

# WORK PAPERS OF SIL-AAB

Series A Volume 4

**A DISTINCTIVE FEATURES APPROACH TO  
DJINANG PHONOLOGY AND VERB MORPHOLOGY**

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INTRODUCTION TO  
SERIES A VOLUME 4

The papers in this volume describe various aspects of Djinang phonology and verb morphology using a distinctive features approach.

The first two papers describe the phonology and verb morphology of the language respectively. The third paper is more theoretical in nature and proposes a distinctive feature, 'Narrow', to characterize rhotics and glides. The final paper discusses recent discoveries which are relevant to the other papers.

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## A PROPOSED DISTINCTIVE FEATURE 'NARROW':

### EVIDENCE FROM DJINANG AND IWAI DJA

Bruce E. Waters

#### 0. INTRODUCTION

Rhotics are a sound class that are not conveniently characterizable in terms of current distinctive features. Commonly, rhotics are either treated as the class of sounds 'left over' after the other sound classes of a language are characterized, or an ad hoc 'rhotic' feature is employed. In this paper a feature 'narrow' is defined in terms of a narrowing of the vocal tract in the midsagittal region. This feature handles rhotics in a non-trivial manner; it groups rhotics, glides and other sound classes in a useful way; and it permits the feature 'consonantal' to be omitted from the phonologies of Australian languages. Validation comes mainly from the Australian language Djingang. Lastly, the feature system presented in this paper is extended to Australian languages generally.

#### 1. DJINANG AND IWAI DJA

Djintang and Iwaidja are Australian Aboriginal languages spoken in the northern central part of Arnhem Land and on Croker Island, respectively. Djintang is classified (Voegelin and Voegelin, 1977) as one of the Murngic languages in the Pama-Nyungan family. Murngic languages are called 'Yuulngu' (or 'yolngu') languages in more recent literature (e.g. Dixon, 1976). Iwaidja is a non-Pama-Nyungan language of the Iwaidjian subgroup (O'Grady, Voegelin and Voegelin, 1966).

In the phonologies of Australian languages there are certain phenomena which are not conveniently handled by distinctive features currently in use. Basically these phenomena involve the statement of consonant cluster constraints and the inability to nontrivially characterize some classes of sounds that repeatedly occur in morphophonemic rules and (in Djintang at least) in word structure constraints.

The issue centres around the difficulty of handling rhotics using distinctive features. Thus nasals can be characterized by the feature 'nasal', laterals by the feature 'lateral', but rhotics require a feature complex such as 'nonsyllabic, nondistributed, continuant, nonlateral'. This disadvantage could be overcome in a purely ad hoc way by positing a feature 'rhotic', but such an approach is hardly compelling in the light of its arbitrariness.

In this paper I will present data that points to the kind of feature that is needed in order to more adequately handle rhotics (and also glides) in the statement of processes and constraints in the phonologies of Australian languages. However, it is to be expected that such a feature will prove to be of benefit in the phonologies of non-Australian languages as well.

## 2. DJINANG PHONEMES

Table 1 gives the consonant oppositions in Djinang in terms of the features necessary for establishing contrast. The feature sonorant is used rather than the feature continuant because the former is of far greater significance in phonological terms (Waters, 1979, a and b). The feature 'peripheral' closely resembles Chomsky and Halle's (1968: 304) coronal feature (but with opposite value). I have used the former feature because the tongue blade is not significant in the production of Djinang lamino-postalveolar sounds, these being articulated with the body of the tongue. For a fuller discussion of the reasons for using the feature 'peripheral', see Waters (1979, a). I have defined the feature as follows: peripheral sounds are produced with a primary obstruction that is located at an extremity of the oral cavity; nonperipheral sounds are produced without an obstruction at an extremity of the oral cavity (Waters, *ibid*).

The feature 'distributed' is given by Chomsky and Halle (1968:312). This is a very important feature in Australian Aboriginal sound systems, because it captures the contrast between apical and nonapical consonants. However, in order to allow this feature to be specified for vowels, it is necessary to slightly modify the definition of nondistributed sounds (Chomsky and Halle, 1968) as follows: nondistributed sounds are produced without a constriction that extends for a considerable distance along the direction of the air flow. Thus vowels are nondistributed. Unless noted otherwise, all features used in this paper are as defined in Chomsky and Halle (1968).

In Table 1 there are six columns, one of which is empty. The empty column represents lamino-alveolar sounds (often called 'interdentals'); these sounds do not occur in Djinang but do occur in the other Yuulngu languages. The other columns represent, from left to right, labials, velars, lamino-postalveolars, apico-alveolars, and apico-postalveolars. The apico-postalveolar order is the set of retroflexed sounds.

In Table 1, /r/ is trilled apico-alveolar rhotic, while /tj/ and /dj/ are lamino-postalveolar obstruents which are phonetically affricates but which function as stops.

TABLE 1  
Djinang Consonants

		+dist				-dist	
		+periph		-periph		-periph	
		+ant	-ant	+ant	-ant	+ant	-ant
-son	-voice	p	k		tj	t	t̥
	+voice	b	g		dj	d	d̥
+son	+nas	m	ŋ		ɲ	n	ɳ
	+lat					l	l̥
	-syll -nas -lat	w			y	r	r̥

Table 2 gives the vowels of Djinang.

TABLE 2  
Djinang Vowels

	-back	+back
-low	i	u
+low		a

Table 3 is a fully specified feature matrix for the phonemes presented in Tables 1 and 2. The feature 'narrow', although not discussed till section 4, is included in Table 3. Twelve features are given in this table although at least twenty one features are required for a full treatment of Djinang phonology (Waters, forthcoming, b). Table 3 therefore includes only those features necessary for characterizing segmental contrasts in Djinang.

TABLE 3

## Fully Specified Feature Matrix

	p	t	j	k	b	d	g	m	ñ	ŋ	w	γ	+	+	d	q	n	ŋ	l	l	r	r	i	a	u				
syll	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	
dist	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
periph	+	-	+	+	-	+	+	+	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ant	+	-	-	+	-	-	-	+	-	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	-	-	-	-	-
son	-	-	-	-	-	-	-	+	+	+	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+
cont	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+
narr	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+
nas	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
lat	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-
back	-	-	+	-	-	+	-	-	+	+	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-
low	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
voice	-	-	-	+	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

## 2.1 CONSONANT CLUSTERS

Underlying syllables are of three types in Djinang: CV, CVC and CVCC. We shall consider clusters of two syllables arising from the juxtaposition of a closed syllable followed by another syllable, or from the final two segments of a CVCC syllable. It appears that there are few restrictions on clusters when the second consonant is a distributed consonant (Waters, 1979, b). However, when the second consonant is nondistributed, there are quite stringent restrictions obtaining on clusters. It is the clusters of form C[-distributed] that we shall be concerned with in this section.

Clusters which occur across a reduplication boundary within a word are not considered. Such clusters may violate restrictions on word-medial clusters. This is because each part of the reduplication functions as a word (e.g. each reduplicated part of a stem receives primary stress, whereas in nonreduplicated words there can only be one primary stress within the word. (See Waters, *ibid*).

The consonant clusters with which we are concerned are given in Table 4. We see that if the second consonant is nondistributed, then so also is the first consonant. Exceptions to this rule only occur across a reduplication boundary, as noted above. In this case the sequences /kɖ/, /ŋɖ/, and /yɖ/ have been observed; but do not constitute counter-examples to the analysis which follows.<sup>1</sup> From Table 4 we observe that voiceless nondistributed obstruents may be preceded only by homorganic rhotics, while voiced nondistributed obstruents may be preceded only by homorganic nonrhotics. Hence we get the sequences:

/rt, r̥t, ld, nd, ŋɖ, tɖ/<sup>2</sup> but not the sequences

/\*rd, \*r̥ɖ, \*lt, \*l̥t, \*nt, \*n̥t/.

TABLE 4  
Consonant Clusters

		-dist			
		-son			
		+	+	d	ɖ
-dist	-son				
	+				+
-dist	n			+	
	ŋ				+
	l			+	
	l				
	r	+			
	ɾ		+		

Consonant clusters<sup>3</sup> in which the second consonant (represented by the segments above the columns) is nondistributed.



When we try to express the constraint exemplified by the co-occurrence restrictions in Table 4 in terms of features, we run into difficulties. The following two conditions are required (Hyman, 1975)

(1)            if:            C             $\begin{bmatrix} C \\ -dist \\ -voice \end{bmatrix}$

↓

                 then:             $\begin{bmatrix} -dist \\ +cont \\ -lat \\ \alpha_{ant} \end{bmatrix}$              $\begin{bmatrix} -son \\ \alpha_{ant} \end{bmatrix}$             where  $\alpha = +$  or  $-$

(2)            if:            C             $\begin{bmatrix} C \\ -dist \\ +voice \end{bmatrix}$

↓

                 then:             $\begin{bmatrix} -dist \\ \{ +nas \} \\ \{ +lat \} \\ \beta_{ant} \end{bmatrix}$              $\begin{bmatrix} -son \\ \beta_{ant} \end{bmatrix}$             where  $\beta = +$  or  $-$

Clearly these two conditions fail to capture the constraint in an adequate way. What is needed is a feature that will characterize rhotics and at the same time separate rhotics from laterals, nasals and obstruents. Such a feature would permit conditions (1) and (2) to be collapsed into a single rule.

## 2.2 CONSONANT CLUSTERS IN THE CODA OF CVCC SYLLABLES

Table 5 gives the consonant clusters which have been observed in the coda of surface CVCC syllables. The table is divided into two parts because surface CVCC syllables may arise from underlying CVCC syllables (clusters occurring in these underlying syllables are presented in the lower part of the table) or from morphophonemic processes which may operate on underlying CVC.Ci syllable sequences to produce a surface CVCC syllable by deletion of the /i/ segment (clusters produced in this way are presented in the first part of the table).

Details of the morphophonemic processes are not relevant to our discussion; the interested reader is directed to my paper.<sup>4</sup>

TABLE 6

Underlying class 1 verb stems inflected for today-past tense.

surface class	stem ending	today-past suffix
1 (28)	ti, ʔi, ɗi mi, ni, ŋi li, ru, ʕi, ɾa	-ŋili
2 (15)	ka, ku, ga, gu, gi	-ŋili
3 (6)	r, ɾ	-i-ŋili
4 (7)	pi, bi	-li
5 (71)	tʃi, dʒi	-li
6 (2)	ri, ɾi	-li <sup>6</sup>
7 (5)	bu	-piŋi
8 (3)	ña	-ŋiŋi

TABLE 7

Underlying class 11 verb stems inflected for today-past tense.

surface class	stem ending	today-past suffix
9 (7)	bir, djir, mir	-djini
10 (3)	tji	-djini
11 (3)	gir	-djini
12 (11)	pi, bi, li <sup>7</sup>	-ni
13 (4)	tjil, djil, qil	-ni stem-final l → ∅

TABLE 8

Underlying class 111 verb stems inflected for today-past tense.

surface class	stem ending	today-past suffix
14 (16)	bi, ki, li mi, ŋi, ni, ŋi	-ni
15 (6)	tjiri, kiri miri, ŋiri	-ni stem-final ri → ∅
16 (2)	ri	-ñini
17 (26)	tji, dji	-ni

Table 6 reveals that underlying class 1 verbs inflected for today-past tense are constrained to end in the phoneme sequences:

$$/ \left\{ \begin{array}{l} p, t_j \\ b, d_j, \eta \end{array} \right\} i i i /, / p i \eta i /, \text{ or } / \eta i \eta i /.$$

Table 7 reveals that underlying class 11 verbs inflected for today-past tense are constrained to end in the phoneme sequence:

$$/ \left\{ \begin{array}{l} p, t_j \\ b, d_j, \eta \end{array} \right\} i n i /.$$

Combining these two observations, and overlooking some collocation restrictions that are not significant to our discussion, we see that underlying class 1 and 11 verbs inflected for today-past tense are constrained to end in the phoneme sequence:

$$(1) \left[ \begin{array}{l} +dist \\ -cont \end{array} \right] i \left\{ \begin{array}{l} [-dist] \\ +nas \\ +lat \end{array} \right\} i.$$

Constraint (1) appears to obtain for underlying class 111 verbs except for the surface class 14, as shown by Table 8. However, my analysis of underlying class 111 verbs (Waters, 1979, a) assumes that constraint (1) is not as significant for that class as it is for classes 1 and 11. Essentially, this is due to the fact that surface class 14 is an open class with numerous exceptions to the allowed consonants which may occur as the first consonant of constraint (1). What is interesting about the verbs in Table 8 is the behaviour of stems in which the consonant /r/ occurs in the stem-final syllable. The deletion of the stem-final /ri/ syllable in surface class 15, and the insertion of a /ri/ syllable in surface class 16, are not unrelated phenomena. A constraint is involved; namely, that the phoneme sequence

(2) \*/rini/

must not occur word-finally in underlying class 111 verbs inflected for today-past tense. The changes observed in surface classes 15 and 16 conspire to prevent the sequence (2) obtaining, and to satisfy constraint (1).

Thus the constraint obtaining on the final four segments of underlying

class 111 verbs inflected for today-past tense is:

$$(3) \left\{ \begin{array}{l} [-cont] \\ [+lat] \end{array} \right\} i \left[ \begin{array}{l} -dist \\ +ant \\ +nas \end{array} \right] i.$$

From constraints (1) and (3) we observe that the final consonant of a verb (in all classes) must be either /l/, /n/ or /ŋ/. The only way to capture this class of sounds (assuming that /l/ need not be excluded on phonological grounds) is by means of the disjunction:

$$(4) \left\{ \begin{array}{l} [-dist] \\ [+nas] \\ [+lat] \end{array} \right\}$$

While (4) captures the class in a trivial way, it fails to indicate an underlying phonetic characteristic that is common to this class and which does not obtain outside of this class. Hence, a feature for handling rhotics should also explain (on phonetic grounds) the difference between rhotics and nonrhotics - as exemplified by the sounds characterized by (4) above.

Likewise the initial consonant of constraint (3) can only be handled in a trivial way as the disjunction:

$$(5) \begin{array}{l} [-cont] \\ [+lat] \end{array}$$

This is the class of nonrhotic nonglide consonants, and is similar to the class of nonrhotic nondistributed consonants discussed in section 2.1. While a feature 'rhotic' could enable the appropriate distinctions to be made for the sound classes that we have discussed, it would not explain the phonetic basis for the distinctions.

In section 2.2 we considered evidence that suggested that a feature which handles rhotics should also group glides and rhotics as a natural class. I will now give further evidence for this contention. Table 9 gives the suffixes which signal inflectional categories other than the today-past in underlying class 1, 11 and 111 verbs. These categories are non-past (non-pst), yesterday-past (y-pst), today-past-continuous (t-pst-c), imperative (imp), and today-past-irrealis (t-pst-irr).

TABLE 9

inflectional category	class 1	class 11	class 111
non-pst	-gi ~ -ŋi	-gi	-dji
y-pst	-mi	-nmi	∅ ~ -ri
t-pst-c	-ñi	-ŋi	-ñi
imp	-wi	-ri	-yi
t-pst-irr	-ñiŋi	-ŋiŋi	-ñiŋi

Inflectional categories of class 1, 11 and 111 verbs (today-past omitted). Where allomorphs are indicated, the citation form (i.e. the unconditioned form) is given first.

Table 9 reveals that the manner of articulation features for the first consonant of each category are fairly uniform over each of the underlying classes. The yesterday-past inflection in class 111 is an exception, being unmarked rather than a nasal.<sup>8</sup> Thus the initial consonant of the non-past suffix is a distributed voiced noncontinuent, the initial consonant of the yesterday-past suffix is a nasal, likewise a nasal in the case of the today-past-continuous and today-past-irrealis suffixes. However, in the case of the imperative category, we must ask whether the class 11 suffix, /-ri/, is an exception to the criterion of a uniform manner of articulation over each of the classes, or whether it complies with that criterion. I see no principled reason for assuming the /-ri/ suffix to be an exception. This then requires that we be able to specify the manner of articulation feature with respect to which /r/ and the glides are alike, and which also differentiates the glides and rhotics from other consonants. At present there is no feature which can do this.

#### 4. EVIDENCE FROM IWAIDJA

At this point we may question whether the difficulties in handling rhotics are an idiosyncrasy of Djinang alone or are typical of Australian languages generally. In this section I will present some evidence from Iwaidja, a non-Pama-Nyungan language, which supports the view that a feature for handling rhotics is needed in Australian languages generally. The data is taken from Pym (1979:112-3, 150).

Pym (ibid) describes how certain verb stem-initial consonants (Table 10 of section 5.1 gives the Iwaidja consonants) are modified when they are preceded by certain verb prefixes. The conditioning factor is

essentially grammatical rather than phonological, and so it will be sufficient for our purposes to use a labelled bracket,  $]_x$ , to indicate the conditioning factor in the rules to be given below, where 'x' represents the appropriate grammatical categories.

The changes which occur are as follows. Distributed sonorants become obstruents at the same point of articulation; but nondistributed anterior nonrhotic sonorant consonants become the nonanterior nonflapped rhotic. Hence, nonapical sonorants harden to obstruents, but apical nonrhotic sonorants are lenited, becoming a rhotic. That is /m/ and /w/ become /b/, /ŋ/ becomes /g/ and /y/ becomes /dj/.<sup>9</sup> But /ĩ/ and /n/ become /ɾ/ rather than /d/ or perhaps /d̥/.

Expressed as rules, these changes are:

$$(6) \quad [+son] \longrightarrow [-son] / ]_x \left[ \begin{array}{c} \text{---} \\ +dist \end{array} \right], \text{ and}$$

$$(7) \quad \left\{ \begin{array}{l} [+ant] \\ [+nas] \\ [+ant] \\ [+lat] \end{array} \right\} \longrightarrow \left[ \begin{array}{c} -syll \\ -ant \\ +cont \\ -lat \\ -flap \end{array} \right] / ]_x \left[ \begin{array}{c} \text{---} \\ -dist \end{array} \right].$$

Rule (6) is a simple flip flop which neatly captures the character of the change, but rule (7) clearly obscures the character of the change undergone by apical consonants, as well as requiring a disjunction to characterize the class of nonrhotic sonorant consonants. (The feature 'flap' is discussed briefly in section 6.)

A feature which distinguishes between rhotics and nonrhotics would enable rule (7) to become a flip flop, paralleling the formal structure of rule (6), and it would also eliminate the disjunction in rule (7).

## 5. THE FEATURE 'NARROW'

From the evidence presented in sections 2 and 3, we have seen that we require a feature which will distinguish between rhotics and glides on the one hand, and (optimally) all other segments on the other hand. We must then ask what phonetic property is shared by rhotics and glides that is not also shared by laterals, nasals, obstruents and vowels.

At this point, some comments from Chomsky and Halle will be helpful.



When discussing their feature consonantal they write as follows:

"When the blade of the tongue is raised close enough to the roof of the mouth to produce ... obstruction, the result is a true consonant or a liquid. Thus an [l]-sound is produced when the tip of the tongue touches the roof of the mouth, thereby blocking the midsagittal region of the vocal tract. In the case of the common lingual [r]-sounds, the raised tongue narrows the passage sufficiently to produce a consonantal obstruction even if it does not make complete contact with the roof of the mouth." (Chomsky and Halle, 1968:302)

I have defined the feature 'narrow' as follows:

narrow sounds are those in which the primary constriction involves a narrowing (without total obstruction) of the vocal tract in the midsagittal region. Non-narrow sounds lack a narrowed primary constriction in the midsagittal region.

Chomsky and Halle's characterization (1968:302) of the consonantal feature involved the blade of the tongue. The feature is defined so as to reflect the fact that glides are both vowel-like and consonant-like. My definition of the feature 'narrow' is generalized to the extent that any vocal tract narrowing (excluding that of the vowels) is a defining characteristic of 'narrow' sounds, whether the tongue blade is involved or not. It is the narrowing of the vocal tract (without producing an obstruction) in the midsagittal region that characterizes glides and rhotics, and sets these two sound classes apart from other consonants<sup>10</sup> (i.e. those with an obstruction) and from vowels (since vowels have a relatively 'open' passage in the midsagittal region).

A further consequence of the feature 'narrow' is that it enables us to dispense with the feature 'consonantal'; glides being a subset of the class of sounds which are 'narrow'. This is an attractive proposition because the consonantal feature does not appear to be as useful in phonological descriptions as are the other major class features (e.g. Huttar and Eslick 1972:114-6; Wood, 1978:62). This is no less true in Djinang, and I have not used the feature 'consonantal' (Waters, 1979, a and b). In fact, the feature 'narrow' may well prove to be more useful than the feature 'consonantal' in languages which independently require the feature 'distributed'. Australian languages are certainly in this category, since the apical versus nonapical manner of articulation distinction is a fundamental characteristic of Australian languages (Dixon, 1970:79; Wurm, 1972:48-55). Hence in Australian phonological systems the feature 'distributed' will always be available for distinguishing between rhotics [-dist, +narr] and glides [+dist, +narr]. In this way, not only are rhotics conveniently handled by the feature

'narrow', but also the feature 'consonantal' is no longer required.

Further support for the feature 'narrow' comes from Lindau (1978: 553-6). She discusses the feature 'rhotacized' (Ladefoged, 1975). This feature is defined to handle r-colouring. Although Lindau (1978) devotes her attention to vowel features, what she has to say is pertinent to the definition of the feature 'narrow'. She writes:

"There is, however, an invariant articulatory correlate of r-colouring - namely, a small retraction of the roof of the tongue, 4-6 centimeters above the larynx. This constriction in the pharynx appears on x-ray data of retroflex consonants ..., r-sounds ..., and r-coloured vowels (1978:554)

... it may not matter precisely where the tip of the tongue is, so long as the root of the tongue is retracted.

Ladefoged's feature label Rhotacized is adopted here, but is further defined in articulatory terms as a constriction of the pharynx just above the epiglottis." (1979:556)

The similarity of the feature 'rhotacized' to the feature 'narrow', in articulatory terms, is quite plain. Which of these is the more useful in non-Australian languages I cannot say. However, in Australian languages there is evidence that 'narrow' may be more useful than 'rhotacized'. This evidence centres around the fact that fricatives may be characterized by the feature complex [-son, +narr]; hence for the few Australian languages with contrastive fricatives, no additional features are required in order to handle fricative sounds. This would not be the case for the feature 'rhotacized'. This point is discussed further in section 6.

The definition of the feature 'narrow' leaves it quite open as to where the primary stricture is located. Lindau's evidence (1978) that the primary stricture for rhotics is in the pharynx is compelling, and supports the definition of the 'narrow' feature, provided that the pharyngeal constriction is a secondary stricture in the case of retroflexed nonrhotic consonants.

Using the feature 'narrow' we shall now briefly reconsider the data presented in sections 2 and 3.

Firstly, we shall deal with the conditions labelled as (1) and (2) in section 2.1 It is now possible to collapse these two conditions into one formal condition. Not only does the feature 'narrow' eliminate the disjunction in condition (2), but there is also a saving of ten features. This also captures the fact that Table 4 displays essentially a unitary phonotactic constraint in certain consonant clusters rather

than two partially similar constraints. Hence we now have the condition:

$$(8) \quad \text{if: } \begin{array}{c} C \\ \downarrow \end{array} \begin{array}{c} [ C \\ -dist ] \end{array} \\ \text{then: } \begin{array}{c} [-dist] \\ +son \\ \alpha ant \\ \beta narr \end{array} \quad \begin{array}{c} \downarrow \\ [ \alpha ant \\ -son \\ -\beta voice ] \end{array} \quad \text{where } \alpha, \beta = + \text{ or } -$$

The similarity of rhotics and glides has been discussed in section 5. and does not need further elaboration. A further consequence of this similarity is that the last row of the table of Djinang consonants (Table 1) may now be specified by just one feature, namely [+narr]. Hence the table of consonants becomes minimally specified with respect to the number of features required for establishing contrast.

We will now consider the sound classes discussed in section 3. In that section, the disjunction (4) characterized the class of nonrhotic nondistributed sonorant consonants (i.e. /n, ŋ, l/ and /l/); this being the class of sounds from which the final consonant of the today-past suffix is drawn (for all verb classes). Instead of a disjunction, this class is now nontrivially characterized by the feature complex [-dist, +son, -narr].

Similarly, the class of nonrhotic nonglide consonants may be characterized by the feature complex [-syll, -narr], instead of by disjunction (5) of section 3.

Lastly, we shall consider rule (7) of section 4. Using the feature 'narrow', rule (7) takes the form:

$$(7') \quad \begin{array}{c} [+ant] \\ -narr \end{array} \longrightarrow \begin{array}{c} [-ant] \\ +narr \\ -flap \end{array} / \_x \begin{array}{c} \_ \\ -dist \\ +son \end{array}$$

There can be no doubt that rule (7') is an improvement over rule (7). Three fewer features are used, the rule becomes a flip flop with a formal structure closely resembling that of rule (6), the disjunction in rule (7) is eliminated, and the lenition character of the change is apparent due to the flip in the value of the feature 'narrow'.

## 6. CONCLUSION

We will now briefly consider the phonologies of other Australian languages. Just how appropriate are the features that I have used for Djinang in the wider context of Australian languages generally? In particular, is the feature 'narrow' relevant in the wider context? In what follows, I will consider only some selected phoneme inventories.

Comparison of the Djinang phoneme inventory with those of other Australian languages (O'Grady, Voegelin and Voegelin, 1966:56-67; Wurm, 1972) reveals that the features appropriate for Djinang contrasts are also well suited for the majority of Australian languages. There are some exceptions, these being mainly those languages in which liquids contrast with respect to whether they are articulated as a flap or are not flapped. This fact suggests that a further feature is required, which we may tentatively label as a binary feature 'flap'. A good example of the contrastive status of the flapped liquids comes from Iwaidja (Pym and Larrimore, 1979). Table 10 gives the phoneme inventory in terms of the features discussed previously. Iwaidja has a three vowel system, /i, a/ and /u/, which I have not included in Table 10. Iwaidja also has a contrastive fricative, the velar fricative  $\chi$ . A few languages exhibit more than one fricative: Kunjen (Sommer, 1969) has labial, laminal-alveolar and velar fricatives (i.e.  $\beta$ ,  $\theta$ , and  $\chi$ ); and Brinken (O'Grady, Voegelin and Voegelin, 1966) has a (retroflexed) apico-postalveolar fricative,  $\zeta$ , as well as the same fricatives which occur in Kunjen. Table 10 illustrates how fricatives can be handled.<sup>11</sup>

TABLE 10

Iwaidja consonants

		+dist			-dist	
		+periph		-periph	-periph	
		+ant	-ant	-ant	+ant	-ant
-son	-narr	b	g	dj	d	ɖ
	+narr		ɣ			
+son	+nas	m	ŋ	ɲ	n	ɳ
	+lat	-flap			l	ɭ
		+flap				ɮ
	+narr	-flap	w		y	
+flap					ɹ	ɽ

There is far more phonetic diversity in Australian languages than is suggested by Table 10 (O'Grady, Voegelin and Voegelin, 1966). It is to be expected that further features will need to be included in the set of features for characterizing segmental contrasts in Australian languages. The features that I have been discussing are a step towards that inventory of features.

Regarding the features 'distributed' there is further research needed into the few languages which exhibit what appears to be a palato-velar versus velar contrast in the class of noncontinuants (Kirton and Charlie, 1978; Furby, 1974; Chadwick, 1975). Huttar and Kirton (1978) analysed the palato-velars of Yanyuwa as [+distributed] and the velars as [-distributed]. However, internal evidence from Yanyuwa seems to support the contention that both the palato-velar order and the velar order are [+distributed]. Certainly this is so phonetically, so these two orders can only be differentiated by the feature 'distributed' on phonological grounds. An examination of Yanyuwa consonant clusters (Kirton and Charlie 1978:192) reveals that the second consonant of a cluster must be [+distributed] - assuming that /g/ is [+distributed]. In fact, the second consonant of a cluster may be any one of the following segments:<sup>12</sup> /b, g, m, ŋ, w, ŋg, dj, nj/, and /y/. On the other hand, the initial consonant of a cluster may be the nondistributed consonants: /ɸ, l, ɭ, n, ŋ/ and /d/; or the distributed consonants: /nj/ and /dj/. These co-occurrence restrictions are even more rigid than in Djingali, since Yanyuwa does not permit the second consonant to be [-distributed]. This argues strongly against characterizing /g/ as [-distributed] in Yanyuwa. It is even less attractive to analyse palato-velars as [-distributed]. While velars do not cause palatalization of preceding vowels, for example, both lamino-postalveolars (i.e. lamino-palatals) and palato-velars do (Kirton, private communication). The most reasonable analysis is that palato-velars and velars are both [+distributed].

However, it is by no means certain that these two orders of sounds are in fact contrastive. Huttar and Kirton (1978) have shown that it is possible, if not highly likely, that Yanyuwa palato-velars are the phonetic exponents of an underlying lamino-postalveolar plus velar consonant cluster. In support of this, palato-velars never occur word initially, or in consonant clusters (Kirton and Charlie, 1978). Kirton and Charlie (ibid:186) also report that Chadwick believes that palato-velar consonants in Djingali have a similar origin.

In Garawa, Furby (1974:6) states that it is possible to analyse palato-velars as allophones of velars which occur following vowel glides. In view of the uncertainty as to the contrastive status of palato-velars, I believe the burden of proof rests with those who assert that this order of sounds are contrastive. Consequently, it should be safe to claim that all peripheral back consonants in Australian languages are also distributed consonants; and hence that the feature inventory discussed in this paper is a useful one for characterizing segmental contrasts in the languages of Australia.

## FOOTNOTES

- 1 Clusters of form C [-dist; +son] do not occur. Also, Table 4 does not show the geminate clusters [tt] and [tʃ]. In Djinang, gemination is characteristic of voiceless stops when they follow a stressed open syllable. The phenomenon is wholly phonetic; no underlying geminate stop sequences occur in the language. See Waters (1979, b) for details.
  
- 2 The sequences /td/ and /!d/ have not been observed (in a dictionary corpus of a thousand words). This is due to the fact that apical obstruents occur infrequently, and even more infrequently within clusters.
  
- 3 The following words illustrate the clusters listed in Table 4: /diɬdiy/ 'milkwood tree', /ɾandinmi/ 'speared', /miŋdirpigi/ 'eat', /mildirpigi/ 'show', /mururt/ 'plains grass', and /yaɽti/ 'tail'.
  
- 4 Examples of the /[-syll, +son]tj/ cluster, and also the /nm/ cluster can be obtained from Waters, 1979, a. Examples of the other clusters are as follows: /butjalm/ 'asking', /miyilk/ 'woman', /bumaŋ/ 'shade', /dju!k/ 'precede', /girark/ 'name', /mururt/ 'plains grass', /gumbirpmi/ 'empty handed', /ɬurkɬurk/ 'heart', /wurpmi/ 'one', /mandjawk/ 'knife', and /muytjpinigi/ 'build'.
  
- 5 For further details concerning the data on which section 3 is based, see Waters, 1979, a.
  
- 6 Two stems, /giɾi/ 'go' and /nundjiri/ 'run', exhibit irregular behaviour for the non-past and today-past inflections. The actual forms which occur in the today-past are /giɾali/ 'went', and /nundjirali/ 'ran'. These forms violate the general constraints to be discussed later. Since these two forms comprise a small closed class of verb stems, I am treating them as irregularities and will not consider them as part of the system of constraints obtaining for verbs inflected for today-past tense.
  
- 7 Only one stem with a stem-final /li/ sequence occurs in this surface class. The stem is /kali/ 'have', 'possess'. Since this is the only stem (of a total of 28 underlying class 11 stems) which violates the constraints to be discussed later, I am treating it as an irregularity and will not consider it pertinent to the discussion from this point on.

8 The allomorph /-ri/ occurs when class 111 stems end in the sequence /dji/. The /-ri/ allomorph here performs a disambiguation function; it ensures that the non-past and the yesterday-past tenses may not both end in a /dji/ sequence.

9 Presumably /ñ/ would change to /dj/ also, but apparently there are no stems with /ñ/ occurring stem initially.

10 Strictly speaking, sounds which are characterized as 'narrow' include glides, rhotics, fricatives (including glottal fricatives), and retroflex vowels.

11 I do not intend to imply that the feature 'strident' is not required for Australian languages having fricatives. It is certainly necessary in such circumstances for specifying phonetic detail. I am only implying that stridency may not be a CONTRASTIVE feature of fricatives when they occur as phonologically distinct oppositions within the sound system of an Australian language.

12 I have retained her notation for the segments. /ng/ is a prenasalized stop, and /nj/ is the lamino-postalveolar (i.e. lamino-palatal) nasal /ñ/.



REFERENCES

- CHADWICK, N., 1976. *A Descriptive Study of the Djingili Language*. Canberra: AIAS.
- CHOMSKY, N. and M. HALLE, 1968. *The Sound Pattern of English*. New York: Harper and Row.
- DIXON, R.M.W., 1970. 'Proto-Australian Laminals'. *Oceanic Linguistics*, Vol.9, No.2:79-103.
- \_\_\_\_\_, ed. 1976. *Grammatical Categories in Australian Languages*. Canberra: AIAS.
- FURBY, C.E., 1974. 'Garawa Phonology'. *Pacific Linguistics*, Series A, No.37:1-11.
- HUTTAR, G.L. and J.A. ESLICK, 1972. 'Distinctive Features in Sarnami Hindustani'. *Phonetica*, Vol.25:108-118.
- \_\_\_\_\_, and J.F. KIRTON, 1978. 'Contrasts in Yanyuwa Consonants'. Unpublished Paper presented in May 1978 at the meeting of the Australian Linguistic Society at the Australian National University, Canberra.
- HYMAN, L., 1975. *Phonology: Theory and Analysis*. New York: Holt, Rinehart and Winston.
- KIRTON, J.F. and B. CHARLIE, 1978. 'Seven Articulatory Positions in Yanyuwa Consonants.' *Pacific Linguistics*, Series A. No.51:179-99.
- LADEFOGED, P., 1975. *A Course in Phonetics*. New York: Harcourt Brace Jovanovich.
- LINDAU, M., 1978. 'Vowel Features'. *Language*, Vol.54:541-563.
- O'GRADY, G.N., C.F. and F.M. VOEGELIN, 1966. 'Languages of the World: Indo-Pacific Fascicle Six'. *Anthropological Linguistics*, Vol.8, No.2.
- PYM, N. and B. LARRIMORE, 1979. *Papers on Iwaidja Phonology and Grammar. Work Papers of SIL-AAB*, Series A, Vol.2. Darwin: SIL.
- SOMMER, B.A., 1969. 'Kunjen Phonology, Synchronic and Diachronic'. *Pacific Linguistics*, Series B, No.11.
- VOEGELIN, C.F. and F.M. VOEGELIN, 1977. *Classification and Index of the World's Languages*. New York: Elsevier.
- WATERS, B.E., 1979a. 'Djinang Verb Morphology'. *Work Papers of SIL-AAB*, Series A, Vol.4:1-49. Darwin: SIL.

\_\_\_\_\_, 1979b. 'Djinang Phonology'. *Work Papers of SIL-AAB*, Series A, Vol.4:51-131. Darwin: SIL.

WOOD, R.K., 1978. 'Some Yuulngu Phonological Patterns'. *Pacific Linguistics*, Series A, No.51:53-117.

WURM, S.A., 1972. *Languages of Australia and Tasmania*. The Hague: Mouton.

## SOME RECENT OBSERVATIONS

Based on data collected in 1979

Since writing the previous three papers, further facts have been ascertained which are of relevance to these papers.

Firstly, consider chart 3 in the paper 'Djinang Verb Morphology', and also constraint 1 of section 6.1 in the same paper. In the discussion following constraint 1 it was stated that ... 'the data does not indicate whether or not the phoneme /ny/ should be included' in the set of sounds occurring as the first consonant of constraint 1). A class 1 verb with a stem ending in the sequence /nyi/ has now been observed. It patterns according to group 5 verbs in chart 3, with the exception of the imperative inflexion in which a /j/ is inserted in the stem preceding the stem final /i/ phoneme. The verb is *dapilinyigi* 'break'off' (non-past); and is inflected as follows:

<i>dapilinyigi</i>	non-pst
<i>dapilinyimi</i>	y-pst
<i>dapilinyinyi</i>	t-pst-cont
<i>dapilinyjuwi</i>	imp
<i>dapilinyinyiri</i>	r-pst-irr
<i>dapilinyili</i>	t-pst

Thus, constraint 1 is too strong a condition, since the nonback nasal /ny/ is a permitted realization of the first consonant of that constraint. Nevertheless, the first consonant still must not be /m/, /g/, /k/ or a continuant. Constraint 4 (section 6.1) is unaffected by this change, and hence the discussion of the rules (section 6.3) is also unaffected.

A verb which patterns similarly to the verb *mini* 'carry', (see footnote 10 and group 2), has been recorded. It is *ragi* 'go inside', 'put into' (stem *rigiligi*) which was erroneously listed as a group 1 verb in class 1. Further investigation has revealed that it patterns as follows:

<i>ragi</i>	non-pst
<i>rigiligimi</i>	y-pst
<i>rigiliginyi</i>	t-pst-cont
<i>rigiliguw</i>	imp
<i>rigiliginyiri</i>	t-pst-irr
<i>rigilali</i>	t-pst

Thus it is perhaps better categorized as another verb either group 2 or group 6. The change of stem in the non-past occurs in order to avoid a word final /gigi/ sequence. The /-ali/ allomorph for the today past inflection (with accompanying stem change for this verb) patterns along the lines of group 6 verbs. Hence, the verbs /mini/ 'carry' and /ragi/ 'go inside', 'put into', could be included in either group 2 or group 6. It is not clear which grouping is to be preferred.

Secondly, consider the paper 'Djinang Phonology'. Further vowel allophones of /i/ have been observed; namely, [ɨ], a high central unrounded syllabic. I have observed this mostly in a non-primary-stressed syllable between a labial noncontinuant and a following velar nasal; but it does occur elsewhere. For example:

/marɨŋ/	[ˈmar.m <sub>ɨ</sub> ŋ]	'grandfather (f.f)
/manɨŋ/	[ˈman.b <sub>ɨ</sub> ŋ]	'hard', 'strong'
/gɨdɨjɨŋi/	[ˈg <sub>ɨ</sub> dɨ.jɨŋi]	'bushfire'

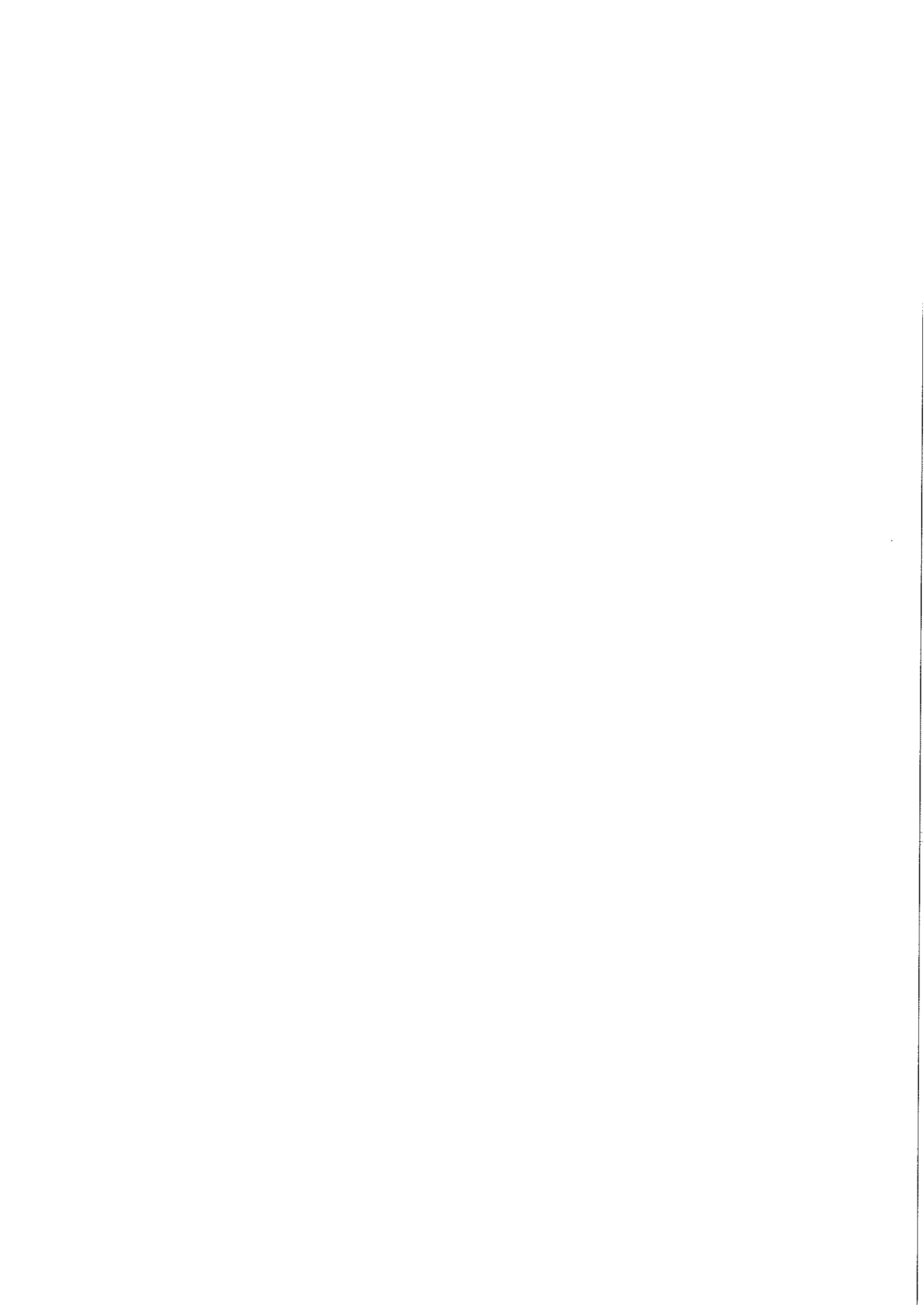
It occasionally happens that the velar nasal causes the /i/ vowel to occur as the allophone [w], a high back unrounded syllabic. Thus, I have sometimes heard /manɨŋ/ pronounced as [ˈman.b<sub>w</sub>ŋ]. I have only recently begun to 'hear' these allophones, thus it is likely that some instances of /u/ in the reported vocabulary in this paper are in reality /i/. However, there are numerous clear realizations of /u/ as [u], and since there are no labialized consonants in Djinang (compare 'Anindilyakwa Phonology', by Velma Leeding, an M.A. thesis submitted to Macquarie University, 1979), the phonemic status of /u/ remains unchanged.

Thirdly, in the same paper I claimed that long vowels and lowered high vowels were allophonic variations of emic short vowels in prominent syllables. I have had the opportunity to test this claim with a Djinang speaker who is fluent and reasonably literate in Gupapuyngu - a language which orthographically recognizes long vowels (written as e, o and ɨ). Previously he could not spell Djinang words consistently using 'e' and 'o' as symbols for long vowels (I did not try to use ɨ). Now that he has tried using just three vowels (i, a and u), he rarely misspells vowel phonemes in Djinang words. Also, when I questioned a young Djinang man (who is fluent and literate in both English and Gupapuyngu) as to whether or not the symbols 'e', 'o' and 'ɨ' are needed in Djinang for long vowels, he said "No". Of course, to 'prove' (statistically) that Djinang requires only three orthographic vowel symbols would necessarily involve testing with numerous speakers: but the above results are certainly consistent with the claim that Djinang has only three emic vowel phonemes.

One clear example of a rounded labial stop, [p<sup>w</sup>], has been recorded.

It occurs in the word ['kup<sup>w</sup>.p<sup>w</sup>ugárling] 'type of shell fish'.

Lastly, consider the paper "A proposed distinctive feature "narrow": evidence from Djinang and Iwaidja". In section 6 of that paper, I gave some phonotactic evidence that palato-velar sounds do not contrast (emically) with velars, in languages where these two orders of sounds have been observed (e.g. Djingili, Yanyuwa, Garawa). Velma Leeding (private communication) reports that Anindilyakwa also has palato-velar and velar orders and has tested these orders of sounds psycholinguistically for their emic status. She found that speakers could not discern between them, and she concludes that the palato-velars are conditioned variants of the velars.



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