THE SEGMENTAL PHONOLOGY OF CUICATECO

OF

SANTA MARIA PAPALO

OAXACA, MEXICO

by

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SYMBOLS AND CONVENTIONS

V   Vocoid or Vowel, depending on context.

C   Contoid or Consonant, depending on context.

V·   Double lengthened vocoid or vowel.

V: Triple lengthened vocoid or vowel.

.   Syllable Division,

/   Separates alternate pronunciations of the same utterance.

~   Separates alternate pronunciations of the same utterance.

-    Morpheme Division.

Space   Word Division.

[ ] Phonetic data.

/ / Phonemic data.

" " English gloss. Must be considered only approximate meaning, especially tenses of verbs.

( ) When following English gloss, indicates further explanation, or Spanish equivalent.

N   Nasal contoid or consonant, depending on context.

V̄   Impressionistic high tone.⎤
⎟ All marked tones are
V   Impressionistic Mid tone. ⎬ impressionistic; none
⎟ were checked in frames.
V   Impressionistic low tone. ⎦

y̶   Voiced alveopalatal flat fricative, also referred to as alveopalatal glide.

*   Reconstructed form not actually observed in data.

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1. INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this study is to analyze the phonology of the dialect of Cuicateco spoken in the village of Santa María Pápalo, Mexico, with the goal of constructing a practical phonemic alphabet.

Cuicateco is a register tone language of the Mixtec family[1] spoken by a group of Indians living in mountains of the north central region of the state of Oaxaca, Mexico. The village of Santa María Pápalo is located about thirty-five miles south east of the town of Cuicatlán. The village has about 1000 inhabitants, most of whom are monolingual in Cuicateco.

The data of this study, approximately 1800 utterances, were gathered over a six week period in the village during July and August of 1974. The data came primarily from two informants, Lázaro Cruz Tranquilino and Aurelio Jiménez Roque. The latter was our principal informant. Both of these informants spoke the trade language, Spanish; our data were obtained bilingually through the medium of spoken Spanish.

During the brief time of this study it was not possible to make an exhaustive description of the phonology. Our goal was to study those aspects of the phonology which have a direct bearing on the establishment

of an orthography. Consequently, our emphasis in this report is on the segmental phonemes of the language. Other than the establishment of the phonemic tones of the language the prosodies--length, stress, pitch--and the higher level phonological units are not discussed except as they have immediate bearing on the segmental items. This dichotomy between the segmentals and the prosodies is possible because, in this language, the prosodies and segmental items function reasonably independently and do not exert much influence over one another.

We regret that the limitation of time makes this restriction in scope necessary. A complete analysis of the phonological system of Cuicateco would include a thorough analysis of tone, as well as length, stress, and the higher levels of the phonology.

1.2 PREVIOUS SCIENTIFIC WORK

Very little material of a scientific nature has been published on any of the dialects of Cuicateco. Only two studies of the phonology, both based on the dialect of the village of Concepción Pápalo, are available in the literature: 1) Needham, Doris and Marjorie Davis, "Cuicateco Phonology" IJAL 12,139-46 (1946); 2) Davis, Marjorie and Margaret Walker, Cuicateco: "Morphemics and Morphophonemics" IJAL 21.46-51 (1955). These papers together

present a single phonological analysis.

An additional work, <u>Proto-Mixtecan</u>, IJAL 23.4 Part III
(1957), by Robert E. Longacre, includes a discussion of
the phonology of Cuicateco in relationship to other
Mixtec languages, Mixteco, Trique, Amuzgo; and posits the
historical form of Proto-Mixtecan phonology. However, the
discussion of Cuicateco phonology is based entirely on the
data of the two papers given above and additional word
lists from Concepción Pápalo supplied by Margaret Walker.

No scientific literature on the grammatical structure
of Cuicateco is available, except as morphonology is dealt
with in the second paper above.

A further paper, "Translating from FL Cuicateco to
TL English" IJAL 20.302-12 (1954) by Marjorie Davis,
discusses translation from Cuicateco to English.

The present work is the first formal study in the
dialect of Santa María Pápalo.

1.3 THEORETICAL FRAMEWORK

The theoretical framework of the present analysis is
that of tagmemics.[2] In this framework the structures of
language are analyzed in terms of fundamental units which
are called emic units. Both speakers and hearers are
thought to organize their linguistic competence in terms
of these units and their interrelationships.

The sounds actually produced in speech--usually

called etic sounds--reflect the emic structures of the language. In order for a listener to understand the speech, he must recognize the emic units symbolized by the etic sounds. Different languages can use the same etic sounds to symbolize quite different emic units. Consequently, the goal of linguistic analysis is to determine for a particular language the emic units, their interrelationships, and the way in which they are symbolized by the etic sounds of the stream of speech.

An important feature of every emic unit is its nucleus. Here the unit reaches a peak of prominence. The non-nuclear regions or margins of the emic unit extend on both sides of the nucleus to its terminus. In a series of successive units it is usually fairly easy to identify the nucleus of each unit, but finding the exact extent of the margins is often an involved process, because the successive units tend to merge continuously into each other.

The emic units of a language are structured into levels--units of a lower level combine to form units of the next higher level, which in turn form the units of the next level above that. The positions of the smaller embedded units within the larger units are called slots. When they occur in the nucleus of the larger unit they are called nuclear slots, and when they occur elsewhere in the unit, non-nuclear or marginal slots.

An emic unit is considered completely determined when the following factors are known: 1) The features which cause the unit to contrast with other emic units at the same level. 2) The various ways or variants in which one unit manifests itself. 3) The relationship of one particular unit to all emic units in the language.

For example, basic to the phonology of a language is the emic unit of phoneme. A particular phoneme has contrastive features which distinguish it from other phonemes, such as voicing, aspiration or point of articulation. Phonemes have variants or allophones by which the same phoneme is manifested in different environments. The relationship of the phonemes to one another is shown by such things as their position in a matrix of contrastive features, for instance a chart of the point and manner of articulation; and by their distribution in emic units of other levels of the phonology, such as the emic syllable.

The emic units of a language are structured into three hierarchies: a lexical hierarchy, a grammatical hierarchy and a phonological hierarchy. Each hierarchy has as its base a minimum unit--the specific morpheme for the lexical hierarchy; the tagmeme for the grammatical hierarchy; and the phoneme for the phonological hierarchy-- and larger emic units in which the lower level units are embedded. For example, the phonological hierarchy, which is the concern of this study, has its minimal unit the

phoneme embedded into the larger units of emic syllables;

the emic syllables are embedded into phonological words;

these phonological words are embedded into phonological

phrases. None of the hierarchies has a maximum unit; the

emic units ultimately become so large as to include not

only language but cultural behavior as well.

1.4 DETERMINATION OF EMIC UNITS

There are no general algorithmic procedures for

determining the emic units of a language. The analyst

must take the etic data of the stream of speech and segment

it and classify it in such a way that the emic units of

the language are revealed. Difficulties arise, however,

because in each language the emic units together form a

closed system peculiar to that language: the emic units

both determine the linguistic system and at the same time

are determined by the system. Therefore, a knowledge of

the total system, including the emic units and their

function, is necessary for a complete understanding of any

one particular emic unit. Because of the circular nature

of the dual role played by emic units in defining and

being defined by the language system, the analyst must

arrive at his understanding through trial and error by

means of a series of successive approximations of both the

emic units and the system in which they function.

The process of trial and error used to determine

the emic units can be considerably aided by following
certain heuristic procedures which have proved useful to
prior investigators. These procedures are based on
generalizations from phenomena which have been frequently
observed in languages of the world. While such procedures
do not provide a direct route to the answer for a
particular problem in a given language, they do provide a
reasonable framework of assumptions for "breaking into"
the language system. Such heuristic procedures are given
by Pike (1947) and Robinson (1970);[3] these are the
procedures used in the present study.

NOTES

[1]Longacre (1957) <u>Proto-Mixtecan</u>

[2]Pike (   ) <u>Language in Relation to a Unified Theory</u>
<u>of Behavior</u>; Pike (1947) <u>Phonemics</u>.

[3]Robinson (1970) <u>Manual for Analytic Procedures in</u>
<u>Phonology</u>.

2. RESEGMENTATION: INTERPRETATION PROCEDURES

2.1 INTRODUCTION

Prior to determining the phonemes of a language
the analyst must decide the phonetic function of a
particular sound according to its distribution in the
syllable. Sounds that are distributed in the margins of
syllables are called contoids, and will eventually be shown
to represent consonant phonemes or sequences of consonant
phonemes. Sounds that occur in the nucleus of syllables
are called vocoids, and will represent vowel phonemes or
sequences of them. This determination must be made
because there are only two classes of phonemes, consonants
and vowels, depending upon whether the phoneme is dis-
tributed in the margin or nucleus of the emic syllable.

It is a universal feature of language that the
degree of stricture used in producing a sound is correlated
with the distribution of that sound in syllables. Sounds
produced with a high degree of stricture tend to occur in
the margin of syllables, while sounds produced with a low
degree of stricture tend to occur only in syllable nuclei.
The remaining class of sounds--those with intermediate
degree of stricture--occur in both margin and nucleus of
syllables. It is these sounds which give the most
difficulty in interpretation. They must be interpreted as
contoids if they occur in the syllable margin, and vocoids

if they occur in syllable nuclei.

In addition to determining whether a sound functions in the nucleus or margin of the syllable it is necessary also to determine if the sound functions as a sequence of contoid or vocoid segments or as a single segment. This determination is facilitated by treating first those syllables or sequences of syllables containing only single phonetic segments, and second, those syllables containing phonetic sequences. Thus, in this chapter phonetic segments are treated, and in the next two chapters, sequences of segments. In both cases the basic procedure is the same--interpretation and resegmentation are accomplished by reference to the fundamental contoid-vocoid patterns of the language. These patterns are used almost as templates to determine the phonetic function of sounds whose role is initially obscure.

The fundamental or canonical contoid-vocoid patterns of single segments are found by observing the occurrence of the single segments that only appear in the syllable nuclei--called the non-suspect vocoid segments--and the occurrence of those single segments which only appear in the syllable margins--the non-suspect contoid segments.

In Cuicateco, the non-suspect vocoid segments are the oral vocoids [e, ɛ, a, ɔ, o]. The non-suspect contoid segments are [p, t, k, b, d, g, ƀ, đ] . Segments which must be interpreted--the suspect segments--are [i, ɩ, u, ʋ, m, n, s, l, ɡ, ʔ] .

2.2 CONTOID-VOCOID PATTERNS

Before discussing the interpretation of specific
suspect segments, we inventory here the fundamental
patterns of contoid-vocoid sequences found in Cuicateco.
The most important of these is the syllable;[1] others are
composed of sequences of syllables.

The basic syllable pattern in Cuicateco is the
pattern CV, where C represents any non-suspect contoid
segment and V represents any non-suspect vocoid segment.[2]
This pattern is basic because it occurs freely throughout
the language. Derived patterns--so-called because their
margins contain non-suspect segments only when they
occur in contractions--are of the following forms:
CCV and CVC. In each of these three patterns, one
phonemic tone occurs on the syllable nucleus.

Other contoid-vocoid patterns are composed of
sequences of syllables. In Cuicateco the most important of
these is the two syllable sequence CV.CV, where the dot
symbolizes the syllable division. This is probably the
most common pattern for phonological words. (A phono-
logical word is the smallest stretch of speech that can
occur between two pauses.) No single syllable phono-
logical words have been found in our data.

Other contoid-vocoid patterns occur, but they
cannot be included as non-suspect patterns since they
contain sequences of sounds which are suspect of being

one or two sounds. (See Chapter 8 for a discussion of
these.)

2.3 INTERPRETATION OF SUSPECT SEGMENTS

2.3.1 The High Vocoids

The high vocoids [i, u] are interpreted to be
vocoids or contoids according to whether they occur in
nuclear or non-nuclear slots in the syllable. When
functioning as vocoids they are written [i] and [u];
when functioning as contoids they are written [y] and [w].

In Cuicateco the high vocoids [i, u] fill both
nuclear and non-nuclear slots. They fill nuclear slots
in the following words:

[i]	[čī?í]	"I drank"
	[ndìčí]	"ten"
	[ɟūɟī]	"aunt"
	[tii]	"head"
[u]	[ɟù?ù]	"who?"
	[túùū]	"rock"
	[nnūʙī]	"sky"
	[ñtúú]	"corn drink" (atole)

They fill non-nuclear slots in the following words:

[y]	[yámì]	"corn tassel"
	[yúkùū]	"squash"
	[yą̃ą̀]	"town"

[w]   [wínù]   "night"

   [wǐʔǐ]   "edible fruit"

The high vocoids [ɩ ,ʋ] will be shown to be

allophones of the high vowels /i, u/; they occur only in

nuclear slots (see Section 5.3.1).

2.3.2 The Nasals [n] and [m]

The nasals [n] and [m] function as contoids, filling

non-nuclear slots in the syllable. Examples are:

[m]   [mɛ́ɛ̀ɛ̄]   "cloud"

   [ʔámá]   "one"

[n]   [nàndà]   "flower"

   [ɟūnūú]   "uncle"

There are some occurrences of apparently syllabic

nasals. They seem phonetically syllabic because they are

slightly lengthened and carry a definite tone. For example:

[m̌čétè]   "machete"(Spanish)

[sá-kʔɔ̀ɔ̀ n̄-dɪ́ɖāb̄á-s]   "he has washed"

[n̄-tō̄ʔō̄]   "ruins"

However, these nasals are best analyzed as contoids,

occurring in contractions. The common contraction process

in the language consists of dropping a vowel, producing in

many cases a non-suspect CCV pattern. Usually the tone of

the vowel is lost when the vowel is dropped; however, in the

case of the contraction of a syllable containing a nasal

contoid, the tone is transfered to the nasal, making it

phonetically syllabic.

In the first example above, it is clear that there has been a contraction involved in borrowing the Spanish word into Cuicateco. In the second example, the [n] is a contraction of [ni] (a sentence particle); this particle is heard in its long form in slow speech, but is commonly contracted in normal and fast speech. The third example consists of a morpheme [n-] followed by the morpheme [to?ō].[3] It is most probable that this morpheme originally had the shape of nV- , but that the vowel has been lost.[4]

Since these apparently syllablic nasals result from contractions and fit the non-suspect CCV pattern, they are best analyzed as contoids, filling non-nuclear slots.

2.3.3 The Continuants [l, s, ş]

The continuants [l, s, ş] occur only in the margin of the syllable and are always contoids.

[l]	[ló?ò]	"having no tail"
[s]	[sá̢?ə̢/sš̢?š̢]	"man"
	[káà-s]	"he bought"
[ş]	[?ī-şáà]	"it is falling"
	[şūbī]	"day"

2.3.4 The Glottal Stop

The glottal stop occurs medially in the sequence CV?V, initially in the sequence ?VCV, and in contoid

clusters ?C or C? which occur word initially or medially.
We restrict ourselves here to the interpretation of the
glottal stops occurring in the sequences CV?V and ?VCV.
The clusters ?C and C? are discussed in Section 4.3.4
along with other contoid clusters.

The glottal stop could conceivably pattern in one
of the following ways: 1) as a contoid or 2) as a compound
nucleus $^?$V, V$^?$, V?V.

It seems natural to interpret the glottal stop as a
contoid in all instances of its occurrence. Then the
patterns CV?V and ?VCV fit the canonical pattern CVCV, ·
and the sequence ?V is a syllable of type CV. No
linguistic difficulties arise because of this choice, and
this is the interpretation we have made.

It is instructive, however, to consider the other
alternatives, especially in light of the restrictions that
occur regarding the glottal stop.

The first restriction is that words that have the
form ?VCV in isolation sometimes drop their initial
glottal stop phrase medially. If the sequence $^?$V were
a compound nucleus, then the absence of the glottal would
not change the contoid-vocoid pattern of the sequence
$^?$V.CV, since the emic pattern would be V.CV whether the
glottal was present or deleted. However, a difficulty
arises here because no canonical syllable of type V has
been observed. A syllable of type V does arise by

interpretation (see Sections 3.4, 3.5); but these V
syllables combine with other syllables to form only the
pattern CV.V (where both vocoids must be the same), and
never the pattern V.CV. Therefore, it seems best to
interpret the initial glottal stop of the pattern ?VCV
as a contoid.

The second restriction involving the glottal stop
is that vocoids occurring on either side of it in the
pattern CV?V must be identical. One interpretation that
would make this restriction seem reasonable would be to
let the sequence $V^?$ be a single complex nucleus. Then
the pattern $CV^?$.V would be of the emic form CV.V, and the
same restriction that makes the vocoids the same on the
interpreted pattern CV.V would apply here also. This
interpretation presents difficulties, however, because the
glottal stop must be interpreted to have two different
functions--as a contoid in the pattern ?VCV and as part of
a complex syllable nucleus in patterns of the form CV?V.
It seems best not to make this interpretation when the
common CV pattern, with the glottal stop interpreted as a
contoid, handles the data so well.

The second restriction (that vocoids on both sides of
the glottal stop must be the same) could also be understood
if the sequence V?V were interpreted to be a re-articulated
vocoid. Then the occurrence of identical vocoids would
be natural. In this case, the pattern CV?V would be

analyzed as a single syllable pattern CV. This analysis,

however, also presents difficulties, since the form CV?V

occurs frequently in isolation as a single phonological word.

If V?V were a re-articulated vocoid, the form CV?V would be

a single syllable phonological word. However, no single

syllable words occur elsewhere in our data, while the

two syllable form CVCV is commonly a single phonological

word. Thus the interpretation of V?V as a re-articulated

vocoid would require a special ad hoc word type.

An additional difficulty with interpreting the sequence

CV?V as a re-articulated vocoid is that the vocoids occurring

in this sequence frequently carry different tones.[5] The

usual pattern is high-low although other patterns also

occur. In the canonical syllable patterns each syllable

nucleus always carries one tone. Hence it would seem best

not to interpret CV?V as a single complex nucleus but as

two separate nuclei, each with its own tone.[6]

We conclude that the glottal stop in the sequences

CV?V and ?VCV patterns as a contoid. Vocoids occurring

contiguous to it in the form CV?V must be identical, but

this is best considered as a co-occurrence restriction on

the ?V syllable, and not an indication that the glottal

stop is part of a compound syllable nucleus. Similarly,

the loss of initial glottal stop in the pattern ?VCV phrase

medially should be considered a contraction phenomenon[7] of

fast speech and not an indication that ?V should be

interpreted as a complex vocoid nucleus.

Examples of the glottal stop are given below.

Word Initial

[ʔúú]   "I"

[ʔɛ́nɛ̀ɛ̄]   "corn silk"

[ʔɨ̄ʔnȳý]   "heat, hot"

Word Medial

[tō?ō]   "place to build a house"

[yá̰ʔà̰]   "tree, stick"

[bí?ì]   "sister of a man"

2.4 SUMMARY

2.4.1 Summary of Interpretation of Suspect Segments

We have concluded that

1. High vocoids function as vocoids ([i] and [u])
    when they occur as nucleus of the syllable, and
    as contoids ([y] and [w]) when they occur as
    the margin.

2. Nasals function as contoids ([m] and [n]) in
    all instances.

3. The continuants function consistently as
    contoids ([l, s, s̯]), always occurring on the
    margin of the syllable.

4. The glottal stop functions consistently as a
    contoid, always occurring on the margin of
    the syllable.

2.4.2 Summary of Single Segments

Chart 2-1 gives all of the single oral vocoid segments occurring in our data, including those which have been discussed in this chapter.

Chart 2-1   Single Oral Vocoid Segments

		Front Unrounded	Central Unrounded	Back Rounded
High	Close	i		u
	Open	ɪ		ʊ
Mid	Close	e		o
	Open	ɛ	ʌ	
Low	Close			ɔ
	Open		a	

All of the single contoid segments occurring in our data, including those discussed in this chapter, are given in Chart 2-2.[8]

Chart 2-2. Single Contoid Segments

	Bilabial	Interdental	Dental	Alveopalatal	Palatal	Velar	Glottal
Stops - Vl.	p		t			k	ʔ
Stops - Vd.	b		d			g	
Fricatives - Vl.		θ	s	š		x	h
Fricatives - Vd.	ƀ	đ				ǥ	
Lateral			l				
Nasals	m		n			ŋ	
Flap			ř				
Trill			r̃				
Glides					ɏ	y	w

NOTES

[1]Syllable patterns are discussed fully in Chapter 8.

[2]Each symbol C or V represents potential location of a sound. These potential locations are sometimes called slots. Thus we speak of nuclear slots (symbolized by V) and non-nuclear or marginal slots (symbolized by C).

[3]The morpheme to?o occurs without the prefix n-; in this form it means "place to build a house".

[4]Davis and Walker (1955) cite noun prefixes (of undetermined meaning) of ni- and ŋ- . About the ŋ- they write "Syllabic n occurs as a prefix to approximately six noun stems and historically comes from a longer form na- whose meaning is obscure." (p. 47, note 3.)

[5]When the sequence CV́?V̀ occurs in phrases it sometimes is articulated more quickly, and the tones on the two syllables may become the same. This is probably a non-significant variation involving tone sandhi and position with respect to the phonological phrase. In isolation the two tones are always heard distinctly.

[6]Longacre (1952) states that in Trique there is a contrast between V?V (two syllables) and the medially checked vowel V?V (one syllable). Medially checked vowels are analyzed as a single phoneme because 1) A medially checked vowel carries only one tone, in contrast to a sequence of two unchecked vowels. 2) The length of V?V or VhV is equal to the length of a word final unchecked vowel. 3) Certain distributional restrictions apply to medially checked vowels: (a) only one vowel quality can occur in the V?V pattern and (b) fortis consonants, which can occur only in word final syllables, can occur before V?V and VhV.

The CV?V pattern in Cuicateco differs from that in Trique in several respects. 1) The vowels in V?V can carry two tones. 2) While V?V is sometimes articulated rapidly, it is longer than a single vowel nucleus. 3) The distributional restriction of only one vowel quality applies, but no restriction in the distribution of consonants has been observed.

[7]Conversely, a glottal stop can sometimes be inserted between lengthened vocoids for emphasis. This seems to occur with only some words of the type CV.CV.V or CV.V.V. Glottal stop also occasionally occurs word final. This final glottal is optional and does not appear to be phonemic.

[8]It has come to our attention that we have omitted
the suspect segments [ŋ] and [ɣ] from the discussion. The
nasal [ŋ] always functions as a contoid; it will be shown
in Chapter 6 to be an allophone of /n/. Similarly, the
glide [ɣ] also functions as a contoid, and will be shown
to be an allophone of /y/.

3. RESEGMENTATION OF VOCOID SEQUENCES

3.1 INTRODUCTION

In addition to determining whether sounds function as contoid or vocoid, the number of segments involved must also be determined. It is usually clear whether a particular sequence of phonetic segments functions in the nuclear slot or a marginal slot of the syllable, so their status as vocoids or contoids is not usually in doubt. The difficulty frequently comes in determining whether these sequences function as single segments (vocoids or contoids) or as sequences of distinct vocoids or contoids. This is the case in Cuicateco. Furthermore, the phonemes that result in the final analysis depend crucially upon the resegmentation procedures.

In working with single segments we were able to define certain classes of segments--the non-suspect segments--whose function in the language was clear; and to interpret the suspect segments in terms of the contoid-vocoid patterns which the non-suspect segments made.

Similarly, we can identify certain sequences of segments which function consistently as distinct vocoid or contoid sequences, and use these non-suspect sequences as patterns by which to interpret the other sequences.

The non-suspect sequences of a language are determined by observing the patterning in sequences of

non-suspect segments. Of particular interest are sequences
of segments whose point and manner of articulation are
quite diverse, and those sequences which occur reversed
in the same slots. Since these could hardly be other than
separate segments, they are considered to be the non-
suspect sequences. It has been found that in many
languages certain sequences consistently function as
distinct segments[1] (for example, sequences of low and mid
vocoids, or a sequence of fricative plus stop).
Consequently, in the analysis of a particular language,
the sequences of this sort are given great weight in
determining the non-suspect sequences of the language.

Further, some apparently single segments have been
found to function as two segments in some languages.
For example, a nasalized vocoid may function as the
sequence of oral vocoid plus voiced nasal contoid.
Consequently, it is necessary to check the function of
these segments.

The canonical contoid-vocoid patterns involving
sequences are determined by observing the patterns of
the non-suspect sequences. (For example, in Cuicateco
the CCV syllable pattern discussed in Section 2.2 was
found in this way.) In some languages, no clear pattern
of non-suspect sequences is found. In these cases, other
evidence, such as tone placement, must be taken into
account in determining the canonical patterns.

Those sounds which are neither single segments
nor non-suspect sequences are called suspect sequences,
and must be resegmented. This resegmentation is
accomplished by interpreting the suspect sequences so
that they follow the same contoid-vocoid patterns as
the non-suspect segments or sequences.

The identification of suspect sequences is aided
by the observation that certain sequences (for example,
homorganic affricates, lengthened vocoids) function as
suspect sequences in many languages. In the analysis of
a particular language, the function of sequences such
as these should be carefully noted.

The suspect sequences of vocoids which occur in
our data are

   1. Nasalized vocoids

   2. Diverse sequences of vocoids in which one
      member is a high vocoid.

   3. Vocoids with double length

   4. Vocoids with triple length

These are discussed in the sections that follow.

The suspect sequences of contoids are discussed
in Chapter 4.

3.2 NASALIZED VOCOIDS

The nasalized vocoids occurring in our data are
given in Chart 3-1.

Chart 3-1   Nasalized Vocoids

		Front Unrounded	Central Unrounded	Back Rounded
High	Close	į		ų
	Open	ᶖ		ʯ̣
Mid	Close	ẹ		ọ
	Open	ɛ̣	ʌ̣	
Low	Close			ɔ̣
	Open		ạ	

Nasalized vocoids can be interpreted as the sequence
of oral vocoid plus nasal contoid (VN), or as a single
segment, nasalized vocoid (Ṽ). We have interpreted them
as single segments.

. In order to interpret nasalized vocoids as two
segments, the patterns of the language must be such that
1) a pattern of closed syllables occurs, 2) oral vocoids
never preceed a nasal contoid in the same syllable, and
3) nasalized vocoids occur only in open syllables. When
these conditions are met, the nasalized vocoids complete
the pattern of closed syllables, being interpreted as
the sequence of oral vocoid plus nasal contoid.

However, in Cuicateco, while there is a closed
syllable pattern, oral vocoids do preceed a nasal contoid
in the same syllable, and nasalized vocoids occur in both

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open and closed syllables. Therefore we conclude that the
nasalized vocoids do not function as the sequence of oral
vocoid plus nasal contoid, but rather as single segments.[3]

In the examples below, the hyphen indicates morpheme
breaks, and the dot represents syllable divisions.

$[k^{w}\acute{a}.\grave{a}-n]$ "you (formal) will buy"

$[k\bar{a}.\acute{a}-n]$ "you (formal) jumped"

$[k\grave{ɔ}.ʔ\grave{ɔ}-n]$ "you (formal) spoke"

$[k^{w}\bar{ɛ}.\acute{ɛ}]$ "yellow"

3.3 SEQUENCES OF VOCOIDS IN WHICH ONE MEMBER IS A HIGH VOCOID

The diverse sequences including a high vocoid which
occur in our data are given in Chart 3-2.

Chart 3-2. Diverse Sequences of Vocoids,
Including a High Vocoid

		Front Unrounded	Central Unrounded	Back Rounded
High	Close	iu		ui
	Open			
Mid	Close	ei	ei̥	
	Open	ɛi ɛu	ɛi̥	
Low	Close			ɔi ʔi̥
	Open		ai au	

These sequences can be interpreted as single
segments (a vocoid with an off-glide) or as sequences

of two segments (two distinct vocoids). We have interpreted
them as sequences of diverse vocoids in all cases but one.
In one case, the sequence [ai] is interpreted as a single
segment.

Sequences of mid and low vocoids, which are usually
considered non-suspect sequences, do not occur in
Cuicateco. However, another important factor in the
resegmentation of vocoids is the tone patterns which occur
in the non-suspect contoid-vocoid patterns. In Cuicateco,
the non-suspect single vocoids carry only one tone. The
absence of tone glides on single non-suspect vocoids leads
us to conclude that a single tone is a contrastive feature
of the syllable nucleus. We have therefore interpreted
single tones as marking single syllable nuclei; the
occurrence of two tones indicates that there are two
syllable nuclei.

3.3.1 Diverse Sequences Interpreted as Two Segments

Sequences of diverse vocoids arise primarily as
follows.[4] In verbs the person-marking suffix -i
(third person singular formal) or -u (first person
plural inclusive) is added to the stem of the verb.
The stem always ends in a vocoid. Thus the sequence
V-i or V-u occurs (where the hyphen indicates a morpheme
break). The tone on the two vocoids is frequently
different.

[ʔɪ̄-sʔȳ̃ȳ̃ ká-ì̃]   "they bought"

[ʔi-m̃ḭ̃ḭ̃ k̰ʔ̰ʔ̰-ḭ̃]   "he spoke"

[sã̰ʔà̰ n-ḛ̃ʔḛ̃tū-í mesá]   "the man is hitting the table"

[m̃ʔy̰y̰ h-nɛ̃-y̰]   "we are here"

[ʔí-kʔɔ̃ɔ̃ nɛ̃ʔɛ̄-ḭ̃]   "he needs"

(The nasalization of the suffix arises because the stem contoids are nasalized.)

Since the two vocoids carry two tones, they are interpreted to be nuclei of two separate syllables,[5] and therefore two distinct segments.

3.3.2 The Sequence [ai]

The sequence [ai] is a single segment ($[a^i]$), excluding the occurrence of this sequence in verbs, since these were dealt with in the previous section (see the first example above). The vocoid [a] has a non-phonemic off-glide [i] preceeding the contoid [y].[6] Examples are:

[pã̄^{i}ȳ̃ ʔíndìã̀]   "reboso"

[ɖā^{i}yú]   "my son"

3.4 VOCOIDS WITH DOUBLE LENGTH

Vocoids with double length occur with approximately twice the time for articulation as a single vocoid. They may occur with one or two tones. The vocoids with double length occurring in our data are given in Chart 3-3.

Chart 3-3. Vocoids with Double Length

		Front Unrounded	Central Unrounded	Back Rounded
High	Close	i· i̧·		u· y̧·
	Open			
Mid	Close	e· ȩ·		o· o̧·
	Open	ɛ· ɛ̧·		
Low	Close			ɔ· ɔ̧·
	Open		a· a̧·	

The following vocoids which do occur in short form
do not occur in our data with double length: [ɪ, ɪ̧, ʌ, ʌ̧, ʊ, ʊ̧].
They will be shown to be allophones of the phonemes
/i, i̧, a, a̧, u, y/ respectively in Section 5.3. The
distribution of double length, stated in terms of phonemes,
is quite inclusive: all of the six vowel phonemes and their
nasalized counterparts can occur with double length.
Therefore, we expect that the lack of occurrence of length
on the allophones listed above is due to their rarity, and
that with more data they would also occur lengthened.

Vocoids with double length can be interpreted as
a single segment (V·) filling a single nuclear slot on
the syllable level; or as a sequence of segments
(a geminate vocoid cluster VV) filling two nuclear slots
and manifesting two syllables.

We have interpreted these lengthened vocoids as
sequences of two segments.

Vocoids occurring with double length frequently
carry two tones. For example:

    [ʔyų́ų́]   "ear of corn"

    [yų̄ų́]   "blood"

    [kʷēè]   "green"

    [ñą̄ą̄/nɔ̄̃ɔ̄̃]   "face"

    [ñdʔą̄gų́ų̀]   "worm"

    [čō̃ʔōó]   "we (incl.) pass by"

There does not seem to be any way to predict the
sequences of tone which occur on these sequences of vocoids.[7]
In fact, there are contrasts between lengthened vocoids
with a single tone, and those with two tones. For
example, [ñą̄ą̄]"face"; [ñą̄ą́]"my face".

Since the short vocoid nuclei in the canonical
syllable patterns carry one and only one tone, we conclude
that the lengthened vocoids carrying two different tones
constitute two syllable nuclei (as discussed in Section 3.3).
Therefore, we have resegmented them as sequences of geminate
vocoids. By analogy, a lengthened vocoid with only a
single tone is resegmented as two vocoids, each the
nucleus of a separate syllable, but each carrying identical
tones.[8]

If lengthened vocoids were analyzed as constituting
a single phoneme, the complex nucleus of a single syllable,
the language would then have phonemic glides, or these
lengthened syllables would have to be composed of two moras.

We have no evidence to indicate that tone contours
occur in Cuicateco, as short vocoids occur with only
one tone; and the postulation of multi-mora syllables
leads to a proliferation of syllable types that we feel
is not warranted by the data.

In resegmenting vocoids with double length as two
distinct segments, we have made the judgement that the
pattern of tone placement--a single tone to a short
syllable nucleus--is the feature which marks the fundamental
pattern of vocoid sequences.[9]

3.5 VOCOIDS WITH TRIPLE LENGTH

Vocoids with triple length occur with approximately
three times the length of articulation as a single vocoid.
They occur with a characteristic tone pattern high-low-mid.
The vocoids with triple length occurring in our data are
given in Chart 3-4.

Chart 3-4. Vocoids with Triple Length

		Front Unrounded	Central Unrounded	Back Rounded	
High	Close	i:		u:	y̪:
	Open				ʋ̪:
Mid	Close	e:		o:	
	Open	ɛ̪:			
Low	Close				ɔ̪:
	Open		a:		

Vocoids which do not occur with triple length although they do occur in short form are: [į, ę, ε, ą, ɔ ǫ, ʌ, ʌ̧, ʋ, ʋ̧]. Of the full vowel phonemes, only /į, ą, ɔ, ǫ/ do not occur with triple length. The phonemes /į, ǫ/ are rare; /ɔ/ in words where it does not fluctuate with /a/ is also rare. There is one occurrence of [ą:] fluctuating with [ɔ:] : [ndūbnąą̧ą̧/ndūbnɔ̧ɔ̧ɔ̧] "to forget". We would expect to find all of these segments with additional data.

Examples of vocoids with triple length are:

[hndíìī]	"hat"
[ʔyέὲε̄]	"bee"
[ɓáàā]	"new
[ɓɔ̧́ɔ̧̀ɔ̧̄]	"six"
[ndóòō]	"we arrive"
[túùū]	"rock"
[ɗų́ų̀ų̄]	"lard"

Parallel to the analysis of vocoids with double length, we have resegmented vocoids with triple length as being three separate segments, because of the occurrence of three separate tones on the three vocoids.[10] Each vocoid is the nucleus of a separate syllable, so that a word of the pattern CVVV is three syllables: CV.V.V.

3.6 SUMMARY OF RESEGMENTATION OF VOCOIDS

Our conclusions on the resegmentation of vocoids are:

1. Nasalized vocoids function as a single segment.

2. Diverse vocoid sequences which include a high
   vocoid are two separate vocoids because they can
   carry two tones; except for the sequence $[a^i]$
   occurring before $[y]$, which is a single
   segment.

3. Vocoids with double length are two segments and
   represent two syllables because they carry
   separate tones.

4. Vocoids with triple length are three segments and
   represent three syllables, because they carry
   three separate tones.

NOTES

[1]Robinson (1970) has compiled for reference lists of sequences of segments which consistently function as separate segments in many of the known languages. These are given on pp. 18-21. He has also given a listing of apparently single segments which can function as two segments (p. 20), and those sequences of sounds which sometimes function as single segments, sometimes as sequences (p. 17-18). All of these types of segments and sequences are referred to later in the text.

[2]Omitted.

[3]Longacre (1957) posits the sequence *Vm for Proto-Mixtecan; this sequence has reflexes of V̯ in all the daughter languages (Section 2.2.4 p. 27ff.; Chart of Vowels in PMx, M, C, T, p.22).

[4]The sequence [i̯u] arises in a contraction where a glottal stop has been dropped; again, the sequence carries two tones: [tī-úúdì/tī-ʔúúdì] "mouse".

[5]In the case of verbs, the morphemes -i and -u will require an addition syllable type V. Other instances of V syllables arise from the occurrence of lengthened vocoids, discussed in sections 3.4 and 3.5.

[6]In the dialect of Concepción Pápalo (Davis,(1946) a word final /a/ has a nonphonemic offglide [a̯ᶦ]. In the speech of Santa María this offglide occasionally occurs in the same environment.

[7]Lengthened vocoids may shorten depending on the position of the word in the phonological phrase. This is best viewed as a contraction process, with the lengthened form being the basic one. If the short form were analyzed as basic, there would be no way to predict which words would lengthen, and what the tone sequences would be if they did lengthen. If the long forms are interpreted as basic, the short forms can be explained by the process of contraction. For example: [ǥéèčè] "arm"; [ʔùbì ǥèčè] "two arms"; [ǥèčè dítùū] "strong arm."

[8]The analysis of lengthened vocoids as separate segments is an advantage in dealing with contractions. If these were analyzed as single segments there would be an additional contraction process in the language--one which shortened a lengthened vowel; as well as the process which deletes a short vowel. However, in the present analysis there is only one

basic contraction process (besides the occasional dropping
of a word initial glottal stop phrase medially)--that of
dropping a vowel, and consequently reducing the number of
syllables by one.

[9]Needham and Davis (1946) analyzed lengthened vowels
as comprising a complex syllable nucleus CVV.CV (two syllables)
or CVV.V (two syllables). Longacre, in arriving at Proto-
Mixtecan (1957), used the analysis of Davis and Walker.
He does not, however, discuss the resultant glides, but
treats them as sequences of tones (p. 96-100). However, see
Pike (1947) p. 146-147, and Robinson (1970) p. 21 for
further support for the analysis of this study.

[10]Sequences of three vocoids contract to two under
certain conditions (see footnote 7 of this chapter). For
example: [hndíìī] "hat"; [ʔámá hndíìī] "one hat"; [hndíì yɛ̄ʔɛ́] "my hat.

4. RESEGMENTATION OF SUSPECT SEQUENCES OF CONTOIDS

4.1 INTRODUCTION

The basic procedures used in the resegmentation of suspect sequences of sounds have been discussed in Section 3.1. The suspect sequences are resegmented on the basis of the patterns of non-suspect sequences and segments which occur in the language.

There are three canonical syllable patterns in Cuicateco: CV, CCV, CVC. Of these three syllable patterns only the pattern CV occurs generally throughout the language. The remaining two--CCV and CVC--are derived from a sequence of two CV syllables, CV.CV, which contracts to one syllable, either CVC or CCV, depending on whether the first or second vocoid is dropped.

The contraction process is widespread throughout the language. Since this is the primary way that non-suspect sequences arise, we have taken the contractions as evidence that contoid clusters are emically permitted. Both of the syllable patterns CCV and CVC are canonical since they contain non-suspect sequences and non-suspect segments, respectively. We have therefore used them in resegmentation.

The existence, however, of both patterns CV and CCV as well as the composite cluster of contoids arising from the sequence CVC.CV, presents a conflict of evidence in

the interpretation of suspect sequences. A contoid sequence
of two suspicious segments could conceivably be resegmented
as either one segment, on the basis of the pattern C^V, or
as two segments, on the basis of the pattern CCV or
CVC.CV. A choice is made, however, in the sections that
follow on the basis of additional evidence specific to the
suspect sequences involved.

The suspect sequences of contoids which are
resegmented as single segments are:

1. The affricate [tš]

2. The sequence of velar contoid plus [w].

The suspect sequences of contoids which are reseg-
mented as sequences of segments are:

1. The sequence contoid plus [y]

2. The sequence nasal contoid plus other contoid

3. Lengthened nasal contoids

4. The sequence of contoid contiguous to glottal stop.

4.2   SEQUENCES OF CONTOIDS RESEGMENTED AS SINGLE SEGMENTS

4.2.1   The Affricate [tš]

The primary reason for interpreting the affricate
[tš] as a single segment relates to the pattern of
distribution of the phonemes that result.

If the affricate were analyzed as a sequence of
two segments, the segment [š] that resulted would give

rise to a phoneme /š/. This phoneme would have a very restricted distribution: only following /t/, or as an alternate to the sequence /t//š/ in contractions. It seems unreasonable to make an interpretation which results in a phoneme with such a limited distribution.

- On the other hand, if the affricate is interpreted as a single segment, the phoneme /č/ that results has a distribution parallel to that of the phonemes which arise from non-suspect segments; it occurs both initially and medially in the phonological word, and preceeds many of the vowel phonemes: /i, i̯, e, e̯, a, o, u/.[1]

Since this interpretation avoids the problems of an additional phoneme with limited distribution, and presents no other linguistic difficulties, we have concluded that the affricate is best analyzed as a single segment [č].

Examples of [č] are given below.

[ʔúú č-íʔí]	"I drank"
[čàkú]	"mother"
[ʔī-dūčí]	"game"
[n-čóòō]	"rotten"

4.2.2 The Sequences [kʷ] and [ǥʷ][2]

As in the interpretation of the affricate, the primary reasons for making the sequences [kʷ] and [ǥʷ] single segments refer also to the distribution of the resulting phonemes.

If these sequences were analyzed as each being two segments, a phoneme /w/ would result with the very restricted distribution of occurring only after /k/ and /g̱/. A further compilcation arises because the phoneme /g̱/ has an allophone [w] (see Section 6.3.3), which would be distinct from the phoneme /w/ required by the interpretation of [kw] and [g̱w] as two segments.

The difficulties presented in the above interpretation are avoided if the sequences [kw] and [g̱w] are interpreted as single segments [k^w] and [g̱^{w}]. The phoneme /k^w/ which arises from this interpretation occurs both initially and medially in the phonological word, although it is more frequently found initially. It preceeds the vowel phonemes /i, ę, e, ą, ɔ, o/. The phoneme /g̱^{w}/ has a more limited distribution; it occurs only word initially, and is followed by /e, ę, a/. The distribution of these two phonemes, while not exactly the same, is consistent with the distributions of non-suspect single segments. We would expect that with more data a closer parallel would result.

Since no linguistic difficulties arise from this analysis, we have interpreted the sequences [kw] and [g̱w] as single segments, the labialized velars [k^w] and [g̱^{w}].

Examples of [k^w] are:

[k^w-óòō]	"we (inclusive) will jump"
[k^{w}éè]	"green"
[yān-tík^{w}à]	"stomach"

Examples of $[\mathfrak{g}^w]$ are:

$[\mathfrak{g}^w\acute{\varepsilon}\acute{\varepsilon}]$ "slender"

$[\mathfrak{g}^w\acute{e}\text{-}ty\grave{a}\grave{a}/g^w\acute{e}\text{-}ty\grave{\mathfrak{o}}\grave{\mathfrak{o}}]$ "early morning" (madrugada)

$[\mathfrak{g}^w\grave{a}\grave{a}]$ "no"

4.3 SEQUENCES OF CONTOIDS RESEGMENTED AS TWO SEGMENTS

4.3.1 The Sequence of Contoid plus [y][3]

The specific occurrences of the sequence contoid plus [y] are given in Chart 4-1.

Chart 4-1. Sequence of Contoid Followed by [y][4]

ty   ky

by   šy

ny   ·

Examples of words in which these sequences occur are given below.

$[st\bar{a}\bar{a}b\text{-}y\acute{\varepsilon}?\grave{\varepsilon}]$ "heart"

$[ky\acute{a}?\grave{a}]$ "mountain"

$[ty\bar{a}k\bar{a}]$ "banana"

$[n\text{-}y\acute{a}?\grave{a}?\bar{a}/n\text{-}y\acute{\mathfrak{o}}?\grave{\mathfrak{o}}?\bar{\mathfrak{o}}]$ "floor"

In reaching the interpretation of the sequence of Cy as two segments, the most important consideration is the pattern of occurrence of the phoneme /y/. This phoneme exists independently, no matter what interpretation is given to the sequence Cy. This is important, because sequences of Cy

arise when morphemes with a final consonant attach to
stems with initial /y/. For example, the verb stem
/yadu/ gives rise to the clusters [ky, ty, ny] when the
stem is preceeded by the tense marking morphemes
k-, kw?ast-, n- as shown below.

[?úú k-yàdú]   "I slept"

[?ì-k?ɔ̀ɔ̀ k-yād̄ū-ī]   "he slept"

[s?ýý kʷ?ást-yòdōō] "we will sleep"

[?ī-mīī n-yàdÙ-ī]   "he has slept"

It seems natural to conclude that in these
cases--where the sequence Cy originates by the affixation
of a bound morpheme to a /y/-initial stem--the sequence,
should be interpreted as two segments. No linguistic
difficulties arise when this interpretation is expanded to
include the suspect sequences of Cy which do not arise by
affixation.

This interpretation of suspect segments Cy as always
being two contoid segments avoids two difficulties. First,
if the sequences of Cy which do not arise from the con-
junction of two morphemes were analyzed as single segments,
it would be necessary to make a distinction between
the single segments (C^y) and the sequences (Cy) discussed
above. Second, the addition of five new phonemes
/t^y, k^y, b^y, s^y, n^y/ would result from the interpreted
single segments, since the sequences of Cy contrast with the
corresponding single consonants. There is no reason to
introduce this added complexity when the interpretation of
Cy as two contoid segments handles the data so well.

4.3.2 The Sequences of Nasal Contoid Plus Non-Nasal Contoid

The occurrences of nasal contoid followed by non-nasal contoid which are found in our data are given in Chart 4-2.

Chart 4-2. Suspect Sequences of Nasal Contoid[5]
Followed by Non-Nasal Contoid

nt nč nk nk^w

mb nd   ng

Examples of these sequences are given below.

[ndākūú]   "sandal"

[lūūnčí]   "sheep"

[ʔī-mïï ŋ-k^w-á-ì]   "he will buy"

[nāŋ-gūbī]   "three days past"

In these sequences the nasal assimilates to the point of articulation of the following stop (Section 6.3.2) and the voiced stops are allophones of the voiced fricatives (Section 6.3.1).

The primary reason for interpreting these sequences as two contoid segments rather than as single segments is the resultant economy of phonemes. The interpretation of these sequences as single segments (pre-nasalized stops) would require the addition of seven phonemes, since these suspect sequences contrast with the simple stops. If they are interpreted as contoid clusters this is not necessary.

The interpretation of these suspect sequences as two separate contoids is supported by the following linguistic

observations.

First, nasals occur preceeding all of the stops
except [p] and [g^w]. The stop [p] is rare, as is the
fricative [g^w]; but we see no reason why both would not
occur with more data (in this case the fricative would
become the stop [g^w]). Distributions such as these seem
more characteristic of contoid clusters than of pre-
nasalized stops, particularly in view of the fact that
voiced stops occur only following a nasal.

Second, many of these clusters appear to result
from contractions that bring together a nasal contoid
plus stop. If this pattern were thoroughly established
with more data, it would provide strong evidence for the
interpretation of these sequences as two segments. Our
best example is [čɛ́m-bà?à] "door", contracted from
[čɛnde] "mouth" and [bá?á] "house". In forming the compound
word, the syllable [de] is dropped from [cɛnde] (indicating
that the [nd] is probably a contoid cluster). When the
[n] and [b] come together in the compound, the resulting
cluster becomes [mb] (or [mm]), due to allophonic and
phonemic variation of the voiced fricatives and nasal
contoids (Sections 6.3.1; 6.3.2).

Other examples of clusters apparently resulting from
contractions, but for which not all of the morphemes are
presently known, are the following: [yāntík^{w}à] "stomach",
probably from [yanV] (exact form and meaning presently

not known) plus ⌐tík^waa⌐ "side of the body"; ⌐nāŋgūbi⌐

"three days past", probably from ⌐nanV⌐ "three earlier"

(exact form not known) plus ⌐gūbi⌐ "day"; ⌐kumbɛ́ɛ⌐

"to listen" probably from ⌐ku?nɛ⌐(exact meaning unknown)

plus ⌐bɛ̀ɛ⌐"ear".

　　We feel that economy of phonemes plus the additional
linguistic observations given above provide strong evidence
for interpreting the sequences of nasal plus non-nasal
contoid as two separate segments.

4.3.3　Lengthened Nasals

　　The lengthened nasal contoids ⌐m·, n·⌐ occur in our
data; there are no examples of ⌐ŋ·⌐ . The lengthened
bilabial ⌐m·⌐ is rare, occurring only as an alternate
of the sequence ⌐mb⌐.[6] The lengthened dental ⌐n·⌐ is more
common, occurring both word initially and word medially.

　　We have interpreted these lengthened nasals as
sequences of two nasal contoids, by analogy with our
interpretation of the other sequences with an initial
nasal contoid. Examples of these sequences of nasals
are given below.

⌐nnĩnṳ⌐	"breast"
⌐nnūbi⌐	"sky"
⌐kṳnnɛ́ɛ⌐	"to help"

　　It should be noted that lengthened nasals would contrast
with non-lengthened nasals, if they were interpreted as a

single contoid segment. (For example [nȷ́nų́] "corn"; [nnȷ̄nų̄] "breast".) This would require two additional phonemes, and obscure the pattern of contoid clusters with an initial nasal.

4.3.4 Sequences of Non-Nasal Contoid Plus Nasal Contoid

The specific sequences of non-nasal contoid plus nasal which occur in our data are given in Chart 4-3.

Chart 4-3. Sequences of Non-Nasal Contoid
Plus Nasal Contoid

đm	bn
	šn
	hn
	hnd

These sequences occur only in contracted and , apparently contracted words. Examples of these sequences in contracted words are the following: [đmē̗ē̗]"day after tomorrow"; contracted from [đʌmē̗ē̗], [h-nē̗ʔé̗]"I heard", from čV- (usually či- or če-) "past" plus [né̗ʔé̗] "hear".

Other examples occurring in apparently contracted words are: [hndíiī/šndíiī] "hat"; probably from [čVndíiī] (single morpheme); [ndūbné̗à̗ā̗/ndūbn3̗3̗3̗]"to forget"; probably from [ndubV] plus [ná̗à̗ā̗] (exact form and meaning uncertain).

We have interpreted these as sequences of two contoid segments, in line with our interpretation of other nasal sequences.[6]

4.3.5 Sequences of Contoid Contiguous to Glottal Stop

The sequences of contoid plus glottal stop which
occur in our data are given below. Chart 4-4 gives the
sequences which occur initially in the phonological word;
Chart 4-5 those which occur word medially.

Chart 4-4. Initial Sequences of Contoid [7]
Plus Glottal Stop

t?   k?   k^{w}?

ɖ?

č?

s?

l?

m?

nd?

Chart 4-5. Medial Sequences of Contoid
Plus Glottal Stop

p?   k?

ɓ?

n?

nd?

In addition, the only sequences of glottal stop
preceeding a contoid which occur word medially are
[?m, ?n, ?y] . The sequence [?y] is the only occurrence
of glottal stop preceeding a contoid which occurs word
initially; this sequence arises when the noun classifier
[?i-] shortens to [?-] before noun stems beginning with [y].

For example [ʔ-yánà] "dog" ; compare [ʔī-tī] "animal",
in which the full form of the classifier occurs.

Examples of the sequence Cʔ occurring initially:

[čʔàtà]   "large"

[kʷʔátàā]   "basket"

[tʔíkà]   "yes; so"

Examples of the sequence Cʔ occurring medially:

[ʔī-ɓʔóòō]   "dry corn stalk"

[kùndʔiyà]   "below"

[ʔípʔà/ʔípʔɔ̀]   , "snow

Examples of the sequence ʔC occurring medially:

[ʔī-ndéʔyè]   "peach"

[čʔéʔnų̀]   "wide"

[ʔīʔáʔmì]   "gray"

We have interpreted the sequences of glottal
contiguous to another contoid as a sequence of contoid
segments. The most important consideration in doing so
is the resultant economy of phonemes. Some fifteen extra
phonemes would be necessary if these suspect sequences
were interpreted as single segments, because they contrast
with single contoid segments. (for example [kʔùù] "this"
(adj.); [kúú] "snake".)

Additional linguistic evidence supporting the
interpretation of these sequences as sequences of contoid
segments is given below.

First, the occurrence of the reverse sequence
[ʔn] and [nʔ] in the words [čʔéʔnų̀] "wide" and [kùnʔį́nų̀]

"above" is evidence that these sequences function as two contoid segments.

Second, several words containing the sequence CV?V alternate frequently with the forms C?V or CV?.[8] Examples of this alternation are:

$$[\check{c}\bar{\bar{\imath}}?\bar{\imath}\text{-}n\acute{a}\grave{a}\bar{a}]$$ "appeared"

$$[\check{c}?\bar{\imath}\text{-}n\acute{e}\grave{a}\bar{a}]$$ "appeared"

$$[\check{c}\bar{\imath}?\text{-}n\acute{a}\grave{a}\bar{a}]$$ "appeared"

$$[k\text{-}\circ?\circ]$$ "to speak"

$$[k?\circ\text{-}ma\text{-}s]$$ "he will speak"

$$[k\circ?\text{-}ma\text{-}s]$$ "he will speak

In the sequence CV?V the glottal stop functions as a contoid (see Section 2.3.4). Therefore it seems natural to consider the sequence C? or ?C that occurs in the type of alternation illustrated above as a sequence of two contoid segments. These sequences then provide a pattern for interpreting other sequences involving a contoid contiguous to a glottal stop.[9]

4.4 SUMMARY

Our conclusions on the resegmentation of suspect sequences of contoids are summarized below.

1. The sequences [tš, kw, ǥw] are analyzed as single segments [č, kʷ, ǥʷ] because interpretation of them as sequences of single contoid segments would lead to phonemes of extremely limited distribution.

"above" is evidence that these sequences function as two

contoid segments.

Second, several words containing the sequence

CV?V alternate frequently with the forms C?V or CV?.[8]

Examples of this alternation are:

[čī?ī-ńą̀ą̀ą̄]		"appeared"
[č?ī-ńą̀ą̄]		"appeared"
[čī?-ńą̀ą̄]		"appeared"
[k-ɔ?ɔ]		"to speak"
[k?ɔ-ma-s]		"he will speak"
[kɔ?-ma-s]		"he will speak

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a contoid (see Section 2.3.4). Therefore it seems natural

to consider the sequence C? or ?C that occurs in the

type of alternation illustrated above as a sequence of two

contoid segments. These sequences then provide a pattern

for interpreting other sequences involving a contoid

contiguous to a glottal stop.[9]

4.4 SUMMARY

Our conclusions on the resegmentation of suspect

sequences of contoids are summarized below.

1. The sequences [tš, kw, ǥw] are analyzed as

single segments [č, k^w, ǥ^w] because interpretation

of them as sequences of single contoid segments

would lead to phonemes of extremely limited distribution.

2. Sequences of contoid plus [y] are analyzed
   as sequences of two contoid segments so that
   they will pattern with contoid clusters arising
   because of the conjunction of a morpheme with
   a final consonant and a morpheme with an
   initial [y].

3. Sequences of nasal contoid contiguous to non-
   nasal contoid, lengthened nasals, and sequences
   of contoid contiguous to glottal stop are
   interpreted as sequences of two contoid segments
   because of the resultant economy of phonemes,
   supported by the pressure of other linguistic
   patterns.

NOTES

[1]For example, the phoneme /t/ occurs before
/i, e, a, ą, o, u/; the phoneme /k/ occurs before
/a, ą,ǫ , o, o, u, u/. See Section 8.5.1 for a chart
of distribution of consonants and vowels in the CV
syllable.

[2]In arriving at the sequences [kw] and [ǥw], the
decision was made that the high vocoid in the sequences
[kwV] and [ǥwV] functions as a contoid and not as a vocoid.
The basis for this is that to interpret these sequences as
[kuV] and [ǥuV] would give rise to the suspect sequences
[uV] ([ui, ue,] etc.). Although sequences involving high
vocoids do occur (Section 3.3) they arise from the conjunction
of two morphemes; the sequences of [uV] in question here do
not form a parallel with them. Therefore, it seems
better to interpret them as sequences of contoids [kwV] and
[ǥwV].

[3]In the sequences of [CyV], the high vocoid is
interpreted as a contoid rather than as a vocoid ([CiV])
because it can be shown that the [y] is the first segment
in some morphemes (C-yV), therefore clearly a contoid. It
seems unreasonable to interpret some as contoids and some
as vocoids, so all sequences of the pattern CyV are interpreted
as containing a contoid sequence.

[4]The initial sequence [?y] is discussed in Section 4.3.5.

[5]The sequence [mb] varies between speakers: [čɛ́m-bà?à]
or [čɛ́m-mà?à] "door".

[6]Note that in these clusters there is no assimilation
of the nasal contoid. The allophonic rules governing the
variation of voiced fricatives and stops in these and
other clusters are given in Section 6.3.1 and Section 6.3.2.

[7]In the words [l?íí] "diminutive" and [m?ųų́] "here"
the initial sequences of C? occasionally alternate with
?C or ?C?. However, the basic form appears to be C?,
as given above.

[8]Not all words of pattern CV?V alternate. Apparently
there is something in a particular type of phonological
environment which permits this type of alternation; probably
this is due to stress placement or the type of syllable
sequence occurring in the word.

[9]Under some circumstances the sequence C?VV may alternate with CV?V. For example [s?ýý] "we (inclusive)" is occasionally heard as [sý?ý]. However, the informant will not accept this pronunciation when it is repeated back to him. This metathesized pronunciation is quite rare.

5. VOWEL PHONEMES

5.1 INTRODUCTION

The resegmentation procedures give the linguist an inventory of all the contoid and vocoid segments in the language. The phonemes that these segments represent must now be determined.

This determination makes use of three characteristics of phonemes. The first characteristic is the contrastive nature of phonemes. In any utterance, if one phoneme is replaced by another the potential exists for the second utterance to mean something quite different from the first. It is this potential to produce meaning differences that allows us to say that two phonemes are different emic units; that is, they contrast.

The second characteristic is the nonsignificant variation that occurs potentially when a particular phoneme is found in various environments, or when it is uttered at different times. The human vocal apparatus is not a precision instrument. It does not produce exactly the same phonetic sound in successive trials, or in different phonetic environments. Frequently, the variation is so great that it is heard as a different phonetic segment. These segments are called allophones; commonly they are distributed so that only in a particular environment or circumstance does one variant occur, but

never elsewhere. This type of allophonic variation is
called a complementary distribution. Another type
of variation--free variation--also occurs, although more
rarely. In this case the allophones fluctuate regardless
of their environment. The important characteristic of
allophonic variation is not the type of variation, but
the fact that the allophones of a single phoneme are not
contrastive; they cannot produce changes in meaning.

The third characteristic of phonemes is their
distribution in patterns. When phonemes are displayed
on a chart by means of their contrastive features, the
distribution tends to be symmetrical. Furthermore, when
combinations of phonemes occur in clusters, these clusters
also tend to form a pattern. Of course, in any particular
language these tendencies may not be completely fulfilled;
but the tendencies remain as a general feature of language.

The procedure often used to determine the phonetic
system of a language is to examine pairs of sounds whose
point and manner of articulation are similar. These are
called suspect pairs of segments, because they could
conceivably be environmental variants of the same phoneme.

After determining the suspect pairs in his data,
the analyst looks for data to eliminate the possibility
that something in the environment determines which of the
two sounds will occur. If the environment is not
conditioning the variation, then the two sounds must be

considered as representatives of different phonemes. If the environment is conditioning the variation, then the sounds are allophones of the same phoneme.

The usual procedure to show that the environment is not causing the variation between pairs of segments is to find pairs of utterances, each containing one member of the suspect pair in environments as nearly identical as possible. Hypotheses explaining the variation between the members of the suspect pair in terms of the remaining non-identical parts of the environment are then made. If these hypotheses can be shown to be untenable on the basis of other language data, the members of the suspect pair are said to contrast in analagous environments. They must be allophones of different phonemes. A special case arises when the environments are identical. Then it is immediately clear that the environment is not causing the meaning difference, and that the segments involved belong to different phonemes.

In making the final determination of the phonemes, the way in which they are distributed must be taken into account. Sometimes the analysis depends in a crucial way on the pattern of distribution of segments in the language.

The vocoid segments occurring in our data are given in Chart 5-1. From these segments the suspect pairs have been determined, on the basis of phonetic similarity

between the segments. Chart 5-2 gives those suspect pairs which will be shown to be contrastive; Chart 5-3 gives those pairs which will be shown to be allophonic variants of one phoneme.

Chart 5-1. Inventory of Vocoid Segments

		Front Unrounded		Central Unrounded		Back Rounded	
High	Close	i	i̧			u	u̧
	Open	ɩ	ɩ̧			ʊ	ʊ̧
Mid	Close	e	ȩ			o	o̧
	Open	ɛ	ɛ̧	ʌ	ʌ̧		
Low	Close					ɔ	ɔ̧
	Open			a	a̧		

Chart 5-2. Suspect Pairs of Vocoids
Which Prove to be Contrastive

Suspect pairs leading to oral vowel phonemes.

    i - e

    e - a

    a - ɔ

    ɔ - o

    o̩ - ʊ

Suspect pairs of oral and nasalized vocoids.

    i - į̃   ɔ - ɔ̃

    e - ẽ   o - õ

    a - ã   u - ũ

Suspect pairs leading to the nasalized vowel phonemes.

    į̃ - ɛ̃

    ɛ̃ - ã

    ã - ɔ̃

    ɔ̃ - õ

    õ - ũ

Suspect pairs which prove to be allophonic variants
   of separate phonemes.

    i̦ - ẹ̃   ɩ - ɩ̃

    ɩ - ɛ   ɛ - ɛ̣

    ɩ̃ - ɛ̃   e - ɛ̃

    o - ʊ   ʌ - ʌ̃

    õ - ʊ̃   ʊ - ʊ̃

    ɛ - a

Chart 5-3. Suspect Pairs of Vocoids
Which Prove to be
Allophonic Variants

i - ɩ

i̬ - ɩ̬

e - ɛ

e̬ - ɛ̬

a - ʌ

a̬ - ʌ̬

u - ʋ

u̬ - ʋ̬

5.2 CONTRASTS BETWEEN SUSPECT PAIRS

The contrasts between the suspect pairs presented
in this section reveal a phonemic system containing six
oral vowels /i, e, a, ɔ, o, u/; at every point of articulation
a corresponding contrastive nasalized vowel is found. Thus,
there are two sets of vowel phonemes--an oral set and a
corresponding nasalized set. The phonetic description of
these phonemes is given when the phonemes and their allo-
phones are discussed in Section 5.3.

In the case of the nasalized vowel phonemes, pattern
pressure is important, because many of the nasalized vocoids
occur only rarely; therefore, data is not always available
to show clearly the contrasts and variations. When this
is the case we interpret them according to the pattern of
the corresponding oral vocoids.

5.2.1 Contrasts Leading to the Oral Vowel Phonemes

The following contrasts show that [i, e, a, ɔ, o, u]
represent separate phonemes.

The vocoids [i] and [e] contrast:

[čītá]	"pot"
[čētē]	"within"
[ʔī-tī]	"animal"
[ndʔété]	"plum"

The vocoids [e] and [a] contrast:

    [ǥʷēé]   "edible fruit"

    [ǥʷàà]   "no"

    [ndìdèbó]   "we have washed"

    [ndìdàbá-s]   "he has washed"

The vocoids [a] and [ɔ] contrast:

    [ǥ-áà-s]   "he buys"

    [ǥ-ɔ́ɔ̀-s]   "he jumps"

The vocoids [ɔ] and [o] contrast:

    [kɔ̄ʔɔ̄]   "foot"

    [k-ò?òō]   "we give"

The vocoids [o] and [u] contrast:

    [ndóòō]   "we arrive"

    [ndūū]   "cane"

    [čò?òō]   "we passed"

    [č-ū?ùū]   "we ate"

5.2.2 Contrasts Leading to the Establishment of Nasalized Vowel Phonemes

The following contrasts show that [i, e, a, ɔ, o, u] and their nasalized counterparts [i̧, ȩ, a̧, ɔ̧, o̧, u̧] represent separate phonemes.

The vocoids [i] and [į] contrast:

    [tì̄ī]   "where?"

    [tį̄į̄]   "head"

The vocoids [e] and [ę] contrast:

    [ǥ-ē?ē-ī]   "they eat"

    [ɏę̄y-ǥɔ̀tʌ́]   "coyote" (contracted form)

The vocoids [a] and [ą] contrast:

    [kʷáà]   [ɔ̧]   "white"

    [kʷā̧ā̧́]   "yellow"

    [kū-tà?á]   "I gather"

    [tū-tá̧?ą̀]   "chicken (feminine)"

The vocoids [ɔ] and [ɔ̧] contrast:

   ok [k-ɔ̀?ɔ́-s]   "he gave"

   ok [k-ɔ̧̀?ɔ̧́-s]   "he spoke"

The vocoids [o] and [o̧] contrast:

   ok [k-ō?ōó]   "we gave"

   ok [k-ō̧?ō̧ó̧]   "we spoke"

The vocoids [u] and [ų] contrast:

    [kúùū]   "iron"

    [kų́ų̀ų̄]   "four"

5.2.3 Contrasts Leading to the Identification of the Nasalized Vowel Phonemes

The following contrasts show that $[i, \varepsilon, \vartheta, \varrho, \psi]$ represent separate phonemes. The variant $[a]$ is not included in the above list for lack of data.

The vocoids $[i]$ and $[\varepsilon]$ contrast:

$[mi\acute{i}]$ "that"

$[m\bar{\varepsilon}\acute{\varepsilon}]$ "dark"

[a] I hear an [ɔ] (handwritten)

The vocoids $[\varepsilon]$ and $[a]$:

No good contrasts occur, since $[a]$ is a rare vocoid.

The vocoids $[a]$ and $[\vartheta]$:

No good contrasts occur, since $[a]$ is a rare vocoid.

The vocoids $[\vartheta]$ and $[\varrho]$ contrast:

$[k\text{-}\grave{\vartheta}?\grave{\vartheta}\text{-}\grave{i}\;k\acute{u}?\acute{u}\text{-}\acute{i}]$ "he is going to drink"

$[k\text{-}\bar{\varrho}?\bar{\varrho}\acute{\varrho}]$ "we (inclusive) spoke"

The vocoids $[\varrho]$ and $[\psi]$ contrast:

$[k\text{-}\bar{\varrho}?\bar{\varrho}\acute{\varrho}]$ "we (inclusive) spoke"

$[k\acute{\psi}\grave{\psi}\bar{\psi}]$ "four"

5.2.4 Contrasts Leading to the Separation of Allophonic Variants of Distinct Phonemes

The following contrasts show that $[i, \varepsilon, \xi, e, a]$ are members of separate phonemes.

The vocoids $[e]$ and $[i]$:

No good contrasts occur, since both are rare vocoids.

The vocoids [ɪ] and [ɛ] contrast:

    [nɪ]   "sentence particle" (bound)

    [nɛ́nɛ́]   "very"

The vocoids [ɪ̞] and [ɛ̞] :

    No good contrasts occur as [ɪ̞] is a rare vocoid.

The vocoids [o] and [ʋ] :

    No good contrasts occur as [ʋ] is a rare vocoid.

The vocoids [o̞] and [ʏ̞] :

    No good contrasts occur as [ʏ̞] is a rare vocoid.

The vocoids [ɛ] and [a] contrast:

    [nɛ́nɛ́]   "very"

    [ʔ-yánà]   "dog"

The vocoids [ɪ] and [ɪ̞] :

    No good contrasts occur as both are rare vocoids.

The vocoids [ɛ] and [ɛ̞] contrast:

    [yūnɛ̄]   "wind"

    [nʏnɛ̞]   "cactus fruit"

The vocoids [e] and [ɛ̞] contrast:

    [kʷēe̱]   "green"

    [kʷɛ́ɛ́]   "black"

    [ɣēyēe̱]   "ashes"

    [ɣɛ̞yɛ̞]   "tomb"

The vocoids $[\wedge]$ and $[\hat{\wedge}]$:

    No good contrasts occur since both are rare vocoids.

The vocoids $[\upsilon]$ and $[\curlyvee]$:

    No good contrasts occur since both are rare vocoids.

5.3 VOWEL PHONEMES AND ALLOPHONES

A description of the vowel phonemes is given in this section. The suspect pairs given in Chart 5-3 are included in the discussion; they represent the allophones of the vowel phonemes

5.3.1 Description of the Vowel Phonemes

The Oral Phoneme /i/--Suspect Pairs [i] and [ɩ]

The high close front unrounded phoneme /i/ has an allophone open [ɩ] which occasionally alternates with the close [i] contiguous to a nasal consonant. This fluctuation occurs infrequently;[1] the close allophone [i] occurs elsewhere.

Example of open [ɩ] :

    [nɩ/ni]   "sentence particle"

Examples of close [i] :

    [ndìkúù]   "old"

    [čīta̅]   "pot"

    [ʔītī]   "animal"

    [yúní]   "road"

This phoneme is distinct because of the contrasts between the suspect pairs [i] and [e], [i] and [i̞], [ɩ] and [ɛ].

The Nasalized Phoneme /i̞/--Suspect Pairs [i̞] and [ɩ̞]

The high close front unrounded phoneme /i̞/ has an open allophone [ɩ̞] which occasionally fluctuates with the close [i̞] contiguous to a nasal consonant; the close [i̞] occurs in all other environments.

Example of open [ɩ̧] :

    [ɣ̧ɩnnɛ̧-ɩ̧/ɣ̧ɩnnɛ̧-ɩ̧]   "he helps"

Examples of close [i̧] :

    [ní̧nú̧] .   "corn"

    [mí̧í̧]   "that" (adj.)

    [ɣ̧i̧?i̧]   "ardor"

This phoneme is distinct because of the contrasts
between the suspect pairs [i] and [ɛ], [i̧] and [i̧].

The Oral Phoneme /e/--Suspect Pairs [e] and [ɛ]

The mid close front unrounded phoneme /e/ has an
open allophone [ɛ] ; this allophone ranges in phonetic value
from mid open to low close front unrounded. The open
[ɛ] occurs contiguous to nasal consonants; the open [ɛ]
and the close [e] fluctuate following /č/ when not preceeding
/w/, /y/, or a word boundary; the close [e] occurs elsewhere.[2]

Examples of the open [ɛ] :

    [čɛ́nɛ́]   "fan for fire" (soplador)

    [čɛ̄m-bà?à]   "door"

    [yūnɛ̄]   "wind"

    [čɛ̄tè/čētè]   "within"

Examples of the close [e] :

    [čeye]   "small change"

    [gē?eé]   "mushrooms"

    [géčeè]   "arm, wing"

This phoneme is distinct because of the contrasts between
the suspect pairs [i] and [e], [e] and [ȩ], [e] and [a],
[ɛ] and [ɛ̧] , [e] and [ɛ̧] , and [ɛ] and [a].

The Nasalized Phoneme /ẹ/--Suspect Pairs [e] and [ɛ]

The nasalized phoneme /ẹ/ reflects the same basic

process that occurs in its oral counterpart. There, a

nasal consonant has the effect of lowering the close [e]

to open [ɛ] . Here, the nasalization of the vocoid itself

has the same effect: the close [ẹ] is lowered to [ɛ̣] .

There is one word in which the close [ẹ] remains: [yẹ̄y-gɔ̀tá]

"coyote", spoken rapidly. Apparently the high articulation of

the /y/ prevents the preceeding [ẹ] from being lowered. This

is the only example, however, in which the /y/ has this

effect; the same word, spoken more slowly, is [yɛ̄yɛ̣-ẹ̀tá.]

Thus, although the close [ẹ] occurs extremely

infrequently, it is the norm of the phoneme. As with the

oral counterpart, the open [ɛ̣] ranges from mid open to low close.

Examples of the open [ɛ̣] :

[ŕɛ̣́ɛ̣̀]	"dirty"
[kỹnnɛ̣̄-í]	"he helps"
[kʷɛ̣́ɛ̣́]	"black"
[bɛ̣̀ɛ̣̄]	"ear"

This phoneme is distinct because of the contrasts

between [e] and [ẹ], [ɛ] and [ɛ̣] , [e] and [ɛ̣] .

The Oral Phoneme /a/--Suspect pairs [a] and [ʌ]

The low open central unrounded phoneme /a/ has

a mid open allophone [ʌ] which occasionally fluctuates

with the low open [a],[3] especially word finally; before

/y/ it has an [i] off-glide, becoming [aⁱ]. The low open

/a/ occurs elsewhere. Phonetically, [a] ranges from central
to front in point of articulation.

      Example of [aʲ] :

        [ðāʲyú]   "my son"

      Examples of mid open [ʌ] :

        [táʌ-k?ɔ̀ɔ́/tá-k?ɔ̀ɔ́]   "she"

        [ɏ̧̄ȳȩ̄-ɡ̀tʌ́/ɏ̧̄ȳȩ̄-ɡɔ̀tá] "coyote"

        [nàndʌ́/nàndà́]   "flower"

      Examples of low open [a] :

        [č?àtà]   "large"

        [ndāčà]   "seven"

        [k-áà-s]   "he bought"

This phoneme is distinct because of the contrast
between the suspect pairs [e] and [a], [a] and [ɔ] ,
[ɛ] and [a], and [a] and [a̧].

The Nasalized Phoneme /a̧/--Suspect Pairs [a̧] and [ʌ̧]

      The low open central unrounded phoneme /a̧/ has a
mid open allophone [ʌ̧] which occasionally fluctuates with
the low open [a̧] ; before /y/ it has an [i] off-glide,
becoming [a̧ʲ]. The low open [a̧] occurs elsewhere. This
is a rare phoneme.

      Example of [a̧ʲ] :

        [pā̧ʲȳyų̄ ?índìčà]   "reboso"

      Example of mid open [ʌ̧] :

        [nyʌ̧́?ʌ̧̀?ʌ̧́/nyá̧?à̧?ā̧]   "floor"

Examples of low open [ạ̧]:

    kʷā̧ą́   "yellow"

    tū-tá̧?ạ̀   "chicken (feminine)"

This phoneme is distinct because of the contrast between the suspect pairs [a] and [ạ̧].

The Oral Phoneme /ɔ/

The low close back rounded phoneme /ɔ/ has no other allophones. It is a rare phoneme.

Examples of [ɔ]:

    [?úú ȩ-ɔ̄?ɔ́]   "I am giving"

    [?úú k-ɔ̄ɔ́]   "I jumped"

This phoneme is distinct because of the contrasts between the suspect pairs [a] and [ɔ], [ɔ]and [o], [ɔ]and [ɔ̧].

The Nasalized Phoneme /ɔ̧/

The low close back rounded phoneme /ɔ̧/ has no other allophones.

Examples of [ɔ̧]:

    [ȩɔ̧́ɔ̧̀ɔ̧̄]   "six"

    [tɔ̧́ɔ̧̀ɔ̧̄]   "angry"

    [k-ɔ̧̀?ɔ̧́-s]   "he spoke"

This phoneme is distinct because of the contrasts between the suspect pairs [ɔ̧] and [ȩ], [ɔ] and [ɔ̧].

The Oral Phoneme /o/

The mid close back rounded phoneme /o/ has no
other allophones. This phoneme is rare in words other
than verbs, where it marks the first person plural inclusive.

Examples of [o]:

[ncǒóòō]	"rotten"
[lóʔò]	"having no tail"
[ɲdóòō]	"we are arriving"

The phoneme is distinct because of the contrasts
between the suspect pairs [ɔ] and [o], [o] and [u], [o] and [o̧].

The Nasalized Phoneme /o̧/

The mid close back rounded phoneme /o̧/ has no other
allophones. It is rare, even in verbs.

Example of [o̧]:

[k-o̧ʔó̧ó̧]	"we (inclusive) spoke"

The phoneme is distinct because of the contrasts
between the suspect pairs [ɔ̧] and [o̧], [o̧] and [u̧], [o] and [o̧].

The Oral Phoneme /u/--Suspect Pairs [u] and [ʊ]

The high close back rounded phoneme /u/ has an open
allophone [ʊ] which occasionally alternates with the close [u]
preceeding a nasal consonant; this fluctuation is relatively
uncommon.[4] The high close [u] occurs in all other environments.

Examples of open [ʊ]:

[kūʊnɛ̄ɛ́/kūnɛ̄ɛ́]	"I remain"
[kʊ̀ndʔìyà/kùndʔìyà]	"below"

Examples of the close [u]:

[ndūyū]	"year"
[ɖú?ù]	"who?"
[yūɖī]	"green beans"

This phoneme is distinct because of the contrasts between the suspect pairs [o]and [u], [u] and [y̨].

The Nasalized Phoneme /u̧/--Suspect Pairs [u̧] and [ʊ]

The high close back rounded phoneme /y̨/ has an open allophone [y̨]which alternates with the close [u] in one word. The high close [y̨] occurs in all other environments.

Example of open[y̨]:

[ky̨ʾ̀ʋ̄/ky̨ʾ̀ʋ̄]	"four"

Examples of close [y̨]:

[ɖy̨ʾ̀ȳ̨]	"lard"
[?i̧yy̨ʾ]	"star"
[ɖ?i̧?yy̨ʾ]	"teeth"

This phoneme is distinct because of the contrast betwen [u] and [y̨].

5.3.2 Contrasts Between Vowel Phonemes

The front oral vowels /i, e, a/ contrast:

/ɓi̧?ì/	"sister of a man"
/ɓē?é/	"gourd" (chilacayote)
/ɓā?á/	"house"

The front nasalized vowels /į, ę, ą/ contrast:

    /mį́?į̀/   "crushed"

    /nę̄?ę́/   "I want"

    /ną́?ą́/~/nɔ́?ɔ́/   "firewood"

The back oral vowels /u, o, ɔ/ contrast:

    /kū?ū/   "plate"

    /k-ō?ōó/   "we (inclusive) gave"

    /kɔ̄?ɔ́/   "my foot"

The back nasalized vowels /ų, ǫ, ǫ̈/ contrast:

    /ǭų̄?ų̄/   "five"

    /k-ō?ōó/   "we (inclusive) gave"

    /k-ɔ̄?ɔ̄-í/   "he is going"

The high oral vowels /i, u/ contrast:

    /yūdī/   "beans"

    /?-yúùdù/   "horse"

The high nasalized vowels /į, ų/ contrast:

    /tįį/   "head"

    /kų́ų̀ų̄/   "four"

The mid oral vowels /e, o/ contrast:

    /čě?ē/   "to eat"

    /čó?ò/   "to pass"

The mid nasalized vowels /ę, ǫ/ contrast:

    /kʷę́ę́/   "black"

    /k-ǭ?ǭǫ́/   "we (inclusive) spoke"

The low oral vowels /a,ɔ/ contrast:

/ká?à/ .   "thin"

/kɔ̄?ɔ́/   "my foot"

The low nasalized vowels /ą, ǫ / contrast:

/kʷą̄ą́/   "yellow"

/k-ǫ̀?ǫ́-s/   "he spoke"

5.3.3 Fluctuation Between Vowel Phonemes

It has been shown that the low vowel phonemes /a, ą,ɔ ,ǫ/ are contrastive (Sections 5.2, 5.3.1). However in many words there is free fluctuation between /a/ and /ɔ/, and between /ą/ and /ǫ/.

Examples of fluctuation between /a/ and /ɔ/:

/tā?ā/~/tɔ̄?ɔ̄/   "hand, leaf"

/kʷā?āá/~/kʷɔ̄?ɔ̄ɔ́/   "reddish"

Examples of fluctuation between /ą/ and /ǫ/:

/mą́?ą̀/~/mǫ́?ǫ̀/   "half"

/yą́?ą̀/~/yǫ́?ǫ̀/   "tree, stick"

5.4 SUMMARY

The vowel phonemes of Cuicateco are given in Chart 5-4. The front vowels are unrounded; the back vowels are rounded, but only slightly.

Chart 5-4. The Vowel Phonemes of Cuicateco

	Front		Back	
High	i	i̢	u	u̢
Mid	e	e̢	o	o̢
Low	a	a̢	ɔ	ɔ̢

NOTES

[1]The open allophone occurs only rarely. When taping examples of the open [ɪ] and [ɨ̞] , the informant pronounced the words in which they usually occur only with the close allophone [i] and [ɨ].

[2]The allophones [e] and [ɛ] also fluctuate in forms of the verb "to eat": [čɛ́ʔē/čḗʔē] "ate" is explained by the past tense marker č-; however, the present tense [ɡɛ́ʔè/ɡé́ʔè] "eat" is an apparent exception. Perhaps the fluctuation occurs by analogy with the past tense form; this alternation does not occur in other words containing the phoneme /ḛ/.

[3]When taping examples of words containing the mid open [ʌ] and [ʌ̞] , the informant consistently used these allophones, rather than the low open [a] and [a̞].

[4]As in the case of the front [ɪ·] and [ɨ̞] , the words containing high open back [ʋ] and [ɥ̞] were pronounced with the open [u] and [ɥ̞].

6. CONSONANT PHONEMES

6.1 INTRODUCTION

The process of determining the phonemes of a language is given in the introduction to Chapter 5. The same principles apply in the determination of the consonant phonemes.

A chart of the contoid segments which occur in our data is given in Chart 6-1.

The suspect pairs of contoids are determined on the basis of phonetic similarity between sets of segments on the chart. The suspect pairs which will be shown to be contrastive are given in Chart 6-2; those which will be shown to be allophonic variants are given in Chart 6-3. Certain segments ([ϑ, s, h, x]) occur only in contractions. Suspect pairs involving these segments are listed in the last section of Chart 6-3. They are discussed in Section 6.43 after the consonantal phonemes have been described.

Chart 6-1. Inventory of Contoid Segments

	Bilabial	Interdental	Dental	Alveopalatal	Palatal	Velar	Labiovelar	Glottal
Stops - Vl.	p		t			k	kʷ	ʔ
Stops - Vd.	b		d			g		
Affricate				č				
Fricatives - Vl.		θ	s	š		x		h
Fricatives - Vd.	ƀ	đ				ǥ	ǥʷ	
Lateral			l					
Nasals	m		n			ŋ		
Flap			ř					
Trill			r̃					
Glides				ɏ	y		w	

Chart 6-2. Suspect Pairs of Contoids
            Which Prove to be Contrastive

Suspect pairs involving voiceless stops

    p - b

    t - d

    k - g

    t - č

Suspect pairs involving flap [ř] and trilled [r̃]

    l - ř

    ř - r̃

    ř - d

Suspect pairs involving velar and labiovelar contoids

    k - k^w

    g - g^w

    k - x

    w - ƀ

Suspect pairs involving the glottal stop

    ? - ∅

    ? - h

    ? - k

    ? - t

Chart 6-3. Suspect Pairs of Contoids
         Which Prove to be Allophonic
         Variants

Suspect pairs of voiced stops and voiced fricatives

   ƀ - b

   đ - d

   ǥ - g

Suspect pairs of nasals

   n̄ - ŋ

Suspect pairs involving contoid glides

   y - ɥ

   ǥ - w

   ǥ^{w} - w

Variants occurring only in contractions

   t - ɵ

   đ - ɵ

   ǥ - x

   č - š

   š - s

6.2 CONTRASTS BETWEEN SUSPECT PAIRS

The contrasts between the suspect pairs discussed
in this section form the basis for the phonemic system
of consonants. A chart of consonants is given in the
summary of this chapter, Section 6.5

6.2.1 Suspect Pairs Involving Voiceless Stops

It is difficult to find contrasts for those suspect·
pairs which include a voiced stop, since voiced stops occur
only contiguous to nasal contoids. Where such contrasts
are not available, we assume that the segments follow the
pattern of the other contrasts between voiced and voiceless
stops.

The dental stops·[t] and [d] contrast:

[yān-tík^{w}à]   "stomach"

[nčā-ndíkùù]   "father-in-law"

[n-tó?ò]   "ruins"

[?ī-ndō?óó]   "trunk (of tree)"

The velar stops [k] and [g] contrast:

[ŋ-kɔ̀?ɔ̀]   "forked stick" (horcón)

[ŋ-góɔ̀tù]   "rifle"

The bilabial stops [p] and [b]:

No good contrasts occur, as both are rare contoids.

The stop [t] and the affricate [č] contrast:

    [tú?ù]   "chicken (general)"

    [č-ú?ūú]   "we (inclusive) are eating"

    [nd?ētē]   "plum"

    [şēečè]   "arm, wing"

6.2.2 Suspect Pairs Involving Flap [ř] and Trill [r̃]

The flap [ř] and the trill [r̃]:

No good contrasts occur; both contoids are rare, occurring only in Spanish loan words. The Spanish [ř] and [r̃] contrast intervocalically: [peřo] "but"; [per̃o] "dog"; we assume that this contrast is preserved in Cuicateco.

Examples of [ř] and [r̃] in loan words are:

    [tāndiřa]   "falsehood" (Spanish: mentira)

    [kuřa]   "corral" (Spanish: corral)

The flap [·ř] and the lateral [l]:

No good contrasts occur, as both are rare contoids.[1]

The flap [ř] and the stop [d]:

No good contrasts occur, as both are rare contoids.

6.2.3 Suspect Pairs Involving Velar and Labiovelar Contoids

The velar [k] contrasts with the labiovelar [kʷ]:

    [ká?à]   "thin"

    [kʷá?à]   "red, gringo"

[kōō]   "joint"

[kʷ-óòō]   "we (inclusive) will buy"

The velar [g] contrasts with the labiovelar [gʷ]:

[gāā]   "skirt"

[gʷàà]   "no"

The stop [k] contrasts with the fricative [x] :

[k-àá]   "I bought"

[x-āà]   "they (inaminate) will fall"

The labiovelar [w] contrasts with the bilabial [ƀ]:

[wī?ī]   "edible fruit"

[ƀīčí]   "cat"

6.2.4 Suspect Pairs Involving the Glottal Stop

The glottal stop [?] contrasts with its absence:

[ƀàà]   "there is; to have"

[ƀà?á]   "house"

[ñāā/nɔ̄ɔ̄]   "face"

[ñá?á/nɔ́?ɔ́]   "firewood"

The glottal stop [?] contrasts with [k]:

[?úú]   "I"

[kúú]   "snake"

[kū-tā?á]   "I gather"

[tākā/tɔkɔ]   "how?; what?"

The glottal stop [?] contrasts with [t]:

[?úú]   "I"

[túùū]   "stone"

[kʷāʔáá/kʷɔʔɔɔ]   "reddish"

[kʷʔátàā/kʷʔɔtɔɔ]   "basket"

The glottal stop [?] and [h]:

No good contrasts occur, as h is a rare contoid.

6.3 ALLOPHONIC VARIATION BETWEEN SUSPECT PAIRS

6.3.1 Suspect Pairs of Voiced Stops and Fricatives

Voiced stops occur following a nasal consonant or preceeding a voiced consonant word medially. Voiced fricatives occur elsewhere.[2]

Examples of bilabial stop [b]:

[ndūb-náàā/ndūb-nɔ̀ɔ̄] "to forget"

[ndūb-ɓābā]   "to clean"

Examples of bilabial fricative [ɓ]:

[ɓātī]   "dirty"

[kúɓì]   "rain"

Examples of dental stop [d]:

[nàndà]   "flower"

[ndīkúù]   "old"

Examples of dental fricative [ð]:

    [ðíí]   "you (familiar)"

    [ðūðī]   "aunt"

    [ðmɛ̧ɛ̧/ðʌmɛ̧̄ɛ̧̄]   "day after tomorrow"

Examples of velar stop [g]:

    [nāŋ-gūbī]   "three days past"

    [ŋ-gɔ́ɔ̀tù]   "rifle"

Examples of velar fricative [ǥ]:

    [ǥūbī]   "day"

    [ʔī-ǥáà]   "it is falling"

Examples of labiovelar fricative [ǥ^w]:[3]

    [ǥ^{w}ɛ̧́ɛ̧̀]   "slender"

    [ǥ^{w}ēé]   "orange (fruit)"

6.3.2 Suspect Pair of Nasals

The velar nasal [ŋ] occurs before velar consonants; the dental [n] occurs elsewhere.[4]

    Examples of velar [ŋ]:

    [nāŋ-gūbī]   "three days past"

    [ŋ-kɔ̄ʔɔ̄]   "forked stick" (horcón)

    Examples of dental [n]:

    [yān-tík^{w}à]   "stomach"

    [kūmnā]   "before"

    [nɛ̧̄ʔɛ̧́]   "I want"

6.3.3 Suspect Pairs Involving Contoid Glides

The contoids [y̵] and [y]

The alveopalatal glide [y̵] occurs before front high and mid vowels word initially; the palatal [y] occurs elsewhere.

Examples of alveopalatal [y̵]:

[y̵íkú]   "river"

[y̵ɛ́yɛ̀]   "tomb"

[ʔíʔada̅ y̵ēko̅]   "quail"

Examples of palatal [y]:

[yàtà]   "grass"

[yúùndù]   "tortilla"

[čeye]   "small change"

The contoids [w] and [ɣ]:

The labiovelar glide [w] occurs before the high vowel /i/; [w] alternates with the velar fricative [ɣ] before /u/ or /ʉ/ phrase initially. The fricative [ɣ] occurs in all other environments. [5]

Examples of labiovelar [w]:

[čē-wínù]   "dinner"

[wi̅ʔí]   "edible fruit"

[kʔɔ́k-wínù]   "night before last"

Examples of Velar [ɣ]:

[ɣʔɔ̀ʔ̅]   "six"

[ɣʉ̣ʔʉ̅/wʉ̣ʔʉ̅]   "five"

[ɣè̀ʔèē]   "mushroom"

The contoids [w̄] and [ə^W]:

The [w̄] occurs phrase initially; the [ə^W] occurs elsewhere; however, due to the labialization of the [ə^W] the initial glide is heard lengthened: [ww]. It is thus distinct from the [w̄] allophone of [ə] discussed above. Examples are:

[ə^Wέὲ/wwέὲ]   "slender"

[ə^Wé-tyὰὰ/wwétyὴὴ]   "early morning" (madrugada)

6.4 THE CONSONANT PHONEMES

6.4.1 Description of the Consonant Phonemes

The voiceless stops /p, t, k, kʷ/ occur at bilabial,
dental, velar and labio-velar points of articulation. They
have no other allophones. They are distinct because they
are articulated at divergent points of articulation, and
because of the contrasts between the suspect pairs [k] and [kʷ],
[t] and [d], [k] and [g].

The glottal stop /ʔ/ has no other allophones. It
is distinct because it contrasts with its absence, with
[t] and with [k].[6]

The voiced fricatives /ƀ, đ, g, gʷ/ occur at bilabial,
interdental, velar and labiovelar points of articulation.[7]
They have voiced stop allophones at corresponding points
of articulation following a nasal or preceeding a voiced
consonant word medially. The velar fricative /g/ has a
further allophone [w] occurring before /i/, and optionally
before /u/ or /ʉ/ utterance initially. The labiovelar
fricative [gʷ] has an allophone [ww] occuring phrase
initially.

The voiceless dental fricative /s/ has no other
allophones. It is distinct because no other contoids
are phonetically similar enough to form a suspect pair.
It occurs in only a few words; however, they are frequently
used words: [sʔúý] "we (inclusive)"; [sá̰ʔá̰] "man"; [-s/-sa]
"third person singular informal".

The voiced dental lateral /l/ has no other
allophones. It is a rare phoneme, occurring in only
two instances in our data, although one of these is
commonly used, the diminutive [l?íí]. The lateral forms
a suspect pair, [l] and [r̆]. There is not enough data
to prove these two contoids contrastive; however, [r̆]
occurs only in Spanish loan words while [l] occurs only
in native words. For this reason it seems best to treat
[l] as a separate phoneme.

The voiced nasals /m, n/ occur at the bilabial and
dental points of articulation. The bilabial nasal /m/
has no other allophones. The dental nasal /n/ has a velar
allophone [ŋ] occurring before velar consonant. There is
an occasional phonemic alternation between /m/ and /n/
(see note 3 of this chapter). The phonemes are distinct
because no other segments are potential allophones.

The voiced dental flap [r̆] and trill [r̃] have no
other allophones. Not enough data is available to
completely determine their function; since they occur
only in Spanish loan words, we presume that they retain
their Spanish contrast.

The voiced palatal glide /y/ has a voiced alveopalatal
flat fricative allophone [y̦] which occurs word initial
before front high and mid vowels. It is distinct because
there are no other phonetically similar segments.

6.4.2 Contrasts Between the Consonant Phonemes

The voiceless stops /p, t, k, kʷ/ contrast word initially:

/pá?à/	"baby (nickname"
/tá?à/-/tɔ́?ɔ̀/	"leaf; hand"
/ká?à/	"thin"
/kʷá?à/	"red"

The voiceless stops contrast word medially:

/?íp?à/	"snow"
/č?àtà/	"large"
/tákà/-/tɔ́kɔ̀/	"what?; how?"
/tíkʷàā/	"side (of a person)"

The affricate /č/ contrasts with dental stop /t/:

/tú?ù/	"chicken (general"
/čú?ūú/	"we (inclusive) are eating"
/nàùtíí/	"fruit; seed"
/?ī-dūčīī/	"game"

The affricate /č/ contrasts with dental fricative /s/:

/č?ę́ę́/	"grandfather"
/?í-s?ę̀ę̀/	"they (near)"

The voiced fricatives /ƀ, đ, ǥ, ǥʷ/ contrast word initially:

/ƀàà/	"there is; to have"
/đāmí/	"my back"
/ǥāā/	"skirt"
/ǥʷàà/	"no"

	TPE	CPA	MPA	TPO	TLA	TEU
Tepeuxila	93	86	96	94	85	79
Concepción Pápalo	88	96	98	82	93	83
Sta Ma Pápalo						
Teponaxtla	99	97	94	93	100	100
Sta.m. Tlalixtac						
Teutila.	88	89	89	83	99	98

Teutila.
Tlalixtac
Concepción Pápalo
Sta. Ma. Pápalo
Teponaxtla
Tepeuxila
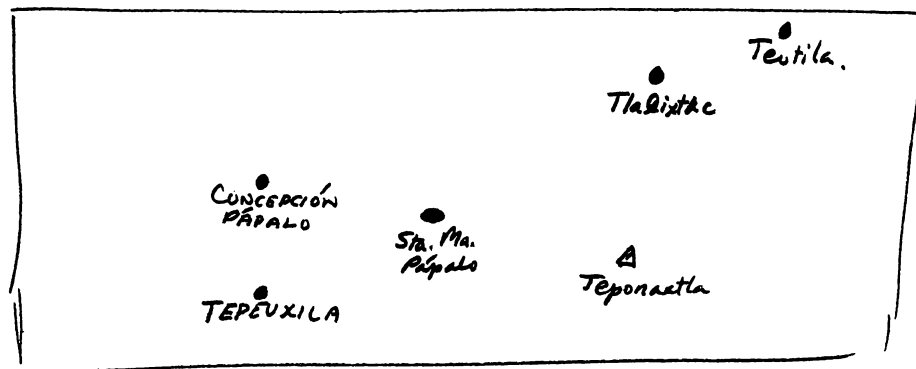
△ municipio libre.

The voiced fricatives /ƀ, đ, ǥ/ contrast word medially:[7]

/kúƀì/	"rain"
/tī-ʔúúđī/	"mouse"
/čē-ǥínù/	"evening meal"

The nasals /m, n/ contrast:

/mą̨ʔą̀/~/mʔ̨?ʔ̀/	"half"
/ną̨ʔą̨/~/nʔ̨?ʔ́/	"firewood"
/ʔámá/	"one"
/ʔ-yánà/	"dog"

The bilabials /p, ƀ/ contrast:

/pą̄yų̄ ʔínđìčà/	"reboso"
/ƀàà/	"there is; to have"

The dentals /t, đ/ contrast:

/tú?ù/	"chicken (general)"
/đù?ù/	"who?"

The velars /k, ǥ/ contrast:

/kúƀì/	"rain"
/ǥūƀī/	"day"

The labiovelars /kʷ, ǥʷ/ contrast:

/kʷę́ę́/	"black"
/ǥʷę́ę́/	"slender"

6.4.3. Phonetic Replacement Occurring in Contractions

The syllable /čV/

Before /t/, this syllable is replaced by /s/. Since /s/ is a full phoneme, contrasting with /č/, this must be considered a phonemic replacement. Examples:

[ɓìs-tá̧ʔà̧] "female cat" --/ɓìčí/ "cat"; /tá̧ʔà̧/ "female"

[ʔúú s-tà̧ʔā] "I gathered"--/čV-/"past"; /ta̧ʔa̧/ "gather"

Before /n/, the syllable /čV/ is replaced by [š] or [h]:

[ʔǐ-sʔú̧ú̧ h-nȩ́ʔȩ̀-ì̧]/ [ʔǐ-sʔú̧ú̧ š-nȩ́ʔȩ̀-ì̧] "they heard"

--/ʔǐ-sʔú̧ú̧/"they";/čV-/ "past" /nȩ́ʔȩ̀/"hear"

Before any other consonant, /čV/ is replaced by [š]:

[šɓàtú]"goat" (Spanish)-- [čìɓatu](Spanish: chivato)

[š-ɡȩ́ʔènè] "edible things"-- čV from/čéʔē/"ate".

(cf. [čē-wínù]"evening mean"; [čē-ɡʷȩ̄̄ȩ̄] "dinner")

[ɡȩ́ʔènè], meaning unknown.

In the full form /čV/, the affricate /č/ occurs:

[čē-wínù]   "evening meal"

[ɓǐčí]   "cat"

[č-ʔȩ̀n-ɓ ȩ̀-ì̧]   "(they) listened"

The syllable /ðV/

The syllable /ðV/ contracts to [θ] or /ð/. The voiceless and voiced interdental fricatives alternate in these contractions, but [θ] is more common preceeding a voiceless consonant or silence. (In the case of /ðV/ contracting to /ð/, there is no replacement involved; just the dropping of the vowel.)

Examples of /đ/:

[đmɛ̄ɛ̄/đʌ̃mɛ̠ɛ̠]   "day after tomorrow"

Example of [θ] :

[θ-kʔáyà]   "young"

    compare [sa̠ʔa̠-kʔaya] "young man"

6.5 SUMMARY

The consonant phonemes of Cuicateco are given in Chart 6-4.

Chart 6-4. The Consonant Phonemes of Cuicateco

	Bilabial	Dental	Alveopalatal	Palatal	Velar	Labiovelar	Glottal
Stops	p	t			k	kʷ	ʔ
Affricate			č				
Fricative - Vl.		s					
Fricatives - Vd.	b	đ			ǥ	ǥʷ	
Lateral		l					
Nasal	m	n					
Flap		ř					
Trill		r̃					
Glide				y			

NOTES

[1]It would be possible, on the basis of our data, to say that [l] and [ř] are in complementation, since [l] occurs only initially and [ř] occurs only medially. However, both are rare contoids ([l] occurs in two words; [ř] in three); furthermore, since [ř] occurs only in borrowed words and [l] only in native words, it seems best to retain them as contrastive.

[2]Needham and Davis (1946) have analyzed the voiced stops as allophones of the voiceless stops; they occur following "a non-syllabic nasal n, or a consonant cluster of a nasal n plus a glottal stop within the same morpheme... When a morpheme boundary divides a cluster of nasal plus stop, the stop remains voiceless and the nasal is always syllabic."

(p. 139) This analysis would handle the dental stops [t] and [d] in our data; however, the velar and bilabial stops cannot be handled in the same manner, as the sequences [mb] and [ŋg] do occur over morpheme boundaries: [čǐm-bá?à]"door" [nāŋ-gūbī]"three days past". No such problems arise if the voiced fricative is considered the basic morpheme.

The analysis of the voiced stops as allophones of the voiced fricatives is supported by the fact that [nd] occasionally alternates with [đ] or [n](but never with [t]): [ndùtīi]"seed; fruit";[đuti-tī]"egg";[nu-ndibī]"potato" (round fruit

Two loan words, however, illustrate a different origin of the voiced stops: [kúmbà] from Spanish "compadre" (companion); [tāndiřà]from "mentira" (falsehood). Here the Spanish[mp] and [nt] have changed in Cuicateco to [mb] and [nd] re-respectively, although the sequences [mp] and [nt]are permitted in the language. The most probable explanation is that although these sequences are permitted, they are less common than the sequences [mb] and [nd] ([mp]does not occur at all in our data; [nt] only once); therefore, the borrowed words sound "more Cuicateco" if the voiced stops are used. A similar process occurs with loan words containing the phoneme /o/; the /o/ becomes /u/ when borrowed into Cuicateco, even though /o/ is a phoneme in the language (e.g. "compadre" becomes [kúmbà]; "burro" becomes [búřù].)

[3]The corresponding voiced stop [g^w] does not occur in our data. However, we expect that it would occur, in a word in which the fricative [ǥ^w]followed a nasal within the same word.

[4]There is a phonemic alternation between /n/ and /m/ preceeding a bilabial stop: [ku?nɛ-bɛ́ɛ̯] "to listen" and the contracted form of the same word: [kum-bɛ́ɛ̯].

[5][ɡ] occasionally alternates with [x]; the environment is not clear. Compare [?i-ɡáà] "it falls"; [š-ɡáá] "it fell"; [xáà] "they will fall". Also [nduxe?e] "papaya" probably a compound of [ndútlí] "fruit" and [ɡe?e] (meaning uncertain, perhaps related to [ɡē?ḗ] "mushroom").

[6]The presence of a glottal stop sometimes causes laryngealization of the contiguous vowels, particularly if there is a glottal stop elsewhere in the word. For example, in [b?à?à] "fear" and [d?í?yǘ] "teeth", there is laryngealization throughout the word.

[7]The labiovelar [ɡʷ] does not occur word medially in our data.

7. PROSODIES: TONE AND STRESS

7.1 INTRODUCTION

A detailed analysis of tone and stress is beyond
the scope of this study. In this report tone has been
written impressionistically; it has not been checked
in frames. Stress has not been written since it does not
seem to play an important role in the segmental phonology.

7.2 TONE

The register tone of Cuicateco is manifested on the
syllable level. It is phonemic since we observe minimal
tone pairs. For example:

[ḡāā]	"skirt"
[ḡāá]	"my skirt"
[ndɪ̆čɪ]	"ten"
[ndɪ̄čí]	"I saw"

Cuicateco apparently has three phonemic tones. We
have symbolized them as ´ for high tone, ` for low tone
and — for mid tone, written over the nucleus of the
syllable.

Chart 7-1 gives the combinations of tones observed
on two syllable words in isolation. Of the nine possible
combinations, eight occur; the only pair not observed
is high-mid.

Chart 7-1. Occurrence of Tone Pairs
in Isolation

	High	Mid	Low
High	⟋ ⟋		⟋ ⟍
Mid	— ⟋	— —	— ⟍
Low	⟍ ⟋	⟍ —	⟍ ⟍

7.3 STRESS

It is not clear from our present data whether stress
is phonemic. Evidence that it might be non-phonemic
is the absence of pairs of words that differ only by
stress, and the preponderence of stressed syllables which
have high tone. Evidence to the contrary is the occurrence,
even if infrequent, of stressed syllables with mid and
low tones. If stress is non-phonemic, it is conditioned
by factors other than tone alone.

8. SYLLABLE AND PHONOLOGICAL WORD

8.2 INTRODUCTION

The segmentation of a stream of speech into emic syllables, like the determination of other emic units, is a circular process best approached by successive approximations. The phonetic segmentation of a stream of speech into etic peaks of prominence gives a rough identification of syllable nuclei. This raw phonetic data is the material from which the emic syllables are determined.

The syllables that occur in language are not all equally important. Certain syllables, those that contain sequences of non-suspect contoids and vocoids, manifest the fundamental syllable patterns of the language. In these syllables, if the slots of the non-suspect contoids are symbolized by the symbol C and the slots of the non-suspect vocoids by the symbol V, the resulting C-V patterns are called canonical syllable patterns. These patterns are used to interpret or resegment suspect segments and sequences of segments.

New syllable patterns may arise by interpretation using the canonical syllable patterns, or through an independent identification of syllable nuclei. An example of the first process is the syllable V which arises from the sequence CVCV in a language having only a canonical syllable pattern CVC. In this case the pattern must be interpreted as CVC.V, leading to the new syllable

pattern V. In Cuicateco, an example of the second
process occurs. Here, a single tone marks the nucleus
of a single syllable. Hence the sequence CVV must be
interpreted as CV.V, giving rise to the new syllable
type V.

8.2 ETIC SYLLABLE PATTERNS

The discussion below inventories the etic syllable
patterns found in Cuicateco.

8.2.1 The Syllable Pattern CV

The syllable pattern CV is the basic canonical
syllable pattern of the language. It arises from
phonological words of the type CVCV, such as /daba/
"clean" where all segments are clearly non-suspect segments.

This syllable pattern is the basic pattern of many
commonly occurring bound morphemes. The morphemes
/-ti/ "animal"; /-sa/ "third person masculine singular
familiar"; /-ta/ "third person feminine singular" are
typical examples.

Further examples of the syllable pattern CV are
given below.

/dā.mí/	"my back"
/bī.čí/	"cat"
/čē.nē/	"fan for fire" (soplador)
/yá.mì/	"corn silk"

/ęí.nù/   "night"

/ʔá.ma᷄/   "one"

/ęū.bī/   "day"

/nį́.nų́/   "corn (grain)"

/tú.ʔù/   "chicken (general)"

/čē.tē/   "within"

/ló?ò/   "having no tail"

/čē.ęí.nù/   "evening meal"

/ku.ya.ku/   "above"

/kā.ɖį́.nų̀/   "lunch"

8.2.2 The Syllable Pattern CCV

The syllable pattern CCV arises from the resegmentation procedures discussed in Section 4.3.2. Examples of this syllable pattern are found initially and medially in non-contracted words, and initially only in contracted words.

Examples of the pattern CCV occurring initially in the phonological word are given below.

/čkų̄.ʔų̄/   "grandmother"

/ʔú.ú s-tà.ʔā/   "I gathered"

/n-kɔ̀.ʔɔ̄/   "to deliver"

/nɖā.čā/   "seven"

/nɖì.kú.ù/   "old

Examples of the pattern CCV occurring medially in the phonological word are given below.

/lū.ū.nčí/   "sheep (general)"

/ʔí.ndà.á/~/ʔí.ndɔ̀.ɔ́/ "I arrived"

/ʔī.-nčé.ʔè.ʔē/   "falsehood"

8.2.3 The Syllable Pattern CCCV

The syllable pattern CCCV also arises from the resegmentation processes discussed in Section 4.3.2 and Section 4.3.3 This pattern occurs initially and medially in non-contracted words, and initially only in words that are apparently contractions.

Examples of the pattern CCCV occurring initially in the phonological word are given below.

/ndʔé.è.ē/   "much"

/ndʔé.té/   "plum"

/ndʔà.ɓá/   "pretty"

/čndí.ì.ī/   "hat"

There is only one example in our data of the pattern CCCV occurring medially in the phonological word: /ndʔē.ēndʔá.à.ā/ "very much".

8.2.4 The Syllable Pattern V

The syllable pattern V arises from the resegmentation of vocoids discussed in Sections 3.3, 3.4, 3.5. This pattern never occurs initially in the phonological word. Examples are given below.

/b̀a.à/	"there is; to have"
/tū.ū/	"thick"
/mḛ̄.ḛ́/	"dark"
/tí.nù.ū/	"clothing"
/ndù.tī.í/	"fruit; seed"
/lū.ū.ňčí/	"sheep (general)"
/ḛ́.è.čè/	"arm; wing"
/tú.ù.ū/	"rock"
/ndó.ò.ō/	"we (inclusive) are arriving"

8.2.5 The Syllable Pattern VC

The syllable pattern VC occurs only finally in the phonological word; it is found only in verb forms, where the final person-marking suffix has been contracted. Examples are given below.

/dí.ì k-ɔ́.ɔ̀-d/	"you (familiar) jumped"
/ndʔì.ì k-á.à-n/	"you (formal) bought"
/sā-mḭ̄.ḭ̄ g-á.à-s/	"he buys"

8.2.6 The Syllable Pattern CVC

The syllable pattern CVC occurs both initially in the phonological words containing contractions.

Examples of CVC occurring initially are:

/nān.gū.b̄i/	"three days past"
/b̄is.tá̰.ʔà/	"female cat"
/čēm.b̄áʔà/	"door"

Examples of CVC occurring finally are:

/saā.-mǐ.ǐ ·kɔ̀.ʔɔ̄-s/ "he gave"

/sá.-mǐ.í kɔ̄.ʔɔ̀.má.-s/ "he is going to speak"

8.2.7 The Syllable Pattern CCVC

The syllable pattern CCVC occurs only initially in
the phonological word; it occurs only in contracted words
Examples are given below.

/nɗub.ɗà.ɓà/   "to clean"

/nɗūb.ná.ə̀.ə̄/   "to forget"

8.3 PROPOSED EMIC SYLLABLE PATTERNS

On the basis of the etic syllable types given in
Section 8.2 we propose here the following emic syllable
patterns: CV, CCV, CCCV and V. These syllable types are
all contrastive in the same slot in the phonological
word (see Chart 8-2, Section 8.6), and therefore represent
different emic types. They are called proposed types
because the analysis of the phonological word is
incomplete (see Section 8.6). The etic syllable patterns
VC, CVC, CCVC are considered here as etic variants of
phonological words--words that are shortened to syllables
by contraction.

The contrastive features of the syllable are

1.   Each syllable contains a nucleus filled by a

vowel, and a margin filled by one or more

consonants.

2. Each nucleus is marked by the obligatory placement

of tone. Only one tone occurs on each vowel

nucleus.

8.4 THE PROCESS OF CONTRACTION AND RESULTANT VARIANT SYLLABLE PATTERNS

There are two contraction processes which occur

in Cuicateco. The primary one is the dropping of a

vowel. In all cases, this results in the dropping of a

syllable, sometimes also yielding a consonant cluster.

In many cases, the contracted form of a word is the only

one in common use. Some examples of this process are

given below. Those syllables which are involved in the

changes between syllable types are underlined. An

asterisk indicates that the long form does not occur in

our data, but we have constructed it for purposes of

illustration on the basis of a knowledge of the morphemes

involved.

CV.CV.CV   contracts to   CCV.CV

/dū.kʷá.ʔá/ "baby"   /dkʷá.ʔá/ "baby"

CV.CV.CV.CV contracts to CVC.CV.CV

*/bī.či-tá.ʔə̧/ "cat; fem." /bīs.tá.ʔə̧/ "female cat"

CCV.CV.CV.CV contracts to CCVC.CV.CV

*/ndu.bi.-da.ba/ "produce; /ndùb.dà.bà/ "to clean"
                  clean"

CV.V.CV   contracts to   CV.VC

/ɡ-á.à.-sa/ "pres;he;buy"   /ɡ-á.à-s/   "he buys"

In the following examples, no change occurs in the type of syllable.

CV.V.CV   contracts to   CV.CV

/ɡé.è.čè/ "arm"   /ɡ-è.čè/ "arm" in the phrase
                                  /ʔùɓì ɡèčè/ "two arms"

CV.V.V   contracts to   CV.V

/mḛ́.ḛ̀.ḛ̄/   /mḛ̄.ḛ̄/ "cloud" in the phrase
                                  /mḛ̄ḛ̄ yá̰ʔà̰ʔā̰/ "it is
                                  foggy"

The other contraction process is the optional dropping of a word initial glottal stop in phrase medially position or within a compound word. For example, the word "mouse" occurs in two forms: /tī-ʔúúɓì//tī-úúɓì/; the verb "I see" /ʔi-naa//ʔi-nɔɔ/ loses its glottal in phrases: [ʔúú ínà̰á yàtà] "I see the grass".

The patterns that result from these contraction processes (initial V; CVC, VC, CCVC) are not considered to be phonemic because they occur only in contractions and never in non-contracted words. The types CCV and CCCV, while they can occur as a result of a contraction, also occur in non-contracted words, and therefore are considered to be emic types.

While the patterns CVC, CCVC, VC are variant syllable types, they are not variants of single emic syllables.

Rather, they are variants of a sequence of emic syllables,
arising due to the loss of a syllable from the sequence
because of contractions. Further analysis must be done
before assigning these patterns to emic units.

8.5 DISTRIBUTION OF PHONEMES IN EMIC SYLLABLES

8.5.1 Distribution of Phonemes in the Emic Syllable Pattern CV

The consonants and vowels which occur in the CV
syllable pattern are given in Chart 8-1. Borrowed words
have been excluded from this inventory, thus /ř, r̃/ do not
appear in the chart. All occurrences are within a
single phonological word.

Several co-occurrence restrictions have been observed:
/b/ does not occur before /u, u̧/; /k/ does not occur before
/i, i̧, e, ȩ/; /kʷ, ȩʷ/ do not occur before /u, u̧/. Other
sequences of consonant and vowel which are lacking are
presumed to be missing because of lack of data or the
rarity of the phonemes involved. Many of these should occur
with further data.

The low vowels /a, ɔ/ and /a̧, ʔ/ fluctuate freely in
many instances. An X in these cases means that the vowel
in question does not fluctuate. The symbol (X) means that
fluctuation between the front and back low vowels does
occur, and that no instances of a non-fluctuating vowel
have been recorded.

Chart 8-1. Distribution of Phonemes
in Syllable Pattern CV

	i	e	a	ɔ	o	u	i̜	e̜	a̜	ɔ̜	o̜	u̜
p	X		X							X		
t	X	X	X	(X)	X	X	X		X	X		
k			X	X	X	X				X	X	X
kʷ	X	X	X	(X)	X		X		X			
ʔ	X	X	X	X	X	X	X	X	X	X	X	X
ɓ	X	X	X	X	X		X					
ɗ	X	X	X		X	X						X
ɠ	X	X	X			X				X		X
ɠʷ		X	X				X					
c	X	X	X		X	X	X	X				
s			(X)	(X)								
l					X							
m	X		X	X			X	X	(X)	(X)	X	
n	X	X	X	(X)		X	X	X	(X)	X	X	X
y	X	X	X	X	X	X	X	X	(X)	(X)		X

The symbol (X) indicates that there is
fluctuation between /a,ɔ/ or /a,ʔ/.

8.5.2 Distribution of Phonemes in the Emic Syllable Pattern CCV

Initially, the following consonant clusters occur in the CCV syllable. Clusters from contracted and non-contracted words are included.

1. t?, k?, ɖ?, kʷ?, c?, s?, m?, l?

2. nt, nc, nk, ng, nɖ, ny, nn, mn

3. ty, cy, ky, ny, ?y

4. ɖm, ɖkʷ, ɖɓ

The following clusters occur word medially in the CCV syllable.

1. p?, k?, ɓ?, n?

2. ?n, ?m, ?y

3. nɖ, nč, nn, mn

4. ɓy

Clusters whose second member is /y/ may be followed only by the low vowels /a, a̧, ɔ, ɔ̧/. Other than this, there is no apparent restriction on the vowels which may follow these clusters. Not all possible combinations occur, but we do not feel that this reflects restrictions in the language.

8.5.3 Distribution of Phonemes in the Emic Syllable Pattern CCCV

Only two clusters of three consonants occur: /nɖ?/ occurs both initially and medially in the phonological word; /cnɖ/ occurs only word initially.

8.5.4 <u>Distribution of Phonemes in the Emic Syllable Pattern V</u>

Emic syllables of the form V never occur word

initially When they occur within the morpheme, they

carry the further restriction that the articulation of the

vowel must be the same as that of the vowel of the preceeding

syllable. Two diverse vowels come together only in verbs,

where the person-marking suffix may be a vowel (see Section 3.3).

Vowels of diverse quality may come together in a phrase,

when a word initial glottal stop is dropped; but this is

not the result of an emic syllable type V.

All of the twelve vowel phonemes may occur in the

V syllable.

8.5.5 <u>Distribution of Phonemes in the Etic Syllable Patterns</u>
       <u>VC, CVC, CCVC</u>

Only /n, s, ꙫ, t/ may occur as the coda in a VC syllable.

All are contracted from verb suffixes.

When a CVC or CCVC syllable occurs preceeding the

syllable CV, certain consonant clusters arise. From the

CVC.CV pattern: /st, nt, ng, mb, tk/, from the CCVC.CV

pattern: /ꙫd, ꙫn/.[1]

8.6 THE PHONOLOGICAL WORD

One phonological word is the minimum complete

isolated utterance possible. The smallest phonological

word in Cuicateco contains two syllables. No single

syllable phonological words occur in our data; single

syllable forms are invariably phonological bound to
larger forms.

While it is easy to define the borders of the
phonological word, it is more difficult to identify the
nucleus. It is not clear at the time of writing whether
stress is phonemic in Cuicateco. If it is phonemic, it
could well mark the nucleus of the phonological word.
If it is not phonemic, the nucleus could conceivably
consist of a two- or three-syllable morpheme of some sort
and be independent of stress. Since the nucleus is
not yet well understood, we have discussed the relationship
of syllables to the phonological word in terms of their
position with respect to the borders, which are clearly
marked--initial, medial or final position in the phonological
word.

A listing of phonological words is given in
Chart 8-2. An example is given of each type.

Chart 8-2. Types of Phonological Words

Initial	Final		
CV	V	/pí.í/	"hurt (referring to child)"
CV	CV	/đa.ba/	"clean"
CV	CCV	/nà.nđà/	"flower"
CCV	V	/s?ú.ú/	"we (inclusive)"
CCV	CV	/đ?í.nù/	"brother of a man"
CCV	CCV	/đ?í.?yú/	"cane" (bejuco)
CCCV	V	/nđ?ē.é/	"to cut"

Initial	Medial	Final		
CV	V	V	/tú.ù.ū/	"rock"
CCV	V	V	/nđó.ò.ō/	"we are arriving"
CCCV	V	V	/nđ?é.è.ē/	"much"
CV	CV	V	/tí.nù.ū/	"clothing"
CV	CV	CV	/kā.đí.nū/	"lunch"
CV	V	CV	/ģé.è.čè/	"arm;wing"
CCV	CV	CCV	/nđā.kú.nđì/	"twisted"
CCV	CCV	V	/nđé.?yè.ē/	"peach"

Initial	Med.	Med.	Final		
CV	CV	V	CV	/?ī.čé.è.nù/	"poison"
CV	CCV	V	CV	/?ī.nđɔ.ɔ.tā/	"they (feminine) are arriving"

NOTE

[1]See note 2 of Chapter 10 for a possible four consonant cluster occurring word medially.

9. ORTHOGRAPHY

9.1 INTRODUCTION

Our recommendations for the orthography of Cuicateco are based on the primary linguistic premise that a good orthography uniquely symbolizes the phonemes of the language.[1] The phonemes rather than the phonetic sounds are symbolized because they represent the smallest phonological unit representing the linguistic structure. The various pronunciations of a phoneme which arise because of the environment--the allophones--are not symbolized because they are perceived as non-significant variants manifesting the existence of a particular phoneme.

A subsidiary linguistic premise important in our consideration is that a good orthography will preserve as far as possible the syllable patterns of the language. The importance of preserving the syllable patterns is that 1) it allows students to recognize words by "sounding them out" a syllable at a time so that they need not memorize the orthographical forms of words, and 2) since the rhythms of the language depend in part on the syllabification, it is easier to read materials in which syllabification is obvious. This second premise is important in Cuicateco since syllable patterns of the form CVV, CVVV and CV?V occur in which all of the vowels are the same. Since one could conceivably write these forms as CV, CV and CV?

respectively; but in doing so the syllable patterns of
the language are destroyed. Furthermore, since the
pattern CV occurs widely in the language and the pattern
CV? occurs in contractions, it is difficult or impossible
to determine from the shortened orthographical form alone
which morphemes are meant. We feel that the best procedure
is to write orthographically the complete syllable pattern.

In designing a practical orthography, considerations
other than linguistics are invariably involved. For
example, it is advisable to make the orthography fit the
orthographical patterns of the trade language in so far as
is possible. In our case, the trade language is Spanish.
We have tried to make our orthography compatible with the
Spanish patterns as much as possible. The compatibility
of the two orthographies is made more important because
throughout Mexico the government maintains a system of
schools which are carried on in Spanish and are obligatory
for children aged 6 to 14. Typically, the monolingual
children find school initially quite difficult since they
do not speak Spanish. However, if they could be taught to
read their native language in the early grades and then
taught Spanish, their instruction would be helped. An
orthography designed to aid in this transition would be
quite useful.

9.2 RECOMMENDED ORTHOGRAPHY

Chart 9-1 gives the phonemes of Cuicateco, the
Spanish representation of these sounds, and the proposed
Cuicateco orthography.

Chart 9-1. Spanish Orthographical Conventions
Related to Proposed Cuicateco
Orthography

Cuicateco Phonemes	Mexican Spanish Orthographical Representation	Proposed Cuicateco Orthography
p	p	p
t	t	t
k	qu/i,e c/o,a,u	qu/i,e c/o,a,u
b	v b	b
d	d	d
g	gu/i,e g/a,o,u	g
k^w	cu	cu
g^w	gü/i,e gu/a,o,u	gu
m	m	m
n	n	n
s	s z c/i,e	s
č	ch	ch
l	l	l
y	y	y

Cuicateco Phonemes	Mexican Spanish Orthographical Representation	Proposed Cuicateco Orthography
ʔ	none	'
ř	r	r
r̃	r (word initial) rr (elsewhere)	rr
i	i	i
e	e	e
a	a	a
ɔ	none	a̲
o	o	o
u	u	u
i̢	none	i̢
e̢	none	e̢
a̢	none	a̢
ɔ̢	none	ʔ̢
o̢	none	o̢
u̢	none	u̢

9.2.1 The Consonant Phonemes

The voiceless stops /p, t, k/ are represented exactly as in the Spanish orthography. The only orthographical problems are presented by the /k/. In Spanish, the sound /k/ is represented as qu before the vowels /i, e/ and as c elsewhere; except for a very small number of foreign words where it is written k .

On linguistic grounds alone, the use of either a
k or a c in all environments would be quite reasonable.
But the frequently occurring orthographical forms qui
and que are a prominent feature of written Spanish. It
seems best, therefore, to preserve the Spanish qu/c
orthography since it will give written Cuicateco a decidedly
Spanish look.

The voiced fricatives /b, d, g/ have stop allophones
occurring after nasals. The Spanish voiced stops /b, d, g/
have fricative allophones intervocallically. No confusion
will arise if we represent the Cuicateco voiced fricatives
as b, d, g.

The only difficulty concerning the voiced fricative /b/
is whether to use the symbol b or v for the bilabial
/b/. Since these two symbols are pronounced the same in
Spanish, we see no reason to preserve the use of both of
them. We prefer the use of the symbol b rather than
v because the fricative /b/ has a stop allophone; the
parallel with /d, g/ is also preserved, since these are
represented by traditional stop symbols d and g.

No difficulties arise with the use of d to
represent the phoneme /d/.

The use of g to represent the phoneme /g/ presents
a problem. The Spanish orthographical convention of gu
before /i, e,/ and g elsewhere could be followed here,
too, as was done with the representation of the Cuicateco
/k/. Here, however, no particular improvement in the

overall look of written Cuicateco results from following
these conventions. They do introduce needless complexity,
particularly in that the /g^w/ would then also have to be
represented with two different symbols, as discussed in
the next paragraph. It seems best, therefore, to drop
the Spanish symbols gu/g and write the Cuicateco
phoneme /g/ as g in all environments.

The Cuicateco phonemes /k^w, g^w/ are represented
orthographically by cu and gu respectively. The
representation of /k^w/ follows the Spanish convention.
Instead of writing /g^w/ as gü before /i, e/ and gu
elsewhere (a procedure necessitated by the Spanish use of
gu before /i, e/ to represent /g/), it seems best to write
the Cuicateco /g^w/ as gu in all environments--especially
since the gu occurs only rarely in Spanish.

The Cuicateco phonemes /m, n, č, l, y/ are written
m, n, ch, l, y as in Spanish.

The Cuicateco phoneme /s/ is written as s. There is
no reason to preserve the Spanish variation of c before
/i, e/ or the use of both z and s .

The glottal stop /?/ has no counterpart in Spanish.
We have chosen to represent it with the appostrophe ' .
In Cuicateco the glottal stop occurs in consonant clusters;
the use of the symbol h would result in strange looking
consonant combinations, and could cause some confusion when
occurring after the phoneme /č/, written chh. Some

examples of words containing glottal stop are given below,
for a comparison of the use of the h and the ' .

/s?ų́ų́/	shuu	s'uu	"we"
/č?àtà/	chhata	ch'ata	"large"
/t?ikà/	thica	t'ica	"so; yes"
/k?ùù/	chuu	c'uu	"this"

The phonemes /ř, r̃/ occur only in Spanish loan words.
We have symbolized them as r and rr, respectively, as
does Spanish. We have not preserved the representation
of /r̃/ as r word initial and rr elsewhere.

9.2.2 The Vowel Phonemes

The Cuicateco vowel phonemes /i, e, a, o, u/ can be
represented by i, e, a, o, u respectively, as in Spanish.
The Cuicateco /ɔ/ phoneme has no counterpart in the Spanish
orthography. We have chosen to symbolize it as a.

The nasalized vowels /į, ę, ą, ɔ̨, o̧, ų/ have no
counterpart in Spanish. We prefer to symbolize them as
i̧, ȩ, ȩ, a̧, o̧, u̧. These symbols would avoid confusion
since they uniquely and compactly represent the nasalized
vowel phonemes; this would facilitate the teaching of
monolingual speakers, especially children.

A possible alternative would be to represent these
vowel phonemes with a following n: in, en, an, an, on, un.
The difficulty with this convention is that the symbol n
would then have two meanings, one as nasalization of the
preceeding vowel, and the other the consonantal phoneme /n/.

A third alternative for representing nasalized vowels is to write them with a small raised ^{n} such as i^n, e^n, a^n, $\underline{a}^n$, o^n, u^n. There is no linguistic objection to this procedure; no confusion will arise from its use. However, we do not recommend the use of this convention because 1) the cluster V^n is a bulky symbol when compared to $V̧$, and when occurring contiguous to other orthographical symbols such as t, k, its use produces a cluttered looking line of type. 2) The symbol V^n produces an orthography that bears little resemblance to written Spanish in appearance.

If it should become necessary for Cuicateco readers to use materials in which nasalized vowels have been symbolized by a following n or by the small raised ^{n}, there should be little problem in making this transition. In our judgment, however, it is better that they learn to read with symbols which represent the phonemic structure of the language uniquely and compactly. As they become facile readers they can, if necessary, make adjustments to other orthographical conventions.

9.2.3 Consonant Clusters with /y/

The consonant clusters /ky, ny, ty, by, cy/ occur in Cuicateco but not in Spanish. However, in Spanish vowel diphthongs occur after consonants in such words as "quien" /k^ien/ or "tierra" /t^iẽŕa/. In order to make

Cuicateco look more like Spanish, it seems best to write
the clusters /ky, ny, ty, by, cy/ as qui, ni, ti, bi, chi
respectively. No confusion will result, as vowel diphthongs
do not occur in Cuicateco.

9.2.4 Contractions

An adequate orthography should be able to symbolize
contractions that arise in the language. There is no
difficulty when the contraction arises because of the loss
of a vowel, with no other phonological change. However,
occasionally contractions occur in Cuicateco which result
in new phonological forms. In this manner, the sounds
[ɡ, š, h, x] arise. These sounds should be symbolized by
the most prominent phoneme in the contracted form; the
allophone in the contraction is represented by the phoneme
which occurs in the uncontracted form of the word. For
example, [šgéènè] "food" is a contraction of [čege?ene;]
The long form of this word would be written chege'ene,
the contraction as chge'ene. (Phonetic replacement occurring
in contractions is discussed in Section 5.3.2.)

9.2.5 Tone and Stress

The tone, while phonemic in Cuicateco, does not appear
to carry a heavy structural load. Hence it can probably be
omitted from the orthography, except for the first person
high tone, which is a grammatical signal. This tone is
symbolized by the symbol V́ where V is the vowel of the

syllable carrying the tone. Should it become necessary

to write the tone, we suggest that it be symbolized

by V́ for high tone and V̀ for low tone with no mark

for mid tone.

Stress does not appear to be contrastive. If it

should be determined to be phonemic, it would still not

have to be written orthographically since morphemes

differing only by stress are extremely rare. No minimal

pairs occur in our data.

9.2.6 Other Possible Simplifications

9.2.6.1 Initial Glottal Stop

Word initial glottal stops occur before vowels, as

in /ʔámá/ "one". It may be possible to omit the glottal

orthographically, since initial ʔV does not contrast

with V. The initial glottal before the vowel is often

lost phrase medially. Omitting the initial glottal

stop before a vowel would make the word look more like

Spanish.

9.2.6.2 Vowel Fluctuation

The vowel phonemes /a/, /ɔ/ and their nasalized

counterparts /ą/, /ǫ/, although clearly separate phonemes,

fluctuate freely in many words. In words where a non-

fluctuating /a/ occurs, or a non-fluctuating /ɔ/, no

difficulty arises in their symbolization. However, when

they fluctuate freely the question arises as how best to

symbolize them. We suggest that vowels which fluctuate freely should be symbolized as a or ą since this is the simplest symbol and conforms with Spanish orthography.

The non-fluctuating phonemes /ɔ/, /ǫ/ occur rarely, and in the few cases where they contrast with /a/ the meanings of the words are quite divergent; for example /ḡ-áà-s/ "he buys" and /ḡ-ɔ́ɔ̀-s/ "he jumps". We expect therefore that it may be possible to write both phonemes with the same symbol. This would alleviate the need for the symbol a.

NOTE

[1] Pike (1947) p. 57.

10. COMPARISON OF DIALECTS

10.1 INTRODUCTION

The only published scientific studies (see Section 1.2) involving Cuicateco were done in the dialect of the town of Concepción Pápalo. This town is located about fifteen miles north east of Santa María Pápalo, where the present study was done. The comparison presented here is taken primarily from the papers by Needham and Davis (1946) and Davis and Walker (1955), with reference to Longacre (1957). This comparison cannot be regarded strictly as reflecting present dialectical differences 1) because we have no first-hand knowledge of the dialect of Concepción Pápalo and hence cannot entirely judge whether a difference between our data and previously reported data reflect true dialectal differences, or merely differences in analysis; and 2) because of the long time-lapse between the original work and our present comparison, during which time the Concepción dialect may have changed.

10.2 COMPARISON OF CONSONANT PHONEMES

The consonant phonemes of Concepción are given in Chart 10-1, along with those of Santa María. The two phonemic systems are discussed below.

Chart 10.1. The Consonant Phonemes of
Concepción and Santa María

Concepción Pápalo   Santa María Pápalo

   t k k^{w} ?   p t k k^{w} ?

     č   č

     s   h   s

 ƀ đ   ƀ đ g g^{w}

 m n   m n

    l   l

    ř   ř

                           r̃

    y   y

From Needham and   From the present study
Davis (1946) p. 139

10.2.1 The Voiceless Stops

The voiceless aspirated stop phonemes /t, k, k^{w}/ of
Concepción are at the dental, velar and labialized velar
points of articulation. They have voiced unaspirated
allophones following non-syllabic /n/ or a cluster of n?,
within the same morpheme.

The corresponding phonemes of Santa María /p, t, k, k^{w}/
are voiceless unaspirated stops at the bilabial, dental,
velar and labialized velar points of articulation. These
stops have no other allophones.

Both dialects are similar in that they both have
voiceless stops at dental, velar and labialized velar points

of articulation. They differ in that the stops of Con-
cepción are aspirated while the stops of Santa María
are unaspirated; Santa María has the additional, although
rare, bilabial stop /p/.

A further difference is the absence of voiced stop
allophones for the voiceless stop phonemes at Santa María.
This difference may be partly one of analysis, since the
voiced stops of Santa María are best analyzed as allophones
of the fricative series, not the voiceless stop series
as was done at Concepción. However, a real difference
does occur in the number and phonetic value of the voiced
stops. Santa María has phonetic voiced stops [b, d, g]
at the bilabial, dental and velar points of articulation;
Concepción has the phonetic voiced stops [d, g, g^w] at
the dental, velar and labiovelar points of articulation.
Thus Santa María has the stop [b] which Concepción lacks,
while Concepción has the stop [g^w] which Santa María lacks.

10.2.2 The Voiced Fricatives

Concepción has the voiced fricatives /b, d/ which
occur at bilabial and dental points of articulation. These
phonemes have no other allophones.

Santa María has the voiced fricatives /b, d, g, g^w/
which occur at the bilabial, interdental, velar and
labiovelar points of articulation. The voiced fricatives
/b, d, g/ have voiced stop allophones [b, d, g] at corresponding

points of articulation following a nasal or preceeding a
voiced consonant word medially. In addition, the labio-
velar /g^w/ has an allophone [ww] occurring utterance
initially; the phoneme /g/ has the allophone [w] occurring
before /i/ and optionally utterance initially before
/u, u̯/.

Other than the differences mentioned under 10.2.1
above, relating to the placement of the voiced stop
allophones, the only difference in the voiced fricatives is
the absence of the allophones [w] and [ww] in Concepción.

10.2.3 The Voiceless Fricatives

The voiceless fricative /s/ occurs in both dialects
at the dental point of articulation, with no other allophones.

The voiceless fricative /h/ at the velar point of
articulation occurs at Concepción. In Santa María, no
phoneme /h/ is found. However, in contractions of a
syllable čV an [h] may occur (alternating with [š])
before /n/.

10.2.4 The Affricate /č/

The voiceless alveopalatal affricate /č/ occurs in
both dialects. In Concepción, it has a voiced allophone
following non-syllabic n or n? within the morpheme.
This allophone has not been observed in Santa María.

10.2.5 The Glottal Stop

The glottal stop /?/ occurs in both dialects, without other allophones.

10.2.6 The Nasals

The voiced nasals /m, n/ occur at the bilabial and dental points of articulation in both dialects. In Santa María the /n/ has an allophone [ŋ] which occurs before velar and labiovelar consonants.

10.2.7 The Flap and the Trill

At Concepción, the phoneme /ř/ at the dental point of articulation has the allophones trilled [r̃] when initial in a full morpheme and flapped [ř] when initial in an enclitic morpheme; it is a rare phoneme. In Santa María both /ř/ and /r̃/ are observed to occur, but only in Spanish loan words, where they are full phonemes.

10.3 COMPARISON OF VOWEL PHONEMES

The oral vowel phonemes of Concepción and Santa María are given in Chart 10-2. Corresponding to the oral vowels in each dialect is a complete set of nasalized vowels.

Chart 10-2. The Oral Vowel Phonemes of
Concepción and Santa María

Concepción Pápalo   Santa María Pápalo

i   u   i   u

e   o   ˙   e   ȯ

a   a   ɔ

From Needham and   From the present study
Davis (1946) and
Davis and Walker
(1955)

10.3.1   The High Front Vowels

The vowel phonemes /i, ɨ/ are high close front and
unrounded in both dialects. The phoneme /i/ has a slightly
opened variant occurring before enclitics at Concepción;
at Santa Maria /i, ɨ/ have opened variants occurring
occasionally before /n/.

10.3.2   The Mid Front Vowels

The phonemes /e, ę/ are mid close front unrounded
in both dialects. At Concepción they have open allophones
(environment not stated; Davis and Walker, 1955). At
Santa María the open oral allophone [ɛ] occurs contiguous
to /n/; and following /č/ when not preceeding /y, w/ or a
word boundary the open [ɛ] alternates with the close [e].
The nasalized allophone [ɛ̨] occurs in all environments, except
occasionally preceeding /y/.

10.3.3 The Low Vowels /a/ and /a̯/

The phoneme /a/ is low and central in both dialects.
In Santa María it is additionally open and unrounded,
with a mid open central unrounded variant.

In Concepción, the nasalized counterpart /a̰/ is
somewhat backed, raised and rounded. This phoneme is
apparently more analogous to the Santa María phoneme /ɔ̰/
(because of its roundedness) than to the rare Santa María
phoneme /a̰/, which is low open central unrounded.

10.3.4 The Low Back Vowels

The phonemes /ɔ,ɔ̰/ are low, close back unrounded.
They apparently occur only in Santa María. The oral /ɔ/
fluctuates freely with the phoneme /a/ in many environments.
However, the two are clearly separate phonemes since they
contrast in words in which they do not fluctuate. It may
be that some fluctuation occurs inConcepción also, since
the /a/ is not specified as to roundedness in the literature.

The phoneme /ɔ̰/ of Santa María occurs more frequently
than the phoneme /a̰/. If this phoneme is identified with the
Concepción /a̰/ a curious assymetry occurs in both dialects.
The oral low open central unrounded vowel /a/ appears to
occur frequently while its nasalized counterpart /a̰/
is infrequent (completely absent in Concepción); the oral
low close rounded vowel /ɔ/ occurs infrequently (completely
absent in Concepción) but its nasalized counterpart /ɔ̰/

occurs somewhat more frequently in both dialects.

10.3.5 The Mid Back Vowels

The phonemes /o, ǫ/ are mid open back and rounded
in Concepción; they are mid close back rounded in Santa
María. They have no other allophones.

10.3.6 The High Back Vowels

The vowels /u, ʯ/ are high open back rounded at
Concepción; they are high close back rounded in Santa
María. In addition, they have slightly open allophones
in Santa María..

10.4 TONE AND STRESS

Tone and stress have not been completely analyzed in
either dialect. Both dialects appear to have three phonemic
tones; and in both tone sandhi occur; it has not been studied
in Santa María, and if it has been studied in Concepción,
no complete statement of it is available in published
literature.

Needham and Davis (1946, p. 140) feel that stress is
not phonemic at Concepción, but do not know completely the
conditions for its placement. We have not studied stress,
but feel that it could reasonably be non-phonemic at Santa
María.

10.5 SYLLABLE PATTERNS

The etic syllable patterns occurring in Concepción and Santa María are given in Chart 10-3.

Chart 10-3. Syllable Patterns of
Concepción and Santa María

Concepción Pápalo	Santa María Pápalo
V	V
CV	CV
CCV	CCV
CCCV	CCCV
CVV	
CCVV	
CCCVV	
	VC
CVC	CVC
CCVC	CCVC
CVVC	
CCVVC	
CCCVVC	

From Needham and	From the present study
Davis (1946) p. 140	

The syllable patterns represent the greatest divergence of a purely analytical nature between the studies at Concepción and Santa María. We have analyzed any sequence of two vowels as two syllables and therefore only single vowel nuclei occur, each with its own tone. Needham and Davis have complex syllable nuclei VV, containing two moras, each with its own tone.

The syllable pattern V occurs in both dialects. However, it arises from a different analysis in each case. At Concepción the syllable V arises word initially in words such as /i(n?tɛɛdí/ "I am carrying"--V.(n?tɛɛdí), where .

parentheses indicate material not pertinent. At Santa

María no phonological word of this sort is found. Such

words always have an initial glottal stop so that they are

of the form ?V.(----), that is, CV.(----).

In Santa María the syllable pattern V arises

through the interpretation of lengthened vowels as two

separate syllable nuclei (Section 3.4), or a vowel cluster

involving a high vowel (Section 3.3). The syllable V

has a restricted distribution since, if it arises from

a long vowel it must have the same articulation as the

vowel of the preceeding syllable, and it if arises due to

a vowel cluster it must be a high vowel (and is determined

by the morpheme in which it occurs).

The syllable patterns CCV and CCCV occur in both

dialects.

The syllable patterns CVV, CCV, CCCVV of Concepción

are analyzed as two separate syllables CV.V, CCV.V,

CCCV.V at Santa María, and hence do not appear in our data.

The syllable patterns CVC, CCVC occur in both dialects.

At Concepción they are formed from the open syllable patterns

with the addition of a consonant. Only glottal stop may

occur utterance final. It is not specified which consonants

occur utterance medial.

In Santa María these syllable types, plus the type

VC occur only in contractions. Word finally /n, s, đ, t/ may

occur (all are contracted verb suffixes); medially other

consonants may occur as well. Final phonemic glottal stop

has not been observed.

At Concepción the syllable patterns CVVC, CCVVC and CCCVC are formed from the open syllable patterns with the addition of a consonant. Again, only glottal stop may occur utterance final; utterance medial consonants are not specified. Because of our interpretation of the lengthened vowels as two syllables, these patterns would be CV.VC, CCV.VC and CCCV.VC.

In both dialects consonant clusters occur, either in syllables with multiple onset slots (CCV, CCCV, etc.) or as a result of a closed syllable occurring before another syllable (CVC.CV, CCV.CV, etc.).

Clusters of two consonants are compared in Chart 10-4. In our data, all of these clusters occur in CCV syllables (for clusters resulting from the pattern CVC.CV, see Section 8.5.5). Distribution is in terms of the phonological word--word initial or word medial. Needham and Davis do not specify what syllable types the clusters occur in. Their distribution is given in terms of the utterance--utterance initial or medial. Cluster types follow Needham and Davis.

Chart 10-4.   Two-Consonant Clusters in
              Concepción and Santa María

Concepción Pápalo   Santa María Pápalo

Type I - Initial

/ʔ/ before anything   /ʔy/
    except /ř, h/
                             /ʔ/ following /t, k, kʷ,
                                 đ, č, s, 1, m/

Type I - Medial

/ʔ/ before anything   /ʔ/ before /n, m, y/
    except ř, s, h/
                             /ʔ/ following /p, k, ь, n/

Type II - Initial

/n/ before /t, č, k, ь   /n/ before /t, č, k, đ, g, y/
    đ, ?, y/

Type II - Medial

/n/ before /t, ?, č, k, kʷ/ /n/ before /đ, č/

Type III - Initial

/y/ following /t, n, č,   /y/ following /t, k, n, č/
    k, ь, đ, ?/

Type III - Medial

/y/ following /t, k, ь/   /y/ following /t, k, ь/

    The two-consonant clusters are much the same in
both dialects; the major difference is that in Concepción
the glottal stop preceeds most consonants while at Santa
María it follows most consonants.

    Both dialects also have three-consonant clusters.
In Santa María only two such clusters occur: /ndʔ/ and /čnd/.

At Concepción the clusters /nʔt, nʔy/ occur initially and
/nky, nʔkʷ/ occur medially in slow speech. In addition,
other clusters occur in rapid speech, utterance medially:
Needham and Davis list many three- and four-consonant
clusters, several five-consonant clusters and one six-
consonant cluster.[1] In contrast, our data from Santa
María contains no clusters with more than three consonants.[2]

10.6 PHONOLOGICAL SHAPES OF MORPHEMES

Although we have not studied the phonological shapes
of morphemes between the two dialects, some alternations
apparently do occur. For example, many of the Cuicateco
forms listed in Longacre (1957, the Cuicateco Index, data
from Davis and Walker) contain /o/ where words in our
data contain /u/. It also appears that the /h/ of
Concepción corresponds to the /e̦/ of Santa María in
most words.

The extent or course of these variations is not
known. However, informal conversations with native
Cuicateco speakers reveal that there is no particular
difficulty in understanding the two dialects, although
they recognize them as different.

10.7 SUMMARY

While each dialect contains some phonemes which the
other lacks, the basic phonological systems of the dialects
overlap. The syllable patterns, discounting differences

in analysis, are also reasonably alike.

It comes as no surprise, therefore, that speakers
of Cuicateco of Santa María do not seem to find great
difficulties understanding the Cuicateco of Concepción.

NOTES

[1]For example, other three-consonant clusters are
/sʔk, nʔt, tnk/; four-consonant clusters: /tnʔč, ʔmnb,
ʔmʔs/; five-consonant clusters: /ʔmmʔt, ʔmnʔč, ʔmnʔk,
ʔmnʔb/ (these are all of the five-consonant clusters);
the six-consonant cluster: /ʔmsnʔt/.

[2]Our data contains one potential four-consonant
cluster occurring word medially. The form [ɲuθʔndibi]
"potato" alternates with [ɲuʔndibi]. This form was gathered
at the beginning stages of our language analysis and
has not been checked. We consider the form to be suspect,
since we have no other consonant cluster with the glottal
stop in this position. We have recorded the same word
with our other informant, who uses the word [nduhndibi].
In all other forms only a three-consonant cluster is recorded.

BIBLIOGRAPHY

Davis, Marjorie. (1954) "Translating from FL Cuicateco
    to TL English", International Journal of American
    Linguistics 20.302-12.

------, and Margaret Walker. (1955) "Cuicateco: Morphemics
    and Morphophonemics", International Journal of
    American Linguistics 21.46-51.

Hunter, Georgia G. and Eunice V. Pike. (1969) "The
    Phonology and Tone Sandhi of Molinas Mixtec",
    Linguistics 47.24-40.

Longacre, Robert E. (1952) "Five Phonemic Pitch Levels in
    Trique", Acta Linguistica 7.62-82.

------. (1957) Proto-Mixtecan. Published as International
    Journal of American Linguistics Vol. 23 No. 4 Part III.

Needham, Doris and Marjorie Davis.(1946) "Cuicateco
    Phonology", International Journal of American
    Linguistics 12.139-146.

Pankratz, Leo and Eunice V. Pike. (1967) "Phonology and
    Morphotonemics of Ayutla Mixtec", International
    Journal of American Linguistics 33,287-299.

Pike, Eunice V. and John H. Cowan. (1967)"Huajuapan
    Mixtec Phonology and Morphophonemics" Anthropological
    Linguistics 9.5.1-15.

Pike, Kenneth L. (1944) "Analysis of a Mixteco Text",
    International Journal of American Linguistics 10.113-138.

------. (1947) Phonemics: A Technique for Reducing Languages
    to Writing. Ann Arbor: University of Michigan Press.

------. (1948) Tone Languages: A Technique for Determining
    the Number and Type of Pitch Contrasts in a Language,
    with Studies in Tonemic Substitution and Fusion.
    Ann Arbor: University of Michigan Press.

------. (1967) Language In Relation to a Univied Theory
    of Human Behavior. The Hague: Mouton and Co.

Robinson, Dow F. (1970) Manual for Analytical Procedures
    in Phonology. Santa Ana: The Summer Institute of
    Linguistics (mimeographed)