CHAPTER TWO

PHONOLOGY

Throughout this thesis I employ a practical orthography, based on similar orthographies for other Kimberley languages, such as Bardi, Ngarinyin, Worora/Worrorra, Gooniyandi, Bunuba, and Miriwoong.[1] Except for two features this orthography is fairly standard for Australian languages. The first feature is the use of "voiced letter symbols" for stops, even though phonetically the stops are most often unvoiced. I regard the choice of symbol as somewhat arbitrary where voicing is non-contrastive, but in this case I am also following a convention established for Northern Kimberley languages by other linguists, and preferred by speakers where they have had input into Kimberley orthographies. They all use the voiced series except in some cases for *k,g* where *k* is regarded as the more convenient choice for writing the nasal-stop clusters *ngk*, *nk* and/or *rnk* (KLRC 1999). I use *ngg*, *n.g* and *rn.g*, with the convention of a full stop to separate segments (though I am open to using *k*, as for the latest Worora and Ngarinyin community orthographies adopted by the Kimberley Language Resource Centre (KLRC 1999).

2.1 CONSONANTS

The consonant phonemes of Wunambal are unremarkable for an Australian language (Dixon 1980: 125-127; 132-150). Manners of articulation include the expected stops, nasals, laterals, rhotics and glides. Voicing is not contrastive in the stops. Stops and nasals distinguish four and five places of articulation. The expected alveolar vs. post-alveolar contrast described for all other Kimberley languages (Capell and Coate 1984; Clendon 1994; Hudson 1978; Kofod 1978, 1996; McGregor 1990, 1993; Rumsey 1982, 2000; Tsunoda 1981) is difficult to establish in Wunambal, particularly in the stops. A likely reason for this is that the contrast does not appear consistently in my own data because I do not hear the distinction well. For example, for a number of lexical items I have recorded both retroflex and alveolar in my transcriptions on separate occasions. Further work with literates who do hear this distinction, although they are not full speakers, should help to clarify this matter. I discuss this lack of extensive contrast further in the sections for each manner of articulation, and make some comparison with

information recorded both for Wunambal and for other Wunambalic languages by other linguists in the examples presented.

The consonant inventory with the orthographic symbols used in this grammar is presented below.

Table 2.1: Consonant inventory

	APICAL		LAMINAL	PERIPHERAL	
	alveolar	post-alveolar	palatal	bilabial	dorso-velar
stops	d	rd	j	b	g
nasals	n	rn	ny	m	ng
laterals	l	rl	ly		
rhotic(trill/tap)	rr				
approximants	r		y	w	

Stop, nasal, lateral, rhotic and glide consonants are discussed below. Some minimal and near-minimal pairs are shown for each manner of articulation. Abbreviations used in this section are:

aff. 'affix, usually a pronominal prefix'
cv. 'coverb'
iv. 'inflected or finite verb'
nom. 'nominal word'

2.1.1 Stops

The major stop contrasts are illustrated in the examples below:

b	*ba**b**a*	'grandparent'	*gaa**b**u*	'nothing'	*gu**b**u*	'brain'
d	*a**d**a* cv.	'sit'	*ga**d**unungu*	'pelican'	*gu**rd**u* cv.	'chase'
j	*Ba**j**a*	'personal name'	*gaa**j**a*	'yam'	*bu**j**u* cv.	'finish'
g	*baa**g**i*	'type of kangaroo'	*ba**g**ude* cv.	'break off'	*bu**g**urr-* aff.	3SG<2PL

Distribution and phonetic realization of stop phonemes

The segment *b* is a bilabial stop. It can be voiced or voiceless and is not aspirated. The lack of aspiration which is probably the most prominent aspect of voiceless stops in

English, means that I hear very little difference between voiced/voiceless allophones. What I take to be voiceless allophones are more usual, occurring both word-initially, and word-medially whether intervocalic or as the second member of a consonant cluster. The voiced allophones are most often heard post-nasally but can be used elsewhere. It is possible that the unvoiced allophone is normal after a long vowel or closed syllables apart from nasal final ones. Though there is a tendency toward complementary distribution, free variation is possible. This tendency is also noted by Dixon (1980:127) for Dyirbal.

baba 'granny' [papa] [paba][bapa], [baba]
gaabu 'nothing' [kɑːpu]
dorlba 'burst' [tɒˑɭpɑ]
jɨnbarri 'Corneille Island' [ʧɨnbʌɾi] *nguwanban* 'I fall' [ŋuwanban]

d

The apical alveolar stop represented by the letter *d* occurs word-initially and medially, but only occasionally word-finally[2]. Initial *d* is quite fronted or near dental in articulation for some speakers for some lexical items but I can establish no pattern to this articulation. The segment *d* can be voiced or voiceless, but voiceless allophones are more common intervocalically. Post-nasally the voiced allophone is heard. Word-initial and word-medial examples appear below. Word-final *d* may occur, my data for word-final apical stops, however, contains retroflexes only. I have included the most unusual (one example only) occurrence of [d] preceding homorganic *l* below.

***d**angana*	'livistonia palm'	***d**urru*	cv. 'put'
*ga**d**unungu*	'pelican'		
*ban**d**ama*	'black bream'	*angamɨ**nd**angi*	iv.'I took it'
*na**d**la* cv.	'camp'		

rd

Post-alveolar phones occur word initially, medially and finally in Wunambal. A voiced allophone is heard word-initially and post-nasally. The intervocalic and word-final segment is usually an unvoiced [ʈ]. The syllable-final segment is frequently unreleased.

***d**urdu*	[ɖuɖu]	'bark parcel'
*wu**r**da*	[wɷʈa]	'thigh'
*buwa**rd*** cv.	[buwaʈ]	'take.out, ?lift'
*buwa**rd**ba* cv.	[buwaɖbɑ]	'taking.out/?lifting out'
*wa**rd**wa**rd***	[waʈwaʈ]	'brushtail possum/phascogale'
*ba**rn**di/baa**rn**di*	[paˑɳɖi]	'head'

dird. ?[dɩʈ] 'cut up' [WG]

In this thesis word-initial retroflexes are written as for the alveolar. A number of word-initial retroflexes do occur in coverbs that appear to contain reduplicated formatives. Two examples are *durdu* [ɖɷɖ u] ~ [ʈɷʈu] nom 'bark package' with a retroflex stop and *lerlewa* [ɭɛˑɭɛˑwɑ]*cv*. 'crawl' with a retroflex lateral.

I have had some difficulty hearing the post-alveolar or 'retroflex' consistently in Wunambal, and have had to rely on visual cues to check for retroflex vs. alveolar articulation. Visually the tongue-tip is pointed quite upright to the anterior part of the alveolar ridge. My attempts at an exaggerated tongue 'turned back' position were rejected by speakers. It would seem that this position is not so retracted as the retroflex of some central Australian languages. No minimal pairs for alveolar vs. retroflex stops that could be used as a convenient reference point when comparing segments occur in my data. As I have not been able to visually check a large set of words containing apical segments many of my transcriptions can be regarded as under-differentiating for this distinction, usually by writing the alveolar for retroflex. In some cases however when checking transcriptions I have been made aware that I have erred in writing retroflex for alveolar. This is enough to establish the psychological reality for speakers of the segments in question.

j

Laminal sounds in Wunambal are made with the blade of the tongue raised toward the hard palate. The stop *j* occurs word-initally and medially. In coverbs it also occurs word-finally. The segment is realized most often as either a slightly aspirated unvoiced [c], or unvoiced affricate [ʧ] word-initially, and medially in the speech of my primary informant. A fricative pronunciation [ç] has also been heard in this position. *J* is most likely to be voiced after nasals but voiced allophones are also possible word-medially. Word finally, (that is in coverbs) *j* is often unreleased.

jarrnge	'quartz' [cɐrŋe] [çɐrŋe]
jiiba	'spectacled hare wallaby' [ʧiːpʌ], [ʧiːpʌ]
buju	'if' [pɷcu], [pɷɟu], [pɷʧu], [pɷʤu]
Banjak	'personal name' [panʤak]
jarrij cv.	'run' [caɾicˠ]

g

Velar *g* is most often realized as voiceless except after nasals. Aspiration, or perhaps more accurately some fricativization, can be heard word-initially. A few investigators

have transcribed both [k] and [ɟ] for the same lexical item before long high [i:] the highest palatal vowel, indicating that the articulation of *g* is furthest forward, approaching the palatal position, in this environment. Word-finally *g* is often unreleased and therefore inaudible.

gubungarri	'caterpillar' [xupuŋʌɾi]
giirra	'Kimberley heather' [ki·rʌ] [xi·rʌ]
giirra	'scratch' [kiraɑ] [ɟiraɑ] (SIL)
bugala	'B:that' [pɷkʌlʌ]
gurn.gurru	'cycad' [xɷŋgɷru], [kɷŋgɷru]
wog cv.	'burn, roast, cook' [wɒ·k˥], ?[wɔ·k˥]
jurrug cv.	'carry' [cɷrɷk˥]

Stop phonemes can be voiced or voiceless. Unaspirated voiceless allophones are more common, the voiced allophones are heard most often after nasals segments.

2.1.2 Nasals

Places of articulation for the nasals are as for the stops.

m	*gam**a**l* 'cry'	*gu**m**a* 'clear gum'	*Du**m**ul* 'pers. name'
n		*gu**n**anggi* 'echidna'	*gu**n**umingga* (you) don't say! (IMP)
rn	*ga**rn**anggurr* 'dog'	?*gu**rn**anggi* 'echidna'	*gu**rn**u* 'yam type'
ny	*ga**ny**a* 'what'	*gu**ny**arrmirangi* 'we got it'	
ng	*(ada) gaa**ng**a* 'you are sitting'	*wu**ng**arr-* aff. W<1in:PL, it<we	*-nu**ng**u* aff. 3:OBL, 'on.it'

Bilabial *m* can occur word-initially and medially, intervocalically and post-apically but not normally word-finally. The notable exceptions are the names of 'Aboriginal'[3] names of two settlements that have been adopted with English pronunciation; *Watjalam/Wotjulum* and *Mowunjum* and the English names of two Kimberley towns, Broome and Wyndham, which are all pronounced with final [m] by Wunambal speakers in Wunambal texts.[4]

mama	'grandparent'
*bar**nm**an*	'magic man'
*bal**m**angan*	'tree type

n

The segment *n* occurs word-initially, medially (both intervocalically and as the first member of a cluster[5]) and finally.

***n**aa*	'you'
*bi**n**i*	'him/her'
*nama**n**di*	'canoe'
*Wunba**n**.gurr~Wunbanggurr*	'country name'
*ga**rn**men*	'cave'
*ba**rn**man*	'magic man'
*balmanga**n**~barlmanga**n***	'Kimberley Christmas tree'

It was difficult in my corpus to find any clear minimal pairs that do not involve inflected verbs. Minimal pairs showing an apical contrast demonstrated by Vászolyi (1972-73a:24) are as follows[6]:

*ga**rn**jal*	'osprey'	*ga**n**jal*	'thy foot'
*wa**rn**a*	'honey'	*wa**n**a*	'if'

but unfortunately, are inconclusive for my purposes. Firstly, I have not attested apical nasal + laminal stop clusters. I hear nasal assimilation to the palatal position and do not recognize any distinction between (*rn* or *n*)+*j* clusters and *ny*+*j*. Secondly, of the four words above I have attested only *ganjal* 'your foot, foot-track or footprint' and *wana/warna* 'honey'. *Wana* 'if' was not used by my informants, though I have recorded *wana(wa)narra* 'afternoon'. I have also recorded *den* [ʈɛ·n] 'pile up' which contrasts with Vászolyi's *dern* cv. 'to cause trouble'. Unfortunately, I was unable to elicit/confirm the latter word.

In an effort to establish whether or not there is in fact an apical contrast as indicated by Vászolyi, and as suggested by the phonemic inventory of other Kimberley languages, I have also compared those putative nasal apical contrasts in similar phonemic environments, suggested by McGregor (1993:15) for Kwini, since in this case they involve near identical lexicon to Wunambal.

Kwini:	*wi**n**mɨra*	'take this'	*ga**rn**mɨn*	'cave'
Wunambal:	*wu**n**=mɨra*	'grab it'	*ga**rn**men*	'cave'

Other nasal apical segments occurring in similar environments, and suggestive of non-allophonic contrast, in Wunambal are:

*nguwa**n**ban*	'I'm falling'	*gub**a**rn*	'blood'
ngu=wan-ban			
1SG=REDUP-'fall'			

Palatal ***ny*** occurs initially, medially and occasionally, word-finally. There are a few word-final examples where the palatal nasal is either devoiced or unreleased, and one example of alternation with a form with an additional syllable. The *ny* final forms may be dialectal variants or forms familiar from closely related languages.[7]

***ny**uma*	'young, immature'
*ga**ny**a*	'what'
*guri**ny*** ~ *guri**ny**al*	'tree type'
*julwu**ny*** ~*julwun*	'male euro' [ʧɑlwuɲ˥], [ʧɑlwun]
*?garnma**ny*** ~*garnmen*	'cave' [kaɳmeɲ˥], [kaɳmen]

Velar ***ng*** can occur word-initially and medially, both intervocalically and post-apically, but as for the other peripheral nasal, *m*, not word-finally. I do not perceive any allophonic variation, although it is likely that *ng* is articulated further back in the environment of back vowels.

***ng**awa*	'water'	***ng**uwa*	'negative particle'
***ng**iyangga*	'I'm going'	X *ba**ng**a* iv	'(s)he is X'
*jarr**ng**e*	'?(quartz) spear-head'		

2.1.3 Laterals

l	*b**a**langgarra*	'everyone'	*b**a**le*	'behind'	*g**a**la*	'that, then'
rl	*b**o**rlarlon*	'flat stone used for grinding'	*b**a**rle*	'wattle type'		
ly	*b**a**lya* cv.	'chase.up'	*m**a**lya* cv.	'play'	*g**a**lya*	'over there'

l Both *l* and *rl* occur word-initially, medially (intervocalically and as the first member of a cluster) and word-finally.

*l**i**na*	'tooth'	*b**a**le*	'far in distance'	*n**e**rrwa**l***	'plant type'
*l**a**wanda*	'cheek'	*y**a**malba*	'spearthrower'	*w**u**ndal*	'fire'

Although the retroflex lateral occurs word-initially and medially I do not write word-initial retroflex in this thesis. To date I have not noted a *l* - *rl* contrast word-finally, although one is very likely, and in this thesis the word-final apical laterals these are also written *l*.

rl
A word-medial contrast occurs for the apical laterals:

bale	'behind'
barle	'wattle, acacia ?tumida'

Lamino-palatal ***ly*** has limited distribution, occurring only word-medially, both intervocalically and as the first member of a cluster. *Ly* does not appear to contrast with a sequence *l*+*y*.

malya cv.	'play'
balya cv.	'chase up, follow.up, visit'
galyba	'over.there'

2.1.4 Trill, flap *rr*

barra cv.	'chat, tell story'
burru	'that/those'
gaarri	'liver'
gurri	'spider'

The segment *rr* occurs word-medially and word-finally only (despite Vászolyi who has word-initial *rr* in e.g. *ray* 'shame' (1973a:33)[8]). *Rr* has two prominent allophones, the trill [r] and flap [ɾ]. I have assumed that both allophones are essentially alveolar, however, retroflex allophones may also occur. Some speakers have a variant pronunciation, which I hear as [l] both intervocalically and word-finally, which is, however, corrected to [r] on investigation. My primary Wunambal informant frequently pronounces intervocalic *rr* as a phone similar to [ɹ], causing some confusion for this listener with *r*. In careful or exaggerated speech (using e.g. the trilled allophone pronunciation intervocalically), however, the contrast between *rr* and *r* in Wunambal is clear to this listener.

Rumsey (1982:5) describes a similar phenomonen in Ungarinyin but in word-final position only. He characterizes what I take to be the same allophone as the one under discussion (note that Rumsey's subscript phonetic symbol is meant to characterize devoicing, *not* retroflex articulation):

Sometimes during the devoiced portions of these word final trills, there is a weakening of articulation such that the tongue fails to make contact and the trill dissolves into a fricative [ɹ̥].

Some word-final trills in Wunambal may also be devoiced, but the voicing is evident whenever the next word begins with a vowel. The following minimal pairs contrast *rr* with *r*:

ngurru	'perhaps'	*nguru* cv.	'listen'
garri	'liver'	*gari* cv.	'paddle'
barran	'hard'	*baran*	'widow'

The following forms also contrast *rr* and *r*, but with concomitant conditioned allophony in preceding vowels; unless, that is, there is some other phonemic vowel contrast involved, a possibility which is taken up in section 2.2.3.

waarri	'faeces'	*wari* cv.	'smoke' (make smoke')
gaarri	'liver'	*gari* cv.	'paddle'
giirra	'Kimberley heather'	*gɨra*	'camp, country'

=MI**RR**A 'come/go to'	=M**ɨR**A 'grab'
e.g *ngundu=mirra-ngi*	e.g *ngundu=mɨra-ngi*
1SG<3B=come/go to-PAST	1SG<3B=grab-PAST
'(S)he came to me.'	'(S)he grabbed me.'

The following examples demonstrate the phonemic contrast between *rr*, and *l* .

ngarranaa	'we'	*naala* cv.	'sick'		(1inPL)
'you and I'					
barra cv.	'tell story'	*balanggarra*	'a large group'	*baya*	'calf'
gurri	'spider'	*gurli*	'blood'		

Contrast with the apical stop phoneme(s) *d* and/or *rd* (which can be confused with the flapped allophone of *rr)* is demonstrated in the following minimal pairs and segments in similar phonemic environments.

jarri cv.	'dig'	*jadi~jardi*	'sharp rock spinifex'
warrmɨna	'quoll'	*wardward*	'brushtail ?possum/?phascogale'
durru	'put, leave'	*durdu* . *cv.*	'spin (wrap around)'; *nom.* 'bark package(tied/wrapped up)'; and
		?*dudu/durdu*	?(*cv.* 'break/shave off')

2.1.5 Semi-vowels

gawi	'fish'	*we(e)*	'sleep'
gari	'paddle' cv.	*rayi*	'shame'
gaya	'over there'/*galgayi* 'tree type'	*ye(e)* cv.	'speak'

The semi-vowels or approximants *r*, *w*, and *y* have been grouped together because they behave in similar ways phonotactically, as well as sharing similarities in their manner of articulation and closeness to the vowels *i*, *u* and *ii*, respectively. Each is a glide approaching vowel-like status with little obstruction to the air flow, but occurs at syllable margins (although they can be elided when they occur with a vowel of the same place of articulation). Each occurs word-initially and intervocalically, but rarely word-finally.[9]

It should, however, be noted that there are some respects in which the semi-vowel *r* and trill *rr* are more alike in their behaviour. Both may produce "*r* colouring" on a preceding short vowel, and they share with other apicals the apical feature affecting consonant distribution in the word (see phonotactics). The interaction of high vowels and apicals, discussed in the next section, applies to both *r* and *rr*, e.g. /i, u/ > [ɨ̞, ɞ̞] / {b, g} __ {rd, l, rn, r, rr} with reduction of stress in certain contexts for initial syllables. Additionally, intervocalic *rr* has an allophone very similar to canonical *r*. Although it is more common to keep the rhotics separate from glides (Ladefoged and Maddieson 1996: 244-245) I prefer to keep *r* with the glides, for the distributional reasons discussed above, and because of the difference in the type of articulation.

My descriptive approach to the rhotics conforms to the presentations in various other works on Kimberley languages (Clendon 1994, Hudson 1978: 4, McGregor 1988c, 1990: 37) and to more general observations about the sounds of world languages. For example Ladefoged and Maddieson (1996) note that: 'it is more common to find contrasts among rhotics that involve the contrast of type, rather than place' (p137) and 'there is no physical property that constitutes the essence of rhotics' (p244). Ladefoged and Maddieson also make the specific observation that many Australian languages: 'have rhotics that differ in place and *manner*' (p238). McGregor (1988c) provides a detailed argument for placing *r* with the 'glides' and grouping *rr* with the 'laterals'. McGregor notes in this article that various other Australianists group *r* with the glides.[10]

r is an apico-post alveolar semi-vowel /ɻ/ which may be realized as either [ɹ] or more commonly [ɻ]. Although most common word-initially and intervocalically, I also recorded two lexical items, listed below, that are invariably pronounced with this consonant word-finally.

ranggu	'heart',	*gari* cv. 'paddle'	*wir* cv. 'fly'
ray(i)	'shame'	*gira/giraa* camp'	*mar* 'Leichhardt pine' (used to make canoes)
rirrwa	'tugging/ pulling'		
rurrmul~rirrmul	'finger or toe-nail'		

y is a palatal glide produced without friction.

ye / yey	'speech'	*wuyu*	'ear'
yamalba	'tree-type, spearthrower'	*baya*	'calf'

Syllables written with *y* preceding the high front vowel *i* are usually pronounced [i] and the sequence iy is pronounced [iː] . These sequences are thus not distinguishable from the phoneme *i* and a possible phonemic segment, the long high vowel *ii*. respectively. In this thesis I do not recognize the segments *i* (or *ii*) as allowable word-initially and word-initial [i] is written as *yi*.

yirrminjal [irmɪnɟal] 'leaves' *yilangal* [ɪlʌŋal]'scaly tail possum'
yinggala 'older sister' [iŋgala]

w is a bilabial continuant glide produced without friction. *wu-* initial syllables are usually pronounced [uː]. When *w* occurs between two high back vowels it is lenited. Short or weak vowels associated with consonant-vowel prefixes are usually realized as [u] in the environment following *w* except before a palatal. When a word-initial vowel is pronounced [u] I take this to be diagnostic of a phonological *w*-initial segment and write *wu-*.

wuyu	'ear'	*gawi*	'fish'
wiji	'sore'	*dalwa~darlwa*	'lizard, small skink'

2.1.6 Consonant contrasts: discussion

Four contrastive places of articulation 'actions' are clearly recognized, bilabial, laminal, apical, and dorsal. Phonetically there are both alveolar and post-alveolar apicals, with clear evidence of contrast for the nasals and laterals but perhaps because of the more restricted distribution of alveolar stop the contrastive load appears to be low for the apical stops. The status of the distinction between *r* and *rr*, on the other hand, is easily identified with many minimal pairs. In this case the relevant contrast in careful speech appears to be in manner, rather than place of articulation. There are also some phonetic dental stops and laterals, but again, they do not seem to be contrastive.

The basic problem with identifying a contrast in the apical series is the listener's uncertainty in distinguishing between alveolar and retroflex articulation aurally. Knowledge of clear minimal pairs would make a strong yardstick for comparison without the complications of speaker and listener focussing on different segments, but a pair was identified for the lateral only. The large number of vowels recognized (when more than 3 or 4) vowels are recognized and the close relationship between retroflex articulation and the quality of preceding vowel segments compounds this problem. Using cues like "*r* colouration" in the previous vowel (as suggested, for example by McGregor 1993:17 for Kwini), to detect post-alveolar articulation only compounds the problem of vowel allophony and phonology. For example, McGregor mentions that short vowels are more effected by "*r* colouration" from a following retroflex than long vowels. In the case of a short 'i' phoneme I would expect "*r* colouration" to produce a phone similar to [ɨ] or [ə]. Many of my /ɨ/ examples do precede perceived retroflexes, and although I have recorded the other high vowels *'ii/iy/iyi'*, and *'u/uu'* before retroflexes *'i'* does not appear in this position in my data, and /ɨ/ does not occur word-finally.

In fact, it is often difficult to segment retroflex consonants from a preceding vowel both aurally and visually. Speakers can slow down their pronunciation for me when I am focussing on difficult segments but they then tend to emphasize the preceding vowel, sometimes lengthening it, leading to confusion not only with vowel quality but additionally vowel length. In the early stages of my research speakers appeared to accept both my attempts at alveolar and retroflex articulations for much of the vocabulary tested. Admittedly it is sometimes difficult to be sure speaker and learner are focusing on the same segment, or, indeed, whether my instructors have the same notion of 'segment' as literates do.

Apart from Oates (1967 see below), other linguists working on Wunambal and the neighbouring languages have not questioned the alveolar - post-alveolar contrast or the existence of retroflex phonemes. Indeed retroflex phonemes may provide a plausible environment for vowel allophony in high vowels. I perceive medial and final retroflex most often after mid-high central and mid-high back vowels and low back vowels, and for non-stops in the environment between low vowel *a* and peripheral nasals, *m* and *ng*. I had most difficulty in establishing a contrast in the stops. Vászolyi's (1972-73a) preliminary phonology statement demonstrated minimal phonemic pairs for apical nasals and laterals but not the stops. My own data also indicates contrast for medial apical nasals and laterals, but this is less clear for the stops.

Capell and Coate (1984) are somewhat ambiguous about retroflexes in North Kimberley (i.e. Worrorran) languages: "retroflex is present in the nasals, laterals and certain other continuants" (p7). Diagrams on page 8 seem to indicate that the phonemes *d*

and *rd* are both realized as retroflexes, but no further comment is made. In addition, in a Wunambal vocabulary list I consulted, Capell himself appears to have underspecified for place of articulation of apicals.[11] Other linguists working on languages in the same family as Wunambal with both alveolar and retroflex phonemes, e.g. Ungarinyin (Rumsey 1982), Kwini (McGregor 1993) and Worrorra (Clendon 1994), do not demonstrate the phonemic contrast by means of minimal pairs. Rumsey (1982) notes the usefulness of his phoneme inventory for orthographic purposes (but notes that retroflexes are an environment affecting vowel allophony, and also an environment that is neutralized in certain parts of morphophonology of Ungarinyin). A previous analyst of Ungarinyin, W.J. Oates (1967 fn 1, p8 cited in Capell 1984: 9), rejected retroflexes as unitary phonemes in North Kimberley languages treating them as clusters of R ?(approximate *r*) and C ?(consonant). Capell dismisses Oate's analysis and also mentions inadmissible clusters *ɽ-n*. Either way a contrast is indicated. McGregor's (1993) sketch grammar of Kwini treats a more closely related language in the Wunambalic sub-grouping of Worroran languages) and indicates some contrast between alveolars and post-alveolars occurring in similar environments. The pair McGregor uses to demonstrate apical contrast for the stop, however, includes Wunambal cognates for which I found no contrast. McGregor has *wɨda* 'upper leg', for the alveolar stop (which I have however transcribed as a retroflex stop in *wurda* 'thigh' in Wunambal) contrasting with *bɨrdeeni* 'small' (*bɨrdibeni* in Wunambal). That is, for me the contrast between these two words is in the initial CV syllable not the following segment.

2.2 VOWEL PHONEMES

With the exception of the restricted sixth vowel *ɨ* (see below) Wunambal displays a vowel phoneme inventory similar to that of other Worrorran languages.

Table 2.2: Vowel inventory:

	front	central	back
high (close)	ii		?uu
(mid-)high(lax)	i/	ɨ [ɨ, ə, ʉ]	u
mid (lax)	e		
mid-low		a	(o/uw)
low			aa

Unlike Worrorra and Gunin, but like Ungarinyin, length is not clearly distinctive for *a*, *i* or *u*, though there are indications of either a past contrast or one resulting from either borrowing, glide elision, or other phonological processes. In orthographic transcription I distinguish *a* and *aa* and *i* and *ii,* although possibly *iy* or *iyi* would be better phonological representations. *e* and *o* are normally pronounced at least 'half-long' as in Worrorra (Clendon 1994). Of these two phonemes *o* is the more marginal.

2.2.1 Obvious contrasts

It is difficult to demonstrate clear three-way contrasts for *a*, *i* and *u,* on account of the (probable) existence of the high central vowel, and the mid vowels, and because of the phenomenon of vowel alternation at some morpheme boundaries. The following examples are the best I have found:

bangga	'she is'	*mamingga*	'she's saying'	*bungga*	'that'
		bimarr	'banksia'	*bumarr*	'his/her 1kidney, 2feeling
bama	'do/say!' IMP			*buma*	'he does/says'

For this reason I demonstrate first those groupings of vowels that show the clearest two-way contrasts. In the next section I outline some of the weaker contrasts and suggest reasons for the situation. Phonetic descriptions for each phoneme follow in section 2.2.2 and 2.2.3. Further discussion of vowel alternation and shared allophone overlap in high vowels is undertaken in 2.2.4.

a vs i

maya	'side'	*miyaani*	'lily type'
Mclass-DEM	'there/that'		
dangana	'Livistona palm'	*dingala*	'tree type'
wala cv.	'cry'	*Wilawila*	'Language name'

***a*(and *aa*) vs. *u*(and *uu*)**

ngawa	'water'	*nguwa*	'NEG particle'
gaabu	'no, nothing'	*gubu*	'brain'
naamba	'wife'	*nuumba*[12]	'roll into a ball'
agala	'that.A-class'	*agula*	'devil'

a, aa* vs. *i, ii

naa	'you'	*nii*	'think'
Baja	'personal name'	*biija*	'father'
baagi	'rock wallaby type'	*baa-gu* cv.	'emerge'-PURP 'in order to come out'
nani	Nclass-'it'	*niinii* cv.	'thinking'
waarri	'shit'	*wirri*	'palm of hand'

a* vs. *e

This contrast occurs in somewhat restricted environments and there is clearly a historical relationship (genetic or areal) between the phonemic sequences *ayi*, *aya* and *ay* (esp. *a+yi* and *e:* e.g {*may, mayi*} of other Kimberley languages > *me* 'tucker' and Wunambal *a*=YA (A-class prefix='go') > [ej]. Some forms *a>e* may be the result of notional {-y} or {yi} suffixation; for further comments see Chapter Four.[13]

baya	'calf'	*bewa ~beywa* cv.	'twisting firedrill'
yayay	'cry.out?' [Vászolyi]	*yeye(y)* cv.	'socialize'
daba	'fix spearblade'	*debarr*	'die'
jaburru	'roots of *wowalga*'	*jebarra*	'emu'
waarri	'shit'	*werra*	'cliff, rise'
wurra ~ wɨrra	'go round, wrap, wind (as for string making using foot)'	*wurre~ wurrey~wɨrre* cv.	'discuss, gossip'
wurra ~ wɨrra	'foot'		
gala	'that' W-class	*gale*	'then'
balanggarra	'group'	*bale*	'far distant'
gulayi ~ guloy	'wild mango, green plum'	*gule*	'tree type (diff. to mango)'
biyangga	'(s)he is going	*biyangge*	'(s)he went'

i* vs *ii

mila	'that' M-class (S. dial.)	*miila* 1.nom., 2 cv.	'spear'
barij bindi	'(s)he arose'	*barij biindi*	'they arose'[14]
?*jiba*	'spit, saliva'	*jiiba*	'spectacled hare wallaby'

As suggested above and below many instances of *ii* might be phonologically *iy* or *iyi.*

2.2.2 Weak contrasts

While it is clear that *ii*, *u* and *a* contrast and also that *a* and *i* and *a* and *u* contrast, there are many environments where it is difficult to detect a clear contrast between *i* and *u*, and even more difficult to contrast *ɨ* with either *i* or *u*. The issue of vowel length and stress add further dimensions to the question of phonemic contrast. I have treated *a* and *aa* as separate phonemes but in fact it is difficult to demonstrate a single phonemic pair for *a* vs. *aa* using strictly Wunambal data. In the case of *ii* and *i* and *ɨ*, I have tended to group *i* sometimes with *ii* and sometimes with *ɨ* to demonstrate contrast, which may not be justifiable (see vowel descriptions below).

i* vs. *u

Examples of this contrast are extremely rare word-medially (unless *ɨ* is classed with *i*), except with phonetically long *i*. Examples of contrast in similar environments, and some possible minimal pairs, are listed below:

biija	'father'	*buju* cv.	'finish'
bimarr	'banksia'	*bumarr*	bV='kidney', '1. his/her kidney 2. his/her feeling'
niima	'heavy'	*numa*	'it (N-class) does'
bini~bɨni	'him'	*bunu*	'shrub type'
wirrej cv.	'cover in sand to cook'	*wurre~wɨrre* cv.	'discuss, gossip'

The contrast is more evident word-finally both in stressed phonetically long vowels, and in unstressed syllables:

lii cv.	'look at'	*luu*	'snake'
-ngarri	'CHAR/SUBORD'	*-ngarru*	'1pl.OBL'
ada ba=ni	'sit' {sit IMP='be'}	*bunu*	'shrub type'

o* vs. *a

bonggul	'urine, bladder'	*bangga*	'(s)he is'
bone	'turtle'	*bani*	'be'-IMP
bordi	'hair-dressing implement'	*barndi*	'head'
dorrorr cv.	'dry'	*darr* cv.	'stand'
bo	'axe handle(wattle type)'	*baa* cv.	'emerge'
wunon	'charcoal'	*wɨnan*	'exchange-law'

o vs awu

orroli	'dingo'	*awurr-*	'Aclass<3PL' prefix
gorrwa	?'jaw '	*gawurr-*	'Wclass<3PL' prefix

Despite these apparent contrasts, there are also some words in which *a* and *o* pronunciations are both found.

orrowa ~ arrowa	'pandanus'
ornmol ~ arnmal	white ochre'
gurorra ~ gurarra cv.	'crawling'
bo(ny)joy ~ ba(ny)jai	'kurrajong'
gurlayi/?gurlaay ~ gurloy	'wild mango'

Possibly a long [a] is perceived as [o] in the contexts above (before and after non-peripherals i.e the apicals and palatals). (Note that *arrowa* is shared with Worrorra and *arnmol* with Ungarinyin and Kwini). I suggest the *o* pronunciation serves to maximize the distinction between back (*a* or *o*) and front *e*.

dorru ~ dawurru	'beard'
dondili ~ dawundili	'whiskers'?

o vs. uu

bo	1. 'wattle type' 2 'axe handle' [pɔː]	*buu* cv.	'blow' [puː]

a v. aa

In terms of minimal pairs, this contrast is weak. Only one minimal pair was found, the first example below and it is a weak example because strictly speaking the appropriate Wunambal verb is *yawirr* cv. 'rub on, apply'. Nevertheless some Wunambal speakers at Kalumburu do use *baarra* (which is also a Kwini/Gunin word). In the second paired example, and possibly the fourth retroflexion is probably the true distinguishing feature. *Maala* is also a Kwini/Gunin word and in Wunambal the preferred lexeme is *manda~maanda*.

barra	'chat, tell stories'	*baarra*	'paint' [borrowed, Kwini]
marlangarri	'red-coloured, whiteman'	*maala*	'guts, belly' ?(borrowed)
=manda ~ =minda i v.'take' (verb root)		*maanda*	'guts, belly'
bumana	'his shoulder'	*maana/ maarna*	'mother'
yawa	'to submerge' [Vás.]	*yaawa*	'growl' [Vás.]
yawal	'water' [Kwini language]	*yaawa* cv.	'argue'

Vászolyi's (1973a:62) minimal pair *yawa* vs. *yaawa* does not stand for my data. *Yawa* was not used as a coverb by my Wunambal informants and although they occasionally used *yawal* 'water' this was said to be the Kwini not the Wunambal (nominal) word for 'water'. There may however be other reasons for retaining a length distinction, that is to mark (historical or underlying) *awa* sequences.

2.2.3 The central vowel *ɨ*

The vowel *ɨ* is not regarded as a phoneme in any other language in the Kimberley region except some of the other Wunambalic language/dialects such as Kwini and Gamberre.[15] Vászolyi treated *ɨ* as a phoneme for Wunambal, McGregor (1993) for Kwini. Capell (1984) did not regard *ɨ* as a phoneme in any Northern Kimberley language but uses it extensively in his orthography where his collaborator Coate used one of either *a*, *e*, *i* or *u* in its place. Capell, however, noted differences between Northern and Southern dialects of Wunambal. Coate was familiar with Ungarinyin and studied some other languages from the Worrorric group and it is possible he regularized the Wunambal phones to their lexically related equivalents in the other Languages. Certainly one of my assistants, a speaker of the South and South-Eastern dialect of Wunambal, does this unconsciously when assisting me to transcribe the speech of "Northern" Wunambal speakers (whether Wunambal from Mitchell Plateau or Cape Voltaire, or possibly Gamberre, Kwini accented speech). The equivalent phomeme in the other dialect/languages however is not transparently derived from any one phonological process but appears to depend on the lexical item or morpheme. Some examples of common 'grammatical' cognates appear below; a similar situation is reflected however in many monomorphemic words.

Language(s)	1SG prefix	Inflecting	Verb roots	LOC suffix	GEN suffix
		'grab'	'take'		
Other Wunambalic	*ngirra-*	*=mɨra*	*=mɨnda*	*-ngɨndalu*	*-nangga*
Wunambal Northern	*ngu-*	*=mɨra*	*=mɨnda*	*-ngɨndalu*	*-ningge*
Wunambal Southern	*nga-*	*=mara*	*=manda*		
Ungarinyin	*?nga-*	*=mara*	*=minda*	*-ngunda*	*-nangga*
Worrorra	*?nga-*	*=mra*	*?=ma-aal*		*-nangga*
			'bring'		

It is almost impossible to distinguish phonetically and phonemically between high vowels occurring after a peripheral consonant and before an apical. This is particularly the case with initial *w* but also occurs in environments after *m*, *ng* and *g*.[16] Vászolyi

(1973a:57) gave as examples of minimal pairs for /ɨ/ and /i/ a contrast involving irrealis prefix-verb root boundaries for different verb roots presumably bivalent =WU 'effect' and monovalent =N 'be' (the intermorphemic segmentation and glosses are my own suggestions for the data).

e.g.	*gɨnɨn* 'it may hit thee'	?{*gɨ-ni=n*; 2sgO/3S-NEG=WU(N)'effect'}
	gɨnin 'you may be [Sg].'	?{*gɨ-ni=n*; 2sgS-NEG=N'be'}

Vászolyi's pairs for /ɨ/ and /u/ are for the same verb root i.e. intransitive =N'be':

gɨnin 'you may be sing.'	{*gɨ-ni=n*	2sg-NEG=N'be'}
gunin 'you may be plural	{*gu-ni=n*	2pl-NEG=N'be'}

and transitive ?(=WU'effect') glossed 'hit' by Vaszolyi, each with a singular-plural contrast:

gɨnangan "I may hit thee [SG]	?{*gɨ-na-nga=n*, 2-NEG-1sg=WU(N)'effect'}
gunangan 'I may hit you [PL]'	?{*gu-ø-na-nga=n*, 2-pl-NEG-1sg=WU(N)}

These latter pairs involve a singular -plural distinction at the pronominal prefix-irrealis(NEG) boundary (where the plural morpheme rr > ø /_(irrealis/NEG) -nV-). Unfortunately I did not elicit full irrealis paradigms for these verbs, so cannot confirm the minimal pairs.

Finally, as mentioned above, there are a number of lexical items peculiar to Wunambal with indeterminate or centralized mid-high vowels in stressed syllables (*wɨr* cv. 'fly', *gɨraa* 'camp', *lerna/lɨna* 'tooth', *mirla/mɨla* cv.'lick', *rɨrrmul* 'fingernail') and in unstressed syllables *gumɨnda* 'sugar glider', *warrmɨna* 'quoll' and *gurndɨli* 'kangaroo', and all preceding apical segments.

Other interacting features which complicate the assignment of allophones to phonemes, such as non-phonemic vowel length, vowel reduction and stress assignment are discussed in the following sections. Vowel harmony is not discussed explicitly here but does appear to be a factor in the realization of the vowels of verb prefixes. The prefixes are discussed with pronominal and mood prefix allomorphy in Chapters 3 & 4.

2.2.4 Phonetic realization of vowel phonemes

The high vowels *ii, i, u* and *ɨ*

The segment i*i* is realized as long high close [iː] or a more accurately as a sequence [iɩ]. The phonetic [iɩ] sequence could be construed as evidence for an underlying phonological

iyi or *iy* sequence, in which case *ii* should be interpreted as the orthographic convention for *iyi* or *iy*. There is some phonotactic and morpho-phonological indication that this is the case for, for example *biindi* below {*birr*=NDI} > (see phonotactics) {*biy*=NDI} > [biɩndi] as rr-n is not a normal cluster in Wunambal. As noted in Footnote 14 I am not certain that the 3B-class singular and plural forms of this verb do contrast.

?mii	'ant'
miila	'spear' (1.noun, 2.cv.)
giirra	'Kimberley heather'
barij ?(biindi)	'they arose'
{bi/bii-ndi, 3PL=Nbe/become:PAST}	

The high vowels *i* and *u* are laxer, lower and more central than the cardinal vowels, except word-finally, and for *i* in palatal environments and for *u* in peripheral environments, where they are tenser, closer and more peripheral.

i

Mid-high lax [ɩ] alternates with central mid-high allophone [ɨ̞] (written as [ɨ] in phonetic transcripts from now on) or [ə], especially before (retroflex) apicals, making them difficult to distinguish from *ɨ* in this position and sometimes from *u*. A higher, closer and longer allophone can occur before palatals. There is also a higher, closer allophone that can occur word-finally and also before another stressed syllable or morpheme-finally with some suffixed words. A high close AND longer vowel occurs at the end of monosyllabic words. Monosyllabic vowel-final words are compulsorily dimoraic, as for many other Australian languages, and although they cannot contrast with short [ɩ] in this position, I spell these also with a doubled vowel.

Many are coverbs where they can be like monosyllables OR like the first syllable of a complex verb, depending on type of syllable occurring at beginning of inflecting verb.

bimarr	'banksia' [pɩmɑɾ]	*?mii*	'ant' [mi:]
limarr	'?'	*lii/liny* cv.	'watch' [li:] (Dial. [liɲ])
dingala	'tree type'	*dii* cv.	'mince' [ti:]
bini	'him/her' [bɩni]	*diiwa* cv.	'mincing' [ti:wa]
bila	'b'class='there/that' [bɩlʌ]		
birtibeni	'small' ['pɨʈi'pəni]		
dird cv.	'cut' [dəʈ]		
mija	[miʧa] ~ [mi:ʧa]		
biyanda	'child' [pi:æ'ndʌ]		

u

u is a short lax mid-high vowel [ɷ]. Closeness, rounding, lengthening and height are more prominent before and after *w* and word-finally. Before some apicals and velars, *u* has an allophone [ʉˇ] or [ɨˇ], or possibly alternates with *i*. Phonetically long [uː] also occurs in vowel final monosyllables. Some other phonetically long allophones may in fact be realizations of*uw* or *uwu*.

gubu	'brain'	[kɷpu]
guma	'clear gum'	[gɷma]
burda	'relation'	[pɷʈɑ]
gurli	'blood'	[kɷɭi]
durru	'put'	[dɷru]
wuyu	ear'	[uːyuː]
luu	'snake'	[luː]
buu	'blow'	[puː]
Lumirri	'Place name associated with a snake story'	[luˈmɪri]

ɨ

ɨ is realized as either a mid-high central unrounded [ɨ] or a mid central [ə]. *ɨ* is the most marginal of the vowel phonemes, occurring only word-medially and principally before apicals, although also recorded before peripherals. Phonetically [ɨ] and [ə] are ubiquitous in Wunambal, especially for some speakers, where it is a clear marker of the Northern dialects, and occurs in stressed syllables. As noted above, there are indications of [ɨ] allophony with *i* and *u,* and [ə] allophony for *a*. Nevertheless, I have retained *ɨ* in my phoneme inventory to handle the score or so of difficult vocabulary items with medial vowels which cannot be assigned with confidence to either *i*, *u* or *a* because of uncertainty about their phonetic quality, although I indicated above some suggestions for some of these synchronically monomorphemic words. This purported segment is discussed further when I look at syllable structure and stress, and also morphophonology.

wɨr cv.	'fly' [wɨɻ], [wˆɻ]
gɨraa	1 'camp' 2 'country' [gəɻaː] [kɨɻaː]
lɨna / lina	'tooth' [lɨɳa] ?([ɭɨna] Source: SIL 197x KAL w'list)
mɨla/ ?mula cv.	'lick' [mɵla] [mɪa]
rɨrrmul /rurrmul	'fingernail, toenail'
rɨrrwa /rirrwa	'pull on, tug at, drag'

bɨrdibani /bɨrdibeni /burdibini /birdibini /burdubani	'small'
balya mɨn.gerri	'planigale (mouse)'
warrmɨna	'Northern quoll' [wɑɾmina] [wɑɾmɨna] [waɾmna]
gumɨnda	'sugar glider' [gɷmɨndʌ] [gumndʌ]
gurndɨli	'kangaroo' [kɷn̪d̪ɨli]

Low vowels *a* and *aa*

a has a range of realizations including [æ], [a], [ɐ], [ʌ], [ə], [ɑ] and [ɒ].

The high front allophone [æ] has been recorded in stressed syllables /palatal _ nasal peripheral but not before the stops, bilabial *b* or velar *g,* indicating that nasalization might be connected to my perception of [æ].

yangguli	(food plant) [yæŋgɷli]
nyanggarri	'we were going' [ɲæːŋgaɾi]
ja(a)ma	j[a]ma ~ j[a:]ma ~ j[æ:]ma~j[e]ma
jaburru	'roots of wowalga plant' [ɟɑbɷru], never *[ɟæbɷru]

a is realized as [ɒ] in the environment of *w* _ peripheral consonant.

Wambu	(personal name) > [wɒmbu)
/wangay(i)/,	'woman' >[wɒŋʌi]
/gawurr-/	(3pl>3'w'pronominal prefix) > [gɔwɨd] ~ [gɔːɾ]-

Elsewhere *a* ranges from between [a] and [ɐ] to between lower-mid central [ʌ] and sometimes [ə] (especially when unstressed), and low unrounded back [ɑ] vowel.

jagarra	'hair' [cakʌɾa]
balya	'flee/leave' [pɐʎa]
galya	'there' [kɑʎa]
gaya	'W class-over there' [kɑiʌ]
gada-ningge	'then' [katəninggɛ]
marl(a)ngarri	'whitefella' [mɐɭŋʌɾi] [mɐˈɭŋʌɾi]

aa

aa has two allophones: low and back [ɑː] and less low, less back [aː].

maana	'mother'	[maːna]
baarra cv.	'paint'	[bɑːɾa]

gaabu	'no, nothing' [kɑːpu]
miyaani	'lily type' [miaːnɩ]
giraa	'camp' *nom.* [kiɽaː]

[æː] also occurs in environments similar to that described for [æ], i.e. between a palatal and a velar segment.

nyaanggerri [ɲæːŋgeɽi] {nyarr=yangge-rri; 1.ex ='go':PAST-CONT}
'We were going (along).'

Some variation in the pronunciation of long and short *a*'s in the same word means the phonemic status of *aa* is weak in Wunambal, but the long segments still may be needed to explain underlying syllable structure. *aa* can be regarded as an *a+a* sequence resulting from a sequence *a*-glide-*a* in other parts of the lexicon also (apart from verbs). For example *gira*, *giraa* and *girawa* have been recorded for 'country, place', although *-wa* suffixing is not expected on a nominal.

The mid vowels *e* and *o*

e and *o* are similar in that they are both realized as half-long phones. They differ along a similar dimension to *i* and *u,* though they are easier to distinguish (in their long forms). *e* contrasts with long *i*, it is more difficult to determine a *o* vs. long *u* contrast. The examples below however show an equally strong relationship between *o* and *aa* to that between *o* and *uu/uw*. Both *e* and *o* can be related to front and back allophones of *a* respectively, but lack central allophones. There is a possible counter-example in *lirna* ~ *lerna* 'tooth'.

e

e is a mid front lax vowel. In stressed syllables it is longer in articulation than the [ɛ] in Australian English. The longest examples of canonical [ɛː] are in monosyllabic 'words' (of two morae), but can be equally long in apparently suffixed forms (**bee* not attested?).

mee	'vegetable food, tucker'
bee/ʔbey/bayi cv. [LyK]	'roll fibre to make string, twirl firestick'
bewa cv.	'twirling firestick, rolling fibre'

In the following words, the first syllable can take approximately the same time as the second syllable for disyllabic words, and the same time as the second and third syllables together for trisyllabic words.

egol	'lizard type' ['ɛːkol]
degulan	'frill neck lizard' ['dɛˑgulʌn]
	(see Rumsey for *dewu* '?(frill neck) lizard' >[deu] in Ungarinyin)
debarr cv.	'die' ['dɛˑbar]
jebarra	'emu' ['çɛˑbarʌ]

In the case of *lewa* 'dog' (which may be a borrowing, see also *karnanggurr* 'dog') however the first syllable is perceived as considerably longer than the second.

lewa	'dog' [lɛˑᵘwʌ]

Phonetically close vowel phones [e] and [e:] and [ei] also occur in Wunambal, (mostly in inflecting verb forms) and are also written *e*; however, they are in some ways distinct from [ɛˑ] occurring mostly at morpheme (or historical morpheme) boundaries and possibly involving conjunction of *a* with *y*. In the examples given below it is possible that the final vowel segment written 'e' in ii) is better represented as 'ay', that is as for the immediate tense/aspect example in i) + a segment /y/ representing the past tense morpheme.

i)	*biyangga*	{bV=yangga, 3B='go':IMM} [pijæŋgɑ]	'(s)he is going'
ii)	*biyangge*	{bV=yangge, 3B='go':PAST} [pijæŋge]	'(s)he went'
iii)	*biyangerri*	{bV=yangge-rri, 3B='go':PAST-CONT}[pijæŋgɛri]	'(s)he was going'

Another explanation is that the final segment of the verb is often elongated in text which may be why I perceive a closer [e] or an off-glide [e:i]. Note that in iii), where the segment under discussion is not verb-final, canonical [ɛ] is perceived. Tense and aspect marking is discussed further in Chapter Four.

ii contrasts with *e* in the following pair:

jebarra 'emu' *jiiba* 'spectacle-haired wallaby'

o

o is realized as a low back vowel [ɒ] word-initially, and before *rr* and as a long or half-long mid, back vowel [ɔˑ] or [ɔː] word-medially (the elsewhere allophone). Sometimes a peripheral offglide is detectable. Some phonemic/dialectal alternation with *awu* and possibly *uw* was indicated above, but contrast with these segments was also

demonstrated indicating that *o*'s status as a phoneme is either emergent or waning. Before some palatal segments an [ɒ] allophone occurs. Note that the phonetically similar [ɒ] phone heard after *w* (in e.g. *wangayi* 'woman') was assigned to *a*, but there are a number of instances of this phone in the environment *w_* peripheral consonant, and particularly *w_w,* which could be spelt either way. The segment *o* does not occur word-finally except in monosyllabic words where it is always di-moraic long [ɔː]. This segment is also relatively rare in unstressed syllables. One noticeable exception is before *y* or *i*, an environment where there is a close relationship between *o* and *a*. I have not attested *o* in inflecting verb forms.

omayi	'left-hand' [ɒmai]~[amɔi]
orroli	'dingo' [ɔrɒli]
orruwa	'pandanus palm' [ɒruwɑ]
dorrorr cv.	'dry'? [dorɒr] [doɹɒɾ]
bone	'turtle type' [bɔˑne] [bɔᵘne]
jog	'pile up' [jɔˑg]
wog	'cook, burn' [wɔˑk]
goya	'fresh-water crocodile' [kɔiʌ]
monyjon	'rock wallaby' [mɒɲcɒn] [mɒɲɟɒn]
bonyjoy	'kurrajong' [bɒɲcɔi]
bo	'axe handle(wattle type)' [bɔˑᵘ]
do / ?dord cv.	'clap' [dɔː] [doˑᵘ]
jo ~ joy cv.	'drink' [cɔi] [cɔˑi]
jowa	'drink' (LyK, fnb98)
jord	'dance' [fnb98-1:9)
jodba	'dance' [cɔːdpʌ] (2-6-98WB, fnb98-1:3)

2.3 Phonotactics

2.3.1 Phonological structure of the word

Wunambal words are minimally bi-moraic and can begin with either a consonant or a vowel. Vowel-initial segments however are restricted to *a*, *e* and *o*, and in monomorphemic words may derive from historical A-class *a-* prefixing or from borrowing of prefixed terms. Certainly many synchronic cases of *a*-initial words are due to prefixing in polymorphemic words. Phonetically [i] and [u] also begin words, however I have generally analysed word-initial (and syllable-initial) [i] and [u] as *yi* and *wu* sequences respectively. Glide *-ɨ* ([wɨ], [rɨ] but not [yɨ]) initial sequences in

Wunambal abound, but there are no cases of [ɨ] initial words, *ɨ* being restricted to word-medial position. As outlined above *o* is restricted to word-initial and medial positions.

Any consonant except *rr* and *ly* can begin a word (and I suspect that *ly* which is rare and occurs only intervocalically, should be considered an *l-y* sequence anyway). All consonants occur intervocalically. Apart from the coverb class, where *j* and *g* final 'words'[17] are permitted, consonants in word-final position are restricted to the apicals, with the apical tap, laterals and nasals more prevalent than the stops and the glide *r* which is relatively rare. I have already discussed the status of *ny*-final segments for Wunambal. I have also suggested that *y*- and possibly *w*-final segments may occur, although they are realized as diphthongs. Examples of words with each consonant segment in allowable word-initial, medial and final positions were also shown above.

Both biconsonantal and triconsonantal clusters occur intervocalically subject to the restrictions outlined below. The syllable types V, CV, CVC and CCVC occur, but only CV and CVC types can occur anywhere in the word. Syllable types for Wunambal then include word-initial (C)V(V)(C) and non-initial (C*)CV?(V)(C) deriving the following syllable template:

(C)V(?V)(C) [(C*)CV(?V)(C)] ^{recurring}

*with the restriction that the starred segment normally occurs only in the second syllable. See tri-consonantal clusters in 2.3.2 below.

Syllable structure and vowel length are discussed further in 2.4, supra-segmental stress.

2.3.2 Consonant clusters

Both biconsonantal and triconsonantal clusters occur intervocalically. (Note that the segments making up 'clusters' discussed here mostly belong to *separate* syllables in the word). Triconsonantal clusters are relatively rare. They are confined by the consonant sonorance hierarchy described below, and appear to be restricted to apical lateral + homorganic nasal-stop clusters.

gelnggu ~geln.gu	'cliff type'
Ngalmbu	'place name'

Table 2.3: Heterorganic intra-morphemic biconsonantal clusters

		First member			
		d or *rd*	*n* or *rn*	*l* or *rl*	*rr*
	b	rdb (1)	nb(2)	lb (1)	rrb (1)
	g		rn.g (?)	lg	rrg
Second	*j*		nj (?)	lj (1?)	
member			rnj (1)		
	m		rnm	lm, rlm	rrm
	ng			lng, rlng	rrng
	w	?rdw (Rf)		lw	rrw (?)

Intra-morphemic clusters

Those consonant clusters that were attested less than three times have an numeral 1 or 2 after them in the chart above to indicate the number of instances of this cluster. R indicates that the cluster occurs in a word comprising a reduplicated formative. A number of generalizations can be made about intra-morphemic biconsonantal clusters. Both homorganic and heterorganic clusters adhere to the consonantal sonorance hierarchy:

continuant (glide *w*, trill or lateral) > nasal > stop

That is, C2 may not be more sonorant than C1 (only one counter example, a homo-organic stop+C2 continuant was recorded).

An additional requirement for heterorganic clusters is that C1 consonants are in the same class as the word-final consonants, i.e. they are usually apical.[18] Those consonants that are prohibited word-finally, the peripherals, cannot occur cluster-initially. Conversely, an apical (with the lone exception already noted) cannot occur in C2 position. C2 are usually peripheral consonants, however /j/ does occur as C2 in some synchronic nasal-stop clusters, so the appropriate generalization is simply that hetero-organic C2s are non-apical. Examples of non-homorganic biconsonantal consonant clusters are given below:

Continuant-continuant

[*?/boywa/* cv.	'scream'	*beywa*	'bush firestick'
dalwa	'skink'	*julwun*	'euro, hill kangaroo'
?garrwa/gorrwa	'jaw'	*barrwarda*	?'this side'

The *y-w* clusters are at what would be considered a morpheme boundary although *boy* 'scream' has not been separately attested. Both *bey* and *beywa* are attested as coverbs, (I discuss the *-wa* suffix elsewhere); however *beywa* is also used as a (derived) noun or at least can be translated as above.

Continuant (liquid)-nasal

C2 *m*	*yirrminjal*	'leaves'	*rirrmul*	'finger & toenails
	gulmerr	'tail'	*balmangan*	'tree type'
C2 *ng*	*wirrngi*	'fat'	*jarrnge*	'quartz, spearhead'
	=alngi	'name'	*marlngarri*	'whiteman'

Nasal-nasal

C2 *m*	*garnmanggu*	'long yam'	*barnman*	'magic, doctor'

Continuant (liquid)-stop

C2 *b*	*yamalba*	'spearthrower'	*galba~galyba*	'there'
C2 *g*	*galgayi~garlgayi*	'tree type'	*burulgu*	'cicatrice'
	namarrga	'coolamon'	*birrga*	'ground'
			?(hetero or homorganic)	
?C2 *j*	*galaja ~ galja*		*wuljarri ~wulyjarri*	'quinine tree'

Other possible (glide) continuant-stop clusters

layburru~layiburru	'knowledge'
dowba~doba	'clapping'

Nasal-stop ?(derived forms)

C2 *b*	*banbi*	'tree type'	*garnbag*	'clap-sticks'
	Jinbarri	'place name'		
C2 *g*	*garn.gu*	'clapsticks'	*yarn.gu ~ yanggu*	'water plant'
	gurn.gurru ~gunggurru	'cycad'	*Wunbarn.gurr~Wunbanggurr* '	'place name'
C2 *j*	*yirrminjal*	'leaves, windbreak'	*yagurnja*	'try'
	=nji	'was/ becomes' (S dial.)		
	malinjarr	'cotton tree' (dial.)		

Stop-stop

C2 */b/* (?morpheme boundaries only?):

*buwar**d-b**a*	'lift, lift out'	*dir**d-b**a*	'cutting action'

A special case

stop-nasal or ?(liquid-liquid)

ngadla cv. 'camp'

This word is possibly derived from *ngar**rl**a*. I have also heard the pronunciation *naala/ngaala* for this coverb.

Inter-morphemic clusters

The stop-stop clusters listed above seem likely to be derived from reduplications or other morpheme boundaries, where these clusters are more plentiful. Examples of inter-morphemic clusters conforming to the above restrictions are:

nb	*nguwa**nb**an*	'I'm falling'
	*mara gu**nb**ia*	'I'll see you'
rnb	*buwar**d-b**a* cv.	'lifting out'
	*dir**d-b**a* cv.	'cutting'
n.g	*lii ngundubu**n.g**a*	'He's looking at me'

As discussed above it is likely that the clusters y-w *boywa* and *beywa* are also arise from original inter-morphemic boundaries.

Some additional clusters may be possible at reduplication boundaries:

rd-w	*war**dw**ard*	'brushtail possum ?(phascogale)'

I have not attested *ward* but Capell recorded the coverb *ward* 'hide'. Note that the cluster violates the sonorance hierarchy. Phonologically some reduplications behave like two separate words.

Other morpheme boundaries resulting in rarer clusters are homorganic:

w-b	*do**wb**a*	'clapping'

and heterorganic:

n-j	*bara**n-j**a*	'good/ solid'-EM
?rr-j	*geji**rr-j**a or geji-ja*	'now'-?ASP-EM

in the second example apical 'rr' assimilates phonetically to the palatal 'j'.

Homorganic clusters

Homorganic clusters are not subject to the same restrictions regarding place of articulation as heterorganic clusters, but do conform to the sonorance hierarchy, so long as C1 and C2 have different manners of articulation (geminates are not recognized in Wunambal). All the possible nasal-stop homorganic clusters occur. The only intra-morphemic homorganic continuant-nasal clusters recorded are a possible *ln* in *?geln.gu* 'cliff type' (which may however be *?gelng.gu.* Inter-morphemically an instance of *wb* was recorded in *dowba* 'clapping' (but again as mentioned above [doːpʌ] may be *dordba*, Capell recorded *dord* 'hammer').

2.3.3 Some further comments on consonant clusters and word structure

Consonant clusters in Wunambal generally occur intervocalically. No word-final clusters occur. Although consonant clusters are not generally permissible word-initially; there are some exceptions. For 'northern' Wunambal speakers a homorganic word-initial cluster occurs in the negative particle *ngga* which alternates with *nguwa.* Another alternative form *nungga* was used by only one speaker, a male speaker of the Southern Wunambal dialect who has lived at Kalumburu since his teenage years and is also familiar with the northern Wunambalic language/dialect Kwini.[19] Another exception is the heterorganic cluster *bl* -initial word *blaay(i)* 'pound', used by one speaker, which has not been heard with a vowel. This word is possibly borrowed from Worrorra *blaay* 'pound' where word initial peripheral-apical (liquid) consonant clusters are more common (see Clendon 1994:ch 1.5 (no page numbers); or KLRC 2000 a - e for Worrorra examples), for Wunambal has other vocabulary for 'pound'. A couple of other word-initial heterorganic clusters occur. The Wunambal 'free' pronominal plural form *birreni* [bɨrɛni] 'them', alternates with [brɛni]. The plural form *brrenjin* 'men' on the other hand, is invariably pronounced with an initial *b-rr* cluster in a two syllable word.[20]

On the other hand there are also many cases where peripheral consonants *b*, *g*, *m*, *ng* and *w* are followed by a phonetically short vowel [ɨ], [ə] or [ɵ] before a following apical consonant, usually one of the rhotics, or the lateral. Words derived from person/class prefixed forms are in this category as the forms of person/class prefixes (i.e. *ngV*, *gV*, *bV*, *a*, *wV*, *mV* and *na*) happen to be predominantly peripheral phonemes followed by a vowel. Plural 1, 2 and 3B forms add the plural marker /rr/ between the appropriate singular prefix and the root morpheme. Sometimes in fast speech the syllable-initial vowel is not heard creating an apparent word-initial cluster, but in careful speech the vowel is detectable.

It is worth noting that many of the difficult word-initial sequences, e.g. *w*-high vowel-*rr* in Wunambal, are analysed as clusters in their Worrorra cognates where peripheral+apical liquid word-initial clusters like *wrr*, *wr*, *brr*, *br*, *bl*, *mrr*, *mr*, *ml*, *gr* etc occur in, for example, *wrrey* 'bake under hot sand' (Wunambal cognate *wirrej~wirrej* 'cook coverd by sand/ashes'), and *krooma* 'cypress pine' (Wunambal *guru*) (Clendon 1994, KLRC 2000). In Wunambal, however, it is usually quite clear that two separate syllables are involved on the surface in the stressed syllable, as well as underlyingly, although the underlying nature of the vowel is often difficult to determine in these positions. More word-initial clusters may become admissible in the speech of the younger generation. For example, in the speech of children from Wunambal and Kwini families living at Kalumburu a popular bush tucker tree *gurloy*~or *gurlaay* in Wunambal is pronounced as [klei].

Summary of intervocalic consonant clusters in Wunambal

To be included in the table a combination must be attested more than 3 times.

X: heterorganic H: homorganic M: (other known) morpheme boundary

Table 2.4: Word-medial biconsonantal clusters

First member*

	rd	*m*	*n*	*rn*	*ny*	*ng*	*l*	*rl*	*ly*	*rr*	*w*	*y*
b	M	H							X	M	?H	?
			M	M								
d			H									
rd				H								
j					H				?H			
				M								
g			X	X		H	X			X		
m				X			X			X		
n							?H					
rn												
ny												
ng			M							X		
w	M						X	?X		X		?M

2.4 Stress

In words of more than 3 syllables primary stress[21] normally falls on the penultimate syllable, and secondary stress on the first syllable. In shorter words this rule also applies to words of two syllables but only sometimes to words of three syllables, which are more likely to be stressed on the initial or ante-penultimate syllable.

Two syllable words are stressed in the first syllable (an uppercase apostrophe preceding a syllable indicates primary stress, lower case 'comma' is used preceding a syllable with secondary stress).

'gaabu 'nothing'
'wiila 'boy'
'wuyu 'ear'
'galwa 'cotton tree'

Three syllable words are normally stressed on the first syllable, that is the ante-penultimate syllable. Some words like *murdura* 'hat' appear to be able to carry secondary stress on the final syllable. Other three syllable words carry stress on the second or penultimate syllable as for longer words. Most of this latter category have an open first syllable with a short vowel, and a second closed or long vowel syllable. Some but not all of these are prefixed words. It is possible that either 1)the prefix is not normally stressed or 2) that the relative length of the stem vowel in comparison to the short vowel of the prefix is perceived as stress by this listener. Some prefixed words like munggaya 'Mclass.that.over.there' below show variation in their stress patterns. This may indicate that there is a tension between stressing the first syllable of the root and the first syllable of the prefix.

'wundugu 'night-time, dark'
'pajaja 'stick'
'murdu,ra 'hat'
gu'raarra cv. 'crawling'
'ngayarri 'I myself', me alone' {1sg-individual(ly)}
bu'gaya '(s)he-over.there' {Bcl-'that.over.there}
'mung,gaya ~ mung'gaya 'that.over.there' {Mcl=that.over.there}
bi'yangga '(s)he goes' {3Bsg=go:IMM}

Four syllable mono-morphemic and reduplicated words have primary stress on the first syllable and secondary stress on the third or penultimate syllable.

'wara,warta 'right hand'
'bundu,wali 'headband'
'lewa,rlewa 'crawling, creeping *cv.*, creeping vine *nom.*'

The pattern for verbal words is more complex and also harder to test as they are rarely uttered in isolation. A complete description cannot be attempted here, although examples are included for three, and five syllable words.

Penultimate stress is most prominent in words of 5 syllables. The first syllable is also stressed. A dactylic (stress-unstress-unstress) + trochaic (stress-unstress) pattern is a very common pattern for words of 5 syllables. In these words the first three syllables take up approximately the same time as the final two. Most words of this length and longer are polymorphemic words containing reduplications, suffixes or prefixes and suffixes. Again there may be some difference between open and closed syllable prefixes in attracting stress. It is significant that the third syllable in each of the following examples is a 'weak' glide onset.

,wandawan'dane
,wanawa'narra 'in the afternoon, cool time'
,nyarrmɨra'nerri 'we'd get it' *iv.* {nyarr=mɨra-ne-rri, 1expl='grab'-PAST-CONT}

Six syllable words:
In these reduplications the initial syllable of the reduplicated portion retains stress:

,burrundi'burrundi '(mob.of)hornets'
,wamarlu'marlurlu 'bat(s)'

Again prefixed verb roots may be stressed, though sometimes the stress is on the second syllable of the disyllabic root. For prefixes where the first syllable is closed, as for plural prefixes), the first syllable of a prefix is also stressed.

The clitic pronoun suffix *-wurru* is treated as a phonological word, attracting stress on its first syllable, the penultimate syllable of the morphological word.

Clitics, Postpositions and stress

Most clitic-like nominal suffixes and postpositions are stressed as for words, i.e. the stem and the suffix retain their normal stress pattern in inflected words. Most such suffixes are of two syllables and therefore likely to attract stress on their first syllable when the suffix/clitic is word-final. The three syllable locative *-ngindalu* however is also stressed on the first syllable. The monosyllabic third person oblique suffix *-ngu* is not always stressed and is therefore less clitic-like in its behaviour. Mono-syllabic postpositions are often stressed after disyllabic words, adding word-final secondary stress to a suffixed word unless the word ends in a vowel and the suffix begins with a glide, where the resulting final phonetic diphthong is not stressed.

'yawal,-gu 'to the/for water'
'ngaya-wu for me, mine
'garra,-ngu: ~ *,garra'-ngu:* 'his/her mother'

'nguma'ngarri {ngu=ma-ngarri, 1sg=MA'do'-SUBOR} 'when I say'
ngu'merri'nu ~ *ngumerri'nu* {ngu=me-rri-nu, 1SG=MA'do':PAST-CONT-2sgOBL}
'I told you'
'nyarrang'gerri,ngarri {nyarr-angge-rri; 1ex:pl=yang'go':PAST-CONT-SUBORD}
'When we were going'

'Mawanjam ~ *'Mawun,jum*
'Mawaju,ma-gu 'to Mowunjum'
bi'yanggada'wurru {bi-yangga-da-wurru; Bcl(S)=YA(NG)'go':IMM-away-3plOBL}
's(he) went away from them'

NOTES

1 Each of these languages uses the voiced letter symbols. The main differences in their phoneme inventories is in the vowels and there is some additional variation in how the vowels are written.

2 Some putative syllable and word final apical stop phones may be [d], [t] or [ˇr] (retroflex trill) allophones of *rr*. See e.g. *nadla* and *dird* above.

3 Probably Worrorra word

4 One speaker used Mawanjama in text not Mawanjam.

5 Note that intra-morphemic retroflex articulations are frequently perceived before peripheral *m*, e.g. *garnmanggu* 'dioscorea transversa yam', *garnmen* 'cave', *barnman* 'magic-man' and *g* e.g. *gurn.gurru*, 'cycad', *yarn.gu~yanggu* 'water plant', although when C2 is a velar stop regressive place of articulation assimilation is also heard for the nasal C1.

6 Vászolyi's paper is an unpublished draft manuscript with an explication of phoneme inventory and realizations containing lists of minimal and near minimal pairs. I found it most useful in finding pairs to test with my informants, however I frequently found that informants offered a different vocabulary item for many of the words I wanted to test or stated that the item in question belonged to another (related) language. Vászolyi's 1973 paper was written as a preliminary statement based on his fieldwork and cannot be said to represent his final word on Wunambal phonology. He identified 11 vowel phonemes a, e, i, ɨ o, u, and all except ɨ with corresponding long phonemes. It would appear that either Gunin/Kwini phonology exactly matches that of Wunambal as presented by Vászolyi or that McGregor 1993 is very much influenced by Vászolyi's phonology statement, because McGregor lists an identical phoneme inventory for the Kwini language.

7 A 'Worrorra' pronunciation or Ngarinyin cognate for example. Perhaps because I perceive *ny* as a glide on the following vowel I found few examples word-finally. It is possible though that Wunambal does not allow *ny* word-finally. For cognates in Ungarinyin, such as ***liny*** cv. 'watch', I have transcribed ***lii*** cv. 'look at' in Wunambal. I recorded *guriny* once only with a 'Southern dialect' speaker who also used *gurinyal*. For the Worrorra place name (Kunmunya in 'English') one Wunambal speaker has *garnmenya-wurai*. '?around Kunmunya' and *Garnmany-gu* 'to Kunmunya' I have suspected that the Wunambal word for cave is *karnmany* although I usually hear *garnmen*. (See also *garnen* 'creeper, edible roots' ?(from *garnany*) i.e. *ny* has been lost and effect on vowel /a/ > [e] remained/ became phonemic?). There remain phonological processes that indicate either borrowing or existence of an underlying nasal in *lii*+ aspectual suffix *-wa* > [li:mpa].

8 The r that usually matches my trill/tap rr is for Vászolyi an alveo-dental vibrant (Vaszolyi:1972-3:33) and is said by Vászolyi to occur word-initially as well as word medially and finally whereas his retroflex vibrant does not occur word-initially.

9 If however the diphthong [ei] is analysed as a sequence *e-y* then there are a large number of *y* final syllables and words to be accounted for.

10 Rumsey (1982, 2000) is an exception. He places *rr* as an alveolar and *r* as a pre-palatal rhotic (1982: 1) or apico-post alveolar.

11 This doesn't tell us a lot because the difference between *r* and *rr* which involves a manner, as well as place, distinction appears to be also underspecified in his list. The possibility exists that typists failed to place the dot under *d*, *n*, *l* and *r*, which is the only way of distinguishing alveolar from retroflex and approximate from tap/trill in Capell's orthography. A further factor could be that Capell obtained some of his data from Coate who admitted difficulty in distinguishing alveolar from retroflex articulation and may also have not distinguished continuant from tap/trill in all cases. Note, however, that some non-trill/flaps or retroflex continuants are indicated in the list, as are some retroflex stops, nasals and laterals.

12 This word has been recorded with a phonetic word-initial nasal retroflex, and so this pair may not constitute a minimal pair.

13 In Bunuba occurrences of word-final [e] in monomorphemic words are analysed as a vowel glide sequence *ay* by Rumsey (2000).

14 It is difficult to establish if there is a phonemic difference between what I have written as *i* and *ii* here. I have attributed the lack of *-rr/-rra* plural marking in this form to be the result of deletion of *rr/_=N* but cannot establish for certain that a lengthened vowel results. I have also written barij birndi (with a retroflex) in fieldnotes which calls into question whether the verb root is really =N'be'.

15 The Jarrakan languages Kija, Miriwoong and Gajirrabeng do have a central schwa phoneme written *e*, but do not have other mid vowels, i.e. they have a four vowel system.

16 More attention should have been taken to obsrve lip rounding and/or lack of lip rounding in these environments.

17 The coverb's status as intermediate between word and morpheme is discussed further in Chapter 3.

18 *j*-initial clusters occur only at morpheme boundaries (i.e. *-ba* suffixed coverbs), as might be expected from their limited word-final distribution in coverbs.

19 Kimberley negative particle forms are of considerable historical-comparative interest. The Jarrakan language Kija's negative particle *nguwan* is used in verbless clauses (see Kofod 1996:13) whereas Wunambal *nguwa* and *gajin.ga* is only used with verbs and gaabu is used for privatives and in verbless sentences. (See ch 3). Worrorra (Clendon 1984, ch11) has the negative particles *waa* and *kajirn* which like the Wunambal particle can only be used with a 'negative or irrealis' verb. Ungarinyin (Rumsey 1982) also has the negative particles *wa* and *gajirn.ga* which are used in a similar way. In each of the Worrorran languages the negative particle immediately preceds the verb. Rumsey (ibid:128) also relates *-ga* interrogative to negative *wa*.

20 *benjin* 'human, man' and *brrenjin* 'people', men' occur but a nominal root *-njin* is not otherwise productive, see person, number and noun class prefixing in Chapter 3.1.1

21 In this section I have tried to take force or loudness as the primary indicator for stress. Extending vowel length in Wunambal is used for emphasis and may or may not be relevant to ordinary syllable stress patterns within the word. The relationship between vowel length and stress patterns needs further investigation.