ðrɪwəⁿgʌχə]
 3.m.sg.abs-break.down-nom.1.pl.dp ‘We took it (the oven) apart.’
- /ðə-rə/ → [ðrə]
 3.m.sg.abs-be ‘he/it is’

The word-initial [ðr] clusters in the two phonetic forms in (5) above are not lexical but rather derive from the deletion of the intervening underlying vowel. This analysis is confirmed by two facts: neither of the glosses indicates ‘future’ tense, and in the first word the resulting initial syllable ([ðrɪ]) is unlike any of the canonical masculine prefixes from Table 3.

To complete the presentation of Arammba data, I now give a partial paradigm of masculine and feminine prefixes all attached to the same root. In Table 5 below, the basic form of the verb ‘look for’ is /ɪŋɜsʌmⁿg/. Both the masculine and feminine prefixes use their weak allomorphs since these words all involve a singular patient (‘him’ or ‘her’). The suffix /-ɔχ/ means ‘non distant past durative’, and /-ɛⁿdɛg/ is glossed as ‘singular past progressive’. The latter is one of the affixes which has a single fixed form, meaning that it does not undergo vowel harmony:

Table 5: partial paradigm of a fully inflected Arammba verb
 (cf. Boevé and Boevé 1999:146)

tense and aspect	masculine singular (third person)	feminine singular (third person)
imperfective	[ðɜŋɜsʌm ⁿ gɔχ] ‘I am looking for him’	[wəŋɜsʌm ⁿ gɔχ] ‘I am looking for her’
past completive	[ðɜɸŋɜsʌm ⁿ gɛ ⁿ dɛg] ‘I was looking for him’	[gɛɸŋɜsʌm ⁿ gɛ ⁿ dɛg] ‘I was looking for her’
future (1 st and 3 rd person subjects)	[ðrɜŋɜsʌm ⁿ gɔχ] ‘I will be looking for him’	[dɛŋɜsʌm ⁿ gɔχ] ‘I will be looking for her’

All of the data sketched in this section establish the fact that masculine prefixes in Arammba invariably begin with the otherwise anomalous consonant /ð/. Furthermore, these morphemes (and hence this segment) are fully productive in the sense that they can attach to any semantically-appropriate verb root, and therefore must be dealt with as a genuine phonotactic phenomenon. Finally, this /ð/ always surfaces fully faithful regardless of independent phonological processes which often affect the prefixal vowels.

For an additional confirmation of the canonical status of /ð/ as a basic phoneme of Arammba, I tabulated its statistical frequency relative to the other consonants of the language. The following counts are based on 43 spontaneous texts of different genres, recorded or written by native speakers. These contain 11,591 total words (non-unique tokens) and 3388 unique words (types):

⁴However, this process is blocked by antigemination when the prefix also contains an /r/ (in the future tense category with first and third person subjects in Table 3).

Table 6: Statistical frequency of the phoneme /ð/ in 43 Arammba texts

corpus	total <i>n</i>	number of words containing /ð/	%	total consonants	<i>n</i> = /ð/	%	rank of /ð/ (among 20 consonants)
total non-unique words	11,591	1085	9.4	31,763	1085	3.4	12 th
total initial consonants in non-unique words	11,008	1085	9.9	11,008	1085	9.9	3 rd
total unique words	3,388	626	18.5	13,390	626	4.7	8 th
total initial consonants in unique words	3,273	626	19.1	3,273	626	19.1	1 st
means			14.2			9.3	6 th

In Table 6, /ð/ occurs in 1085 total words (9.4% of all tokens) and constitutes 3.4% of a grand total of 31,763 individual consonant occurrences. As such it ranks 12th out of 20 phonemes (excluding /p/), beating out 8 other segments which are not restricted in distribution. Among 3388 unique word types, /ð/ occurs 626 times (18.5%) and constitutes 4.7% of the total of 13,390 consonants, ranking 8th. Now if we restrict our comparison to word-initial consonants only, the relative frequency of /ð/ is naturally even stronger. Among 11,008 total word-initial consonant tokens, /ð/ occurs 1085 times (9.9%), ranking 3rd. Of 3273 initial consonants types in unique words, /ð/ occurs 626 times (19.1%) and ranks 1st, beating out all other 19 consonants. (The 2nd most common initial consonant in unique words is /t/ — 316 occurrences, only about half as frequent as /ð/.) So according to one objective criterion of measurement, at least, we can say that /ð/ is the most common word-initial segment in the language! Among the three columns in Table 6 which allow for averaging, the mean frequency of /ð/ is 14.2% of all words, comprising 9.3% of all consonant occurrences and ranking 6th overall among Arammba's consonant segments. The lowest rank that /ð/ ever achieves is 12th, in the first row. For this language it would be pointless to tabulate the frequency of /ð/ in a list of isolated words, such as a dictionary, since its expected proportion of occurrences would be close to either 100% or 0%, depending on which citation form of the verbs is referenced. As an aside, 95.8% of all Arammba words in these texts begin with at least one consonant.

The statistical data in Table 6 provide additional support for the status of /ð/ as a true phoneme of Arammba. However, a reviewer points out that high frequency, in and of itself, is not necessarily an indicator of phonemic status. In English, for example, [ə] is not a contrastive underlying vowel, in spite of the fact that it is so common. Rather, it is the most frequent vowel segment simply because it is an allophone of all of the other (phonemic) vowels, which regularly reduce to [ə] in unstressed syllables. Nevertheless, there is a big difference between these two cases: while [ə] is in complementary distribution with all other English vowels, Arammba [ð] is not in complementary distribution with any other consonants. Rather, in Arammba the segment /ð/ clearly contrasts with all other consonant phonemes, as evidenced by the data in (2) and (3). Therefore, in this particular context the high statistical frequency of Arammba /ð/ does not undermine the phonological analysis in any way, but actually reinforces it. That is, given the fact that [ð] cannot plausibly be derived from any other consonant, its relative statistical robustness (numerical counts) in Table 6 serves as an important and satisfying confirmation of my claims (sort of like icing on the cake).

The statistical data in Table 6 also suffice to rule out the potential objection that the restriction of /ð/ to a particular verbal prefix in Arammba is simply an accidental gap rather than a systematic constraint. Among the 626 occurrences of /ð/ in unique words, in every single case this segment appears in the masculine prefix, without exception — never in verb roots, common nouns, proper nouns, adjectives, adverbs, suffixes, etc. Consequently, a chi-square test returns an astronomically low *p* value of 3.705×10^{-138} . I conclude that a skewed distribution of /ð/ this extreme cannot be reasonably ascribed to random chance or brushed aside as simply a historical quirk.

In a sense it is not surprising that /ð/ is so frequent in Arammba, given its restricted distribution. This paradox has a natural explanation. A segment such as /ð/ in Arammba presents a dilemma to the language. Extremely rare words and phonemes tend to become regularized over time by analogy to canonical patterns. This reduces the memory load of the speakers. On the other hand, some highly functional items that have exceptional phonological and/or morphological characteristics tend to be very common so that speakers will hear them often enough to learn them correctly and resist making them regular (cf. Tiersma 1982:841). Other examples of this type of phenomenon are verbs such as *be*, *do*, and *go* in English.

Based on all of the evidence presented in this section, the conclusion at which I arrive is that in Arammba, /ð/ is a completely native and systematic consonantal phoneme. Although it is highly (and curiously) restricted in distribution, it is nevertheless quite stable and robust when it does occur. It would therefore be incorrect to dismiss this segment as some type of marginal, sporadic, pseudo-phoneme which is limited to data that are questionable, borrowed, dialectal, sub-standard, exceptional, etc.

Finally, it would now be interesting to ask, how did the consonant /ð/ come to be restricted to masculine verbal prefixes in Arammba? Although not much is known about the comparative history of the Tonda sub-family, a few remarks can be made. Typical lexicostatistical cognate figures among the more closely related member languages are 55-71% (Wurm 1971, 1975). Based on his own fieldwork, Wurm (1971) actually posits the presence of the phoneme /ð/ as a typological feature of the Tonda group. Sarsa's (2001) sketch of Wára phonology shows that in this related language, /ð/ contrasts initially, medially, and finally in both nouns and verbs. Furthermore, the third person masculine singular verbal object prefix in Wára (comparable to Arammba's /ðV-/) is /s-/. Unpublished survey data gathered by members of SIL show that /ð/ also appears initially, medially, and finally, at least in nouns, in Kunja (Lower Morehead or Peremka); no data are available for verbs in this language. An initial inspection of a few of these Tonda cognate sets tentatively indicates that proto */ð/ generally corresponds to one of the phonemes /s d ɖ̥ ɖ̥ n r j/ in at least a few Arammba words each. It thus appears that Arammba inherited the consonant /ð/ as a phoneme from its mother language, rather than borrowing it from outside the family. At the same time, however, the restriction of /ð/ to masculine prefixes is probably an innovation peculiar to Arammba. How and why this situation came about is more difficult to explain, and will have to be left for future research.

2.2 Excursus: an alternative analysis considered

In this section I momentarily digress in order to consider an alternative analysis mentioned above and discuss why it will not work. That is, instead of parsing the third person masculine singular prefixes in Table 3 as portmanteau units consisting of /ðV-/ (/ð/ plus one vowel and sometimes other material), suppose that we posit just /ð-/ by itself as the underlying morpheme marking masculine gender. A reanalysis of the prefixes in Tables 3 and 4 along these lines might go like this. Suppose we posit that the masculine morpheme consists of just the segment /ð-/. Then we could say that the past completive tense is marked by /ɸ/ (plus or minus a vowel). Similarly, the /ɾ/ by itself would indicate the future category for first and third person subjects. Finally, most of the prefixal vowels would then be supplied by epenthesis when the verb root begins with a consonant. In response to this hypothesis, there are several arguments which, when taken together, provide rather strong evidence against this reanalysis of the masculine and feminine prefixes. In the first place, the weak form of the feminine future tense with first and third person subjects in Table 4 ([dɛ-]) would be irregular in that it lacks an /ɾ/, so this morpheme would have to be stipulated as an exception. Secondly, this alternative analysis would require that we posit a process of vowel epenthesis which is otherwise unattested in Arammba. Furthermore, vowel insertion would have to be complicated by many different ad hoc syntactic stipulations in order to produce all of the right results. In Arammba there is no independent evidence for a process of stray epenthesis to break up unwanted consonant clusters. Consequently, in order to account for all of the morphophonemic alternations involving prefixal vowels, this solution would have to complicate the grammar by invoking two different phonological processes: truncation and epenthesis. Recall that Arammba robustly attests vowel deletion preceding another vowel, as illustrated in (4) above. Regardless of how we analyze the prefixes in Tables 3 and 4, truncation must already be operational in this language. Therefore, by simply positing some underlying vowel as part of the masculine prefix, we obviate the need for an additional process of vowel

insertion, for which there is no other evidence. All else being equal, an analysis which requires two phonological processes (truncation and stray epenthesis) is more complicated than one which posits just one process (truncation) to account for the same data. So by Occam's Razor, the simpler alternative should be preferred.

Furthermore, in order to insert the four different vowel qualities which occur in the masculine prefixes in Table 3, we would have to rely on a brute force approach in at least one case. These four vowels are realized phonetically as [ɛ ʌ ə ɜ], so they are all mid and unrounded. Now suppose we grant that one of these four qualities is supplied by default as the unmarked epenthetic vowel of Arammba. Of the remaining three vowels, two can be derived by front/back harmony. The big problem is the fourth vowel: where do its phonetic features come from? It is not the case that the vowels in the strong allomorphs are always stressed, nor are the weak vowels /ə/ and /ɜ/ always unstressed. So an epenthesis analysis would have to be supplemented with a stipulation such as, for example, "insert [ʌ] in a syntactically strong context" or "insert [ɜ] in a weak form," in order to account for the fourth phonetic vowel quality. This need for an ad hoc fix entails an admission that a strictly phonological solution (vowel epenthesis) to the issue of masculine allomorphy does not work. Once this concession is made, the original morphophonemic analysis (positing an underlying vowel in the masculine prefixes) turns out to be more simple and hence preferable. As an analogy, the reanalysis in this case would be no more natural than positing a phonological rule in Arammba whose effect is to say, "Insert the segment [ð] at the beginning of a syllable marked for masculine gender." This explains nothing. Therefore, at least one distinctive feature of at least one vowel must be present in the underlying form(s) of the masculine morphemes. Having recognized this, the possibility of limiting the masculine prefix to just /ð-/ is lost.

In addition, it would not be possible in all cases to motivate vowel insertion as a repair strategy to license stray consonants based on facts of syllabification alone. Specifically, the past completive allomorphy is problematic. The strong forms have the surface shape [ðVϕV-], while the weak forms consist of [ðVϕ-] only. This indicates that /ϕ/ can appear at the end of a prefix before a consonant-initial root in surface forms (cf. Table 5), so the insertion of a vowel in this environment would not be phonologically predictable on phonotactic grounds alone. Consequently, a process of stray epenthesis would once again have to be complicated by referring to grammatical categories in some way. The same would be true for the corresponding past completive feminine prefixes as well.

As a final blow against the hypothetical reanalysis of the masculine morpheme as just /ð-/ , this would also fail because of a contrast arising with verb roots that begin with the segment /r/. Recall from (5) that the short vowels /ə/ and /ɜ/ elide from the prefix when the following (stem-initial) consonant is /r/, e.g., /ðɜ-riwəⁿg-ʌχə/ → [ðriwəⁿgʌχə]. The strong form of this verb begins with [ðʌri...] phonetically because the vowel /ʌ/ does not delete in this situation. In an epenthesis analysis, however, the underlying form of the latter would be /ð-riwəⁿg-ʌχə/, and the [ʌ] between the /ð/ and the root-initial /r/ would be introduced through a constraint ranking compelling insertion. So far this works. The problem arises when we consider the future forms of verbs whose root begins with a vowel rather than a consonant. For instance, from (4) we have the weak form /ðə-igen-ørøn/ → [ðigenørøn] by truncation (given my original analysis). Now in the reanalysis we are considering, this /ə/ would not be present in the underlying prefix of this word: (hypothetical) /ð-igen-ørøn/. The rub is that the future form of this verb, given an epenthesis hypothesis, would have to be /ð-r-igen-ørøn/ underlyingly. In this case we must not insert a vowel between the /ð/ and the /r/ morphemes. Nevertheless, this is exactly what the epenthesis analysis would incorrectly predict: this word would infelicitously surface as *[ðVrigenørøn]. The problem is that, in an epenthesis analysis, a strong verb form with a root-initial /r/ (immediately following the masculine /ð/) would require an anaptyctic vowel to break up the initial cluster: /ð-rV/ → [ðVrV]. However, in exactly the same segmental context, namely, /ð-r-V/, we would need to block vowel epenthesis when the /r/ is the future marker. Once again, a strictly phonological solution is not possible since it produces the wrong results. This epenthesis reanalysis would thus lead to a ranking paradox in a situation of this type, and no OT constraint system known to me can fix this without directly referring to the morphological affiliation of these segments in a brute force way. For this reason, as well as the others discussed above, a reanalysis of Arammba's masculine prefix as just /ð-, without an underlying vowel, would not work. Consequently, I agree with Boevé and Boevé's (1999) conclusion that it is necessary to analyze Arammba's masculine and feminine prefix series as blended morphemes listed in the lexicon as consisting not only of an initial

consonant, but also of all the other consonants and vowels together. These fused affixes simultaneously encode not only gender, number, and person, but also tense and aspect, as I originally posited in Tables 3 and 4. In summary, positing a morphosyntactic analysis different from the one assumed above (in §2.1) is highly problematic, and, even if we could make it work, it would not benefit us in any tangible way, such as by simplifying the formal grammar.

3 Discussion

3.1 On the relative markedness of [ð]

Cross-linguistically, the consonant [ð] is inherently marked in three respects. First, it is an obstruent yet voiced. Second, it is a fricative rather than a stop. Finally, it is a coronal fricative but non-strident. The convergence of these three factors in one consonant predicts that /ð/ should be rarer than many other phonemes in the languages of the world. To substantiate this fact, in the UPSID survey of 451 languages (Maddieson and Precoda 1992), only one language has a segment which appears to be descriptively identical to /ð/ in all articulatory characteristics. There are also two other languages which contain a phoneme symbolized as /“ð”/ and described as a “voiced dental/alveolar sibilant fricative”, presumably distinct from /z/.⁵ Similarly, in the P-base inventory of 549 languages, only 33 (6.0%) contain /ð/ (Mielke 2006). There are probably many more languages, however, which have [ð] as an allophone of /d/, /l/, or some other consonant. In a survey of my own I examined the inventories of 331 languages spoken in Papua New Guinea which have been analyzed by members of SIL. Of these a total of 8 languages (2.4%) exhibit the phoneme /ð/, including Arammba. This figure is not significantly higher than the one obtained with UPSID, so we cannot claim that an areal characteristic of the South Pacific is a special affinity for the segment /ð/.

The convergence of these typological facts indicates that Universal Grammar needs to contain a general markedness constraint militating against the consonant [ð]. Technically speaking this should probably be decomposed into a confluence of several different individual markedness constraints, each one targeting a specific feature like *[+continuant], *[+voice], *[-strident], etc. Nevertheless, since these minutiae are orthogonal to our main topic here, we can simplify by calling the relevant constraint(s) just *ð:

(6) *ð: The segment [ð] is prohibited in output forms.

In most languages of the world this markedness constraint is undominated, resulting in a complete lack of any optimal output forms having this consonant in them. In other words, in such a case the phonetic inventory does not contain the segment [ð]. In a language like Arammba, on the other hand, one or more faithfulness constraints need to outrank *ð so that this phoneme will be retained in just the right contexts, namely, in the masculine verbal prefixes. It would also take us too far afield to discuss the precise formal nature of the relevant faithfulness constraint(s) in this paper, but in the next section I will touch on this issue in passing.

3.2 Some theoretical musings

I now briefly discuss a few theoretical points related to this presentation of Arammba data, returning to an issue raised in §1. However, as foreshadowed there, I stop short of pursuing a complete formal analysis. Within OT (Prince and Smolensky 1993/2004), the Positional Faithfulness program (Beckman 1998) claims that certain phonological domains are characterized by faithfulness constraints targeting strong or psychologically salient positions. When these stringent constraints outrank their more general (domain-independent) faithfulness counterparts, a Pāṇinian or elsewhere type of relationship obtains. The result is that phonologically prominent positions, e.g. syllable onsets, may exhibit privileged behavior such as licensing a greater number of contrastive structures or features than codas do. One of these prosodic asymmetries is the distinction between lexical roots and affixes. Specifically, it has been

⁵Thanks to Taka Shinya for helping me access the UPSID data.

claimed that in every human language the set of sounds permitted in affixes is a (potentially improper) subset of possible root segments, never vice-versa (McCarthy and Prince 1995, Beckman 1998, Urbanczyk 2006). For example, in Cusco Quechua (spoken in Peru), aspirated and ejective stops occur syllable-initially in roots but are systematically unattested in suffixes and in codas, even in roots (Parker and Weber 1996). Facts such as these have motivated positional faithfulness constraints like MAXROOT(spread glottis), IDENTONSET(Laryngeal), etc., alongside their general (context-free) counterparts MAX(spread glottis) and IDENT(Laryngeal) (Parker 1997, Beckman 1998, Lombardi 1999).

Another phonologically prominent position identified by Beckman (1998) is the initial syllable of roots and/or words. She therefore posits constraints such as IDENT- σ_1 (high) in order to capture the effects of root-driven vowel harmony and neutralization in Shona (Beckman 1997). So in this sense it is not so surprising that word-initial position should be implicated in licensing more contrasts than those which occur non-initially in Arammba. What *is* problematic, though, as I have emphasized above, is the fact that /ð/ surfaces in an affix rather than a lexical root. However, Ken Olson (p.c.) reminds me of another complication as well: the natural dichotomy between prefixes and suffixes. Specifically, it may not be so obvious that suffixes should necessarily pattern in the same way as prefixes do with respect to phenomena such as positional faithfulness. Rather, he suggests, all else being equal, it is likely that prefixes might exhibit more contrasts than suffixes. If this is true, it would constitute further evidence for preferential σ_1 faithfulness constraints. So in this respect as well the distribution of /ð/ in Arammba is not completely unprincipled or anomalous.

In arguing for an extension of the positional faithfulness strategy, Smith (1997, 2001) notes that in some languages nouns are also special in that they contain segments or other contrastive elements which are lacking in verbs. A novel illustration of this phenomenon is provided by stress placement in Huariapano, an extinct Panoan language of Peru (Parker 1994). In Huariapano, primary stress in the default case is assigned by a moraic (quantity-sensitive) trochee aligned with the right edge of the prosodic word, in both nouns and verbs. Thus when the final syllable is light, stress falls on the penult: [ka'noti] 'bow (weapon)', [a'atsa] 'manioc', [winti] 'oar, paddle'. However, when the ultima is heavy (closed by a coda consonant), it attracts stress, again both in nouns and verbs: [ta'h'põŋ] 'root', [ja'wi:] 'opossum'. Despite this basic and predictable pattern, nevertheless, nouns (but not verbs) may also surface with primary stress on a final syllable that is light: [a'wa] 'tapir', [a'no] 'snake species'. Irregular oxytonic nouns such as the latter two occur in about 25% of all cases, but no verbs in Huariapano ever bear stress on a final light syllable (Parker 1994). In the spirit of Smith's (1997) proposal, these facts can be captured in OT by assigning a lexical accent (or grid head) to the final syllable of words such as [a'wa] (in their input forms). Then we invoke a positional faithfulness constraint requiring the preservation of an underlying stress specifically in nouns: IDENTSTRESS(noun). The final step is to rank this above the antagonistic metrical constraints which induce penultimate stress in the general (unmarked) case. (The more general constraint IDENTSTRESS would also have to be lower-ranked so as to preclude this faithfulness effect in verbs, adjectives, etc.) Smith (1997:25) summarizes the implications of this type of analysis with the following strong claim: "Including noun-faithfulness constraints in the grammar, along with markedness constraints and context-free faithfulness constraints, predicts that every language should either allow a given contrast in words of all lexical categories, permit the contrast in no words at all, or allow the contrast in nouns but not in other categories."

Nevertheless, as we have seen, this latter generalization is falsified by Arammba: verbs contain all the segments that occur in nouns, but in addition to this the phoneme /ð/ **also** occurs in the series of masculine verbal prefixes, whereas /ð/ never appears anywhere in nouns. These facts are therefore troublesome not only for the root vs. affix dichotomy, but also for the notion of noun faithfulness. The main reason why the issue of positional faithfulness even arises at all in many cases is due to the standard OT assumption of Richness of the Base (ROTB: Prince and Smolensky 1993/2004). This principle claims that there are no language-specific restrictions on underlying forms. That is, the set of possible inputs is both infinite and universal, and is therefore the same for all languages. ROTB constitutes the death of language-particular Morpheme Structure Constraints governing the lexicon. Rather, in OT, phonological constraints such as *ð only evaluate surface (phonetic) candidates, jointly weeding out all but the optimal form for each input. One of the primary motivations for ROTB is to avoid the so-called duplication problem of rule-based models: constraints on underlying forms often persist throughout the sequential derivation, and in many languages these same constraints are still totally obeyed by every phonetic representation. This overlap in constraint purview constitutes a huge amount of redundancy in formal grammars, and is

therefore rejected as unacceptable by most practitioners of OT (Smolensky 1996, Kager 1999, McCarthy 2002, 2007, Davidson *et al.* 2006). At the same time, however, ROTB itself is also somewhat controversial; see, e.g., Vaux (1998), Reiss (2000), and Vaysman (2002) for dissenting points of view.

There are three possible ways to directly (empirically) access Richness of the Base: (1) neologisms, (2) psycholinguistic tests (experiments) using nonce forms, and (3) incorporation of loan words from other languages. To illustrate, recent studies show that native speakers of English, Hebrew, and Hungarian have remarkably similar, grammatically-governed intuitions about whether hypothetical forms are close enough to actually attested outputs in their language to count as possible words (Hayes and Londe 2006, Coetzee 2008, 2009). So attempts to posit systematic restrictions on input forms (in the lexicon) are not only redundant, but unenforceable as well, and thus unnecessary. Therefore, in an approach assuming ROTB (as mine does here), Arammba must also contend with hypothetical inputs containing infelicitous /ð/'s in morphemes other than the masculine verbal prefixes, such as verb roots, other (non-masculine) affixes, and different parts of speech. ROTB is not just a peculiar way of making life difficult in OT. It is an uncontroversial fact that Arammba has no /ð/'s outside of word-initial masculine affixes, and **any** synchronic formal analysis must account for this generalization in one way or another, i.e., encode it in the phonology. For example, suppose Arammba speakers wish to borrow a word from English (one of the national languages of Papua New Guinea) containing a /ð/ in a bare root, such as *lathe*. Their grammar must inform them what to do with this segment, and the strategy that OT adopts is to rule it out with a general markedness constraint (*ð) scanning surface forms alone, which dominates the corresponding general faithfulness constraints that would otherwise preserve it (such as IDENT(ð) and MAX). Unfortunately, I am not aware of any studies on loan words in Arammba, nor attempts on the part of speakers to actively accommodate an actual borrowing containing an underlying [ð], so in this particular case we are dealing with a fully hypothetical situation. Nevertheless, what OT requires us to show in this type of scenario is simply that any input /ð/, regardless of its source, will be winnowed out by the constraint system — either be deleted or changed into some other phonotactically-licit segment of Arammba — everywhere except in masculine prefixes.

This naturally raises the question of how to compel the retention of /ð/, in a fully intact way, specifically in this particular series of morphemes. That is, having shown that some of the claims of positional faithfulness are partially incorrect, we should now consider what type of constraint **will** satisfactorily produce the right results for Arammba. Here I suggest that we need to invoke some type of affix-specific faithfulness constraint (ranked above root faith), following the lead of Ussishkin (2005, 2007). See also Anttila (2007) for further arguments showing that positional faithfulness constraints targeting nouns and lexical roots are problematic and therefore not entirely sufficient. While I will not formalize this (potentially) new constraint here, we can at least briefly speculate about its nature. In this case we would probably need to posit that such a constraint targets up to three particular details of the distributional facts of Arammba: (1) the involvement of the segment /ð/ only, (2) in word-initial position only, and (3) in the masculine gender only. Nevertheless, a constraint specifying all of these factors simultaneously would seem, on the face of it, to be rather ad hoc and language-specific. This is rather disheartening given the strong and basic OT claim that all constraints are universal (present in every language). Therefore, I prefer to leave this issue for other linguists to debate. At the same time, however, we can at least attempt to reign in the power of our formal machinery and strive for a principled account by appealing to the observation that 'masculine' is the default gender in many languages, including Arammba. This claim — that masculine is the universally unmarked gender (in a linguistic sense) — is of course not an innovation of mine but is rather based on a long history of argumentation in the grammatical literature, exemplified by works such as Greenberg (1966, 2005), Tiersma (1982), Bybee (1985), Croft (2003), and Blevins (2004). However, Corbett and Fraser (2000) and Rice (2006) show that genders other than masculine are sometimes the default in other languages: neuter in Latin, Greek, and Icelandic, and feminine in Arabic and Kala Lagaw Ya (spoken in Australia). Nevertheless, we can still claim that cross-linguistically masculine is the unmarked gender in the default case, and since this is only a hypothesis about a universal tendency, it is not problematic if it is not absolutely true in all cases.

Finally, I am aware of two other examples which are analogous to Arammba in the sense that an entire phoneme is uniquely restricted to a particular affix. First, in Awara, another Papuan language of Papua New Guinea, the segment /ʃ/ is limited to a 'specific' suffix used as a noun classifier, where it is in free variation with /s/, an independently-occurring phoneme. This consonant (/ʃ/) never occurs in noun roots or anywhere in verbs, and contrasts primarily with /h/ in the corresponding diminutive suffix (Quigley

2003). Secondly, Guambiano, a Barbacoan language of Colombia, has a phoneme /ʒ/ which appears only in the diminutive suffix for nouns, which is quite common (Branks and Branks 1973). In this case Tom Branks (p.c.) suspects that the phoneme (/ʒ/) was borrowed from Paez, a neighboring language in which this consonant also occurs in the diminutive suffix.

4 Conclusion

In summary, the limited distribution of /ð/ in Arammba is both novel and important, not only on descriptive grounds, but for theoretical reasons as well. When we add to this case the affix-specific phonemes /ʃ/ in Awara and /ʒ/ in Guambiano (just mentioned), I am struck by the fact that all three of these segments are coronal consonants. This is probably not accidental since most languages have more consonants than vowels anyway (Maddieson and Precoda 1992). And among supralaryngeal consonants, there is ample evidence that the coronal place of articulation is universally unmarked (Paradis and Prunet 1991, Lombardi 2002, de Lacy 2006). Nevertheless, it is also noteworthy that each of these three segments is simultaneously marked in at least one feature. For example, both /ʃ/ and /ʒ/ are [–anterior], and the latter is also voiced. Therefore, it will be interesting to see if this curious pattern is confirmed as a general tendency when other examples are discovered and documented.

Abbreviations

1	first person
2	second person
3	third person
abs	absolute
dp	distant past
loc	locative
m	masculine
nom	nominative
OT	Optimality Theory
p.c.	personal communication
pl	plural
sg	singular
SIL	Summer Institute of Linguistics

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