An Areal-Typological Study of Phonological Systems of Middle American Indian Languages

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I. INTRODUCTION

There is very large variation in the phonological systems of the Middle American Indian languages. Otomanguean, for example, have fortis vs. lenis contrasts in some systems and prenasalized consonants in some other systems. Some have nasalized vowels, while others do not have. Surveying the whole of Middle America, the total number of consonants in an inventory varies between 11 and 35. Although the number of segmental phonemes does not vary too much, if compared to that of the languages of the world which varies between 6 and 95 [MADDIESON 1986: 109], the choice of consonants in an inventory shows too much variation, and furthermore, we encounter some rare phonemes such as glottalized fricatives or both alveolar and palatal retroflex sibilants in a system, etc. As for vowels, 18 of 23 vowels distinguished by the symbols of so-called "American Usage" occur, and some of them are lengthened, nasalized and even laryngealized. There are also tone languages with two to five contrasts. It is as if they cover almost all phonemes described in a textbook of

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phonology. Although the phonological systems are remarkably divergent, they also have some similarities that can be called areal characteristics.

The studies dealing with typology of phonological systems started with the Prague School [TRUBETZKOY 1969(1939)] and then Hockett [1955] took up the theme. Since towards the end of the 1950s structuralism gave way to universalism in the linguistic field, there have been two trends: one is generative theory whose studies focus on one particular (investigator's native) language and the other is linguistic typology which approaches human universals from the world's languages. The generative school has made important contributions in phonological typology. These works, chiefly made by Postal [1968] and Chomsky and Halle [1968], who owed much to the Prague School, were mainly concerned with the concepts such as distinctive features, markedness and implicational universals. Linguistic typology, on the other hand, became popular with *Universals of Language* [1966], edited by Greenberg, who also stimulated typological studies on phonological fields. Much important work treating phonology typologically appeared in *Stanford Working Papers on Language Universals* and *UCLA Working Papers in Phonetic.* General work on phonological typology based on the segmental inventory is found in Hockett [1955] and Lass [1984]. Sedlak [1969] and Crothers [1978] contribute to vowel-system typology and Maddieson [1980a, 1980b, 1984], Nartey [1979] and other members of or associated with the Stanford Phonology Archive (SPA) and UCLA Phonological Segment Inventory Database (UPSID) to consonant-system typology. However, phonological systems of Middle American Indian languages have not yet been studied extensively, although some scholars have already treated them in small scale [KAUFMAN 1973; ESCALANTE 1975; SUÁREZ 1983b].

This paper discusses the phonological systems of Middle American Indian languages from an areal-typological perspective. Firstly I present available descriptive materials, arranging them according to my classification. On the basis of the data gathered together, I will analyze the consonant and vowel systems. Then, I will treat areal features, investigating diffusion of some peculiar phonemes across language boundaries. Finally I will discuss linguistic universals.

In my previous studies [YASUGI 1989a, 1989b, 1990], I stressed the importance of areal influences on linguistic structures, although it seems to have been generally believed that neighboring languages did not seriously influence one another structurally [cf. SHERZER 1976: 9]. The present study is concerned mainly with phonological systems of Middle American Indian languages rather than typology itself, but treats also areal influences, that is, sound changes which spread across genetic boundaries. From these points I will clarify characteristics of phonological traits of the languages of Middle America.

II. PHONOLOGICAL DESCRIPTIONS

Although there are many descriptive systems of presentation, this paper follows the traditional framework, partly because almost all investigators of Middle American Indian languages utilize this framework and partly because it is convenient to utilize this scheme for typological studies of phonological systems. A typical chart consists of places of articulation from left to right and manners of articulation from top to bottom. Phonetic symbols used in this study, however, are not the IPA but "American Usage" symbols with some modifications [cf. PULLUM and LADUSAW 1986]. Based on such a chart of each language, we can typologically compare not only the number but also the range or variety of places and manners of articulation.

The data on each language were obtained from one or more published sources. However, the symbols used here are not those of the original sources but all symbols are translated into a standard set. See Appendix 2 for the full set of symbols used here. We may say that these tables manifest the full range of phonological units of Middle American Indian languages.

Phonological systems of almost all languages (including many dialects) in Middle America have now been published, but the descriptions vary from publication to publication. It depends partly on differences of their stand point from structural-phonemic to transformational-phonemic, and partly on their quality of analysis, which is apt to be influenced by academic tradition. For example, in Mixe-Zoquean linguistics, a distinction between marginal and full phonemes is usually made, which yields voiced obstruents as phonemes, and some Costa Rican linguists tend to set up nasal vowels instead of admitting nasal consonants.

In the phoneme inventories of each language, some are fully phonemic while others are rather phonetic. Sometimes reanalysis of whether they are regarded as phonemes would be needed (for example, Kaufman [1967]). Cuna gives us another example. Cuna has only twelve consonants in the report, but the geminate consonants occur frequently in intervocalic position. The plain stops tend to be voiced, while the geminated stops are always voiceless. The plain consonants and the geminates correspond to each other as follows:

p	t	k	k^w	m	n	l	r	s	w	y	
pp	tt	kk	kk^w	mm	nn	ll	rr	č		yy	[HOLMER 1946]

This interpretation is very similar to Zapotecan phonology where fortis and lenis consonants are distinguished. The quality varies depending on the literature. But I have generally accepted the inventories proposed by the authors who deal primarily with the language in consideration and utilize them as data base of my study. This raises questions about the reliability of the data, and makes it difficult to compare the data equally, but I have not reanalyzed the data, because I don't have enough data nor knowledge of the language in question.

In the phoneme inventory some phonemes are more problematical than others. For example, sibilants have often such varieties as apico-alveolar, lamino-alveolar,etc. It is not always easy to determine from phonological descriptions when some conventional symbols are used. Therefore detail description is needed. It would be necessary to consider not only phonemes but also allophones and morphophonemic rules. But in some cases only phoneme lists are available, while in some other cases detail descriptions are given. It should be noted, however, that I have not attempted to include information on allophonic variation, syllable structure or phonological-morphophonological rules, although it is important to improve the quality of irregular data for typological studies. When detail information is available, I add some relevant descriptions as note. Rare phonemes are also commented after a phoneme inventory. Some phonemes given in a language are changed according to the description, for example, /š/ is replaced by /ʂ/ when the /š/ is described as a retroflexed /š/.

It happens that even the same author has changed his previous analysis and presents a new system. In such a case I take the phoneme inventory from the latest publication. Otherwise, I add some comments. When two or more data are available on the same language and their descriptions are different, I present them and utilize them for this study. In some cases, however, I select the most reliable data or add some comments, judging his or her devoteness to the language under consideration, because some of them are done during a short period and with little experience.

In describing the segment inventories for typological studies, there are the problems mentioned above, and more besides. For example, it is difficult to decide whether a unit or sequence interpretation is appropriate for affricates, prenasalized stops, geminates, diphthongs, labialized and palatalized consonants, etc. The glottal stop /ʔ/ has been treated as consonant, but in Zapotec languages it is interpreted as belonging to the syllable nucleus. /w/ or /y/ are sometimes treated as /u/ or /i/. These facts show that if these different interpretations are not regularized, it is difficult to compare the phonological systems typologically. However, phonemes are language-particular and regularization is impossible by nature. Even if one tries to achieve a uniform level of description, it is impossible to do so. For example, compare Otomi and Chatino data in Maddieson [1984: 376, 378] with my data. Maddieson tried to regularize phonological systems. In Otomi, he set up many phonemes absent in the original by Blight and Pike [1976] such as laryngealized voiced plosives and voiceless ejective stops and so on, but he did not admit affricates in the Chatino system. This is another reason to respect original sources.

Rare phonemes in a given inventory are also a source of trouble. Whether rare phonemes are included or excluded affects typology. Although evaluating rare phonemes is very difficult, I have included them. They are presented in parentheses in phoneme inventories. However, I have excluded foreign phonemes.

The order of presentation of each language (including dialects) follows my language classification (Appendix 1). The number in square brackets following a language name corresponds to the number in the classification and map. Consonant and vowel number are given after the souce(s) examined for the phonological data, where C represents consonants and V vowels. For example, (20C, 5V+5L) means the proper language has 20 consonants and 5 short and 5 long vowels. The symbols L, G, and N represent long, geminate, nasalized vowels, respectively. Languages marked by ※ before a language name are eliminated in this study, because they are less reliable. Although 59 language data are eliminated from the whole data, I have added 15 Nahuan dialects, which may skew the statistical and typological survey. The difference among them is very little and there is quite a possibility that voiced stops and voiceless glides are allophones.

I follow the convention for enclosing phonetic citations between square brackets ([ ]) and phonemic ones between slashes (/ /). I present length with /:/, geminate with double letters and nasalized vowels with a hook (/V̨/). For other symbols, see Appendix 2.

Papago [2] [SAXTON 1963, 1982] (18C, 5V+5G)

Consonants:

p	t	č	k	ʔ
b	d	ǰ	g	
	s	ṣ		h
m	n	ñ		
	ɺ	ḍ		
w				

Vowels:

i	ɨ	u	ii	ɨɨ	uu
		o			oo
	a			aa	

/ɺ/ is an apico-alveolar lateral flap. /ḍ/ is an apico-alveolar retroflexed lax stop and is restricted in occurrence to medial position. /ṣ/ is an apico-domal retroflexed sibilant. /w/ is a fricative preceding *i/a*. /ŋ/ and /y/ acquire phonemic status in speech through Spanish loans. Vowels occur stressed or unstressed. All geminate sequences are permitted. Vowel length is interpreted as geminate vowels, but Hale [1965] and Zepeda [1983] interpret as long vowels. Diphthongs registered by Zepeda are *ai, ei, oi, ui.*

Northern Tepehuan [4]

Northern Tepehuan[1] [BASCOM 1982] (19C, 5V+5G)

Consonants:

p	t	t^y	č	k	ʔ
b	d	d^y		g	
v	s	š		x	
m	n	ñ			
	l	r			

Vowels:

i	ɨ	u	ii	ɨɨ	uu
		o			oo
	a			aa	

Vowel length is interpreted as geminate clusters. There are two tones, high and low. Stress is noncontrastive. /č/ is found in relatively few words. In most of these /č/ fluctuates with [š] or [t^y] or both. Bascon does not recognize the glides /w y/, but I give below for reference another analysis where the same author recognizes /w y/.

※**Northern Tepehuan**[2] [BASCOM 1959]

Consonants:

p	t	t^y	č	k	ʔ
b	d	d^y		g	
v	s	š		x	
m	n	ñ			
	l	r		R	
w		y			

Vowels:

i		u	ii		uu
e	ʌ	o	ee	ʌʌ	oo
	a			aa	

Southern Tepehuan [5]

Southeastern Tepehuan[1] [WILLETT 1982; WILLETT 1988] (14C, 6V+6L)

Consonants:

p	t	(č)	k	ʔ
b	d	(ǰ)	g	
v	s	(š)		h
m	n	(ñ)		
(ʔm)	(ʔn)	(ʔñ)	(ʔŋ)	
	ř	(l^y)		
		y		

Vowels:

i	ï	u	i:	ï:	u:
	ë	o		ë:	o:
	a			a:	

Parentheses enclose allophones. /d t s n ř/ are palatalized contiguous to /i/ as [dž tš š ñ gł]. The voiced stops and the palatal affricate have preglottalized nasals [ʔm ʔn ʔñ ʔŋ] at the same point of articulation as variants in syllable coda position. /ë/ is replaced by /ʌ/ in Willett [1988], who describes that seven different diphthongs occur; /ui ïi oi ai io ia ua/. I give another analysis by the same author for reference.

※Southeastern Tepehuan[2] [WILLETT 1978]

Consonants:

p	t	č	k	ʔ
b	d	ǰ	g	
v	s	š		h
m	n	ñ		
	r	l^y		
		y		

Vowels:

i	ɨ	u
e		o
	a	

Tarahumara [6]

Western Tarahumara[1] [BURGESS 1970, 1984] (15C, 5V)

Consonants:

p	t	č	k	ʔ
β			γ	
	s			h
m	n			
	ḷ	ṛ		
w	y			

Vowels:

i		u
e		o
	a	

Since Burgess [1984] notes that /b g/ are typically fricatives, although they have voiced lenis stop allophones which occur phrase initially and /g/ has a voiced stop allophone when following /n/, I substitute /β γ/ for them. /ḷ/ is a voiced alveolar retroflexed lateral. /ṛ/ is an alveolar retroflexed vibrant and has both trilled and forward-flapped allophones. The syllable types are C, CV, CCV. Stress is phonemic.

Norogachi Tarahumara[2] [LIONNET 1966] (16C, 5V)

Consonants:

p	t	č	k	ʔ
b	r		g	
	s		x	
m	n			
	l R			
w		y		

Vowels:

i		u
e		o
	a	

/r/ is considered as voiced stop corresponding to the voiceless *t*. There is no phonetic interpretation of /R/ (versalita), which occurs in medial position of the roots or in initial position of nominalizing suffixes. It may correspond to /ṛ/ in Western Tarahumara.

※Varohio (Sonora) [7] [Johnson and Johnson 1947] (14V, 5V+5G)

Consonants:

p	t	č	k	ʔ
b	d		(g)	
	s		x	
m	n			
	r			
w		y		

Vowels:

i		u	ii		uu
e		o	ee		oo
	a			aa	

/b/ is a stop after nasal but in other positions it is a voiced fricative. /g/ is probably a positional variant of /w/ or /k/. Accent is phonemic. The following vowel diphthongs are observed; /au ai ae ao ei ia io iu oi oa oe ua ui/.

※Guarijío (Chihuahua) [7] [Escalante 1967] (17C, 5V)

Consonants:

p	t	č	k	ʔ
b			g	
	s	š	x	
m	n			
	l	ḷ		
	r			
w		y		

Vowels:

i		u
e		o
	a	

Accent /ˊ/

/ḷ/ is a voiced retroflexed lateral. /x/ is interpreted as velar fricative but it is symbolized as /h/ and positioned under the /ʔ/ in the phonemic inventory. /r/ is a vibrant. The syllable types are V, CV, CVC.

Yaqui [8]

Yaqui[1] [Lindenfeld 1973] (16C, 5V+5G)

Consonants:

p		t	č	k	ʔ
b	b^w			g	
		s			h
m		n			
		l			
		r			
w			y		

Vowels:

i		u	ii		uu
e		o	ee		oo
	a			aa	

/d f ñ/ appear only in Spanish borrowings. Lindenfeld indicates consonant and vowel length by clusters of identical segments as in /lottila/ "tired" or /gooʔo/ "mosquito." The main stress falls most often upon the second syllable.

※**Yaqui**[2] [JOHNSON 1962] (14C, 5V+5G)

Consonants:

p	t	č	k	ʔ
b				
	s			h
m	n			
	l			
	r			
w		y		

Vowels:

i		u	ii	uu
e		o	ee	oo
	a		aa	

/f/ and /d/ appear in Spanish loans. /b/ is a weak fricative in positions other than after nasal. /r/ is a vibrant. Accent /′/.

※**Arizona Yaqui**[3] [FRAENKEL 1959] (16C, 5V+5G)

Consonants:

p	t	č	k	k^w	ʔ
b^w					
	s				h
β					
m	n				
	l				
	(r)				
w		y			

Vowels:

i		u	ii	uu
e		o	ee	oo
	a		aa	

Historically speaking, the fricative /f ð γ/ occur only in Spanish loans. /r/ occurs only in one single instance in an affix, the suffix *-reo/-leo*. Since Fraenkel writes that there is only one stop series but /p^w/ is always voiced, /b^w/ is set up instead of /p^w/. Stress is phonemic. The syllable types are CV, CVV, CVVCVC, CVCV, CVCVC, CVCCV, CVCVCV.

Mayo [9] [COLLARD and COLLARD 1979] (15C, 5V+5G)

Consonants:

p		t	č	k	ʔ
b	b^w				
		s			h
m		n			
		l			
		r			
w			y		

Vowels:

i		u	ii	uu
e		o	ee	oo
	a		aa	

The Mayo phonemic system is not obvious but the above system may be reasonable. /b^w/ may be a phoneme as is in Yaqui, because bu+V clusters exist in the dictionary. /w/ is written by *gu* before *a* and *o* or *hu* before *i* and *e*.

Cora [10]

Jesús María (El Nayar) Cora[1] [CASAD 1984] (18C, 5V+5L)

Consonants:

p	t	t^y	c	$č^y$	č	k	ʔ
	s				š		h
m	n	n^y					
	l	r					
w					y		

Vowels:

i	ɨ	u	i:	ɨ:	u:
e			e:		
	a			a:	

Tone is phonemic.

Ixcatán Cora[2] [MCMAHON 1967] (18C, 6V+6G)

Consonants:

p	p^w	t	c	č	k	k^w	ʔ
β							
		s					h
m	m^w	n					
	l	ṛ					
w				y			

Vowels:

i		u	ii		uu
e	ə		ee	əə	
æ	a		ææ	aa	

/β/ has a stop allophone after nasal and fricative allophones elsewhere. /ṛ/ has a dental allophone before /æ/ and elsewhere is a retroflexed flap. /s/ has three allophones; dental [s] before /æ/, alveolar [š] before /i e/ and alveopalatal retroflexed [ş] before /a u ə/.

Huichol [11]

Huichol[1] [GRIMES 1955, 1959, 1964] (13C, 5V+5G)

Consonants:

p	t	c	k	k^w	ʔ
		ẓ			h
m	n				
	r				
w	y				

Vowels:

i		ï	u	ii		ïï	uu
e				ee			
	a				aa		

/ï/ is a high back unrounded vowel. /ẓ/ is a voiced retroflex sibilant. Syllables are either high or low in tone, short (CV, CVC) or long (CVV, CVVC) in length.

※**Huichol**[2] [MCINTOSH 1945] (15C, 5V+5G)

Consonants:

p	t	c	č	k	k^w	ʔ
		ẓ				h
m	n					
	l	ṛ				
w	y					

Vowels:

i	ɨ	u	ií	ɨɨ́	uú
e			eé		
	a			aá	

/ẓ/ is a voiced backed alveolar grooved spirant, somewhat retroflexed. /l/ is a voiced lateral with alveolar apical articulation. /ṛ/ is a voiced retroflex alveolar flap. /ɨ/ is a high central close unrounded vowel. This is written as /ʌ/ by McIntosh. Stress is phonemic. The sequence of identical vowel is analyzed as two syllables VV in which the second V is stressed.

Nahuatl [12]

Classical Nahuatl [ANDREWS 1975] (15C, 4V+4L)

Consonants:

p	t	ƛ	c	č	k	kʷ	ʔ
			s	š			
m	n						
	l						
w				y			

Vowels:

i			i:		
e		o	e:		o:
	a			a:	

San Jerónimo Amanalco (México) [LASTRA DE SUÁREZ 1980a] (16C, 4V+4L)

Consonants:

p	t	ƛ	c	č	k	kʷ	ʔ
			s	š			h
m	n						
	l						
w				y			

Vowels:

i			i:		
e		o	e:		o:
	a			a:	

Tetelcingo (Morelos) [TUGGY 1979] (15C, 4TV+4LV)

Consonants:

p	t	ƛ	c	č	k	kʷ	
			s	š			h
m	n						
	l						
w				y			

Vowels:

Tense		Lax	
i	u	ɪ	o
ie	ɔ	e	a

/b d g f r/ occurs predominantly in Spanish loanwords.

Amilcingo (Morelos) [DAKIN 1979] (16C, 4V+4L)

Consonants:

p	t	ƛ	c	č	k	kʷ	
					g		
			s	š			h
m	n						
	l						
w				y			

Vowels:

i			i:		
e		o	e:		o:
	a			a:	

※**San Augustin Guapa (Guerrero)** [Dakin 1979] (15C,4V+4L)

Consonants:

p	t	ƛ	c	č	k	k^w		
			s	š				h
m	n							
	l							
w				y				

Vowels:

i			i:		
e		o	e:		o:
	a			a:	

※**Ixcatepec (Guerrero)** [McQuown 1940b] (16C, 4V)

Consonants:

p	t	ƛ	c	č	k	k^w	ʔ	
			s	š				h
m	n							
	l							
w				y				

Vowels:

i	o
e	a

McQuown's analysis of vowel length is dubious, if compared with other dialects. He notes that long vowels surely exist although they are not registered as phonemes.

※**Ahuacatlan (North Puebla)** [Dakin 1979] (15C, 4V+3L)

Consonants:

p	t	ƛ	c	č	k	k^w	ʔ
			s	š			
m	n						
	l						
w				y			

Vowels: 4 short and 3 long vowels

i			i:		
e		o	e:?		o:?
	a			a:	

Tlaxpanaloya (North Puebla) [Brockway 1963] (16C, 4V+4L)

Consonants:

p	t	ƛ	c	č	k	k^w	ʔ
			s	š			
m	n						
	l						
w(W)				y			

Vowels:

i			i:		
e		o	e:		o:
	a			a:	

Brockway does not register long vowels in 1979, saying that vowel length is quite erratic, varying among speakers. He does not admit /W/, neither.

Zongolica (Orizaba, Veracruz) [Goller *et al.* 1974] (17C, 5V+4L)

Consonants:

p	t	ƛ	c	č	k	k^w	
					g		
f			s	š			h
m	n						
	ł						
	(ř)						
w				y			

Vowels:

i		u	i:		
e		o	e:		o:
	a			a:	

/f/ occurs infrequently. Alveolar flap /ř/ has been found in one word *čigiran* "rooster." /b/ occurs only in Spanish loan words. /u/ occurs primarily in Spanish loan words but also in a few words of native origin.

Matlapa (San Luis Potosi) [CROFT 1951] (15C, 4V+4L)

Consonants:

p	t	ƛ	c	č	k	k^w	
			s	š			h
m	n						
	l						
w				y			

Vowels:

i		i:	
e	o	e:	o:
a		a:	

Coscatlan (San Luis Potosi) [DAKIN 1979] (17C, 4V+4L)

Consonants:

p	t	ƛ	c	č	k	k^w	
b							
			s	š			h
m	n						
	l						
	r						
w				y			

Vowels:

i		i:	
e	o	e:	o:
a		a:	

※Cuamelco (Hidalgo) [DAKIN 1979] (15C, 4V+4L)

Consonants:

p	t	ƛ	c	č	k	k^w	
			s	š			h
m	n						
	l						
w				y			

Vowels:

i		i:	
e	o	e:	o:
a		a:	

Acaxochitlan (Hidalgo) [LASTRA DE SUÁREZ 1980b] (17C, 4V+4L)

Consonants:

p	t	ƛ	c	č	k	k^w	ʔ
			s	š			h
m	n						
	l						
	r						
w				y			

Vowels:

i		i:	
e	o	e:	o:
a		a:	

※**Huazalinguillo, Huautla (Hidalgo)** [Kimball 1990] (17C, 4V+4L)

Consonants:

p	t	ƛ	c	č	k	k^w	ʔ
			s	š			h
m	n						
	l						
	r						
w				y			

Vowels:

i			i:	
e	o		e:	o:
	a			a:

Cuatenahuatl, Huautla (Hidalgo) [Beller and Beller 1979] (18C, 4V+4L)

Consonants:

p	t	ƛ	c	č	k	k^w	ʔ
					g		
			s	š			h
m	n						
	l						
w	W			y			

Vowels:

i			i:	
e	o		e:	o:
	a			a:

Nahual [13]

Pomaro (Michoacan) [Sischo 1979] (17C, 5V)

Consonants:

p	t	c	č	k	k^w	ʔ	
		s	š				h
m	n						
	l						
w	W		y	Y			

Vowels:

i	u
e	o
a	

Nahuat [14]

※**Nauzontla (North Puebla)** [McQuown 1942] (15C, 4V)

Consonants:

p	t	c	č	k	k^w	ʔ
		s	š			h
m	n					
	l					
w			y			

Vowels:

i	o
e	a

See Ixcatepec (Guerrero).

Zacapoaxtla (Puebla) [DAKIN 1979] (15C, 4V+4L)

Consonants:

p	t	c	č	k	kʷ	
				g		
		s	š			h
m	n					
	l					
w			y			

Vowels:

i		i:		
e	o	e:	o:	
a		a:		

※**Xalacapan (Sierra Nahuat, Puebla)** [KEY and KEY 1953] (15C, 4V+4L)

Consonants:

p	t	c	č	k	kʷ	
				g		
		s	š			h
m	n					
	l					
w				y		

Vowels:

i		i:	
e	o	e:	o:
a		a:	

Mecayapan (Veracruz) [WOLGEMUTH 1981] (17C, 4V+4L)

Consonants:

p	t	c	č	k	kʷ	ʔ
	d			g		
		s	š			h
m	n					
	l					
w				y		

Vowels:

i		i:	
e	o	e:	o:
a		a:	

/b f r v z ll/ occur in Spanish loans.

Pajapan (Veracruz) [GARCÍA DE LEÓN 1976] (15C, 4V+4L)

Consonants:

p	t	c	č	k	
b				g	
		s	š		h
m	n				
	l				
w				y	

Vowels:

i		i:	
e	o	e:	o:
a		a:	

/d f ñ r r̃/ occur in Spanish loans.

Jalupa (Tabasco) [GARCÍA DE LEÓN 1967] (14C, 4V+4L)

Consonants:

p	t	c	č	k	
bʷ		s	š		h
m	n				
	l				
w				y	

Vowels:

i		i:	
e	o	e:	o:
a		a:	

Pipil (El Salvador) [15] [CAMPBELL 1985] (14C, 4V+4L)

Consonants:

p	t	c	č	k	kʷ	
		s	š			h
m	n					
	l					
w				y		

Vowels:

i			i:	
e	o		e:	o:
	a			a:

Pochutec (Oaxaca) [D6] [BOAS 1917] (17C, 5V+5L)

Consonants:

p	t	c	č	k	
b	d			g	
		s	š		h
m	n		ñ		
	l				
w				y	

Vowels:

i	u	i:	u:
e	o	e:	o:
a		a:	

Cuitlatec [D7]

Cuitlatec¹ [ESCALANTE 1962] (17C, 6V)

Consonants:

p	t	č	k	kʷ	ʔ	
β	ð		ɣ			
		š			h	
m	n					
	l	ł				
w		y				

Vowels:

i	ɨ	u
e		o
	a	

Tones: ´ (high)

High tone (´) is only found in the ultimate or penultimate syllable.
/s f r r̃/ are found in Spanish loans.

※**Cuitlatec²** [MCQUOWN 1940a] (18C, 8V)

Consonants:

p	t	č	k	kʷ	ʔ	
b	d		g	gʷ		
		š			h	
m	n					
	l	ł				
w		y				

Vowels:

i	ɨ	u
e		o
	ʌ	
æ		ɔ

Tones: ´ (high)

/s r r̃/ are found in Spanish loans. Since McQuown uses /ə/ as high, central, and /a/ as low, front, they are substituted here by /ɨ/ and /æ/ respectively. /ł/ is a voiceless fricative lateral.

Notes:

According to Escalante, /β ð γ/ are voiced fricatives, although they are written as /b d g/. He does not admit /gʷ ə ʌ ɔ/ presented by McQuown. Later authors such as Campbell [1979], Suárez [1983b] and Valiñas *et al.* [1984] follow Escalante's inventory.

Paipai [16]

※**Paipai**[1] [ROBLES and BRUCE 1975] (24V, 6V+6L)

Consonants:

p		t	tʸ	č	k	kʸ	kʷ	ʔ
b	bʸ				g			
		ş		š	x			h
m	mʸ	n	nʸ					
		l	ɬ	ŗ				
w			y					

Vowels:

i	ɨ	u	i:	ɨ:	u:
e		o	e:		o:
	a			a:	

Paipai[2] [LANGDON 1971, 1976] (18C, 5V+5L)

Consonants:

p	t	(c)	č	k	q	ʔ
v	s		š	x		
m	n		nʸ			
	l	ɬ r				
w			y			

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

/c/ is found in only one morpheme. /i a u/ appear to be much more common than /e o/.

※Cochimi [17] [ROBLES and BRUCE 1975] (21C, 5V)

Consonants:

p	t	tʰ	č	k	kʷ	ʔ
b						
	s		š	x		h hʷ
m	n					
	l	ɬ				
	r	r̃				
w			y			

Vowels:

i		u
e		o
	a	

Kiliwa [18]

※**Kiliwa**[1] [Robles and Bruce　1975] (22C, 6V+6L)

Consonants:

p	p^h	t	t^w	č	k	k^w	ʔ	
b								
		s		š	x		h	h^w
m	m^y	n	n^y					
		l	r					
w				y				

Vowels:

i	ɨ	u	i:	ɨ	u:
e		o	e:		o:
	a			a:	

Kiliwa[2] [Mixco　1985] (18C, 3V+3L)

Consonants:

p	t	č	k	k^w	q	ʔ
(v)	s	(ss)	x	x^w	(h^w)	h
m	n	ñ				
	l					
	r	(rr)				
w		y				

Vowels:

i	u	i:	u:
a		a:	

Pitch: high, low, falling

The consonants given in parentheses are extremely rare. Most often /ss/ represents the rare palatal -s [sic]. Occasionally, however, it has been used for the even rarer gemination of the fricative /s/ [Mixco　1985: xi]. I have eliminated the parenthesized phonemes for this study.

Cocopa [19]

※**Cocopa**[1] [Robles and Bruce　1975] (20C, 6V+6L)

Consonants:

p	t	t^y	č	k	ʔ	
b						
	s		š	x	h	h^w
m	n	n^y				
	l	ɬ r				
w			y			

Vowels:

i	ɨ	u	i:	ɨ:	u:
e		o	e:		o:
	a			a:	

Cocopa[2] [Crawford　1989] (24C, 3V+3L)

Consonants:

p	t	ţ	c	k	k^w	q	q^w	ʔ
	s	ş	š	x	x^w			
m	n		n^y					
	ɬ		$ɬ^y$					
	l		l^y					
	r							
w			y					

Vowels:

i	u	i:	u:
a		a:	

Stress: high, medium, emphatic low

/t/ is a dental stop and /ṭ/ is an alveolar stop. /t/ is rare in native words in normal speech, but common in affective speech and in Spanish loanwords. /f v θ ð d g ŋ e o/ occur in Spanish loanwords.

Seri [20]

Seri[1] [Marlett 1984, 1988] (16C, 4V+4L)

Consonants:

p		t			k	k^w			ʔ
Φ	W	s	ɬ	ş	x		X	X^w	
m		n							
				y					

Vowels:

i			i:		
		o			o:
æ	a		æ:	a:	

/ř/ occurs in loanwords. /ş/ represents a voiceless retroflexed alveopalatal fricative, /W/ a voiceless spirantized [w], and /X/ a voiceless uvular fricative. The round consonants /k^w/, /W/, and /X^w/ have an extremely limited distribution due to some fairly transparent historical developments. /æ/ is a low front vowel, which is represented by /e/ in Marlett [1984, 1988]. Stress generally occurs on the first syllable of the root.

※**Seri[2]** [Moser and Moser 1965] (18C, 4V+4L)

Consonants:

p		t			k	k^w			ʔ
Φ	W	s	ɬ	ş	x		X	X^w	
m		n		ŋ					
l				y					

Vowels:

i			
ɛ		o	
	a		V, VV, VVV

/ř/ is a flap and occurs only in Spanish loans. Since Moser and Moser describe that /e/ is a mid open front vowel which has a phonetic quality varying between [ɛ] and [æ], /e/ is replaced by /ɛ/ in the above chart. Stress /ˊ/ is phonemic. Moser and Moser do not admit long vowels but sequences of two and three identical vowels. In the latter case the first vowel of three identical vowels seems to be only a stressed vowel. Thus I treat the sequence of two identical vowels as long vowel, though this interpretation is different from that of Moser and Moser. Nasalization occurs but it is restricted to vowel nuclei preceded by /k^w/. (The only exceptions are *į̨į* "yes" and *ʔįʔįįki* "a nickname.")

Tarasco [21]

Ichupio and Tarerio Tarasco[1] [Foster 1969, 1971] (19C, 6V)

Consonants:

p	t	c	č	k
p^h	t^h	c^h	$č^h$	k^h
		s	š	x
m	n			
	r	ṛ		
w			y	

Vowels:

i	ɨ	u
e		o
	a	

/b d g f l ñ/ occur in Spanish loans.

San Jerónimo Purenchécuaro Tarasco[2] [NANSEN DÍAS 1985] (19C, 6V)

Consonants:

p	t	c	č	k	kʷ
pʰ	tʰ			kʰ	kʷʰ
		s	š	x	
m	n				
	r	ṛ			
w			y		

Vowels:

i	ɨ	u
e		o
	a	

Totonac [22]

Xicotepec [REID 1991] (17C, 5V+5L)

Consonants:

p	t	c	č	k	q	ʔ
		s	š			h
m	n					
	l	ɬ	ƛ			
w			y			

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

CVʔ

※**Zapotitlan** [ASCHMANN 1946, 1983] (17C, 3V+3L)

Consonants:

p	t	c	č	k	q	ʔ
		s	š			h
m	n					
	l	ɬ	ƛ			
w			y			

Vowels:

i		u	i:		u:
	a			a:	

CVʔ

/ƛ/ is added in his Diccionario [ASCHMANN 1983].

Papantla [ASCHMANN 1973; HERNÁNDEZ GARCÍA 1982; LEVY 1987] (17C, 3V+3L)

Consonants:

p	t	c	č	k	q	ʔ
		s	š			h
m	n					
	l	ɬ	ƛ			
w			y			

Vowels:

i		u	i:		u:
	a			a:	

CʔV

/r/ is registered by Levy [1987] but it is a marginal phoneme. Levy reports laringealized vowels and CʔV is described as CV.

※**Coatepec** [LEVY 1987 (from MCQUOWN 1940, 1983)] (23C, 3V+3L)

Consonants:

p	t	c	č	k	kʷ	q	ʔ	
f		ṣ	š	x	xʷ		h	hʷ
m	n							
	l	ɬ	ƛ					
	r							
w			y					

Vowels:

i		u	i:	u:
	a		a:	

/f/ and /xʷ/ are found after 1940 and added in edition. /b g e o/ appear in Spanish loans.

※**Ahuacatlán** [LEVY 1987 (from ESPINOZA 1978)] (14+3C, 3V+3L)

Consonants:

p	t	c	č	k	q	ʔ
m	n					
	l	ɬ	ƛ			
w			y			

Vowels:

i		u	i:	u:
	a		a:	

/s š h/ are not found in his inventory, which must be quotation errors.

Tepehua [23]

Teachichilco [WATTERS 1980] (15C, 5V+5L)

Consonants:

p	t	c	č	k	q	ʔ
		s	š			h
m	n					
	l					
w			y			

Vowels:

i		u	i:	u:
e		o	e:	o:
	a		a:	
CʔV				

/r̃/ is attested only in Spanish loanwords and in a few onomatopoetic words. [ɬ] occurs in syllable-final position or before a consonant.

Huehuetla [BOWER 1948; BOWER and ERICKSON 1967] (22C, 3V+3L)

Consonants:

p	t	c	č	k	q	ʔ
p'	t'	c'	č'	k'	q'	
		s	š			h
m	n					
	l	ɬ				
w			y			

Vowels:

i		u	i:	u:
	a		a:	

/e e: o o:/ contrast with /i i: u u:/ only in Spanish loans.

Notes:

The glottal stop presents some peculiarities for the Totonacan languages. It follows the vowel in some dialects, precedes the vowel in others, and in some towns "it acutalizes as a laryngealization of the syllabic nucleus without any full glottal stop present" [Aschmann 1946: 42]. In Huehuetla a series of glottalized stops is reported. These variations are described as follows:

C'V~CʔV'~CV'ʔ~CV̇ (V̇ represents a laryngealized vowel.)

Even in the same dialect different treatments are observed. See Papantla Totonac, in that Levy registers glottal stop plus vowel as a laryngealized vowel, while Aschmann and Hernández García treat them as CʔV.

Chichimec [24]

Chichimec[1] [Lastra de Suárez 1984] (20C, 7V+7N)

Consonants:

	p	t	c	č	k	ʔ
	b	d		ǰ	g	
			s			h
			z			
Fortis	m	n				
Lenis	m̲	n̲				
		l	r			
	w					

Vowels:

i	ü	u	į	ü̜	ų
e		o	ę		ǫ
æ	a		æ̨	ą	

/d ǰ/ only occur after /n/. /l/ occurs in very few words. There is no description of tone, but judging from the transcription there is a tone contrast, high and low.

※**Chichimec**[2] [Romero Castillo 1960] (17C, 7V+5N)

Consonants:

p	t	c	č	k	ʔ
b	d			g	
		s			h
		z			
m	n				
	l	r			
w					

Vowels:

i	ü	u	į	ü̜	ų
e		o	ę		
æ	a			ą	

Tones: high, low

Pame [25]

Central Pame (Santa María Acapulco) [Gibson 1956] (21C, 5V+5N)

Consonants:

p	t	c	č	k	q	ʔ	
b	d			g			
		s	š			h	
m	n			ŋ			
	l	lʸ	r				
w			y				

Vowels:

i		į	
e		ę	
ɛ	o	ɛ̨	ǫ
a		ą	

Tones: high, low, falling glide

/f/ occurs in Spanish loanwords.

South Pame (Jiliapan) [MANRIQUE C. 1967] (19C, 6V+6N)

Consonants:

p	t	c	č	k	ʔ
b	d	j	ǰ	g	
		s	š		h
m	n				
	r				
w			y		

Vowels:

i	ɨ	u	į	ɨ̨	ų
e		o	ę		ǫ
	a			ą	

Tones: high, low, glide

Matlatzinca [26] [SCHUMANN 1975] (16C, 7V)

Consonants:

p	t	c	č	k	k^w	ʔ
	s		š			h
β						
	l					
m	n					
w			y			

Vowels:

i	ɨ	u
e	ʌ	o
	a	

Schumann describes both Matlatzinca and Ocuiltec phonemes. His Ocuiltec inventory differs from Muntzel's analysis displayed below in the following points:

1) /d z ñ/ occur in Schumann's inventory, while Muntzel does not register them.
2) Schumann does not admit long vowels which Muntzel sets up.
3) Muntzel analyzes /e o/ as more open mid vowels.

Ocuiltec [27] [MUNTZEL 1982, 1985] (17C, 7V+7L)

Consonants:

p	t	c	č	k	k^w	ʔ
	(s)		š			h
β						
	l	(r)				
m	n					
w			y			

Vowels:

i	ɨ	u	i:	ɨ:	u:
ɛ	ʌ	ɔ	ɛ:	ʌ:	ɔ:
	a			a:	

Tones: high, glide

/f r̃/ are found in Spanish loans. /s/ and /r/ are rare phonemes. Nasal vowels are conditioned by nasals.

Otomi [28]

Mezquital[1] [Sinclair and Pike 1948; Hess 1968] (23C, 9V+4N)

Consonants:

p	t	c	č	k	ʔ
b	d			g	
f	θ	s	š	x	h
		z			
m	n		ñ		
	l	r			
w			y		

Vowels:

i		ï	u	į	ų
e	ʌ		o	ę	
ɛ	a		ɔ		ą

Tones: high, low, rising

※**Mezquital**[2] [Bernard 1973] (21C, 9V)

Consonants:

p	t	c		k	ʔ
Φ	θ	s	š	x	h
β	ð	z		γ	
m	n		ñ		
		r			
w			y		

Vowels:

i	ɨ	u
e	ʌ	o
æ	a	ɔ

Tones: high, low, rising

/č ž l/ are phonemic only in recent Spanish loans. Nasalization has apparently declined in modern times and may be in the process of becoming a strictly phonetic feature. Nasalized /a/ may persist as phonemic, but it appears as nasal /ɔ/ in the speech of many Otomies.

Temoayan Otomi [Andrews 1949] (23C, 9V+3N)

Consonants:

p	t	c	č	k	kʷ	ʔ
b	d			g	gʷ	
		(s)	š			h
		z	(ž)			
m	n		ñ			
	(l)	ř				
w			y			

Vowels:

i		u	į	ų
e	ə	o		
ɛ	ʌ	ɔ		
	a			ą

Tones: high, low, rising

/s ž l/ are rare phonemes.

Tenango Otomi [BLIGHT and PIKE 1976] (18C, 9V+4N)

Consonants:

p	t		k	ʔ
b	d		g	
ɸ	s	š	x	h
	z			
m	n			
		ř		
w		y		

Vowels:

i		ï	u	į		ų
e	ə		o			
æ	a		ɔ	æ̨	ą	

Tones: high, low, rising

A voiced lateral /l/ and a voiceless alveopalatal affricate /č/ occur in Spanish loanwords.

Sierra Otomi (San Gregorio and San Antonio el Grande) [ECHEGOYEN GLEASON 1979] (16C, 9V+4N)

Consonants:

p	t	c	k	ʔ
b	d	j	g	
		š		h
m	n			
		r		
w		y		

Vowels:

i		ï	u	į		ų
e	ə		o			
æ	a		ɔ	æ̨	ą	

Tones: high, low, falling, rising

Mazahua [29] [SPOTTS 1953, 1956] (23C, 9V+6N)

Consonants:

p	t	c	č	k	kʷ	ʔ
b	d			g	gʷ	
		s	š			h
		z	ž			
m	n		ñ			
	l	r				
w			y			

Vowels:

i	ɨ	u	į		ų
e	ə	o	ę	ə̨	ǫ
ɛ		ɔ			
	a			ą	

Tones: high, low, falling

Tlapanec [30]

Tlapanec[1] [SUÁREZ 1983a] (20C, 5V+5N+10L)

Consonants:

p	t	c	č	k	ʔ
b	d		ǰ	g	
ɸ		s	š		h
m	n				
	l	r			
w			y		

Vowels:

i	u	i:	u:	į	ų	į:	ų:
e	o	e:	o:	ę	ǫ	ę:	ǫ:
a		a:		ą		ą:	

Tones: 1 (high), 2 (mid), 3 (low)

1, 2, 3, 12, 13, 21, 23, 32, 31, 323, 48

[SUÁREZ 1983b]

※**Tlapanec**[2] [Tito Morán 1988] (23C, 5V+5N+10L)

Consonants:

p	t		č	k	?
b	d		ǰ	g	
p^h	t^h			k^h	
Φ		s	š		h
m	n		ñ		
	l	r			
w			y		

Vowels:

i	u	i:	u:	į	ų	į:	ų:
e	o	e:	o:	ę	ǫ	ę:	ǫ:
a		a:		ą		ą:	

Tones: high, mid, low

These two are the phonemic inventories of the same dialect (Malinaltepec), but the diferences are observed in /c ñ/ and aspirated stops. [c], [ñ] and the aspirated stops exist but they are interpreted as consonant clusters, that is, *ts* in Tito Morán and *ph, th, kh, ny* in Suárez. They are due to the different interpretation.

Ixcatec [31] [Fernández de Miranda 1959, 1961] (23C, 5V+5N)

Consonants:

	t	t^y	c	č	k	?
b	d	d^y		ǰ	g	
φ	s			š		h
m	n			ñ		
	l	ř		r̃		
w				y		

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tones: high, mid, low

/p/ occurs in loanwords. Since voiced stops appear only after nasals, they may be analyzed as voiced allophones of voiceless stops or prenasalized consonants /^{n}b ^{n}d ^{n}d^y ^{n}ǰ ^{n}g/.

Popoloc [32]

Western Popoloc[1] **(Otlaltepec)** [Williams and Pike 1968] (21C, 5V+5N)

Consonants:

	t	c	č	č̣	k	?
		s	š	ṣ̌		h
		(z)	(ž)	(ẓ̌)	γ	
m	n		ñ			
	(l)	ř				
w			y			

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tones: high, mid, low

/p/ is found only in loanwords. /r̃/ is found in loanwords except in one native word. /l/ is a rare phoneme. But for /γ/, the voiced fricatives are rare. /z/ occurs in only four morphemes. /ẓ̌/ occurs in only two morphemes. A sequence of two vowels is not analyzed as long vowel.

※**Western Popoloc**[2] **(Otlaltepec)** [PIERSON 1953] (20C, 5V+5N)

Consonants:

	t	c	č	ç̌	k	ʔ
	d	j	ǰ			
		s	š	ş̌		h
	v			γ		
m	n					
	l	ř				
			y			

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tones: high, mid, low
12, 13, 21, 23, 31, 32,
131, 121, 213, 312, 313

/p/ occurs only in loanwords. /v/ varies freely to [w] in all positions.

Eastern Popoloc (Atzingo) [KALSTROM and PIKE 1968] (18C, 5V+5N)

Consonantas:

(p)	t	c	č	ç̌	k	ʔ
		s	š	ş̌		h
	(ð)					
m	n					
	l	r				
w			y			

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tones: 1 (high), 2, 3, 4 (low)

/p/ and /ð/ are found in only two morphemes, respectively.

Popoloc (Tlacoyalco) [STARK and MACHIN 1977] (24C, 4V+4N+8L)

Consonantas:

(p)		t	c	č	ç̌	k	ʔ
ϕ	θ	s		š	ş̌		h
β	ð	z		ž		γ	
m		n		ñ			
		l ř r̃					
					y		

Vowels:

i		į		i:		į:	
e	o	ę	ǫ	e:	o:	ę:	ǫ:
a		ą		a:		ą:	

Tones: 1 (high), 2, 3, 4 (low)

/p/ is rare phonemes found in a few native words. /θ t c č ç̌ k/ are voiced following /n/ when not preceding /h/.

Chocho [33] [MOCK 1977] (24C, 5V+5N)

Consonants:

p	t	c	č	ç̌	k	ʔ
ϕ	θ	s	š	ş̌	x	
β	ð	z	ž	ẓ̌	γ	
m	n					
	l	r r̃				

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tones: 1 (high), 2, 3 (low), 12, 21, 32

Accent is generally placed on penultima. /ð γ/ are pronounced as [d g] after nasals.

Mazatec [34]

Chiquihuitlan [Jamieson 1977a, 1977b; Jamieson 1982, 1988] (15C, 6V+6N)

Consonants:

	t	tʸ	c	č	k	ʔ
	s			ş̌		h
m	n	ñ				
	ř					
β				y		

Vowels:

i	u	į	ų
ɛ	o	ę	ǫ
æ	a	æ̨	ą

Tones: 1 (high), 2, 3, 4 (low), 14, 24, 34, 21, 31, 41, 42, 214, 314, 414, 424

/p ð γ r̃/ are found in Spanish loans.

Jalapa de Diaz [Schram and Pike 1978] (21C, 5V+5N)

Consonants:

	t	c	č	k	kʷ	ʔ
	d	j	ǰ	g	gʷ	
	s		š			h
m	n		ñ			
	l	r				
w		y				

Vowels:

i	u	į	ų
	o		ǫ
æ	a	æ̨	ą

Tones: high, mid, low

Huautla de Jimenez [Pike 1967] (17C, 4V+4N)

Consonants:

p	t	c	č	ç̌	k	ʔ
	s			ş̌		h
m	n		ñ			
	l	(ř)				
v			y			

Vowels:

i		į	
e	o	ę	ǫ
	a		ą

Tones: 1 (high), 2, 3, 4 (low), 13, 14, 23, 24, 34, 43, 42, 32, 21, 424, 423

/b d g r̃/ occur in Spanish loans. /ř/ is a rare phoneme.

Soyaltepec [Pike 1956] (18C, 5V+5N)

Consonants:

p	t	c	č	ç̌	k	ʔ
	s		š			h
m	n		ñ			
	l	ř	r̃			
w			y			

Vowels:

i	u	į	ų
e	o	ę	ǫ
	a		ą

Tones: 1 (high), 2, 3, 4 (low), 12, 21, 23, 24, 31, 32, 34, 41, 42, 43

Amuzgo [35]

San Pedro Amuzgo[1] [SMITH-STARK and TAPIA GARCÍA 1984] (21C, 7V+5N)

Consonants:

(p)	t	t^y	c	č	k	ʔ
b		d^y			g	
	s			š		h
m	n			ñ		
	(l)	r	(r̃)			
w			y			

Vowels:

i u
e o ę ǫ
ɛ a ɔ ɛ̨ ą ɔ̨

Tones: 1 (high), 3, 5 (low), 12, 34, 35, 31, 53

※San Pedro Amuzgo[2] [CUEVAS SUÁREZ 1985] (16C, 7V+5N)

Consonants:

	t	t^y	c	č	k	k^w	ʔ
	s			š			h
β							
m	n						
	l						
w				y			

Vowels:

i u į ų
e o ę ǫ
ɛ a ɔ ą

Tones: 1 (high), 2, 3 (low), 21, 13, 31

Although the informant of both Amuzgo charts is the same person (Tapia García), the inventories are different.

Xochistlahuaca [BAUERNSCHMIDT 1965] (25C, 7V+5N)

Consonants:

(p)	t	c	t^y	č	k	k^y	k^w	ʔ
(m^p)	n^t		n^{ty}		$ŋ^k$			
(β)	s			š				h
m	n		n^y					
	l							
	r	(r̃)						
w			y					

Vowels:

i u
e o ę ǫ
æ a ɔ æ̨ ą ɔ̨

Tones: 1 (high), 2 (mid), 3 (low), 13, 32, 21

n̩ m̩b are syllabic consonants. Parenthesized phonemes are extremely rare.

Mixtec [36]

Acatlan [PIKE and WISTRAND 1974] (22C, 5V+5N)

Consonants:

p	t		č	k	k^w	ʔ
^{m}b	^{n}d	^{n}j	$^{n}ǰ$	^{ŋ}g		
	s		š			(h)
v	ð					
m	n		ñ			
	l					
(w)			y			

Vowels:

i u į ų
e o į ų
a ą

Tones: high, mid, low

/w h/ are rare. /ř r̃/ are rare and found mostly in loanwords.

Huajuapan [Pike and Cowan 1967] (17C, 5V+4N)

Consonants:

	t	č	k	k^{w}	ʔ
	^{n}d		(^{n}g)		
	s	š			
β	ð	ž			
m	n	ñ			
	l				
(w)					

Vowels:

i	ü	į	
e	o	ę	ǫ
a		ą	

Tones: high, mid, low

/^{n}g w/ are rare phonemes. /p ^{m}b ɸ h γ r r̃/ occur in Spanish loanwords. Notice that there is no /y/, nor are there any palatal clusters described.

Silacayoapan [North and Shields 1977] (20C, 5V+4N)

Consonants:

p	t	č	k	k^{w}	ʔ
(^{m}b)	^{n}d	(^{n}ǰ)	(^{n}g)		
β	s	š	ž		h
m	n	ñ			
	l				
		y			

Vowels:

i	ʉ	į	ų
e	o	ę	
a		ą	

Tones: 1 (high), 2 (mid), 3 (low)

/^{m}b ^{n}ǰ ^{n}g/ are rare. /ř/ occurs in Spanish loans with a few exception.

Mixtepec [Pike and Ibach 1978] (22C, 5V+5N)

Consonants:

(p)	t	c	č	k	k^{w}	ʔ
(^{m}b)	^{n}d	^{n}j	^{n}ǰ	^{n}g	($^{n}g^{w}$)	
	s		ş̌			
m	n		ñ			
	l ř					
v			y			

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tones: 1 (high), 2 (mid), 3 (low)
1, 2, 3, 13, 23, 31, 32

/p ^{m}b $^{n}g^{w}$/ are rare. /ǫ/ occurs only in one morpheme -ǫ "we exclusive."
/v/ varies from labiodental to bilabial.

Alacatlazala [Zylstra 1980] (17C, 5V+5N)

Consonants:

	t	č	k	k^{w}	ʔ
	^{n}d		(^{n}g)		
β	s	š			(h)
m	n	ñ			
	l ř				
		y			

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tones: high, mid, low

/p ᵐb/ occur only in loanwords. /ⁿg/ occurs only in one morpheme /iⁿgà/ "other." The phoneme /β/ has an allophone [w] before the vowel /a/ and is realized as [β] elsewhere. /h/ is a rare phoneme. Zylstra's inventory [1991] is as follows:

/t č k kʷ b d ᵐb ⁿd s š x v m n ñ l r y ʔ i e a o u į ą ǫ ų/ (19C, 5V+4N) /p g f/ occur in Spanish loans.

※**Ayutla**[1] [PANKRATZ and PIKE 1967] (23C, 5V+4N)

Consonants:

(p)	t	tʸ	č	k	kʷ	ʔ
(ᵐb)	ⁿd	ⁿdʸ		(ⁿg)	(ⁿgʷ)	
	s		š	(h)	(hʷ)	
m	n		ñ			
	l	r				
β			y			

Vowels:

i	u	į	ų
e	o	(ę)	
a		ą	

Tones: high, mid, low

/p ᵐb ⁿg ⁿgʷ h hʷ ę/ are rare phonemes. /r/ is a vibrant. The semiconsonant /β/ is a bilabial continuant and varies from slight friction to frictionless.

Ayutla[2] [HILLS 1990] (23C+ʔ, 5V+3N)

Consonants:

(p)	t	tʸ	(kʸ)	k	kʷ	
(ᵐb)	ⁿd	ⁿdʸ		(ⁿg)	(ⁿgʷ)	
	s	(sʸ)	š	(x)		
(m)	n	nʸ	ñ			
	l	ř				
v			y			

Vowels:

i	u	į	ų	iʔ	uʔ	įʔ	ųʔ
e	o			eʔ	oʔ		
a		a		aʔ		ąʔ	

Tones: high, mid, low

/p kʸ ᵐb ⁿg ⁿgʷ sʸ x m/ are rare.

※**Ocotepec**[1] [MAK 1958] (18C, 5V+5N)

Consonants:

(p)	t	č	k	kʷ	(ʔ)
	s	š			h
	z	ž			
β	ð				
m	n	ñ			
	l				
		y			

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tones: high, mid, low

/p ʔ/ are rare. /ᵐb ⁿd ⁿǰ ⁿg/ are treated as clusters /mp nt nč nk/.

Ocotepec[2] [Alexander 1988] (19C, 5V+5N)

Consonants:

(p)	t	č	k	k^w	ʔ
	^{n}d	(^{n}ǰ)	(^{n}g)		
	s	š	x		
v	(ð)				
(m)	n	ñ			
	(l)				
		y			

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tones: high, mid, low

/p ^{n}ǰ ^{n}g ð m l/ are rare. /^{m}b f g r r̃/ have been introduced in Spanish loanwords.

Molinos [Merrifield and Stoudt 1967] (18C, 5V+5N)

Consonants:

p	t	č	k	k^w	ʔ
	d				
	s	š			h
v		ž			
m	n	ñ	ŋ		
	l r				

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tones: high, mid, low

/^{n}d/ is interpreted as /nd/.

Atatlahuca [Mak 1953] (23C, 6V+6N)

Consonants:

p	t	č	k	k^w	ʔ
^{m}b	^{n}d	^{n}ǰ	^{n}g		
	s	š	h		
β	ð	ž			
m	n N	ñ			
	l	r			
		(y)			

Vowels:

i	ï	u	į	į̈	ų
e		o	ę		ǫ
a			ą		

Tones: 1, 2, 3, 4
(1, 2, 3 [Alexander 1980])

/N/ is a voiceless alveolar nasal. /y/ is rare and occurs as second member of a consonant cluster.

San Miguel El Grande [Mak 1950] (21C, 6V+5N)

Consonants:

p	t	č	k	k^w	ʔ
^{m}b	^{n}d	^{n}ǰ	^{n}g		
	s	š	h		
β	ð	ž			
m	n	ñ			
	l r				

Vowels:

i	ï	u	į	į̈	ų
e		o			ǫ
a			ą		

Tones: high, mid, low

/β/ is slightly voiced except after glottal stop or between /ï/ vowels, when it becomes [w]. Pike notes that /β/ varies freely from a stop especially initially in morphemes, to a flat fricative, in the same position, to a [w], especially morpheme medially [PIKE 1939: 115]. /ž/ is [y] after /l/ or /š/, [ž] or [y] elsewhere.

Chalcatongo [MACAULAY 1987] (17C, 6V+4N)

Consonants:

	t	č	k	k^w	ʔ
b	^{n}d				
	s	š	h		
		ž			
m	n	ñ			
	l r				
w					

Vowels:

i	ɨ	u	į	ɨ̨	ų
e		o			
	a			ą	

Tones: high, mid, low

※**Diuxi**[1] [PIKE and ORAM 1976] (18C, 6V+6N)

Consonants:

	t	č	k	k^w	ʔ	
	d					
	s	š			h	h^w
β	ð	ž				
m	n	ñ				
	l ř					

Vowels:

i	ɨ	u	į	ɨ̨	ų
e		o	ę		ǫ
	a			ą	

Tones: high, low

/^{n}d/ is interpreted as /nd/, that is, /d/ occurs only after /n/.

Diuxi[2] [KUIPER and ORAM 1991] (19C, 6V+6N)

Consonants:

	t	č	k	k^w	ʔ
	^{n}d		^{n}g		
	s	š	x	x^w	
β	ð	ž			
m	n	ñ			
	l r				

Vowels:

i	ɨ	u	į	ɨ̨	ų
e		o	(ę)		ǫ
	a			ą	

Tones: high, mid, low, high downglide

Since it is reported that *d* and *g* occur only after *n*, they are symbolized as /^{n}d ^{n}g/ here. /ž/ is transcribed by *y* in the source. /p b g^w f/ occur in loanwords.

Peñoles [DALY 1973; DALY and DALY 1977] (20C, 6V+6N)

Consonants:

	t	č	k	k^w	ʔ
^{m}b	^{n}d	^{n}ǰ	^{n}g	^{n}g^w	
	s	š			
ɸ	ð	ž			
m	n	ñ			
	l ř				

Vowels:

i	ɨ	u	į	ɨ̨	ų
e		o	ę		ǫ
	a			ą	

Tones: high, mid, low

/p f h r̃/ are found in Spanish loans.

Coatzospan [Pike and Small 1974; Small 1979, 1990] (23C, 6V+5N)

Consonants:

(p)	t	c	č	k	k^{w}	ʔ
^{m}b	^{n}d	^{n}j	$^{n}ǰ$	^{n}g	$^{n}g^{w}$	
	s	š				
β	ð	$ð^{y}$				
m	n	ñ				
	l	ř				

Vowels:

i	ɨ	u	į	ɨ̨	ų
e		o	ę		
	a			ą	

Tones: high, low, high-low glide

[Small 1990] high, low, high-low, low-high

/p/ is rare. /f x g y w/ have entered through Spanish loanwords.

Jamiltepec [Johnson 1988] (21C, 6V+6N)

Consonants:

(p)	t	t^{y}	č	k	k^{w}	ʔ
(^{m}b)	^{n}d	$^{n}d^{y}$		^{n}g		
v	s		š	x		
m	n		ñ			
	l	r				
			y			

Vowels:

i	ɨ	u	į	ɨ̨	ų
e		o	ę		ǫ
	a			ą	

Tones: high, mid, low

/p ^{m}b/ are rare.

San Juan Colorado [Stark, Johnson and Lorenzo Cruz 1986] (20C, 6V+6N)

Consonants:

p	t	t^{y}	c	k	k^{w}	ʔ
^{m}b	^{n}d	$^{n}d^{y}$				
	s		š	x		
m	n		ñ			
	l	r				
v			y			

Vowels:

i	ɨ	u	į	ɨ̨	ų
e		o	ę		ǫ
	a			ą	

Tones: high, mid, low

Chayuco [Pensinger and Lyman 1975] (20C, 6V+6N)

Consonants:

p	t	t^{y}		k	k^{w}	ʔ
^{m}b	^{n}d	$^{n}d^{y}$		^{n}g		
v	θ	s	š			
m	n		ñ			
	l	ř				
			y			

Vowels:

i	ɨ	u	į	ɨ̨	ų
e		o	ę		ǫ
	a			ą	

Tones: high, mid, low

/q/ possibly is /k^{w}/, although it is noted that /q/ represents [ky].

Jicaltepec [BRADLEY 1970] (20C, 5V+5N)

Consonants:

p	t	t^y	č	k	k^w	ʔ
^mb	nd	$^nd^y$		^ng		
	s		š			
m	n		ñ			
	l	ř				
w			y			

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tones: high, mid, low

/Φ s^y x/ are found only in Spanish loans. /ř/ is a postdental flap.

Cuicatec [37]

※**Concepción Pápalo**[1] [NEEDHAM and DAVIS 1946] (14C, 6V+6N)

Consonants:

	t	č	k	k^w	ʔ
β	ð				
	s		x		
m	n				
	(l)				
	(r)				
		y			

Vowels:

i	u	į	ų
e		ę	
ɛ	ɔ	ɛ̨	ɔ̨
a		ą	

Tones: high, mid, low

/l r/ are rare phonemes. /f/ occurs in Spanish loans. Davis and Walker change the analysis of /e ɛ/, uniting them into one phoneme /e/, and long vowels are treated as vowel clusters VV [DAVIS and WALKER 1955].

Concepción Pápalo[2] [BRADLEY 1991] (15C, 5V+5N)

Consonants:

p	t	č	k	k^w	ʔ
	s		x		
v	ð				
m	n				
	l	r			
		y			

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tones: high, mid, low

/f/ occurs in Spanish loanwords.

※**Santa María Pápalo** [ANDERSON and CONCEPCIÓN ROQUE 1983]

Vowels:

i	u	į	ų
e	o	ę	ǫ
a	ɔ	ą	

Tones: 1 (high), 2, 3, 4 (low), 14, 24, 243, 32, 43

I cannot exactly extract phonemes from Anderson's Dictionary, but the vowel system is surely indicated above and different from that of Concepción Pápalo, although the consonant system seems to be identical to that of Concepción Pápalo.

Trique [38]

San Andres Chicahuaxtla [LONGACRE 1952, 1959; HOLLENBACH 1977]
(25C, 7V+6N)

Consonants:

Fortis	p	t	k	s	š	m	n	l	y	w
Lenis	b	d	g	z	ž	m̲	n̲	l̲	y̲	w̲
		c	č	r	ʔ	h				

Vowels:

i	ɨ	u		į	ɨ̨	ų
e	ʌ	o		ę		ǫ
	a				ą	

Tones: 1, 2, 3, 4, 5,
12, 13, 21, 23, 32, 34, 35, 43, 45, 51, 52, 53, 54,
343, 354

San Juan Copala [HOLLENBACH 1977] (22C, 5LV+3SV)

Consonants:

Fortis	p	t	k	s	š	ş̌
Lenis	b	d	g	z	ž	r
Affricates	c	č	ç̌			
Resonants	m	n	l	w	y	
Laryngeals	ʔ	h				

Bilabial stops are a recent innovation, found in Spanish loanwords and a few onomatopoeic forms.

Vowels:

There are eight vowels: five long vowels and three short vowels. They may be nasalized. The long vowels constitute the simple, unmarked case, contrary to a traditional analysis. The short vowels consist of a simple vowel checked by an abstract laryngeal *!*, which has the phonetic characteristics of a ballistic accent [HOLLENBACH 1985: 456].

Long	i		u	Short		
	e		o		e!	o!
		a				a!

Tones:

There are eight tones.

21, 32, 3, 34, 35, 4, 5, 53

The tone system is analyzed as a contour system rather than as a register system, such as those reported for various Middle American languages.

Note:

Trique and Zapotecan have fortis and lenis consonant contrasts. The fortis consonants are more tense and generally longer than the coprresponding lenis cosonants. Lenis consonants are more lax, with stops tending towards fricative articulation [LONGACRE 1952: 63; JONES and KNUDSON 1977: 163].

Zapotec [39]

Although the most famous characteristics is the contrast of fortis and lenis, some do not describe the contrast. There are two types of the description of vowel clusters. One is the separation of vowel clusters; simple, glottalized, laryngealized and aspirated. The other is no-separation, that is, the vowel clusters are regarded as vowel plus consonant. The glottal stop /ʔ/ is normally considered as consonantal but in Zapotecan it is considered as part of the vocalic nucleus, creating a contrast between plain and checked vowels [JOSSERAND 1983: 177].

※**Sierra Zapotec (Atepec)** [NELLIS 1947] (23C, 5V+3N)

	p	t	c	č	k	k^w	ʔ
	s	ş̌	f	θ	x		
	z	ž̧	v	ð	ɣ		
	m	n	l	r	ř	w	
Vowels	i	e	a	o	u		
	į		ą		ų		
Tones	high, mid, low						

There is no interpretation of phonemes. Juarez Zapotec presented below is the same dialect, but the description is different.

Juarez Zapotec (Eastern Ixtlan=Atepec) [BARTHOLOMEW 1983] (35C, 5V)

pp	bb	tt		cc	čč	kk		kk^w		θθ	s	ş̌ş̌		m	n	l	r	y
p	b	t	d	c	č	k	g	k^w	g^w	θ		ş̌	ž̧	m̱	ṉ	ḻ	ṟ	y̱
	w	ʔ																

Vowels i e a o u

Vowels can be nasalized.

simple: V

glottalized (cortada): Vʔ

laryngealized (quebrada): VʔV

Tones high, mid, low, rising, falling

/f x ll ñ/ occur only in Spanish loans. Diphthongs are /ia iu ie ua ue ui/.

Western Ixtlan [THIESSEN 1987] (24C, 5V)

Fortis	p'	t	t:	c	č	k	kʷ	s	š	n	l	r
Lenis	b	d				g	gʷ		ž	n̲	l̲	r̲
Non-contrast	θ	x	m	ʔ								
Vowels	i	e	a	o	u							

simple: V
laryngealized (interrupted): VʔV

Rincon (Villa Alta district) [EARL 1968] (21C, 7V)

Fortis	p	t	c	č	k	s	š
Lenis	b	d	j	ǰ	g	z	ž
Non-contrast	l	n	r	w	y	ʔ	X
Vowels	i	e	a	o	u	ï	æ

/X/ varies between uvular trill and [h]. /m ñ f/ are borrowed from Spanish.

Zoogocho [BUTLER 1985; LONG 1985] (25C, 4V)

Fortis	p	t	č	k	s	š	ṣ̌	m	n	l
Lenis	b	d	ǰ	g	z	ž	ẓ̌	m̲	n̲	l̲
Non-contrast	ř	w	x̭	X	ʔ					
Vowels	i	e	a	o						

In Spanish loans /b f x ñ r̃ y(ll) u/ occur.

Yatzachi [BUTLER 1976, 1980] (26C, 5V)

Fortis	p	t	č	k	kʷ	s	š	ṣ̌	n	l
Lenis	b	d	ǰ	g	gʷ	z	ž	ẓ̌	n̲	l̲
Non-contrast	m	x̭	ř	X	Xʷ	ʔ				
Vowels	i	e	a	o	ə					

/f x xʷ y r̃ ñ/ occur in Spanish loans. /x̭/ is a voiceless alveolo-palatal fricative.

※**Villa Alta (Yatzachi)** [LEAL 1950; Pike 1948] (25C, 5V)

Fortis	p	t	č	k	kʷ	s	š	ṣ̌	n	l
Lenis	b	d	ǰ	g	gʷ	z	ž	ẓ̌	n̲	l̲
Non-contrast	m	y	X	Xʷ	ʔ					
Vowels	i	e	a	o	ï (high back unround)					
Tones	high, mid, low, 1, 2, 3, 12, 13, 21, 23, 32									

/f xʷ x r r̃/ occur in borrowed words.

Cajonos [NELLIS and HOLLENBACH 1980] (26C+ʔ, 4V)

Fortis	p	t	c	č	k	s	ṣ̌	m	n	l	r	X	
Lenis	b	d	j	ǰ	g	z	ẓ̌	$\underline{m}$	$\underline{n}$	$\underline{l}$	$\underline{r}$	$\underline{X}$	(uvular fricative)
Non-contrast	w	y											
Vowels	i	e	a	o									

simple: V
checked (glottalized): Vʔ
laryngealized: VV

Tones	high, low, downglide

/f x/ are found only Spanish loanwords.

Yalalag [NEWBERG 1987] (25C, 5V)

Fortis	p	t	č	k	k^w	s		ṣ̌	n	l
Lenis	b	d	ǰ	g	g^w	z	ž	ẓ̌	$\underline{n}$	$\underline{l}$
Non-contrast	m	r	X	X^w	y	ʔ				
Vowels	i	e	a	o	u					
Syllable nuclei	V and Vʔ									
Tones	high, mid, low, mid-falling									

Yatee [JAEGER and VAN VALIN 1982] (19C+ʔ, 4V)

Fortis	p	t	č	k	s	ṣ̌	n	l
Lenis	b	d	ǰ	g	z	ẓ̌	$\underline{n}$	$\underline{l}$
Non-contrast	γ	w	y					
Vowels	i	e	a	o				
	iʔ	eʔ	aʔ	oʔ				
	iʔi	eʔe	aʔa	oʔo				

/γ/ is a voiced uvular fricative.

Tones	high, low, low-to-high rising, high-to-low falling

/m $\underline{m}$ r/ are phonemic only in loanwords.

Choapan [LYMAN and LYMAN 1977] (19C, 6V)

Fortis	p	t	c	č	k	s	š
Lenis	b	d	j	ǰ	g	z	ž
Non-contrast	m	n	l	r	ʔ		
Vowels	i	e	ɛ	a	o	u	

simple, laryngealized, checked
V̇ʔV $V^ʔ$

Tones	high, mid, low

Albarradas [Kreikebaum 1987] (22C+ʔ, 7V)

Fortis	p	t	č	k	k^w	s	ş̌	n	l	r
Lenis	b	d	ǰ	g		z	ž̧	n̲	l̲	r̲
Non-contrast	m	w	y							
Vowels	i	e	a	o	u	ɛ	ü	(ɨ?)		

simple, laryngealized, interrupted, aspirated

Tones: rising, falling, low

/g^w f x/ occur in Spanish loans. There are two unstandard orthographical symbols, *ë* and *ü*. The former is interpreted as an unrounded mid-open front vowel and therefore it is transcribed as *ɛ*. Since the latter is given no interpretation, it is impossible to specify it.

※**Mitla**[1] [Briggs 1961] (26C, 6V)

Fortis	p	t	k	k^w	s	š	m	n	l
Lenis	b	d	g	g^w	z	ž	m̲	n̲	l̲
Non-contrast	f	x	ř	r̃	h	ʔ	w	y	
Vowels	i	e	æ	a	o	u			

Tones: high, low, high-falling, low-rising

Consonants clusters consist of two, three or four consonants. /f m/ are rare in native words.

Mitla[2] [Stubblefield and Hollenbach 1991] (29C, 6V)

Fortis	p	t	c	č	k	k^w	s	š	m	n	l	r
Lenis	b	d	j	ǰ	g	g^w	z	ž	m̲	n̲	l̲	r̲
Non-contrast	f	h	w	y	ʔ							
Vowels	i	e	æ	a	o	u						

checked (glottalized): Vʔ

laryngealized: VV

aspirated: Vh

Tlacochahuaya [Rendón 1970] (21C, 6V)

Fortis	p	t	č	k	k^w	s	š	n
Lenis	b	d	ǰ	g	g^w	z	ž	n̲
Non-contrast	m	l	r	y	ʔ			
Vowels	i	e	a	o	u	ɨ		

Tones: high, low, rising

Guelavia[1] [Jones and Church 1985] (22C+ʔ, 6V)

Fortis	p	t	c	ç̌	k	s	ş̌	m	n	l
Lenis	b	d	j	ǰ	g	z	ž̧	m̲	n̲	l̲
Non-contrast	w	y	(ʔ)							
Vowels	i	e	a	o	u	ɨ				

simple, laryngealized, checked

※**Guelavia**[2] [JONES and KNUDSON 1977] (26C+ʔ, 6V)

Fortis	p	t	c	č	č̣	k	s	š	ṣ̌	m	n	l
Lenis	b	d	j	ǰ		g	z	ž	ẓ̌	m̲	n̲	l̲
Non-contrast	ř	w	y	(ʔ)								
Vowels	i	e	a	o	u	ɨ						

plain, laryngealized, checked

Tones high, mid, low

Eleven different syllable patterns occur: V, VC, CV, CVC, CVCC, CVCCC, CCV, CCVC, CCVCC, CCCV, and CCCVC.

Chichicapan [BENTON 1987] (27C, 6V)

Fortis	p	t	t^y	č	k	k^w	s	ṣ̌	m	n	ñ	l
Lenis	b	d	d^y	ǰ	g	g^w	z	ẓ̌	m̲	n̲	ñ̲	l̲
Non-contrast	w	y	ʔ									
Vowels	i	e	a	o	u	+						

simple: V

glottalization: Vʔ

high-intensity: Vh

low-intensity: VV

Tones high, low, high-rising, low-rising, low-falling, high-falling

/+/ is written as *i, wi,* or *yi* in the text. Since there is no interpretation, it is impossible to specify it.

Quioquitani [WARD 1987] (24C+ʔ, 6V)

Fortis	p	t	c	č	k	k^w	s	š
Lenis	b	d	j	ǰ	g	g^w	z	ž
Non-contrast	m	n	ñ	l	r	h	w	y
Vowels	i	e	æ	a	o	u		

simple, laryngealized (ʔ)

Tones high, low, low-rising, mid-rising

Ayoquesco [MACLAURY 1989] (20C+ʔ, 6V)

Fortis	p	t	č	k	k^w	s	ṣ̌
Lenis	b	d	ǰ	g	g^w	z	ẓ̌
Non-contrast	m	n	l	r	w y		
Vowels	i	e	a	o	u	ï (high back unrounded)	

simple: V

laryngealized: Vʔ (creaky)

glottalized-released: VʔV (checked plus echo)

Tones 1 (extra high), 2 (high), 3 (mid), 4 (low), 5 (extra low), 12, 21

/f x r̃/ occur in Spanish loanwords.

Lachixio [Persons　1979] (25C+ʔ, 4V)

	p	t	c	č	k^y	k	k^w	
	^{m}b	^{n}d			^{n}g			^{n}z
	f	s		š		h		
	β	ð		ž				
	m	n	ñ	l	ř	w	y	
Vowels	i	e	a	u				

lengthened: VV
checked: Vʔ
interrupted: VʔV

Tones　1 (high), 2, 3, 4 (low)

Guevea de Humboldt [Marks　1980] (26C, 5V)

Fortis	p	t	c	č	k	s	š	m	n	l	w	y
Lenis	b	d	j	ǰ	g	z	ž	$\underline{m}$	$\underline{n}$	$\underline{l}$	$\underline{w}$	$\underline{y}$
Non-contrast	r	ʔ										

Vowels
simple: i e a o u
glottal interruption: Vʔ
aspiration: V^h

Tones　high, low, rising

/f x n r/ occur in Spanish loans.

Isthmus[1] [Marlett and Pickett　1987] (23C, 5V)

Fortis	p	t	č	k	s	š	n	ñ	l
Lenis	b	d	ǰ	g	z	ž	$\underline{n}$	$\underline{ñ}$	$\underline{l}$
Non-contrast	m	r	w	y	ʔ				
Vowels	i	e	a	o	u				

simple: V
checked: Vʔ
laryngealized: VV

Tones　high, low rising, low

/f r̃ h/ occur in loanwords or interjections.

※**Isthmus**[2] [Pickett　1967] (23C, 5V)

Fortis	p	t	č	k	s	š					
Lenis	b	d	ǰ	g	z	ž					
Non-contrast	m	n	ŋ	l	ř	r̃	w	y	f	h	ʔ
Vowels	i	e	a	o	u						

simple: V
rearticulated: VV

Tones　high, low, rising

The phonetically long resonants have previously been analyzed as fortis consonants as is shown below, but the description is somewhat simplified by considering them to be clusters of like consonants. Vowel phonemes are of two types: simple and rearticulated. Rearticulated vowels freely vary from rearticulation with no glottal closure to weak glottal closure in normal speech and heavy glottal closure in special emphatic style. There are four common syllables patterns: CV, CVV, CCCV, and CVC.

※**Isthmus**[3] [PICKETT 1953, 1955] (20C, 5V)

Fortis	p	t	k	s	š	n	l	w
Lenis	b	d	g	z	ž	$\underline{n}$	$\underline{l}$	$\underline{w}$
Non-contrast	m	ř	h	y				
Vowels	i	e	a	o	u			
Tones	high, low							

/f/ occurs in Spanish loans. /r̃/ is rare and found in only three native-origin words but now being introduced in borrowed words. /B/ is a bilabial voiced trill found in only one word.

Chatino [40]

Yaitepec [PRIDE 1963; UPSON 1960,1968] (16C, 5V+4N)

Consonants:

p	t		k	ʔ
b	d		g	
	s	š		h
m	n			
	l	r		
w		y		

Vowels:

i	u	į	ų
e	o	ę	ǫ
a			

Tones: 1 (high), 2, 3, 4 (low), 12, 23, 34, 43, 32, 21

/c/ and /č/ are analyzed as /t/ plus spirants /s/ and /š/. In McKaughan's inventory nasalized stops /B D G/ are added [MCKAUGHAN 1954]. If this analysis is true, it is very interesting typologically because the contrast of voiceless vs. voiced vs. nasalized is very rare. But later analysts deny it.

Tataltepec[1] [PRIDE 1984] (25C, 5V+3N)

Consonants:

p	t	t^y	c	č	k	k^w	ʔ		
	d	d^y			g	g^w			
	s	š					h	h^y	h^w
m	n	n^y							
	l	l^y	r						
w		y							

Vowels:

i	u	į	ų
e	o		
´ a		ą	

Tones: 2, 4, 21, 32, 43, 23, 45

※**Tataltepec**[2] [UPSON and LONGACRE 1965] (18C, 5V+4N+9L)

Consonants:

	t	tʸ	c	č	k	kʷ	?	
			s	š			h	hʷ
m	n	nʸ						
	l	lʸ						
w		y						

Vowels:

i	u	į	ų	i:	u:	į:	ų:
e	o	ę	ǫ	e:	o:	ę:	ǫ:
	a				a:		

Only segmental phonemes are presented and there is no description of the tonal system. /w y/ are not mentioned in the inventory but they exist in the word list, and so are added /w y/ to the above inventory.

※**Zenzontepec** [UPSON and LONGACRE 1965] (19C, 5V+5N+10L)

Consonants:

	t	tʸ	c	č	k	kʷ	?		
			s	š			h	hʸ	hʷ
m	n	nʸ							
	l	lʸ							
w		y							

Vowels:

i	u	į	ų	i:	u:	į:	ų:
e	o	ę	ǫ	e:	o:	ę:	ǫ:
a		ą		a:		ą:	

Only segmental phonemes are presented and there is no description of the tonal system.

Chinantec [41]

Lealao [RUPP 1989, 1990] (17C, 6V+6N+12L)

Consonants:

p	t		k	?
b	d	j	g	
f	s			h
v				
m	n	ŋ		
	l			
	r			

Vowels:

i	ï	u	į	ï̜	ų	i:	ï:	u:	į:	ï̜:	ų:
e		o	ę		ǫ	e:		o:	ę:		ǫ:
	a			ą			a:			ą:	

Tones: 1 (high), 2, 3, 4 (low), 43, 42

Stress: controlled, ballistic

※**Lalana** [RENSCH 1968] (20C, 8V+N+L)

Consonants:

p	t		k	?
b	d	ǰ	g	
	s	š		h
	z			
m	n	ñ	ŋ	
	l			
	r			
w		y		

Vowels:

i		ɨ	u
e	ö	ə	o
		a	

Tones: 1 (high), 2, 3 (low), 23, 32, 31, 232

I am not sure whether /ǰ/ represents /ǰ/ or /ž/, because Rensch gives the position of /ǰ/ as follows:

s	š		s	č
z	ǰ		z	ǰ
in Lalana			in Ozumacín	

I take /ǰ/ at its value and regard it as a voiced affricate. Consonant clusters are /hm hn hñ hŋ hw hl hy ʔm ʔn ʔñ ʔŋ ʔw ʔl ʔy/.

Comaltepec [ANDERSON 1989; ANDERSON, MARTÍNEZ and PACE 1990] (16C, 8V+7N+15L)

Consonants:

p	t	č	k	ʔ
b	d	ǰ	g	
	s			h
m	n		ŋ	
	l			
	ṛ			

Vowels:

i	ï	u	į	ï	ų	i:	ï:	u:	į:	ï:	ų:
e	ë	o	ę		ǫ	e:	ë:	o:	ę:		ǫ:
æ	a		æ	ą		æ:	a:		æ:	ą:	

Tones: 1, 2, 3, 12, 13, 32, 31

/ṛ/ is a retroflexed palatal that varies between a spirant [ẓ̌] and a trill [r̃]. /æ/ is in near complementary distribution with the sequence /ia/, only contrasting after laryngeals /h ʔ/. /ë/ is least common of the vowels and is the only one which never occurs with nasalization.

※**Yolox** [RENSCH 1968] (19C, 8V+N)

Consonants:

p	t		k	ʔ
b	d		g	
f	s	š		h
	z			
m	n	(ñ)	ŋ	
	l			
	r			
w		y		

Vowels:

i	ü	ɨ	u
e		ə	o
		a	

Consonant clusters are /ky kw gy gw/ and /hm hn (hñ) hŋ hl ʔm ʔn (ʔñ) ʔŋ ʔl ʔw ʔy/. Optional nasalization is a feature of syllable finals along with contrastive pitch, and optional length is reported, but the detail is not clear.

※**Temextitlan** [RENSCH 1968] (11C, 6V+N)

Consonants:

	t		k	ʔ
b				
f	s			h
	z			
	n	ñ		
	l			

Vowels:

i	ɨ	u
e		o
	a	

Consonant clusters are /gy gw/ and /hn hl ʔm/. The system presented above is very interesting but it is said that it is provisional due to lack of data. Therefore I don't adopt it for this study.

Quiotepec [ROBBINS 1961, 1968] (23C, 8V+8N)

Consonants:

p	t	t^y	k	ʔ
b	d	d^y	g	
f	s	š		h
w	ð	y	ɣ	
m	n	ñ	ŋ	
	l			
	r̃			

Vowels:

i	ü	ï	u	į	ü̜	ï̜	ų
e		ë	o	ę		ë̜	ǫ
	a				ą		

Syllable types:	short free	V	short checked	V'
	long free	Vh	long checked	Vh'
	extended free	Vh-	extended checked	Vh-'

Tones: 1, 2, 3, 32, 31, 23, 21

Consonant clusters are /kw ts ds/; /ʔ/ or /h/ followed by any nasal, /l/ or /g/; or /ʔ/ followed by /w/ or /y/. Another analysis of syllable types by Gardner and Merrifield [1990] is as follows:

syllable types:	short ballistic checked	CV!ʔ
	short ballistic open	CV!
	short controlled checked	CVʔ
	long controlled open	CV:
	long ballistic open	CV!:

※**Ozumacín** [RENSCH 1968] (19C, 7V+N)

Consonants:

p	t	č	k	ʔ
b		ǰ	g	
	s			h
	z			
m	n	ñ	ŋ	
	l	l^y		
w		(y)		

Vowels:

i		ɨ	u
e	ö		o
		a	

Consonant clusters are /ky kw gy gw/ and /hm hn hñ hŋ hw hl ʔm ʔn ʔñ ʔw ʔl $ʔl^y$ ʔy/. /y/ seems to occur only in clusters. Optional nasalization and obligatory tone are contrastive. Length is possibly contrastive.

※Valle Nacional [Rensch 1968] (15C, 7V+N)

Consonants:

p	t	c	k	ʔ
b			g	
				h
	z			
m	n		ŋ	
	l			
w		(y)		

Vowels:

i	ɨ	u
e	ə	o
	a	

Tone and nasalization exist.

Consonant clusters are /ky kw gy gw/ and /ty zy ly cy ŋy/ and possibly /ny/ and /hm hn hŋ hŋy hw hl (hly) hy ʔm ʔn ʔŋ ʔw ʔl ʔly ʔy/ and possibly /hny ʔny/.

Palantla [Merrifield 1968] (19C, 7V+7N)

Consonants:

p	t	c	k	ʔ
b	d	j	g	
ϕ	s	r		h
m	n		ŋ	
	l			
w		y		

Vowels:

i	ï	u	į	ï	ų
e	ë	o	ę	ë	ǫ
	a			ą	

Tones: 1, 2, 3, 32, 31, 13

Stress: ballistic, controlled

Tepetotutla [Westley 1971, 1991] (19C, 7V+7N)

Consonants:

p	t	c	k	ʔ
b	d	j	g	
m	n		ŋ	
f	s	r		h
	l			
w		y		

Vowels:

i	ï	u	į	ï	ų
e	ë	o	ę	ë	ǫ
	a			ą	

Tones: 1, 2, 3, 21, 32, 31, 12, 23

/r/ is a lightly voiced lamino-domal spirant. Formerly /m n ŋ/ were interpreted as /ᵐb ⁿd ⁿg/ [Westley 1971].

Sochiapan [Foris 1973] (17C, 7V+7N)

Consonants:

p	t	c	k	ʔ
β	ð		γ	
ϕ	θ	s		h
m	n		ŋ	
	l	ṛ		

Vowels:

i	ï	u	į	ï	ų
e	ë	o	ę	ë	ǫ
	a			ą	

Tones: 1, 2, 3, 21, 32, 13, 23

Stress: ballistic, controlled

/ë/ is mid front retracted, occurring only after laryngeals and only in certain ideolects. /ṛ/ is retroflexed and slightly voiced [ẑ]. Semivowels are expressed by /u/ and /i/. /ř/ occurs in Spanish loans. /γ/ occurs post-vocalically, following /a/ in the absence of nasalization, and following /aï/ in the presence of nasalization. It is a lenis velar spirant in the absence of nasalization, and a velar nasal [ŋ] in its presence. Foris [1978] analyzes vowels as follows:

i	ɨ	u
e	ë	o
	a	

※**Usila** [Rensch 1968] (19C, 5V+N)

Consonants:

p	t	t^y	c	k	ʔ
b	d	d^y		g	
f	s				h
m	n		ñ	ŋ	
	l r				

Vowels:

i		u
e		o
	a	

Tones: 1, 2, 3, 4, 5,
23, 34, 43, 32

Consonant clusters are /hm hn nñ hŋ hl hd^y ʔm ʔn ʔñ ʔŋ ʔl $ʔd^y$/. Vowels may be optionally nasalized and checked by /ʔ/.

Tlacoatzintepec [Thelin 1980] (17C, 7V+7N)

Consonants:

p		t	c	k	ʔ	
				g		
	θ	s			h	
	ð					
m		n		ŋ		
		l r				
w		y				

Vowels:

i	ï	u	į	ï	ų
e	ë	o	ę	ë	ǫ
a			ą		

Tones: 1, 2, 3, 4, 12, 34, 42

/r/ is a retroflexed alveopalatal grooved affricate in a stressed syllable; in unstressed syllbales it is an alveolar flap. /t c θ l s n ŋ k g h/ may be palatalized through the addition of the semivowel /y/. /p ŋ g k h/ may be labialized through the addition of the semivowel /w/. Five vowel sequences /ei ai aɨ au ou/ occur. /b f/ are only found in Spanish loanwords.

※**Ojitlan** [Rensch 1968] (16C, 7V+N)

Consonants:

p	t	c	č	k	ʔ
	s				h
m	n		ñ	ŋ	
	l	r			
w			y		

Vowels:

i	ɨ	u
e	ə	o
	a	

Tones: 1, 2, 3, 4,
13, 23, 32, 31

Consonant clusters are /ky kw sy/ and /hm hn nñ hl hw hy ʔm ʔn ʔñ ʔŋ ʔl ʔw ʔy/. Vowels may be nasalized and/or checked by /ʔ/.

※**Chiltepec** [RENSCH 1968] (17C, 7V+N)

Consonants:

p	t	c	k	ʔ
	d		g	
θ	s			h
m	n		ŋ	
	l r			
w			y	

Vowels:

i	ɨ	u
e	ə	o
	a	

Syllable finals may be nasalized and/or checked by /ʔ/ and bear contrastive tone. /d g/ are rare.

Note:

In Amuzgo and Chinantec there are two kinds of word stress, ballistic and controlled. A ballistic syllable is characterized by a surge and rapid decay of intensity, with fortis articulation of its consonantal onset and tendency to loss of voicing and breathy release of final segments. A controlled syllable displays a more constant level of intensity throughout its duration. [GARDNER and MERRIFIELD 1990: 92]

The primary feature which distinguishes ballistic syllables versus controlled syllbales in alll environments is that the ballistic syllable ends in a crescendo or an extra pulse, whereas the controlled syllable has a decrescendo or at least lack of crescendo. Some secondary features of the ballistic syllable are: 1) a CV̌ syllable may be slightly longer than a CV syllable, 2) a CV̌ʔ syllable is always shorter than a CVʔ syllable, 3) a CV̌ may have an upglide, but usually doesn't, 4) the final glottal in closed syllables is very clearly marked (fortis) on ballistic syllables, whereas they are lenis in controlled syllables [THELIN 1980: 5].

Huave [42] (18C,5V+5L)

San Mateo del Mar [STAIRS and HOLLENBACH 1969, 1981; STAIRS and STAIRS 1983]

Consonants:

p	t	c	č	k	
b	d			g	
		s	š		h
m	n				
	l	ř	r̃		
w			y		

Vowels:

i	ɨ		i:	ɨ:	
e		o	e:		o:
	a			a:	

/r̃/ contrasts with /ř/ only in intervocalic position. /ř/ in word initial position occurs only in Spanish loans. There are high and low tones but only a few words are differentiated by the tone. Accent falls on the last syllable in the consonant-final word, while there are a few words ending with a vowel, whose accent falls on the penultimate. /u/ appears only in Spanish loans.

Oaxaca Chontal [43]

Huamelultec [Waterhouse 1962, 1967] (35C, 5V+5L)

Voiceless	Central							Lateral		
Obstruent	p	t	c	t^y	č	k			
Continuant	f		s		š	x		ɬ	$ɬ^y$
Glottalic	f'		c'		č'	k'	ʔ	ɬ'	
Voiced									
Obstruent	b	d	r			g			
Continuant	m	n	r̃	ñ	y	w		l	l^y
Glottalic	m'	n'		ñ'		w'		l'	
Vowels									
short	i	e	a	o	u				
long	i:	e:	a:	o:	u:				

/ɬ'/ is a lightly glottalized affricate [tɬ'] and is the same as /L'/(ƛ') described by Waterhouse and Morrison [1950], who list /N Y W/ but they are not considered as phonemes later.

Tequistlatec[1] [Waterhouse 1980] (27C, 5V)

Voiceless								
Obstruent	p	t	c		k			
Continuant	f	s	N	š	W	h		ɬ
Glottalic	f'		c'	č'	k'	ʔ		
Voiced								
Obstruent	b	d			g			
Continuant	m	r	n	ñ	y	ŋ	w	l
Vowels	i	e	a	o	u			

Tequistlatec[2] [Turner 1967; Turner and Turner 1971] (27C, 5V)

Voiceless	Central							Lateral
Obstruent	p	t	c	č	k			
Continuant	f	s	N	š	W	h		ɬ
Glottalic	f'		c'	č'	k'	ʔ		ƛ'
Voiced								
Obstruent	b	d			g			
Continuant	m	n		y	ŋ	w		l
Vowels	i	e	a	o	u			

The sequence tɬ', a voiceless glottalized alveolar lateral affricate, is written as /ƛ'/. /ɬ/ is a voiceless alveolar fricative and frictionless lateral. /N/ is a voiceless nasal. /W/ is a voiceless non-syllabic high, close, back, slightly rounded vocoid. /ð r r̃ β/ occur in words of Spanish origin. Syllable consonant-vowel patterns that occur are: CV, CVC, CVCC, CCV, CCVC, CCVCC, CCCV, and CCCVC.

Compared with both systems, the difference is seen in /ñ/, /ƛ'/ and /r/. /ƛ'/ is interpreted as /$l^{ʔ}$/ by Waterhouse. /ñ/ seems to occur in Spanish loans. Waterhouse gives an example /gel 'ora/ "el sol (the sun)" for the phoneme /r/. Turner does not admit /r/ but *galhora* is found in his dictionary for the entry "sol (sun)." Since *hora* seems to be Spanish, it is better to think the /r/ occurs only in Spanish loans.

Huamelultec has more phonemic contrasts than Tequistlatec. Huamelultec has three alveopalatals /t^y l^y $ɬ^y$/, and three glottalized nasals /m' n' ñ'/, and a glottalized vocoid /wʼ/, while Tequistlatec has a phoneme /ŋ/.

Zoque [44]

※**Ostucán Zoque** [ENGEL and LONGACRE 1963] (22C, 6V)

Consonants:

p	t	t^y	c	č	k	ʔ
b	d	d^y		ǰ	g	
	s			š		h
m	n			ñ	ŋ	
	l					
w				y		

Vowels:

i	ɨ	u
e		o
	a	

/f r r̃/ may appear in Spanish loans. Since /ʌ/ is described as a high, central, unrouded vowel, /ʌ/ in original is changed for /ɨ/.

※**Rayón Zoque** [HARRISON *et al.* 1984] (22C, 6V)

Consonants:

p	t	t^y	c	č	k	ʔ
b	d	d^y	j		g	
	s			š		h
m	n			ñ	ŋ	
	l					
w				y		

Vowels:

i	ɨ	u
e		o
	a	

Since it is noted that /ʌ/ is pronounced just like /u/ but with unround lips, /ʌ/ must be high, central /ɨ/.

Copainalá Zoque [WONDERLY 1951; HARRISON *et al.* 1981] (22C, 6V)

Consonants:

p	t	t^y	c	č	k	ʔ
b	d	d^y		ǰ	g	
	s			š		h
m	n			ñ	ŋ	
	l					
w				y		

Vowels:

i	ɨ	u
e		o
	a	

/f r r̃/ appear in Spanish loans. /ɨ/ is unround, tense, usually nasalized, varying from mid back to high back position. This phoneme is analyzed as /ə/ in Wonderly [1946].

Francisco León Zoque [ENGEL and BARTHOLOMEW 1987] (12C, 6V)

Consonants:

p	t	c	k	?
	s			h
m	n		ŋ	
w		y		

Vowels:

i	ɨ	u
e		o
	a	

/b d g č dz f š ñ l r/ are the secondary phonemes which result from morphophonemic processes or appear in Spanish loans.

Chimalapa Zoque [KNUDSON 1980] (14C, 6V)

Consonants:

p	t	c	k	?
	s			h
m	n		ŋ	
	l	r		
w		y		

Vowels:

i	ɨ	u
e		o
	a	

Veracruz Zoque/Popoluca Zoque [45]

Sierra Popoluca [ELSON 1960, 1967] (22C, 6V+6L)

Consonants:

p	t	t^y	c	č	k	?
b	d	d^y			g	
	s			š		h
m	n			ñ	ŋ	
	l	r				
w				y		

Vowels:

i		u	i:		u:
e	ʌ	o	e:	ʌ:	o:
	a			a:	

Veracruz Mixe/Mixe Popoluca [46]

Sayula Popoluca [CLARK 1959] (18C, 6V+6L)

Consonants:

p	t	c	č	k	?
b	d			g	
		s	ṣ̌		h
m	n				
	l	r̃			
w			y		

Vowels:

i		u	i:		u:
e	ʌ	o	e:	ʌ:	o:
	a			a:	

/Φ β ð r/ appear in Spansh loans.

Oluta Popoluca [CLARK 1981] (14C, 6V+6L)

Consonants:						Vowels:					
p	t	c	č	k	ʔ	i	ɨ	u	i:	ɨ:	u:
	s		š		h	e		o	e:		o:
m	n						a			a:	
	l										
w			y								

/b d g f r r̃/ appear in Spanish loans.

Mixe [47]

Coatlán Mixe [HOOGSHAGEN 1984] (15C, 6V+6L+6EL)

Consonants:					Vowels: Short			Long			Extra long		
p	t	c	k	ʔ	i	ɨ	u	i·	ɨ·	u·	i:	ɨ:	u:
b	d		g		e		o	e·		o·	e:		o:
		š		h		a			a·			a:	
m	n		ŋ										
w		y											

/f s l r̃/ appear in Spanish loans.

San José El Paraíso Mixe [VAN HAITSMA and VAN HAITSMA 1976] (12C, 6V+6L+6EL)

Consonants:					Vowels: Short			Long			Extra long		
p	t	c	k	ʔ	i	ɨ	u	i·	ɨ·	u·	i:	ɨ:	u:
		š		h	e		o	e·		o·	e:		o:
m	n		ŋ			a			a·			a:	
w		y											

/b d g j ǰ/ are the secondary phonemes, which are the voiced counterparts of the primary phonemes /p t k c š/. The voiced obstruents are in complementary distribution with the voiceless ones. /z/ is the voiced counterpart of the marginal phonemes /s/.

Tlahuitoltepec Mixe [LYON 1980] (14C, 7V+7L)

Consonants:					Vowels:					
p	t	c	k	ʔ	i		u	i:		u:
	s	š		h	e	ʌ	o	e:	ʌ:	o:
m	n					a	ɔ		a:	ɔ:
	l	r								
w		y								

Totontepec Mixe[1] [SCHOENHALS and SCHOENHALS 1982; SCHOENHALS 1979] (16C, 9V+9L)

Consonants:

p	t	c	č	k	ʔ
	d			g	
v	s		š		h
m	n		ñ		
			y		

Vowels:

i	ɨ	u	i:	ɨ:	u:
e	ə	o	e:	ə:	o:
æ	a	ɔ	æ:	a:	ɔ:

/b f l ll r/ appear in Spanish loans. /č/ is not included in Schoenhals [1979].

※**Totontepec Mixe**[2] [CRAWFORD 1963] (15C, 9V+9L)

Consonants:

p	t	c	k	ʔ	
	d		g		
v	s	ş̌		h	
		ẓ̌			
m	n				
		y			

Vowels:

i	ɨ	u	i:	ɨ:	u:
e	ʌ	ʊ	e:	ʌ:	ʊ:
æ	a	o	æ:	a:	o:

/v/ varies toward a bilabial [*β*] and even to a vocoid approximant [w].

Huastec [48]

Veracruz (Xiloxúchil) Huastec [OCHOA PERALTA 1984] (21C, 5V+5L)

Consonants:

p	t	c	č	k	kʷ	
	t'	c'	č'	k'	kʷ'	ʔ
β						
	θ		š			h
m	n					
	l					
w			y			

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

/d g f s r r̃/ are introduced through Spanish borrowings, although /r r̃/ can be found in some onomatopoeias.

San Luis Potosí Huastec [MCQUOWN 1984] (22C, 5V+5L)

Consonants:

p	t	c	č	k	kʷ	
b	t'	c'	č'	k'	kʷ'	ʔ
	θ	s	š			h
m	n					
	l	r				
w			y			

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

All vowels may be nasalized in a limited number of onomatopoetic forms.
/p^w b^w d g g^w f f^w x x^w h^w m^w n^w ñ l^w r^w ř $ř^w$/ are found in Spanish loans.
/s/ may be found only in Spanish loans.

Yucatec [49]

※**Yucatec**[1] [BLAIR 1964] (21C, 5V)

Consonants:

p	t	c	č	k	
p'	t'	c'	č'	k'	ʔ
b'					
		s	š		h
m	n				
	l				
	(ř)				
w			y		

Vowels:

i		u
e		o
	a	

/b d g f ř/ occur in Spanish loanwords. /ř/ occurs only intervocally in about a dozen words. Vowels may combine with either of the accents /´/ (high) and /`/ (low), or may occur without accents.

Yucatec[2] [BARRERA VÁSQUEZ 1946; PO'OT YAH and BRICKER 1981] (20C, 5V+5L)

Consonants:

p	t	c	č	k	
p'	t'	c'	č'	k'	ʔ
b'					
		s	š		h
m	n				
	l				
w			y		

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

There are two tones, /´/ high or rising and /`/ low or falling [PO'OT YAH and BRICKER 1981].

Lacandon [50] [BRUCE 1968] (20C, 6V+6L)

Consonants:

p	t	c	č	k	
p'	t'	c'	č'	k'	ʔ
b					
		s	š		h
m	n				
	l				
w			y		

Vowels:

i		u	i:		u:
e	ə	o	e:	ə:	o:
	a			a:	

Itza [51]

※Itza[1] [Schumann 1971] (21C, 6V+5L)

Consonants:

p	t	c	č	k	
p'	t'	c'	č'	k'	ʔ
b					
		s	š		h
m	n				
	l				
	r				
w			y		

Vowels:

i	ɨ	u	i:		u:
e		o	e:		o:
	a			a:	

Itza[2] [Hofling 1990] (20C, 6V+5L)

Consonants:

p	t	c	č	k	
p'	t'	c'	č'	k'	ʔ
b'					
		s	š		h
m	n				
	l				
	r				
w			y		

Vowels:

i	ɨ	u	i:		u:
e		o	e:		o:
	a			a:	

/d g f v r r̃ ñ/ occur in Spanish loans. Hofling describes /ɨ/ as /ä/ but does not interpret it. Judging from his chart, /ä/ seems to be a central, high-lower vowel, but I transcribe it into /ɨ/.

Mopan [52] [Ulrich and Ulrich 1982, 1986] (21C, 6V+6L)

Consonants:

p	t	c	č	k	
p'	t'	c'	č'	k'	ʔ
b	d				
		s	š		h
m	n				
	l				
	(ř)				
w			y		

Vowels:

i	ɨ	u	i:	(ɨ:)	u:
e		o	e:		o:
	a			a:	

/ř/ occurs rarely, mostly in onomatopoetic words. /ɨ:/ has been encountered only in Belize on the word *tikɨ:ntic* "following."

Chol [53]

Tila[1] [WARKENTIN and SCOTT 1980] (23C, 6V)

Consonants:

p	(t)	t^y	c	č	k	
p'	(t')	t^{y}'	c'	č'	k'	ʔ
b'						
			s	š		h
m	n			ñ		
	l					
w			y			

Vowels:

i		u
e	ə	o
	a	

/d g f r r̃/ appear in Spanish loans. Since /ʌ/ is interpreted as a mid, central vowel, it may be better to be substituted for /ə/. /t t'/ are found only in a few words, while /t^y t^{y}'/ occur normally.

※**Tila**[2] [SCHUMANN 1973] (22C, 6V)

Consonants:

p	t	c	č	k	
p'	t'	c'	č'	k'	ʔ
b					
		s	š		h
m	n		ñ		
	l				
	r				
w			y		

Vowels:

i	ɨ	u
e		o
	a	

/d g/ appear in Spanish loans. /t t'/ are manifested by [t^y t^{y}']. [t t^{y}'] occur in only a few words.

Chontal [54] [KNOWLES 1984] (21C, 6V)

Consonants:

p	t	c	č	k	
p'	t'	c'	č'	k'	ʔ
b					
	s		š		h
m	n				
	l				
	r				
w			y		

Vowels:

i	ɨ	u
e		o
	a	

/d g r̃/ are most commonly found in Spanish loanwords, but they are found in a few native Chontal words in restricted environments. /f ñ/ are only found in Spanish loanwords.

Chorti (Jocotan) [55] [Lubeck 1989] (20C, 5V)

Consonants:

p	t	c	č	k	
b'	t'	c'	č'	k'	ʔ
		s	š		h
m	n				
	l				
	r				
w			y		

Vowels:

i		u
e		o
	a	

g is registered in the orthography but does not seem to be a phoneme. In Kaufman [1976] *g* does not appear.

Tzotzil [56]

Tzotzil[1] (Zinacantan) [Aissen 1987; Haviland 1981] (21C, 5V)

Consonants:

p	t	c	č	k	
p'	t'	c'	č'	k'	ʔ
b					
		s	š		h
m	n				
	l				
	r				
v			y		

Vowels:

i		u
e		o
	a	

/d g f w/ occur only in recent loans. /r/ occurs in a few words. /b/ is manifested by [b], [ʔb], [ʔm] and [ʔM] [Weathers 1947].

※Tzotzil[2] (Chalchihuitan) [Hopkins 1967a] (20C, 5V)

Consonants:

p	t	c	č	k	
b'	t'	c'	č'	k'	ʔ
		s	š		h
m	n				
	l				
	ř				
w			y		

Vowels:

i		u
e		o
	a	

Tzeltal [57] (Aguacatenango) [KAUFMAN 1971],
(Tenejapa) [BERLIN 1963] (21C, 5V)

Consonants:

p	t	c	č	k	
p'	t'	c'	č'	k'	ʔ
b					
		s	š		h
m	n				
	l				
	r				
w			y		

Vowels:

i		u
e		o
	a	

/d g f r̃/ occur only in Spanish loans.

Tojolabal [58] [FURBEE-LOSEE 1976] (20C, 5V)

Consonants:

p	t	c	č	k	
b'	t'	c'	č'	k'	ʔ
		s	š		h
m	n				
	l				
	r				
w			y		

Vowels:

i		u
e		o
	a	

/b d g/ appear only in Spanish loanwords.

Chuj [59] [HOPKINS 1967b] (22C, 5V)

Consonants:

p	t	c	č	k	
b'	t'	c'	č'	k'	ʔ
		s	š	x	h
m	n			ŋ	
	l				
	r				
w			y		

Vowels:

i		u
e		o
	a	

/b d g f/ occur only in non-native roots.

Jacaltec [60] [Day 1973] (26C, 5V)

Consonants:

p	t	c	č	ç̌	k		
b'	t'	c'	č'	ç̌'	k'	q'	ʔ
		s	š	ş̌		x	h
m	n				ŋ		
	l						
	r						
w			y				

Vowels:

i		u
e		o
	a	

/b d g/ are found only in Spanish loans. /f/ occurs in only two native roots.

Kanjobal [61] [Kaufman 1976] (26C, 5V)

Consonants:

p	t	c	č	ç̌	k	q	
b'	t'	c'	č'	ç̌'	k'	q'	ʔ
		s	š	ş̌		x	h-
m	n						
	l						
	r						
w			y				

Vowels:

i		u
e		o
	a	

/h-/ occur only in some prefixes and some pronominals.

Acatec [62] [Dakin 1976; Peñalosa 1987] (23C, 5V+5L), (25C, 5V+5L)

Consonants:

p	t	c	č	ç̌	k	(q)	
b'	t'	c'	č'	ç̌'	k'	(q')	ʔ
		s	š	ş̌		x	
m	n						
	l						
	r						
w			y				

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

/b d g f/ occur in loanwords from Spanish. Phonological difference between San Rafael La Independencia and San Miguel Acatán is as follows:

Acatec[1] (San Rafael)	/q/	/q'/
Acatec[2] (San Miguel)	/k/	/ʔ/

This means San Miguel dialect has no /q q'/.

Tectitec [65] [STEVENSON 1987] (26C, 5V+5L)

Consonants:

p	t	c	č	ç̌	k^y	k	q	
b'	t'	c'	č'	ç̌'	k^{y}'	k'	q'	ʔ
		s	š	ş̌			x	
m	n							
	l							
w			y					

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

/b g f/ occur only in Spanish loans. /d r/ occur in Spanish loans, but are marginal in relation to the phonemic system, that is, /d/ appears only in *tidi'* "what, thing," and /r/ is found in some onomatopoetic words.

Mam [66] [ENGLAND 1983] (26C, 5V+5L)

Consonants:

p	t	c	č	ç̌	k^y	k	q	
b'	t'	c'	č'	ç̌'	k^{y}'	k'	q'	ʔ
		s	š	ş̌			x	
m	n							
	l							
w			y					

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

/b' q'/ are implosives. /b d g/ are found in Spanish loans. /ř/ occurs mostly in loans and sound imitative words.

Aguacatec [67] [MCARTHUR and MCARTHUR 1956] (27C, 5V+5L)

Consonants:

p	t	c	č	ç̌	k^y	k	q	
b'	t'	c'	č'	ç̌'	k^{y}'	k'	q'	ʔ
		s	š	ş̌			x	
m	n							
	l							
	r							
w			y					

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

Ixil [68]

Ixil[1] (Nebaj) [Ayres 1980] (25C, 5V+5L)

Consonants:

p	t	c	č	ç̌	k	q	
b'	t'	c'	č'	ç̌'	k'	q'	ʔ
	s		š	ş̌			x
m	n						
	l						
	r						
w			y				

Vowels:

i	u	i:	u:
e	o	e:	o:
a		a:	

/d g/ occur in Spanish loans. /r/ varies between [r̃] and [ř]. /b'/ is implosive [ɓ].

Ixil[2] (Chajul) [Ayres 1980] (28C, 5V+5L)

Consonants:

p	t	c	ć	č	ç̌	k	q	
b'	t'	c'	ć'	č'	ç̌'	k'	q'	ʔ
	s		ś	š	ş̌			h
m	n							
	l							
	r							
w			y					

Vowels:

i	u	i:	u:
e	o	e:	o:
a		a:	

/d g/ occur in Spanish loans. In Chajul dialect apico-alveolo-palatals /ć ć' ś/ are added. /č č' š/ are lamino-alveolo-palatals. /b'/ is implosive /ɓ/.

Ixil[3] (Cotzal) [Townsend 1986] (27C, 5V+5L)

Consonants:

p	t	c	č	ç̌	k	q	
b'	t'	c'	č'	ç̌'	k'	q'	ʔ
pʷ					kʷ		
v	s		š	ş̌			h
m	n						
	l ř		y				

Vowels:

i	u	i:	u:	iʔ	uʔ
e	o	e:	o:	eʔ	oʔ
a		a:		aʔ	

/b'/ is implosive [ɓ]. Words are generally stressed on the penult or, if the vowel in the final syllable is either long or laryngealized on the ultima.

Kekchi [69] [STEWART 1980; CUC CAAL 1988] (23C, 5V+5L)

Consonats:

p	t	c	č	k	q	
b'	t'	c'	č'	k'	q'	?
		s	š		x	h
m	n					
	l					
	r					
w			y			

Vowels:

i	u	i:	u:
e	o	e:	o:
a		a:	

/d g f v/ occur in Spanish loans.

Pocomchi [70]

Pocomchi[1] [BROWN 1979] (24C, 5V+5L)

Consonants:

p	t	c	č	k	q	
p'	t'	c'	č'	k'	q'	?
b'						
		s	š		x	h
m	n					
	l					
	r					
w			y			

Vowels:

i	u	i:	u:
e	o	e:	o:
a		a:	

/d g/ occur in Spanish loans. /b'/ is a preglottalized resonant which is manifested as a voiced semi-vowel [w'] syllable-initially and a voiceless nasal [m'] syllable-finally.

Pocomchi[2] [RAMIREZ and RAMIREZ 1983] (23C, 5V+5L)

Consonants:

p	t	c	č	k	q	
b'	t'	c'	č'	k'	q'	?
		s	š		x	h
m	n					
	l					
	r					
w			y			

Vowels:

i	u	i:	u:
e	o	e:	o:
a		a:	

/b d g/ occur in Spanish loans.

Pocomam [71] [McArthur and McArthur 1983] (23C, 5V+5L)

Consonants:

p	t	c	č	k	q	
b'	t'	c'	č'	k'	q'	ʔ
		s	š		x	h
m	n					
	l					
	r					
w			y			

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

/w/ is [g^w]. /b'/→['w]/#_
→['m]/_#

Uspantec [72] [Kaufman 1976] (22C, 5V+5L)

Consonants:

p	t	c	č	k	q	
b'	t'	c'	č'	k'	q'	ʔ
		s	š		x	
m	n					
	l					
	r					
w			y			

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

In Cartilla Uspanteca long vowels are not registered [Anonymous 1980].

Quiche [73]

※Quiche[1] (Totonicapan) [Fox 1973] (22C, 6V)

Consonants:

p	t	c	č	k	q	
b'	t'	c'	č'	k'	q'	ʔ
		s	š		x	
	m	n				
		l				
		r				
	w			y		

Vowels:

i		u
e	ə	o
	a	

Quiche[2] (Zunil) [PYE 1983]

(Momostenango, Santa Catarina Ixtahuacan) [SUY TUM 1988] (23C, 5V+5L)

Consonants:

p	t	c	č	k	q	
b'	t'	c'	č'	k'	q'	ʔ
		s	š		x	-h
m	n					
	l					
	r					
w			y			

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

/h/ occurs only in word-final position.

Quiche[3] (Nahuala) [MONDLOCH 1978] (22C, 5V+5L)

Consonants:

p	t	c	č	k	q	
b'	t'	c'	č'	k'	q'	ʔ
		s	š		x	
m	n					
	l					
	r					
w			y			

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

/b'/ is implosive before a vowel but ejective before a consonant or in word-final position. Devoicing of /l r w y/ occurs before consonants or at the end of utterances.

Sacapultec [74] [KAUFMAN 1976] (26C, 6V+5L)

Consonants:

p	t	c	č	k^y	k	q	
b'	t'	c'	č'	k^{y}'	k'	q'	ʔ
f		s	š			x	
m	n				-ŋ		
	l						
	r						
w			y				

Vowels:

i		u	i:		u:
e	ə	o	e:		o:
	a			a:	

/ŋ/ occurs in word-final position.

Sipacapeño [75] [Kaufman 1976; Hoiland and Sánchez 1980] (24C, 5V+5L)

Consonants:

p	t	c	č	k^y	k	q	
b'	t'	c'	č'	k^{y}'	k'	q'	ʔ
		s	š			x	
m	n						
	l						
	r						
w			y				

Vowels:

i		u	i:		u:
e		o	e:		o:
	a			a:	

Hoiland and Sánchez analyze vowels as five standard vowels each having a contrasting short vowel counterpart.

Cakchiquel [76]

Cakchiquel[1] (Patzicia) [Blair *et al.* 1981] (23C, 6V)

Consonants:

p	t	c	č	k	q	
b'	t'	c'	č'	k'	q'	ʔ
f		s	š		x	
m	n					
	l					
	r					
v			y			

Vowels:

i		u
e	ə	o
	a	

Cakchiquel[2] (Comalapa) [Chacach Cutzal 1990] (23C, 5TV+4LV)

Consonants:

p	t	c	č	k	q	
b'	t'	c'	č'	k'	q'	ʔ
f		s	š		x	
m	n					
	l					
	r					
v			y			

Vowels:

Tense			Lax	
i		u	ɪ	ʊ
e		o	ɛ	ɔ
	a			

Tzutujil [77]

Tzutujil[1] (Santiago) [DAYLEY 1985] (22C, 5V+5L+2)

Consonants:

p	t	c	č	k	q	
b'	t'	c'	č'	k'	q'	ʔ
		s	š		x	
m	n					
	l					
	r					
w			y			

Vowels:

Short			Long		Broken Long	
i		u	i:	u:		
e		o	e:	o:	ie	uo
	a		a:			

/b d g/ occur in Spanish loans.

Tzutujil[2] (San Pedro La Laguna) [BUTLER and BUTLER 1977] (22C, 5V+5L)

Consonants:

p	t	c	č	k	q	
b'	d'	c'	č'	k'	q'	ʔ
		s	š		x	
m	n					
	l					
	ř					
w			y			

Vowels:

i		u	i:	u:
e		o	e:	o:
	a		a:	

/b' d' q'/ are implosive. /b d g v/ occur in Spanish loans. The contrast between long and short vowels occurs only in final (stressed) syllables of nouns and particles.

Xinca [78]

※**Xinca[1]** [SCHUMANN 1966] (20C, 6V)

Consonants:

p	t	c	č	k	ʔ
b				g	
f					
	s	ṣ	š		h
m	n				
	l	ł			
	r				
w		y			

Vowels:

i	ɨ	u
e		o
	a	

/ṣ/ is a voiceless alveolar retroflexed fricative. Stress is phonemic.

Xinca[2] [CAMPBELL 1972] (17C, 6V)

Consonants:

p	t		k	
p'	t'	c'	k'	ʔ
		ş		h
m	n			
	l ɬ			
	r			
w		y		

Vowels:

i	ɨ	u
e		o
	a	

/č/ occurs only in loanwords.

※**Xinca[3]** [MAYERS 1966: 309] (22C, 6V+4L)

Consonants:

p	t	c	č	k	ʔ
		c'		k'	
b	(d)			g	
p^h	t^h				
	s		ş̌		h
m	n			ŋ	
	l	r			
w	y				

Vowels:

i	ɨ	u	(i:)	u:
e		o	e:	o:
	a		a:	

/l/ is manifested by [l] in initial and medial position, [ƛ] or [ɬ] in final position. /r/ is manifested by [ř] in initial and medial position, [r̃] in final position. Compared with other two systems, this is less systematic as is noted that the analysis is preliminary.

Garifuna (Black Carib) [79] [TAYLOR 1955, 1977] (16C, 5V+5N)

Consonants:

p	t	c	k	
b	d		g	
f	s			h
m	n			
	l			
	r			
w		y		

Vowels:

i	u	į	ų
e	o	ę	ǫ
a		ą	

Tol [80] [FLEMING and DENNIS 1977] (22C, 6V)

Consonants:

p	t	c	k	
p^h	t^h	c^h	k^h	
p'	t'	c'	k'	ʔ
β		s		h
m	n		ŋ	
	l			
w	ɨ̠	y		

Vowels:

i	ɨ	u
e		o
	a	

Stress is phonemic. /ɨ̠/ occurs only as an infix and is interpreted as semivowel because it is phonetically nonsyllabic. /β/ is eliminated by Campbell,who unites /w/ and /β/ into /w/ [CAMPBELL and OLTROGGE 1980: 21].

Miskitu [81] [ANONYMOUS 1986] (15C, 3V+3L)

Consonants:

p	t	k	
b	d	g	
	s		h
m	n	ŋ	
	l		
	r		
w		y	

Vowels:

i		u	i:		u:
	a			a:	

Heath [1950] notes that there are 5 vowels (※Miskitu[1]), but /e/ and /o/ scarecely exist at all and it would seem that originally only the three fundamental vowels, *a*, *i*, and *u*, were present in the language [HEATH 1913: 55].

Sumu (Ulwa) [82] [ANONYMOUS 1989] (15C, 3V+3L)

Consonants:

p	t	k	
b	d	g	
	s		h
m	n	ŋ	
	l		
	r		
w		y	

Vowels:

i		u	i:		u:
	a			a:	

Voiceless nasals and liquids are found only in word-final position.

Rama [86] [Craig 1986] (14C, 3V+3L)

Consonants:

p	t		k
b	d		
	s	š	
m	n		ŋ
	l		
	r		
w		y	

Vowels:

i	u	i:	u:
a		a:	

/e o/ occur only in loanwords.

Guatuso [85] [Sánchez C. 1984] (15C, 5V+5L)

Consonants:

p	t	č	k
		ǰ	
ɸ		s	x
	l	ɬ	
	r	r̃	
m	n		ŋ

Vowels:

i	u	i:	u:
e	o	e:	o:
a		a:	

A strong accent is phonemic. Sánchez does not admit /w/ and /y/, but when /u/ and /i/ occur before or after a vowel, they are described as [u̯] and [i̯].

Boruca [86] [Abarca González 1988] (19C, 5V)

Consonants:

	t	c	č	k	ʔ
b	d		ǰ	g	
	s	š		x	
	r				
m	n	ñ		ŋ	
w		y			

Vowels:

i	u
e	o
a	

Tones: high, low

Cabécar [87] [Margery 1982, 1989] (15C, 7V+5N)

Consonants:

p	t	c	č	tk	k	ʔ
b	d		ǰ			
	s		š			h
					ŋ	
		ɽ				

Vowels:

i	u	į	ų
ɪ	ʊ		
e	o	ę	ǫ
a		ą	

Tones: high, low

/ṛ/ is a retroflexed trill. /tk/ is a dento-velar stop. [m n ñ] are not phonemes. They are nasalized /b d ǰ/. [w] and [y] are not phonemes, neither. There are two tones, the high and the low. According to Constenla, /ṛ/ is lateral flap /ɺ/ and there are three tones, rising, falling and low [CONSTENLA 1981].

Bribri [88]

Bribri[1] [CONSTENLA UMAÑA 1990] (14C, 7V+5N)

Consonants:

p	t	c	č	tk	k	ʔ
b	d		ǰ			
	s		š			h
	ř					

Vowels:

i		u	į		ų
ɪ		ʊ			
e		o	ę		ǫ
	a			ą	

[m n ñ] are nasalized /b d ǰ/. /ř/ is lateral flap /ɺ/ and /h/ is /x/ and tonemes are high, low,rising and falling in Constenla [1981].

※**Bribri**[2] [SCHLABACH 1974] (20C, 7V+5N)

Consonants:

p	t	c	č	tk	k	ʔ
hp	ht	hc	hč	hk		
b	d		ǰ			
	s		š			
	ɺ					
w		y				

Vowels:

i		u	į		ų
ɪ		ʊ			
e		o	ę		ǫ
	a			ą	

/ɺ/ is a lateral vibrant. /hp ht hk hc hč/ are preaspirated obstruents. /b d ǰ/ are nasalized and manifested by [m n ñ] before a nasalized vowel or before a voiced obstruents.

※**Bribri**[3] [WILSON 1974] (16C, 7V+5N)

Consonants:

p	t	č	k	ʔ
b	d	ǰ		
	s	š		h
	r	ř	ṛ	
w		y		

Vowels:

i		u	į		ų
ɪ		ʊ			
e		o	ę		ǫ
	a			ą	

Nasalized /b d ǰ/ are manifested by [m n ñ] before a nasalized vowel or at the word-final position. There are two tone contrasts and its combinations.

Terraba [89] [Portilla Cháves 1986, 1989] (21C, 7V+5N)

Consonants:

p	t		k	
b	d		g	
	tʰ		kʰ	
Φ	s	š		h
	z	ž		
m	n	ñ	ŋ	
	l			
	ř ṛ			

Vowels:

i	u	į	ų
ɪ	ʊ		
ɛ	ɔ	ɛ̨	ɔ̨
a		ą	

There is an accent phoneme /ˊ/. Semivowels *w* and *y* are interpreted as /u/ and /i/ in the non-syllabic nucleus. /ṛ/ is a lateral flap /ɺ/ in Constenla [1981].

Teribe [89] [Portilla Cháves 1986, 1989] (23C, 8V+8N)

Consonants:

p	t	k		
b	d	g		
pʰ	tʰ	kʰ		
	s	š		h
	z	ž		
m	n	ñ	ŋ	
	l			
	ř ṛ			
w		y		

Vowels:

i	u	į	ų
ɪ	ʊ	ɪ̨	ʊ̨
e	o	ę	ǫ
a	ɔ	ą	ɔ̨

There are two tone contrasts. Portilla Cháves [1986] registers /kʷ gʷ ʔ/ as phonemes, but does not admit /l/.

Guaymí Movere [90] [Abarca González 1985] (15C, 8V+7N)

Consonants:

	t	č	k
b	ð	ǰ	g
	s		x
m	n	ñ·	ŋ
	l	ṛ	

Vowels:

i	ï	u	į	į̈	ų
e	ë	o	ę		ǫ
a		ɔ	ą		ɔ̨

There are two tone contrasts.

Bocotá [91] [MARGERY 1988] (11C, 7V+7N)

Consonants:

	t	č	k	
b	d	ǰ	g	
	s			h
	l			
	r			

Vowels:

i	u	į	ų
e	o	ę	ǫ
ɛ	ɔ	ɛ̨	ɔ̨
a		ą	

[m n ñ ŋ] are interpreted as nasalized /b d ǰ g/. /w/ and /y/ are written as /u/ and /i/ and are not recognized as phonemes. This interpretation may be related to the fact that /ǰ/ is written as *y*. There are two tone contrasts.

Cuna [92] [HOLMER 1946,1947; SHERZER 1983] (12C, 5V+5L)

Consonants:

p	t	č	k	k^w
	s			
m	n			
	l	r̃		
w		y		

Vowels:

i	u	i:	u:
e	o	e:	o:
a		a:	

All consonants, except /w/, can occur either long or short. The long /s/ is pronounced [č]. Short /p t k k^w/ are pronounced as the corresponding voiced sounds [SHERZER 1983: 36].

III. CONSONANT SYSTEM TYPOLOGY

Since consonantal systems are highly varied, it is very difficult to handle them as a whole. However, different subsystems of consonants can be separated from each other on the basis of features. Following traditional division, I will discuss these subsystems which are stops, fricatives, nasals, liquids, and glides (vocoid approximants). The first two are obstruents, and the rest are sonorants. Liquids here is a cover term for so-called *l* and *r* sounds. Before discussing them in detail, I will treat consonantal systems statistically.

III–1. Statistical Survey

In this section I will survey consonant systems statistically. First I will examine the number of contrasting units and then the number of contrasting features, that is, places and manners of articulation.

III–1–1. The Number of Contrasting Units

I include many dialects, especially those of Nahuan, Mixtecan and Zapotecan. It is difficult, however, to define what is a language and what is a dialect. The classification is also influenced much by the academic tradition. For example, the Mayan family is minutely classified, if compared with the Mixtecan, Zapotecan, Chinantecan, Mazatecan and several other languages. Many dialects of Mixtecan, Zapotecan and some others are in fact languages, if we apply the standard of the classification of the Mayan family to these. The criteria are not the same. Leaving these problems unsettled, because of difficulties in defining what is a language, I collected the data as much as I could. Accordingly, many dialects are included in the data. Each language (or dialect) data must be naturally regarded as a sampling unit. Since both dialects and languages (depending on the definition) are counted, the following number may bias the finding. For example, I described the phonological systems of 22 dialects of Nahuan in Chapter II. If I cite all the Nahuan data, the number of consonants and that of dialects are as follows (I have included two different interpretations for the Tlaxpanaloa dialect by the same author, which increases the total from 22 to 23.):

The number of phonemes	14	15	16	17	18
The number of dialects	1	12	5	4	1

However, I may select only representative dialects, because the phonological systems are very similar. Let's treat the extreme case, in which I cite only one dialect for each different phoneme number.

The number of phonemes	14	15	16	17	18
The number of dialects	1	1	1	1	1

Thus the languages having 15 consonant phonemes, for example, are reduced from twelve to one. Or I can choose only one dialect, for example Classical Nahuatl, as a Nahuan phonological system.

For typological studies it would be better to get data from at least one language for each genetic group or major subgroup as well as from each language isolate, but this study attempts a synthesis in phonological systems of Middle American Indian languages. It is not designed to contribute to typological universals but to study Middle American Indian languages from a typological point of view as is noted in Chapter I.

I must note that the number of phonemes depends on somewhat subjective interpretation by the analyst and the number varies from publication to publication, even if the same language is treated. Although I have eliminated 59 language data marked by ※ in Chapter II, there may be still inadequate data to be eliminated. Therefore the following numbers must be regarded as a sample based on my data (Appendix 3). Distribution in terms of number of consonants in the system is as Table 1.

Table 1 may not reflect the characteristics of Middle American Indian languages. Even if the frequency gives a false picture, the range of the number of consonants is more or less delimited. The lower and upper limits of the number are 11 and 35 respectively, and we can say almost all (95% in this data)

Table 1. Distribution in terms of number of consonants in the system

Number of phonemes	11	12	13	14	15	16	17	18	19	20	21	22	23
Number of languages[1]	1	3	1	8	17	11	18	12	10	13	14	13	20
Number of phonemes	24	25	26	27	28	29	35		Total				
Number of languages	6	9	8	6	1	1	2		174				

languages lie between 14 and 27 consonant phonemes.

III–1–2. Manner Contrast

III–1–2–1. Manner Contrasts in Stop Series

Manner contrasts in stop series vary from one to three way contrasts. Languages with two stop series are the most common. The frequency among languages with different numbers of series is given in Table 2.

Languages with only one series have voiceless series. Two-way manner contrasts are of five types, that is, voiceless vs. voiced, voiceless vs. prenasal, and voiceless vs. aspirated, voiceless vs. glottalized, and fortis vs. lenis. Three-way manner contrasts are of three types, voiceless vs. voiced vs. glottalized, voiceless vs. voiced vs. aspirated and voiceless vs. aspirated vs. glottalized. Ten languages with voiceless vs. voiced vs. glottalized contrasts are Mayan. They have only /b/ as voiced stop except Mopan, but /b/ is normally lightly glottalized, although it has several allophonic variants such as bilabial implosive, preglottalized bilabial and glottalized labial nasal. If we regard /b/ as a glottalized consonant, we reduce the number of languages with this three-way contrast type from 13 to 3. In fact all the other Mayan languages have /b'/ as a voiced glottalized phoneme instead of /p'/ for the plain counterpart /p/ and are classified as two-way contrast types, voiceless vs. glottalized. According to this interpretation, the number of voiceless vs. glottalized increases from 28 to 38. Note that I have inlcuded Chalcatongo Mixtec having a voiced stop and a prenasalized stop into voiceless vs. prenasal, and Juarez Zapotec having voiceless and voiced lenis and voiced stops into fortis vs. lenis types.

We have 9 types of manner contrast in stops, but some types are seen only in specific language groups. This means some types exert limited distributions

Table 2. Number of stop series

Number of stop series	1	2	3
Number of languages	37	121	16
Percent of languages	21%	70%	9%

1) I loosely use a term "language(s)" throughout this paper. Actually the term includes many dialects.

Table 3. Manner contrasts in stops

	Number of languages	
Voiceless only	37	(21%)
Voiceless vs. voiced	52	(30%)
Voiceless vs. prenasal	19	(11%)
Voiceless vs. aspirated	2	(1%)
Voiceless vs. glottalized	28(→38)	(16%→22%)
Fortis vs. lenis	20	(11%)
Voiceless vs. voiced vs. glottalized	13(→3)	(7%→2%)
Voiceless vs. voiced vs. aspirated	2	(1%)
Voiceless vs. aspirated vs. glottalized	1	(1%)
Total	174	

geographically. For example, glottalized consonants are characteristic of the Mayan family. Besides the Mayan, only Tepehua, Oaxaca Chontal, Xinca and Tol have them. Tol, however, has aspirated consonants in addition to glottalized consonants, which results in a triple contrast of voiceless vs. aspirated vs. glottalized stops. Although the glottalized consonants of the languages other than Oaxaca Chontal are limited to the stops, Oaxaca Chontal has the contrasts not only in stops but also in nasals, laterals and glides. As is indicated in the Note of Totonacan in Chapter II, glottal stops of Tepehua seem to be developed from the historical process of CVʔ > CV̉ > CʔV > C'V. Fortis vs. lenis contrasts are limited to Zapotecan and Trique, and voiceless vs. aspirated contrasts to Tarascan only. Prenasalized consonants occur only in Mixtecan, Xochistlahuaca Amuzgo and Lachixio Zapotec. Voiceless vs. voiced vs. aspirated contrasts are found only in Terraba and Teribi. Voiceless only occupies 21% and voiceless vs. voiced 30% of all. However, a distinction between these two types is not firm, but depends on phonemic analysis in some languages. Among Mixe-Zoquean, for example, four dialects have a voiceless vs. voiced contrast, while five have voiceless stops only. The latter have surely voiced consonants phonetically, but they are generated by morphophonemical rules, that is, voiceless consonants become voiced before or after nasals and between vowels. On the other hand, in the former languages voiced consonants are regarded as phonemes, but marginal ones. Therefore when we discuss these two types, we must separate individual language family. More detailed discussion will be seen in section III–2.

III–1–2–2. Manner Contrasts in Fricative Series

Manner contrasts in fricatives are of four types, voiceless only, voiceless vs. voiced, fortis vs. lenis and voiceless vs. glottalized. The last type is only seen in Oaxaca Chontal. More than half of the data are voiceless only type

Table 4. Manner contrasts in fricatives

	Number of languages
Voiceless only	98
Voiceless vs. voiced	52 (of which 36 are Otomanguean)
Fortis vs. lenis	20
Voiceless vs. glottalized	3
Total	173

(Table 4). Note that although Yatee Zapotec has a non-contrastive /γ/ besides fortis and lenis fricatives, it is included in fortis vs. lenis type. One language, Lachixio Zapotec is excluded in Table 4, because prenasalized fricative /^{n}z/ seems to be uncommon. Thus Lachixio Zapotec has a voiceless vs. voiced vs. prenasalized contrast.

III–1–2–3. Manner Contrasts in Sonorant Series

Manner contrasts in sonorants are not so common, but some languages have the following contrasts. Other distinctions are treated in sections III–4 to III–6.

III–1–2–3–1. Nasals

Voiced vs. voiceless

Tequistlatec Chontal, Mixtec (Atatlahuca)

Fortis vs. lenis

Chichimec[1], Trique (Chicahuaxtla), Zapotec (Juarez, Ixtlan, Zoogocho, Yatzachi, Cajonos, Yalalag, Yatee, Albarradas, Mitla[2], Gelavia[1], Chichicapan, Guevea, Isthmus[1])

Voiced vs. glottalized

Huamelultec Chontal

III–1–2–3–2. Liquids (l-sound)

Voiced vs. voiceless

Cuitlatec[1], Paipai[2], Cocopa[2], Seri[1], Totonac (Xicotepec, Papantla), Tepehua (Huehuetla), Tequistlatec Chontal[1], Xinca[2], Guatuso

Fortis vs. lenis

Trique (Chicahuaxtla), Zapotec (Juarez, Ixtlan, Zoogocho, Yatzachi, Cajonos, Yalalag, Yatee, Albarradas, Mitla[2], Guelavia[1], Chichicapan, Guevea, Isthmus[1])

Voiced vs. voiceless vs. glottalized

Huamelultec Chontal, Tequistlatec Chontal[2]

III–1–2–3–3. Glides

Voiced vs. voiceless

Nahuatl (Huautla), Nahual (Pomaro), Seri[1], Tequistlatec[1,2]

Fortis vs. lenis

Trique (Chicahuaxtla), Zapotec (Juarez, Guevea)

Voiced vs. glottalized

Huamelultec Chontal

III–1–3. Position Contrast

III–1–3–1. Stop Series

As for stops, three-position contrast is the simplest in Middle America, which conforms to the simplest known in the world. Stop series here include affricates but exclude lateral affricates. Glottal stop /ʔ/ is treated specially in some cases. Glottal stop /ʔ/ is popular in Middle America, but it is not found in 23 languages (Table 5).

If we take into consideration only voiced stops, the number of place of articulation is from 0 to 5 (Table 6). From Table 6 languages with voiceless stops only are 68 and occupy 39% of all.

The number of place of articulation for prenasalized and lenis stops are as in Tables 7, 8.

Table 5. Number of place of articulation and number of languages in voiceless stops

Voiceless stops:								Total
Number of place of articulation	3	4	5	6	7	8	9	
Number of languages including /ʔ/	12	31	51	63	10	6	1	174
(Number of languages having no /ʔ/	7	2	6	8	0	0	0	23)

Table 6. Number of place of articulation and number of languages in voiced stops

Voiced stops:							Total
Number of place of articulation	0	1	2	3	4	5	
Number of languages	68	18	6	23	15	5	135

Table 7. Number of place of articulation and number of languages in prenasalized stops

Prenasalized stops:							Total
Number of place of articulation	1	2	3	4	5	6	
Number of languages	1	3	3	7	3	2	19

Table 8. Number of place of articulation and number of languages in lenis stops

Lenis stops:					Total
Number of place of articulation	3	4	5	6	
Number of languages	2	5	9	3	19

In these tables Juarez Zapotec is not included. Juarez Zapotec is reported to have 6 voiceless fortis and 6 voiceless lenis, 1 voiced fortis and 3 voiced lenis stops.

III–1–3–2. Fricative Series

Fricative series have the position contrasts from 1 to 6. Voiced fricative series have from 0 to 6 position contrasts. Voiced fricatives include lenis fricatives found in 2 Trique dialects and 18 Zapotec languages/dialects, and a prenasalized fricative found only in Lachixio Zapotec. 101 (58%) languages have only voiceless fricatives (Table 9).

Languages with a voice contrast are mainly Otomanguean (57 of 73 languages having voiced fricatives).

III–1–3–3. Nasal Series

Nasals have four position contrasts (Table 10).

Palatal modification seems to result in a somewhat different basic position of articulation, but all are treated as /ñ/ in this study.

In Tepetotutla Chinantec and Bribri nasals are not registered as phonemes, but Tepetotutla Chinantec has prenasalized stops instead of nasals [WESTLEY 1971]. However, Westley later reversed his earlier practice by replacing /ⁿb ⁿd ⁿg/ with /m n ŋ/, following Rensch [WESTLEY 1991; RENSCH 1989] (See Chapter III–4).

III–2. Stop Systems

I deal with affricates (except lateral affricate /ƛ/) as positions as do Hockett [1955] and Lass [1984], but when I treat languages with a voice con-

Table 9. Number of place of articulation and number of languages in fricatives

								Total
Voiceless fricatives:								
Number of place of articulation		1	2	3	4	5	6	
Number of languages		2	37	87	36	7	5	174
Voiced fricatives:								Total
Number of place of articulation	0	1	2	3	4	5	6	
Number of languages	101	31	25	14	1	1	1	174
(Lenis fricatives		1	13	6				20)

Table 10. Number of place of articulation and number of languages in nasals

Nasals:						Total
Number of place of articulation	0	1	2	3	4	
Number of languages	2	3	95	64	10	174

Table 11. Number of phonemes and variations

									Total
Number of phonemes	3	4	5	6	7	8	9	10	
Number of variations	2	2	8	10	8	8	3	1	42
Number of languages	7	7	35	54	54	11	5	1	174
(of which number of languages with /ʔ/	0	5	29	45	54	11	5	1	150)

trast, some of them have no counterparts of voiceless affricates and furthermore it is often said that there is a strong association between the occurrence of affricates and of sibilants. Therefore I will discuss them further after treating stops.

Among voiceless types the simplest known is three-position contrast. Although the three-position contrast consists of only three phonemes, two variations are observed. The relationship between the number of phonemes and the number of variations is shown in Table 11, together with the number of languages including the glottal stop /ʔ/.

The resultant table differs somewhat from Table 5 in the previous section. In the following I present every variation of voiceless stop series observed in my data.

Phoneme variation	Languages
3 p t k	Miskitu, Sumu, Rama, Terraba, Teribe
3 t č k	Guaymi, Bocota
4 p t č k	Garifuna, Guatuso
4 p t k ʔ	Southern Tepehuan[1], Otomi (Tenango), Chinantec (Lealao), Chatino (Yaitepec)
5 p t t^y k ʔ	Chinantec (Quiotepec)
5 p t c č k	Nahuat (Pajapan, Jalupa), Pochutec, Tarasco[1], Huave
5 p t c k ʔ	Otomi (Sierra), Chinantec (Palantla, Tepetolutla, Sochiapan, Tlacoatzintepec), Tequistlatec[1], Zoque (Leon, Chimalapa), Mixe (Coatlan, Paraiso, Tlahuitoltepec), Tol
5 p t č k k^w	Cuna
5 p t č k ʔ	Papago, Tarahumara[1,2], Yaqui[1], Mayo, Zapotec (Zoogocho, Yatee, Isthmus[1]), Chinantec (Comaltepec)
5 p t k k^w ʔ	Seri[1]
5 t c č k ʔ	Boruca
5 t č k k^w ʔ	Mixtec (Huajuapan, Alacatlazala, Chalcatongo, Diuxi[2], Peñoles)
6 p t t^y k k^w ʔ	Mixtec (Chayuco)
6 p t t^y č k ʔ	Northern Tepehuan
6 p t c č k ʔ	Chichimec[1], South Pame, Mezquital Otomi[1], Tlapanec[1], Trique (Chicahuaxtla), Tequistlatec[2],

	Zapotec (Cajonos, Rincon, Choapan, Guelavia[1], Guevea), Sayula Popoluca, Oluta Popoluca, Mixe (Totontepec[1]), Mayan (Yucatec[2], Lacandon, Itza[2], Mopan, Chontal, Chorti, Tzeltal, Tzotzil[1], Tojolabal, Chuj)
6 p t c č k k^w	Nahuatl (Tetelcingo, Amilcingo, Zongolica, Matlapa, Coscatlan), Nahuat (Zacapoaxtla, Mecayapan), Pipil, Tarasco[2]
6 p t c k k^w ʔ	Huichol[1]
6 p t č k k^w ʔ	Cuitlatec[1], Mixtec (Acatlan, Molinos, Ocotepec[2], Silacayoapan, Atatlahuca, El Grande), Cuicatec[2], Zapotec (Yatzachi, Yalalag, Albarradas, Tlacochahuaya, Ayoquesco)
6 p t č k q ʔ	Paipai[2]
6 t t^y c č k ʔ	Ixcatec, Mazatec (Chiquihuitlan)
6 t c č ç̌ k ʔ	Western Popoloc[1]
6 t c č k k^w ʔ	Jalapa Mazatec
7 p t t^y c č k ʔ	Amuzgo (San Pedro[1]), Huamelultec Chontal, Sierra Popoluca, Zoque (Copainala), Chol[1]
7 p t t^y č k k^w ʔ	Mixtec (Jamiltepec, Jicaltepec, Colorado), Zapotec (Chichicapan)
7 p t t^y k^y k k^w ʔ	Mixtec (Ayutla[2])
7 p t c k k^w q ʔ	Kiliwa[2]
7 p t c č tk k ʔ	Cabecar, Bribri[1]
7 p t c č k k^w ʔ	Nahuatl (Classical, San Jeronimo, Tlaxpanaloya, Acaxochitlan, Huautla), Pomaro Nahual, Matlatzinca, Ocuiltec, Otomi (Temoayan), Mazahua, Mixtec (Mixtepec, Coatzospan), Zapotec (Juarez, Mitla[2], Quioquitani), Huastec (Veracruz, Potosi)
7 p t c č k q ʔ	Totonac (Xicotepec, Papantla), Tepehua (Teachichilco, Huehuetla), Central Pame, Mayan (Jacaltec, San Miguel Acatec, Kekchi, Pocomchi[1,2], Pocomam, Uspantec, Quiche[2,3], Cakchiquel[1,2], Tzutujil[1,2])
7 p t c č ç̌ k ʔ	Eastern Popoloc, Tlacoyalco Popoloc, Chocho, Mazatec (Huautla, Solaytepec), Copala Trique
8 p p^w t c č k k^w ʔ	Cora[2] (Ixcatan)
8 p t t^y c č k k^w ʔ	Chatino (Tataltepec[1])
8 p t t^y c č $č^y$ k ʔ	Cora[1] (Jesus Maria)
8 p t tt c č k k^w ʔ	Zapotec (Ixtlan)
8 p t c č ç̌ k q ʔ	Kanjobal, Acatec[1] (San Rafael), Ixil[1] (Nebaj)
8 p t c č k^y k k^w ʔ	Zapotec (Lachixio)
8 p t c č k^y k q ʔ	Sacapultec, Sipacapeño
8 t c t^y č k k^y k^w ʔ	Amuzgo (Xochistlahuaca)
9 p t ţ c k k^w q q^w ʔ	Cocopa[2]
9 p t c č ç̌ k^y k q ʔ	Tectitec, Mam, Aguacatec
9 p t c ć č ç̌ k q ʔ	Ixil[2] (Chajul)
10 p p^w t c č ç̌ k k^w q ʔ	Ixil[3] (Cotzal)

Middle American Indian languages have from 3 to 10 voiceless stops and are classified into 42 types. The frequency of occurrence of phonemes that appeared in the 42 types are as follows. I only count phonemes in each type, which might be useful to control overweights of the dialects, such as Nahuan.

p	p^w	t	ṭ	tt	t^y	c	ć	č	č^y	ç̌	tk	k^y	k	k^w	q	q^w	ʔ
35	2	42	1	1	10	26	1	32	1	5	1	5	42	19	9	1	36

And the hierarchy of occurrence can be described as follows:

t, k > ʔ > p > č > c > k^w > t^y > q > k^y, ç̌ > p^w > ṭ, tt, ć, ç̌^{y}, tk, q^w

Every language has /t/ and /k/ but /p/ is lacking in some Otomanguean and Chibchan. Among Chibchan, however, Boruca, Guaymi and Bocota have /b/ in the voiced stop series. /ʔ/ appears from 4 position contrast types onward and is an obligatory component from 7 position contrast types onward. In frequency the normal stops /p t k ʔ/ are followed by the affricates /č/ and /c/. Then /k^w/ and /t^y/ follow them. /q/ is not found at all until 5 position contrast types and shows geographically restricted distributions. It is found only in Highland Mayan, Totonacan (including Tepehua), Central Pame, and Yuman. /ç̌/ appears also restrictedly, found only in two regions, i.e., Northwestern Oaxaca (mainly in Popolocan, but Copala Trique and Guelavia Zapotec have it too) and western Highland Guatemala (Kanjobal, Acatec, Tectitec, Mam, Aguacatec, Ixil). Other phonemes such as /p^w, ṭ, tt, ć, č^y, tk, q^w/ occur very restrictedly. They are unusual phonemes and seem to be allophones.

Secondary articulations are of two types; labialization and palatalization. Of these labialized velar /k^w/ is the most common. Labialized labial /p^w/, and uvular /q^w/ are found also but are very rare. Palatalization is observed with alveolar /t^y/, palato-alveolar /č^y/ and velar /k^y/, of which /t^y/ is more often found than /k^y/. /č^y/ is very rare.

I have already discussed manner contrasts in chapter III–1–2, but briefly. Since the relationship between voiceless stops and voiced or other articulatory manners is very interesting, I treat it in detail.

III–2–1. Manner Contrasts

III–2–1–1. Voiceless Only

Languages with only voiceless stops number 37 languages, in which the number of phonemes are from 5 to 9 (Table 12). One language with 5 phonemes does not have /ʔ/ and among languages with 6 phonemes, 2 do not have /ʔ/. All other languages have /ʔ/.

III–2–1–2. Voiceless vs. Voiced

I separate /ʔ/ from the number of voiceless stops, because the voiced counterpart does not exist (Table 13).

Table 12. Number of phonemes and languages in voiceless stops

						Total
No. of phonemes	5	6	7	8	9	
No. of languages	8	9	17	2	1	37
(No. of languages with /ʔ/	7	7	17	2	1	34)

Table 13. Number of voiceless and voiced stops and number of languages

																				Total
No. of voiceless stops	4	5	6	3	4	5	6	3	4	5	6	3	4	5	6	7	4	5	6	
No. of voiced stops	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	
No. of languages	2	2	5	1	1	2	1	6	4	4	4	2	6	3	3	1	1	3	1	52

The sets of the identical number are only 15, but the languages with a symmetrical series are less than 15. They are 12 given below.

3 : 3 Southeastern Tepehuan[1], Otomi (Tenango), Chatino (Yaitepec), Miskitu, Sumu,

4 : 4 Otomi (Sierra), Chinantec (Comaltepec, Quiotepec, Palantla, Tepetotula),

5 : 5 Pame South, Mazatec (Jalapa)

Boruca has 4 voiceless (t c č k) and 4 voiced (b d ǰ g) stops, but they are not matched. Guaymi has 3 voiceless (t č k) and 3 voiced (b ǰ g). Ixcatec has 5 voiceless (t tʸ c č k) and 5 voiced stops (b d dʸ ǰ g), which also does not form a symmetrical series.

Three languages have more voiced stops than voiceless stops. They are Chinantec (Lealao), Bocota and Papago. Chinantec (Lealao) and Papago have /ʔ/.

Chinantec (Lealao)				Bocota				Papago				
p	t		k		t	č	k	p	t		č	k
b	d	j	g	b	d	ǰ	g	b	d	ḍ	ǰ	g

III–2–1–3. Voiceless vs. Prenasal

Prenasal consonants are found in Mixtecan, Xochistlahuaca Amuzgo, and Lachixio Zapotec (Table 14). The languages with a symmetrical set are only

Table 14. Number of voiceless and prenasal stops and number of languages

													Total
No. of voiceless stops	4	4	5	6	7	5	6	8	4	5	6	6	
No. of prenasal stops	1	2	3	3	3	4	4	4	5	5	5	6	
No. of languages	1	3	1	1	1	4	2	1	1	1	1	2	19

two, Mixtepec and Coatzospan Mixtec. Note that Chalcatongo Mixtec, which is classified as 4 voiceless stops vs. one prenasal stop, has /b/ besides /^{n}d/. Acatlan Mixtec has 5 voiceless and 5 prenasal stops, but the system is asymmetical (p t č k k^{w} // ^{m}b ^{n}d ^{n}j ^{n}ǰ ^{n}g).

III–2–1–4. Voiceless vs. Aspirated

This contrast is found only in Tarascan. Tarasco[1] (Ichupio) has a symmetrical set, while Tarasco[2] (Purenchecuaro) has no aspirated affricates corresponding to /c/ and /č/.

III–2–1–5. Fortis vs. Lenis

Fortis vs. lenis contrast is reported in Zapotecan and Trique (Table 15). 15 of 19 have a symmetrical series. Fortis stops having no counterparts are /c/, /č/, /ç̌/ or /k^{w}/. These phonemes except /ç̌/ can have the counterpart in other languages with a symmetrical series. Note that Juarez Zapotec has a different system, that is, 6 voiceless fortis vs. 6 voiceless lenis and 1 voiced fortis vs. 1 voiced lenis and 3 voiced stops.

III–2–1–6. Voiceless vs. Glottalized

Glottalized stops are a characteristics of the Mayan. They have a symmetrical series except bilabial consonants. For example, Mam's stop series is as follows:

p　t　c　č　ç̌　k^{y}　k　q
b'　t'　c'　č'　ç̌'　k^{y}'　k'　q'　ʔ

As for bilabials two different systems are observed, that is, /p p' b$^{(')}$/ and /p b$^{(')}$/. The former is, roughly speaking, found in Lowland Mayan, while the latter in Highland Mayan. However, Cotzal Ixil is reported to have /p b' p^{w}/ and Mopan has /d/ besides /t'/.

Huehuetla Tepehua has a similar system to the Mayan, but it forms a perfectly symmetrical series, /p t c č k q/ vs. /p' t' c' č' k' q'/.

In Xinca[2] there are more glottalized stops than plain stops, /p t k/ vs. /p' t' c' k'/.

III–2–1–7. Voiceless vs. Voiced vs. Glottalized

Languages with a contrast of voiceless vs. voiced vs. glottalized are only

Table 15. Number of fortis and lenis stops and number of languages

								Total
No. of fortis stops	5	6	4	5	7	5	6	
No. of lenis stops	3	3	4	4	4	5	6	
No. of languages	1	1	3	1	1	9	3	19

Oaxaca Chontal, if the Mayan having only /b'/ as voiced consonant are excluded. Both Huamelultec and Tequistlatec Chontal have an asymmetrical system.

III–2–1–8. Voiceless vs. Voiced vs. Aspirated.

From the data, Terraba and Teribe have this contrast[2)]. Although these are the dialects of the same language, Teribe has a symmetrical series, /p t k/ vs. /b d g/ vs. /p^h t^h k^h/, while Terraba lacks /p^h/ in the same series.

III–2–1–9. Voiceless vs. Aspirated vs. Glottalized

Tol has a triple contrast of voiceless vs. glottalized vs. aspirated in stops, which forms symmetry.

III–2–2. Affricates and Sibilants

I have included affricates in stops, but affricates, in turn, have some relations to sibilants in their articulation. Accordingly, I clarify their relationship. Theoretically there are sixteen combinations of plain affricates and sibilants, of which 8 combinations are found in Middle America (Table 16). Note that there is a language lacking perfectly the voiceless counterpart in affricates (Lealao Chinantec) and also one language lacking the voiceless counterpart in sibilants (Huichol[1]). Acatlan Mixtec lacks the counterpart of

Table 16. Types of affricates and sibilants combinations

	Affricates		Sibilants	Types		Number of
	VL	VD	VL	VD		attested languages
1.1	–	–	+	–	VL sibilants	9
1.2	–	–	+	+	VL:VD sibilants	3
2.1	+	–	+	–	VL affricates and VL sibilants	60
2.2	+	–	–	+	VL affricates and VD sibilants	1
2.3	+	–	+	+	VL affricates and VL:VD sibilants	13
2.4	–	+	+	–	VD affricates and VL sibilants	1
2.5	+	+	+	–	VL:VD affricates and VL sibilants	20
2.6	+	+	+	+	VL:VD affricates and VL:VD sibilants	22
Total						129

2) If we take all the data into consideration, Cochimi, Kiliwa[1], Tlapanec[2], Bribri[2] have this contrast. Cochimi and Kiliwa[1] have only one voiced stop and aspirated stop respectively, while voiceless stops are rich. However, Kiliwa[2], in which I put more confidence, does not have aspirated stops but only a voiceless stop series. Tlapanec[2] has four voiceless, four voiced, three aspirated stops. However, in Tlapanec[1] three aspirated stops are interpreted as consonant clusters. Bribri[2] has preaspirated stops /hp ht hc hč hk/. These preaspirated stops are recognized as phonemes by Schlabach [1974], but other scholars do not admit them. Similar interpretation is seen in Chinantecan. Chinantecan have also preaspirated stops but they are interpreted as consonant clusters.

/ⁿj/ but has /č ⁿǰ/. There are, furthermore, 3 types having aspirated and/or glottalized affricates. These types are attested to be 42 languages, which have only voiceless sibilants.

I will describe the types along the above classification. The following languages have only sibilants. They can be divided into two types, languages with voiceless only and with a voiceless-voiced contrast.

III–2–2–1–1. Sibilants only

	s			Miskitu, Sumu, Southern Tepehuan
	s	š		Chatino (Yaitepec), Chinantec (Quiotepec), Rama
	s		ş̌	Seri[1]
θ	s	š		Mixtec (Chayuco)
	s	s^y	š	Mixtec (Ayutla[2])

III–2–2–1–2. Voiceles vs. voiced in sibilants

s	š	z		Otomi (Tenango)
s	š	z	ž	Terraba, Teribe

[c] and [č] are interpreted as consonant clusters [ts] and [tš] in Yaitepec Chatino. In Southern Tepehuan [č ǰ š] are interpreted palatalized /t d s/ contiguous to /i/. In other languages affricates occur too, except in Miskitu, Sumu and Rama, but they are interpreted not as phonemes /c č/ but as consonant clusters or palatalized consonants.

III–2–2–2. Affricates and Sibilants

The relationship between affricates and sibilants is more complex than expected. I divide it into 7 major types: voiceless only, voiceless affricates and voiced sibilants, voiceless affricates and voiceless-voiced in sibilants, voiced affricates and voiceless sibilants, voiceless-voiced in affricates and voiceless sibilants, voiceless-voiced in both affricates and sibilants, and voiceless-aspirated/glottalized in affricates. They are subdivided into various types, of which I will focus only on symmetrical types.

III–2–2–2–1. Voiceless types: 60 languages

c		s			Kiliwa[2], Zoque (Leon, Chimalapa), Garifuna
c				š	Mixe (Coatlan, Paraiso)
c		s		š	Mixtec (Colorado), Mixe (Tlahuitoltepec)
c		θ s			Chinantec (Sochiapan, Tlacoatzintepec)
c		s	ş	š	Cocopa[2]
	č	s			Tarahumara, Yaqui[1], Mayo, Cuicatec[2], Cuna
	č			š	Cuitlatec[1]
	č	s		š	Northern Tepehuan[1], Paipai[2], Mixtec (Alacatlazala, Jamiltepec, Jicaltepec)
c	č	s			Cora[2]
c	č	s		š	Nahuan (All, 17), Tarasco[2], Totonac (Xicotepec, Papantla), Tepehua (Teachichilco), Central Pame, Matlatzinca, Ocuiltec,

						Amuzgo (San Pedro[1], Xochistlahuaca), Chatino (Tataltepec[1]), Huave, Sierra Popoluca, Oluta Popoluca, Mixe (Totontepec[1])
c	č		s		ş̌	Mazatec (Chiquihuitlan), Sayula Popoluca
c čʸč			s	š		Cora[1]
c	č	ç̌	s	š	ş̌	Eastern Popoloc
c	č	ç̌	s	š		Mazatec (Soyaltepec)
c	č	ç̌	s		ş̌	Mazatec (Huautla)

There are 60 sampling languages (including dialects) under fifteen combinations, of which /c s/(4 samples), /č š/ (1), /c č s š/ (31) and /č ç̌ s š ş̌/ (1) are perfectly symmetrical. They occupy 37(62%) of 60. If we include near symmetrical series such as /c š/, /č s/, and /c č s ş̌/, the total becomes 46(77%). /č s š/ is observed in 5 languages. Other combinations are attested in only a few languages.

III–2–2–2–2. Voiceless affricates and voiced sibilants: 1

This type is attested in only one language.

c	ẓ̌	Huichol[1]

III–2–2–2–3. Voiceless vs. voiced in sibilants: 13

This type means to have voiceless affricate(s) and voiceless vs. voiced sibilants. They are subdivided into 9 subtypes, which are attested in only a few languages, respectively.

	č			s	š			ž			Mixtec (Huahuapan, Molinos, Chalcatongo, Diuxi[2])
c	č			s	š			ž̲			Zapotec (Lachixio)
c	č			s	š		z	ž			Temoayan Otomi, Mazahua
c	č			s	š		z̲	ž̲			Trique (Chicahuaxtla)
c	č		θ	s	š			ž̲			Zapotec (Ixtlan)
c	č		θ	s	š		z				Mezquital Otomi[1]
c	č	ç̌		s	š	ş̌	z	ž			Tlacoyalco Popoloc
c	č	ç̌		s	š	ş̌	z	ž	ẓ̌		Western Popoloc[1], Chocho
c	č	ç̌		s	š	ş̌	z	ž	r(=ẓ̌)		Trique (Copala)

Symmetrical voiceless vs. voiced sibilants are only two types, /s š z ž/ (including lenis sibilants) and /s š ş̌ z ž ẓ̌/. Taking affricates into consideration, these two types show also symmetry, /c č s š z ž/ and /c č ç̌ s š ş̌ z ž ẓ̌/.

III–2–2–2–4. Voiced affricates and voiceless sibilants: 1

Lealao Chinantec is reported to have only a voiced affricate and voiceless sibilant.

j	s	Chinantec (Lealao)

III–2–2–2–5. Voiceless vs. voiced in affricates: 20

This type has a voiceless vs. voiced contrast in affricates, but sibilants are only voiceless.

c		j			š	Sierra Otomi
c		j		s		Chinantec (Palantla, Tepetotutla)
	č		ǰ	s		Chinantec (Comaltepec), Guatuso, Guaymi, Bocota
	č		ǰ	s	ş	Papago

	č		^{n}ǰ	s	š		Mixtec (Ocotepec[2])
	č	^{n}j	^{n}ǰ	s	š		Mixtec (Acatlan)
c	č		ǰ	s	š		Tlapanec[1], Ixcatec, Zoque (Copainala), Boruca, Cabecar, Bribri[1]
c	č	j	ǰ	s	š		South Pame, Mazatec (Jalapa de Diaz)
c	č	^{n}j	^{n}ǰ	s	š		Mixtec (Coatzospan)
c	č	^{n}j	^{n}ǰ	s		ş̌	Mixtec (Mixtepec)

Symmetrical systems in affricates are of 5 subtypes, /c j/, /č ǰ/, /č ^{n}ǰ/, /c č j ǰ/, and /c č ^{n}j ^{n}ǰ/. If sibilants are taken into consideration, symmetrical systems are of 3 subtypes, /c j s/, /c č j ǰ s š/, and /c č ^{n}j ^{n}ǰ s š/.

III-2-2-2-6. Voiceless vs. voiced in both affricates and sibilants: 22

This type, voiceless vs. voiced in both affricates and sibilants, is subdivided into 9 subtypes, of which 2 subtypes, /c č j̲ ǰ̲ s š z̲ ž̲/ and /c č j ǰ s ş̌ z̲ ẓ̲̌/ show symmetry.

c	č			ǰ		s				z			Chichimec[1]
	č			^{n}ǰ		s	š				ž		Mixtec (Silacayoapan, Atatlahuca, El Grande, Peñoles)
	č			ǰ̲		s	š			z	ž		Zapotec (Tlacochahuaya, Isthmus[1])
	č			ǰ̲		s		ş̌		z̲		ẓ̲̌	Zapotec (Yatee, Albaradas, Chichicapan, Ayoquesco)
	č			ǰ̲		s		ş̌		z̲	ž̲	ẓ̲̌	Zapotec (Yalalag)
	č			ǰ̲		s	š	ş̌		z̲	ž̲	ẓ̲̌	Zapotec (Zoogocho, Yatzachi)
c	č		j̲	ǰ̲		s	š			z̲	ž̲		Zapotec (Rincon, Choapan, Mitla[2], Quioquitani, Guevea)
c	č		j	ǰ		s		ş̌		z̲		ẓ̲̌	Zapotec (Cajonos, Guelavia[1])
c	c̲	č	č̲		θ	s		ş̌	θ̲		ş̲̌	ẓ̲̌	Zapotec (Juarez)

III-2-2-3. Voiceless vs. Glottalized and/or Aspirated in Affricates: 42

This type includes aspiration and glottalization in affricates. Aspirated affricates are seen in Tarasco and Tol, but the latter has furthermore a glottalized affricate. Glottalized affricates are seen in Huehuetla Tepehua, Oaxaca Chontal, Mayan and Xinca. They form symmetry with plain affricates and sibilants, except Huastec, Xinca[2] and Tequistlatec[1].

c	č		cʰ	čʰ			s	š		Tarasco[1]
c			cʰ c'			s				Tol
			c'				ş			Xinca[2]
c			c'	č'			s	š		Tequistlatec[1]
c	č		c'	č'			s	š		Huehuetla Tepehua, Tequistlatec[2], Huamelultec, Mayan (Yucatec[1], Lacandon, Itza[2], Mopan, Chol[1], Chontal, Chorti, Tzeltal, Tzotzil[1], Tojolabal, Chuj, Kekchi, Pocomchi[1,2], Pocomam, Uspantec, Quiche[2,3], Sacapultec, Sipacapeño Cakchiquel[1,2], Tzutujil[1,2])
c	č		c'	č'		θ		š		Huastec (Veracruz)
c	č		c'	č'		θ	s	š		Huastec (Potosi)
c	č	ç̌	c'	č'	ç̌'		s	š	ş̌	Jacaltec, Kanjobal, Acatec, Tectitec, Mam, Aguacatec, Ixil[1,3]

c ć č ç̌ c' ć' č' ç̌'   s ṣ š ṣ̌ Ixil[2] (Chajul)

The hierarchy of occurrence can be described as follows:

Voiceles sibilants:

s(55) > š(40) > ṣ̌(15) > θ(6) > ṣ(4) > θ̱(1), ṣ̱̌(1), s^{y}(1)

Voiced sibilants:

z(9), ž(9) > ẕ(6) > ẕ̌(5), ẓ̱̌(5) > ẓ̌(2) > ẓ(1), or z ẕ > ž ẕ̌ > ẓ̌ ẓ̱̌

Voiceless affricates:

č(42) > c(39) > ç̌(8) > c'(8) > č'(6) > c^{h}, ç̌'(2) > c̱, č̱, č^{y}, č^{h}, ć,ć'(1)

Voiced affricates:

ǰ(7) > ǰ̱, ^{n}ǰ(5) > j(4) > ^{n}j(3) > j̱(1), or ǰ, ǰ̱ > j j̱ > ^{n}ǰ > ^{n}j

In the above series of voiceless sibilants, voiced sibilants, voiceless affricates and voiced affricates, the number in parentheses indicates the frequency of the phonemes in the above different sets.

The phonemes with more than half frequency of occurrence are /s š c č/. In other words, they are common phonemes.

III–3. Fricative Systems

The fricative series, both voiceless and voiced, show the greatest variability. Voiceless fricative series have 27 types and fricative systems with both voiceless and voiced fricatives have 55 types[3]. Every language except Huichol has /s/. Voiceless fricatives may include, besides /s/, some of the following: /θ š ṣ̌ h x f/, and other fricatives are extremely rare.

/h/ is often called a glottal fricative, although a turbulent airstream, a characteristic of fricatives, can hardly be heard. Hence some linguists exclude /h/ from fricatives [cf. MADDIESON 1984: chap. 3], but /h/ is discussed here with other fricatives, because some languages such as Yuman, Highland Mayan, and so on have both /x/ and /h/, although there are in general no contrasts between /x/ and /h/. However, /h/ has also some relationship with /ʔ/, and is sometimes put into a special class of laryngeals together with /ʔ/. This is recognized in Nahuan languages, where 2 dialects have only a /ʔ/, and 10 dialects have only an /h/, while 5 other dialects have /h ʔ/.

I was embarassed when I found that a retroflexed sibilant is transcribed by either *ṣ* or *ṣ̌* in my data. Bright notes that the sound *ṣ* is between *s* and *š*, and *ṣ̌* is strongly retroflexed [BRIGHT 1984]. These two sound different, although they are not distinguished even in the IPA scheme, in which only one retroflexed sibilant is given. Generally speaking, lamino-alveolar is transcribed as *s* and apico-alveolar is represented by *ṣ*, but retroflex is also expressed by *ṣ*. That is, *ṣ* is used for either the retroflex or the apico-alveolar sibilant. Moreover, *ṣ̌* is sometimes transcribed as *ṣ*.

3) If we take all the data into consideration, voiceless fricative series have 33 types and fricative systems with both voiceless and voiced fricatives have 68 types.

Turning to the Middle American languages, *ṣ* is used for Papago, Guarijio, Cocopa and Xinca. *ṣ* is interpreted as an apico-domal retroflexed sibilant. This *ṣ* is an areal feature of Californian languages [Bright 1984]. On the other hand, southern languages such as Zapotecan and Mayan have an alveo-palatal retroflex ṣ̌. Chajul Ixil, one dialect of Ixil has an apico-alveolo-palatal *ś* besides *s*, *š*, and ṣ̌. This may be the same as *ṣ*. Therefore I distinguish two retroflexed sibilants as follows:

Alveolar	Retroflexed	Alveo-palatal	Retroflexed
s	ṣ	š	ṣ̌

I was also perplexed to find that /ð/ is used for a fricativized /đ/. /ð/ is a voiced interdental fricative and the counterpart is /θ/. /đ/ is different from /ð/. Nevertheless, they are not distinguished in IPA nor in American Usage. Since there seems to be no reason to distinguish them, I use /ð/ for all fricativized *d* sounds.

The following list contains every variety of types of fricatives. I exclude lateral fricatives and spirantized *W* from the data, and they are treated in the laterals and glides respectively. Fricative series can be classified into two, voiceless only and voiceless vs. voiced fricatives. These two major classes can be subdivided further.

/f/ and /ϕ/ do not co-occur and they are regarded as interchangeable phonemes. Their voiced counterparts /v β/ are also interchangeable. Thus they can be gathered into two classes, voiceless bilabial/labial and voiced bilabial/labial, respectively. Moreover, in many cases /x/ does not contrast with /h/, although some languages have a contrast between /x/ and /h/. And in some cases /š/ and /ṣ̌/ are interchangeable. Accordingly, the following list may be simplified. For example, /s h/ and /s x/ may be put together. Similar (interchangeable) sets are put in a brace[4].

III–3–1. Languages with Voiceless Fricatives Only

III–3–1–1. Language with One Fricative

s					Cuna

III–3–1–2. Languages with Two Fricatives

s				h	Tarahumara[1], Yaqui[1], Mayo, Zoque (Leon, Chimalapa), Chinantec (Comaltepec), Tol, Miskitu, Sumu, Bocota
s			x		Tarahumara[2]
		š		h	Sierra Otomi, Mixe (Coatlan, Paraiso)
	ṣ			h	Xinca[2]
s		š			Nahuatl (Classical, Tlaxpanaloya) Mixtec (Jicaltepec), Rama

4) If similar sets are put together, voiceless fricative series decrease to 17 types and fricative systems with both voiceless and voiced fricatives to 44 types.

III-3-1-3. Languages with Three Fricatives

		s	ş						h			Papago
		s		š					h			Cora[1], Nahuan (14: Jeronimo, Tetelcingo, Amilcingo, Matlapa, Coscatlan, Acaxochitlan, Huautla, Pomaro, Zacapoaxtla, Mecayapan, Pajapan, Jalupa, Pipil, Pochutec), Totonacan (Xicotepec, Papantla), Tepehua[1,2], Central Pame, South Pame, Mazatec (Jalapa, Soyaltepec), Amuzgo (San Pedro[1]), Chatino (Yaitepec), Huave, Zoque (Copainala), Sierra Popoluca, Oluta Popoluca, Mixe (Tlahuitoltepec), Yucatec[2], Lacandon, Itza[2], Mopan, Chol[1], Chontal, Chorti, Tzeltal, Tojolabal, Cabecar, Bribri[1]
		s		š		x						Tarasco[1,2], Uspantec, Quiche[3], Sipacapeño, Tzutujil[1,2], Boruca
		s			ş̌				h			Sayula Popoluca
ɸ		s							h			Chinantec (Palantla)
f		s							h			Chinantec (Tepetotutla), Garifuna
ɸ		s				x						Guatuso

III-3-1-4. Languages with Four Fricatives

		s				x	x^w		h			Kiliwa[2]
		s		š		x			h			Chuj, Kekchi, Pocomchi[1,2], Pocomam, Quiche[2]
		s		š	ş̌	x						Acatec[1,2], Tectitec, Mam, Aguacatec, Ixil[1]
	θ	s		š					h			Huastec (Potosi)
f		s		š					h			Nahuatl (Zongolica)
ɸ		s		š					h			Tlapanec[1], Ixcatec
f		s		š		x						Sacapultec

III-3-1-5. Languages with Five Fricatives

		s		š					h	h^y	h^w	Chatino (Tataltepec[1])
		s	ş	š		x	x^w					Cocopa[2]
		s		š	ş̌	x			h			Jacaltec, Kanjobal
		s	ş	š	ş̌				h			Ixil[2] (Chajul)
f	f'	s		š		x						Huamelultec, Tequistlatec[2]
f	f'	s		š					h			Tequistlatec[1]

III-3-1-6. Language with Six Fricatives

ɸ		s			ş̌	x	X	X^w				Seri[1]

III-3-2. Languages with Voiceless vs. Voiced Fricatives

III-3-2-1. Language with One Voiceless and One Voiced Fricative

			h	ẓ			Huichol[1]

III-3-2-2-1. Languages with two voiceless and one voiced fricatives

s			h	z			Chichimec[1]
s			h		v		Southern Tepehuan
s			h		β		Cora[2]
s		x				ð	Guaymi
s	ş̌				v		Mixtec (Mixtepec)

III-3-2-2-2. Languages with two voiceless and two voiced fricatives

		s						h				β	ð			Tarahumara[1]
		s				x						v	ð			Cuicatec[2]
		s		š					z̲	ž̲						Zapotec (Choapan, Tlacochahuaya, Guevea, Isthmus[1])
		s			ʂ				z̲		ʐ̲					Zapotec (Albarradas, Guelavia[1], Chichicapan, Ayoquesco)

III-3-2-2-3. Languages with two voiceless and three voiced fricatives

				š				h				β	ð		γ	Cuitlatec[1]
		s		š						ž		β	ð			Mixtec (Huajuapan)
		s		š								β	ð	ðʸ		Mixtec (Coatzospan)
		s			ʂ				z̲		ʐ̲				γ	Zapotec (Yatee)

III-3-2-3-1. Languages with three voiceless and one voiced fricatives

		s		š				h		ž						Mixtec (Chalcatongo)
		s		š				h				v				Tzotzil[1], Mixe (Totontepec[1])
		s		š				h				β				Matlatzinca, Ocuiltec, Amuzgo (Xochistlahuaca), Mixtec (Alacatlazala)
		s		š		x						v				Northern Tepehuan, Paipai[2], Mixtec (Jamiltepec, Colorado)
		s			ʂ			h				β				Mazatec (Chiquihuitlan)
		s			ʂ			h				v				Mazatec (Huautla)
	θ	s						h					ð			Chinantec (Tlacoatzintepec)
	θ	s		š								v				Mixtec (Chayuco)
	θ			š				h				β				Huastec (Veracruz)
f		s						h				v				Chinantec (Lealao)

III-3-2-3-2. Languages with three voiceless and two voiced fricatives

		s		š				h				v	ð			Mixtec (Acatlan)
		s		š		x						v	ð			Mixtec (Ocotepec[2])
		s		š				h		ž		v				Mixtec (Molinos)
		s		š				h		ž		β				Mixtec (Silacayoapan)
		s		š				h	z	ž						Temoayan Otomi, Mazahua, Teribe
		s		š				h	z̲	ž̲						Trique (Chicahuaxtla), Zapotec (Quioquitani)
		s		š			X		z̲	ž̲						Zapotec (Rincon)
φ		s		š						ž			ð			Mixtec (Peñoles)

III-3-2-3-3. Languages with three voiceless and three voiced fricatives

		s		š				h		ž		β	ð			Mixtec (Atatlahuca, El Grande)
		s			ʂ		X		z̲		ʐ̲		X̲			Zapotec (Cajonos)
	θ	s			ʂ				θ̲	ʂ̲		ʐ				Zapotec (Juarez)

III-3-2-4-1. Languages with four voiceless and one voiced fricatives

		s	sʸ	š		x						v				Mixtec (Ayutla[2])
		s		š	ʂ			h					ð			Eastern Popoloc
		s		š	ʂ			h				v				Ixil[3]
	θ	s		š		x				ž̲						Zapotec (Ixtlan)

f s š x v Cakchiquel[1,2]

III–3–2–4–2. Languages with four voiceless and two voiced fricatives

f s š h ð γ Chinantec (Quiotepec)

f s š h z̲ ž̲ Zapotec (Mitla[2])

f s š h z ž Terraba

III–3–2–4–3. Languages with four voiceless and three voiced fricatives

s ṣ̌ x xʷ ž β ð Mixtec (Diuxi[2])

s ṣ̌ X Xʷ z̲ ž̲ ẓ̲̌ Zapotec (Yalalag)

s š ṣ̌ h z̲ ž̲ ẓ̲̌(=r) Trique (Copala)

ϕ θ s h β ð γ Chinantec (Sochiapan)

III–3–2–4–4. Languages with four voiceless and four voiced fricatives

s š ṣ̌ h z ž ẓ̌ γ Western Popoloc[1]

f s š h ž̲ ⁿz β ð Zapotec (Lachixio)

III–3–2–5–1. Language with five voiceless and one voiced fricatives

ϕ s š x h z Tenango Otomi

III–3–2–5–2. Language with five voiceless and three voiced fricatives

s š ṣ̌ x X z̲ ž̲ ẓ̲̌ Zapotec (Zoogocho)

III–3–2–6–1. Language with six voiceless and one voiced fricatives

f θ s š x h z Mezquital Otomi[1]

III–3–2–6–2. Language with six voiceless and three voiced fricatives

s š ṣ̌ x X Xʷ z̲ ž̲ ẓ̲̌ Zapotec (Yatzachi)

III–3–2–6–3. Language with six voiceless and five voiced fricatives

ϕ θ s š ṣ̌ h z ž β ð γ Tlacoyalco Popoloc

III–3–2–6–4. Language with six voiceless and six voiced fricatives

ϕ θ s š ṣ̌ x z ž ẓ̌ β ð γ Chocho

From the above sets the frequency of occurrence are deduced as follows: (Parenthesized numbers show frequency. I only count phonemes in each type.)

s(77) > š(53) > h(50) > x(24) > ṣ̌(21) > ð(18) > β(15) > v(14) > f(13) > ž(12) > z̲(11) > ž̲, θ(10) > z, ϕ(9) > ẓ̲̌(8) > γ(7) > X(6) > ṣ(4) > ẓ̌, xʷ, Xʷ (3) > f'(2) > θ̲ ẓ hʷ hʸ X̲ ðʸ sʸ(1)

The most common set is /s š h/. In fact, languages having /s š h/ are 42. If we include /s š x/ and /s ṣ̌ h/, the total number becomes 50.

Some phonemes such as /θ ṣ̌/ show areal traits. Languages having /θ/ and /ṣ̌/ are as follows:

/θ/: Otomi (Mezquital[1]), Tlacoyalco Popoloc, Chocho, Mixtec (Chayuco), Zapotec (Ixtlan, Juarez), Chinantec (Sochiapan, Tlacoatzintepec), Huastec (Veracruz, Potosi)

/ṣ̌/: Seri[1], Eastern Popoloc, Tlacoyalco Popoloc, Western Popoloc[1], Chocho, Mazatec (Chiquihuitlan, Huautla), Mixtec (Mixtepec), Zapotec (Juarez, Yalalag, Yatee, Cajonos, Yatzachi, Albarradas, Zoogocho, Guelavia[1], Chichcapan, Ayoquesco), Trique (Copala), Sayula Popoluca, Mayan (Jacaltec, Kanjobal, Acatec[1,2], Tectitec, Mam, Aguacatec, Ixil[1,2,3])

/θ/ is found in two areas, one is in the Otomi-Huastec region and the other is in North Oaxaca to South Puebla. The areal distribution of /ş̌/ partially overlaps with that of /θ/, but extends more widely. There are two centers of diffusion; one is in Oaxaca and the other is in western Highland Guatemala. Only Seri is far away from the others.

/ṣ/ is said to be an areal feature of Californian languages and languages close to them, such as Papago, Paipai and Cocopa have also /ṣ/. In Middle America, /ṣ/ is found only in Xinca[2]. Ixil[2] has an apico-alveolo-palatal /ś/, which may be the same as /ṣ/.

/f/ and /ϕ/ have also areally interesting distributions. The distributional center may be in Oaxaca, extending north to the Otomi region. The languages far from the center are Seri, Mayan (Sacapultec, Cakchiquel[1,2]), Guatuso and Terraba.

/f/: Nahuatl (Zongolica), Otomi (Mezquital[1]), Zapotec (Mitla[2], Lachixio), Chinantec (Lealao, Tepetotutla, Quiotepec), Huamelultec, Tequistlatec[1,2], Mayan (Sacapultec, Cakchiquel[1,2]), Terraba

/ϕ/: Seri[1], Otomi (Tenango), Tlapanec[1], Tlacoyalco Popoloc, Chocho, Ixcatec, Mixtec (Peñoles), Chinantec (Palantla, Sochiapan), Guatuso

The phonemes related to /h/ and /x/ are also interesting areally. The languages having a contrast of /x/ and /h/ are as follows:

/x h/: Otomi (Mezquital[1], Tenango), Mayan (Jacaltec, Kanjobal, Chuj, Kekchi, Pocomchi[1,2], Pocomam, Quiche[2])

The contrast may be a genetic feature in Mayan, but the Mayan languages having this feature are delimited areally.

Fricatives from velar to glottal place with lip-rounding show also limited distribution. Uvular fricatives /X X^w/ are found only in Northern Zapotec and Seri.

/x^w/: Kiliwa[2], Cocopa[2], Mixtec (Diuxi[2])

/h^w/: Chatino (Tataltepec[1])

/X^w/: Seri[1], Zapotec (Yalalag, Yatzachi)

/X/: Seri[1], Zapotec (Rincon, Yalalag, Cajonos, Zoogocho, Yatzachi)

As is indicated in Chapter III-1-2-2, more than half of the Middle American Indian languages have only voiceless fricative series. Most of the languages with a contrast of voiceless vs. voiced fricatives belong to the Otomanguean phylum. Fifty-seven languages (including dialects) of Otomanguean have voiced fricatives and 20 have a fortis and lenis contrast. Languages having voiced fricative(s) other than Otomanguean are 16;

Northern Tepehuan[1], Southern Tepehuan[1], Tarahumara[1], Cora[2], Huichol[1], Cuitlatec[1], Paipai[2], Mixe (Totontepec[1]), Huastec (Veracruz), Tzotzil[1], Ixil[3], Cakchiquel[1,2], Terraba, Teribe, and Guaymi. Among these languages, Northern Tepehuan[1], Southern Tepehuan[1], Mixe (Totontepec[1]), Tzotzil, Ixil[3] and Cakchiquel[1,2] have only /v/ or /β/, which corresponds to /w/ in other members of the corresponding family. That means /w/ became /v/ or /β/ in these languages. Cuitlatec[1] has /β ð γ/, which are fricativized /b d g/. /ð/ of Guaymi seems to fill a gap of stop series /t č k b ǰ g/. Note that Bocota's stop series is /t č k b d ǰ g/. If these languages are eliminated, it is said that Tarahumara[1], Cora[2], Huichol[1], Paipai[2], Huastec (Veracruz), Terraba, and Teribe have really fricative(s), but they have only one or two fricatives as follows:

/β/ Cora[2], Huastec (Veracruz)
/v/ Paipai[2]
/β ð/ Tarahumara[1]
/ẓ/ Huichol[1]
/z ž/ Teribe, Terraba

Furthermore, we have other data of languages closely related to Cora[2], Huastec (Veracruz), Tarahumara[1], Paipai[2]. These data show no voiced fricatives. If these languages are also eliminated, Huichol[1], Teribe and Terraba remain. From these considerations, it is concluded that Middle American Indian languages except Otomanguean do not develop a voiced fricative series.

III–4. Nasal Systems

The number of places of articulation for nasals ranges from one to four. There are, however, some Chibchan languages such as Bribri and Cabecar (only /ŋ/ is registered) for which no nasal is reported. They have both oral and nasal vowels, and nasal consonants are interpreted as nasalized stops. Instead of setting up /m n ñ ŋ/, nasal vowels are set up. Thus [m n ñ ŋ] are allophones of /b d ǰ g/ before a nasalized vowel. This analysis is not a trick. It is an attempt to extract in the most economic way those factors which are maximally independent of each other in their occurrence, non-occurrence, and co-occurrence [HOCKETT 1955: 120]. However, even in Bribri and Cabecar *m n ñ* are practically used in dictionaries, tales, and even academic papers and therefore the interpretation seems to be unnatural. In fact, in Tepetotutla Chinantec /m n ŋ/ have once been analyzed as /b d g/ with simultaneous nasalization, because of the fact that [m n ŋ] occur before a nasalized vowel and [b d g] before an oral vowel and they are in complementary distribution. However, /m n ŋ/ are now recognized as phonemes [WESTLEY 1991; RENSCH 1989].

Now the position of nasal with no position contrast is not bilabial /m/ but alveolar /n/. In Cabecar only /ŋ/ is registerd as nasal, but Cabecar and Bribri are the same language. As is stated above, other nasals are interpreted as stops plus nasalized vowels. Yatee Zapotec has both fortis /n/ and lenis /$\underline{n}$/.

All systems with two position contrast have /m n/. This type is the most popular one and is attested in 82 languages. Two subtypes are observed, both of which have lenis counterparts. One is /m n $\underline{m}$ $\underline{n}$/ and the other is /m n $\underline{n}$/. These subtypes are attested in 13 languages.

Three position contrast types are of two major patterns, /m n ñ/ and /m n ŋ/. These are shown in 38 and 20 languages, respectively. /m n ñ/ type has four subtypes. Each subtypes are seen in only one sampling unit, respectively. Chichicapan Zapotec has /m n ñ $\underline{m}$ $\underline{n}$ $\underline{ñ}$/ but Isthmus[1] Zapotec is lacking of the lenis /$\underline{m}$/. Huamelultec Chontal has glottalized nasals /m' n' ñ'/ corresponding to /m n ñ/. Atatlahuca Mixtec has voiceless /N/ besides /m n ñ/. The other major type /m n ŋ/ has one subtype which has voiceless /N/. Cora[2] has a labialized /m^w/ besides /m/ and /n/.

Languages with four position nasals demonstrate three different patterns;/m n ñ ŋ/, /m n ñ ŋ N/, and /m n n^y ñ/. The latter three are rare. The major type /m n ñ ŋ/ is attested in 8 languages. Tequistlatec Chontal analyzed by Waterhouse has voiceless /N/ as well as /m n ñ ŋ/. However, Turner analyzes it differently from Waterhouse and gives /m n ŋ N/. /m n n^y ñ/ is attested in Mixtec (Ayutla[2]). Although /n^y/ is treated as position, it may not be interpreted as a difference in position but in manner. In general, palatalized *n* is treated as the same as /ñ/, but Ayutla[2] Mixtec gives both /n^y/ and /ñ/, while Ayutla[1] Mixtec has only /m n ñ/. Ayutla[2] Mixtec gives only the phoneme list and it is difficult to understand the difference between /n^y/ and /ñ/, although I have found /n^y/ (written as *ny* in the text by Hills) in some morphemes such as n^yą^3 "they, their," n^yą^3'ą^3 "come," n^yą^3'ą^2 "evil." ų^2n^yą^3 "eight" [Hills 1990]. By the way, /ny/ or /n^y/ is used in the inventories of the following languages:

ny = Xochistlahuaca Amuzgo, Tataltepec[1] Chatino

n^y = Kiliwa[2], Cocopa[1,2], Cora[1], Chatino (Tataltepec[2], Zenzontepec)

They are represented by /ñ/ in this paper.

In the following I classify nasals in terms of position.

1) No nasal:

Zero	Bribri[1], Bocota

2) One position contrast types:

n	Zapotec (Rincon)
ŋ	Cabecar
n $\underline{n}$	Zapotec (Yatee)

3) Two position contrast types:

m n	Southern Tepehuan[1], Tarahumara[1,2], Yaqui[1], Mayo, Huichol[1], Nahuan (15 dialects), Pipil, Cuitlatec[1], Seri[1], Tarasco[1,2], Totonac (Xicotepec,

	Papantla), Tepehua (Teachichilco, Huehuetla), South Pame, Matlatzinca, Ocuiltec, Otomi (Tenango, Sierra), Tlapanec[1], Eastern Popoloc, Chocho, Cuicatec[2], Trique (Copala), Zapotec (Choapan, Ayoquesco), Chatino (Yaitepec), Huave, Sayula Popoluca, Oluta Popoluca, Mixe (Tlahuitoltepec), Mayan (Veracruz Huastec, Potosi Huastec, Yucatec[2], Lacandon, Itza[2], Mopan, Chontal, Chorti, Tzeltal, Tzotzil[1], Tojolabal, Kanjobal, Acatec[1,2], Tectitec, Mam, Aguacatec, Ixil[1,2,3], Kekchi, Pocomchi[1,2], Pocomam, Uspantec, Quiche[2,3], Sipacapeño, Cakchiquel[1,2], Tzutujil[1,2]), Xinca[2], Garifuna, Cuna
m n $\underline{m}$ $\underline{n}$	Chichimec[1], Trique (Chicahuaxtla), Zapotec (Juarez, Cajonos, Zoogocho, Mitla[2], Guelavia[1], Guevea)
m n $\underline{n}$	Zapotec (Ixtlan, Yatzachi, Yalalag, Albarradas, Tlacochahuaya)

4) Three position contrast types:

m n ñ	Papago, Northern Tepehuan[1], Cora[1], Pochutec, Paipai[2], Kiliwa[2], Cocopa[2], Otomi (Temoayan, Mezquital[1]), Mazahua, Ixcatec, Tlacoyalco Popoloc, Western Popoloc[1], Mazatec (Chiquihuitlan, Diaz, Huautla, Soyaltepec), Amuzgo (San Pedro[1], Xochistlahuaca), Mixtec (Acatlan, Huajuapan, Silacayoapan, Mixtepec, Alacatlazala, Ocotepec[2], El Grande, Chalcatongo, Diuxi[2], Peñoles, Coatzospan, Jamiltepec, Colorado, Chayuco, Jicaltepec), Zapotec (Quioquitani, Lachixio), Chatino (Tataltepec[1]), Tila Chol[1]
m n ñ m' n' ñ'	Huamelultec Chontal
m n ñ $\underline{m}$ $\underline{n}$ $\underline{ñ}$	Zapotec (Chichicapan)
m n ñ $\underline{n}$ $\underline{ñ}$	Zapotec (Isthmus[1])
m n ñ N	Mixtec (Atatlahuca)
m n ŋ	Central Pame, Zapotec (Isthmus[2]), Chinantec (Comaltepec, Lealao, Tepetotutla, Palantla, Sochiapan, Tlacoatzintepec), Zoque (Leon, Chimalapa), Mixe (Coatlan, Paraiso, Totontepec[1]), Chuj, Jacaltec, Sacapultec, Tol, Miskitu, Sumu, Rama, Guatuso
m n ŋ N	Tequistlatec[2]
m m^w n	Cora[2]

5) Four position contrast types:

m n ñ ŋ	Mixtec (Molinos), Chinantec (Quiotepec), Zoque (Copainala), Sierra Popoluca, Boruca, Terraba, Teribe, Guaymi
m n ñ ŋ N	Tequistlatec[1]
m n n^y ñ	Mixtec (Ayutla[2])

The above list is summed up as Table 17.

In the above list and table, voiceless, glottalized, and lenis (or fortis, if fortis nasals are regarded as long nasals and marked category) nasals are treated as the same positions as their corresponding plain voiced nasals, because these never occur unless a plain voiced counterpart occurs at the same place of articulation. Palatalized nasals, on the other hand, are treated as an independent position.

In the following Table 18, number of nasals and number of languages are presented, where all members are counted.

We can get some generalizations like the following:

No nasal with a secondary articulation occurs unless a simple nasal occurs at the same place of articulation, and none occurs unless consonants of another type also occur with the same secondary articulation and in the same place of articulation [MADDIESON 1984: 66].

Table 17. Nasal types

No. of position contrasts	No. of languages	Nasal inventory	No. of languages
Zero	2		2
One	3		
		n	1
		ŋ	1
		n n̲	1
Two	95		
		m n	82
		m n m̲ n̲	8
		m n n̲	5
Three	64		
		m n ñ	38
		m n ñ m' n' ñ'	1
		m n ñ m̲ n̲ ñ̲	1
		m n ñ n̲ ñ̲	1
		m n ñ N	1
		m n ŋ	20
		m n ŋ N	1
		m m^w n	1
Four	10		
		m n ñ ŋ	8
		m n ñ ŋ N	1
		m n n^y ñ	1
Total	174		174

Table 18. Number of nasals and number of languages

Number of nasals	Number of languages
0	2
1	2
2	83
3	64
4	19
5	2
6	2

However, this study is concerned more with Middle American Indian languages than with generalizations. In this respect areal traits contribute more directly to the understanding of the features of Middle American Indian languages. It is difficult to delineate exactly the geographical distribution, but we can read a tendency that /ñ/ occurs in Otomanguean from Otomi to Western Oaxaca and /ŋ/ occurs in Eastern Oaxaca including Chinantecan and Mixe and extends eastward.

III–5. Liquid Systems

It is a general characteristic of the American Indian languages that the sounds of *l* and *r* are not distinguished. Some languages have the *l* sound only, a few only the *r* sound, while a much larger number use various intermediate sounds and certain languages lack both *l* and *r* [Holmer 1947: 16]. This is partly true for the Middle American Indian languages but liquids are more complicated. Amuzgo data give us a typical example. We have two analyses for the data of the same informant. Both analyses recognize one liquid, but it is written as /r/ in one inventory and as /l/ in the other. Yucatec provides another good example. One source registers both /l/ and /r/, but the other only /l/. In the former, however, /r/ occurs only intervocalically in about a dozen words. How can we treat such a rare phoneme? Furthermore, in some cases it is possible that /r/ from Spanish is registered in the inventory.

There are various sorts of liquids. The phonetic value of some of the liquids can be determined, but others not, because of their fluctuation. In Chichimec, for example, /r/ is a flap in initial position and intervocalically; a vocoid trill when followed by /ʔ/; and voiceless when followed by /h/ and in final position [Lastra de Suárez 1984: 21]. In Mayan languages of Guatemalan Central Highlands, such as Quiche and Kekchi, /r/ is pronounced like an alveopalatal retroflexed voiceless fricative, but it is designated by /r/ in the literature. /r/ is, therefore, used here as a symbol for such a fluctuating or exotic and consequently unspecified sound.

R sounds found in Middle American Indian languages are as follows:

Unspecified	Trill	Flap/Tap	Retroflex	Lenis
r	r̃	ř	ṛ	r̲

Since it is difficult to specify the *r* sounds in many cases, I type the languages, only distinguishing the number of *r* sounds which a given language has, although in the following list I have classified them as well as I can. Note that I have eliminated rare phonemes in this chapter. However, I have included all the *r* sounds registered in each inventory, although I am careful to distinguish native *r* sounds from borrowed *r* sounds.

On the other hand, *l* sounds can be specified in almost all languages, although there are some cases in which *r* and *l* are not distinguished. The varieties of *l* sounds are as follows:

Laterals	Approximant	Fricative	Affricate	Retroflexed	Flap
Voiceless		ɬ　ɬʸ	ƛ		
Voiced	l　lʸ			ḷ	ɺ
Glottalized	l'	ɬ'	ƛ'		
Lenis	l̠				

Note that it is impossible to distinguish voiceless fricative laterals from voiceless approximant laterals in the surveyed languages and thus all voiceless laterals are classified as fricatives. However, Maddieson notes that unlike voiceless approximants, voiceless lateral fricatives are reported in inventories that contain no voiced lateral approximant [MADDIESON 1980a: 95]. My data reveals that Seri[1] and Zongolica Nahuatl have a voiceless lateral, but other languages with a voiceless lateral have a voiced lateral approximant. If we apply Maddieson's rule, the voiceless lateral of Seri[1] and Zongolica Nahuatl is lateral fricative and the voiceless lateral of other languages is lateral approximant. But ※Seri[2] has /l/ furthermore and in this case /ɬ/ must be lateral approximant. Since the sources do not distinguish them reliably, I classify all voiceless laterals as fricatives for the present. It is also impossible to determine places of articulation. It seems that almost all laterals are produced in the dental-alveolar region. Only two languages (Tarahumara[1] and ※Guarijio) have a retroflex lateral.

Number of r- and l-sounds and number of languages are given below:

Number of r/l sounds	Number of languages
none	5
one r-sound	12
two r-sounds	2
one lateral and one r-sound	83
one lateral and two r-sounds	7
two laterals and one r-sound	11
two laterals and two r-sounds	6
one ɺ	1
one lateral	27
two laterals	5
one lateral+ƛ	8
one lateral+one r-sound+ƛ	2
two laterals+ƛ	2
two laterals+ƛ'	1
four laterals+r-sound	1
six laterals+two r-sounds	1
Total	174

The following list is for reported inventories and languages having them.

0	Zoque (Leon), Mixe (Coatlan, Paraiso, Totontepec[1]), Mixtec (Ocotepec[2])
r	Huichol[1], South Pame, Otomi (Tenango, Sierra), Amuzgo (San Pedro[1]), Boruca
ṛ	Cabecar
ř	Southern Tepehuan[1], Mazatec (Chiquihuitlan), Western Popoloc[1], Otomi (Temoayan), Bribri[1]
r ṛ	Tarasco[1,2]
ɺ	(Alveolar lateral flap) Papago
l	Pomaro Nahual, Nahuat (Zacapoaxtla, Mecayapan, Pajapan, Jalupa), Pipil, Pochutec, Tepehua (Teachichilco), Ocuiltec, Matlatzinca, Mazatec (Huautla), Mixtec (Acatlan, Huajuapan, Silacayoapan), Chinantec (Palantla), Zoque (Copainala), Oluta Popoluca, Veracruz Huastec, Yucatec[2], Lacandon, Itza[2], Mopan, Chol[1], Tectitec, Mam, Tol
l r	Northern Tepehuan[1], Yaqui[1], Mayo, Cora[1,2], Kiliwa[2], Chichimec[1], Otomi (Mezquital[1]), Mazahua, Tlapanec[1], Eastern Popoloc, Mazatec (Jalapa de Diaz), Amuzgo (Xochistlahuaca), Mixtec (Molinos, Atatlahuca, El Grande, Chalcatongo, Diuxi[2], Jamiltepec, Colorado), Cuicatec[2], Trique (Copala, r = ẓ̌), Zapotec (Rincon, Choapan, Tlacochahuaya, Quioquitani, Ayoquesco), Chatino (Yaitepec), Chinantec (Lealao, Tepetotutla, Tlacoatzintepec), Zoque (Chimalapa), Sierra Popoluca, Mixe (Tlahuitoltepec), Potosi Huastec, Chontal, Chorti, Tzeltal, Tzotzil[1], Tojolabal, Chuj, Jacaltec, Kanjobal, Acatec[1,2], Aguacatec, Ixil[1,2], Kekchi, Pocomchi[1,2], Pocomam, Uspantec, Quiche[2,3], Sacapultec, Sipacapeño, Cakchiquel[1,2], Tzutujil[1], Garifuna, Miskitu, Sumu, Rama, Bocota, Cuna
l ř	Mixtec (Peñoles, Coatzospan, Alacatlazala, Ayutla[2], Mixtepec, Chayuco, Jicaltepec), Zapotec (Lachixio), Ixil[3], Tzutujil[2]
l r̃	Chinantec (Quiotepec), Sayula Popoluca
l ṛ	Cora[2], Chinantec (Comaltepec, Sochiapan), Guaymi
ḷ ṛ	Tarahumara[1]
l R(ṛ)	Tarahumara[2] (r = a voiced stop)
l r r̃	Chocho
l ř ṛ	Terraba, Teribe
l ř r̃	Ixcatec, Tlacoyalco Popoloc, Mazatec (Soyaltepec), Huave
l lʸ r	Central Pame, Chatino (Tataltepec[1])
l l̲	Zapotec (Yatee, Chichicapan, Guelavia[1])
l l̲ r	Trique (Chicahuaxtla), Zapotec (Yalalag, Guevea, Isthmus[1])
l l̲ ř	Zapotec (Zoogocho, Yatzachi)
l l̲ r r̲	Zapotec (Ixtlan, Juarez, Cajonos, Albarradas, Mitla[2])
ɫ	Seri[1]
l ɫ	Cuitlatec[1], Tepehua (Huehuetla)
l ɫ r	Paipai[2], Tequistlatec[1], Xinca[2]
l ɫ r r̃	Guatuso
l ɫ lʸ ɫʸ r	Cocopa[2]
l ƛ	Nahuatl (Classical, Jeronimo, Tetelcingo, Amilcingo, Tlaxpanaloya, Matlapa, Huautla)

l			r	ƛ				Nahuatl (Coscatlan, Acaxochitlan)
	ɬ			ƛ				Nahuatl (Zongolica)
l	ɬ			ƛ				Totonac (Xicotepec, Papantla)
l	ɬ			ƛ'				Tequistlatec[2]
l	l'	lʸ	ɬ	ɬ'	ɬʸ	r̃	r	Huamelultec

The most common is one *l* and one *r* system, which nearly half of the data have. The next most frequent is one *l* system, which only 16% of the surveyed languages have.

/ƛ/ is a specific feature for Nahuatl and Totonac. /ƛ/ functions as a marker of dividing Nahuatl-other Nahuan and Totonac-Tepehua. /ɬ/ is also found in restricted languages (Paipai, Cocopa, Seri, Cuitlatec, Tepehua, Totonac, Oaxaca Chontal and Xinca, Guatuso), but areally scattered. Zongolica Nahuatl may borrow /ɬ/ from Totonac.

III-6. Glide Systems

Glides are generally represented by /w/ and /y/. They are also called vocoid approximants or semivowels or even semiconsonants. As is often called semivowels, in some languages such as Cabecar and Bribri /y/ and /w/ are not recognized as phonemes but the high vowels /i/ and /u/ are used instead. In Tol even /ɨ/ is interpreted as semivowel. The phoneme /v/ or /β/ sometimes corresponds to /w/, which makes the systems more complicated.

First I will give the frequency of glides (Table 19). The percentage of languages having glide(s) is very similar to that of Maddieson's survey [MADDIESON 1984: 92].

The majority of languages have both /w/ and /y/, but 26% of the surveyed languages lack one of the segments or both. I may speculate that there are three factors responsible for this high percentage. (1) There is a strong association between palatalized consonants and /y/ and between labialized velars and /w/ [MADDIESON 1980b: 118]. For example, in Kekchi /w/ and /y/ are manifested by [kʷ~gʷ~w] and [dʸ~kʸ~y], respectively. (2) It is also possible that /w/ is replaced by /v/ or /β/. I have heard one informant of Quiche pronounce [wux]~[vux]~[ʋux] (labio-dental approximant)~[βux] for the word "paper." Each time he pronounced, his pronunciation fluctuated. Tzotzil and Cakchiquel have /v/ instead of /w/. It is clear that this

Table 19. Distribution of /y/ and /w/

	With /y/	No /y/	Total
With /w/	129(74.1%)	5(2.9%)	134(77.0%)
No /w/	21(12.1%)	19(10.9%)	40(23.0%)
	150(86.2%)	24(13.8%)	174(100%)

/v/ is derived from Proto-Maya */w/, if compared with other Mayan languages. (3) The vowels [i] and [u] are typical approximants and the semivowels are similar approximants, except that they are ultra-short [CATFORD 1988: 71–72]. The absence of semivowels in Cabecar and Bribri mentioned above may be related to this feature of semivowels. Therefore it is necessary to examine the relationships between glides and the segments concerned. In the following I present every case found in the data.

1) Languages with /w/:
/w/ only: Papago, Chichimec[1], Zapotec (Zoogocho)
also with /β/ and /kʷ/: Mixtec (Huajuapan)
also with /kʷ/: Mixtec (Chalcatongo)
2) Languages with /y/:
with /v/: Southern Tepehuan[1], Mazatec (Huautla), Cuicatec[2], Mixe (Totontepec[1]), Tzotzil[1], Cakchiquel[1,2]
with /β/: Tlacoyalco Popoloc, Mazatec (Chiquihuitlan)
with /kʷ/: Zapotec (Yalalag, Tlacochahuaya), Ixil[3]
with /β/ and /kʷ/: Mixtec (Silacayoapan, Alacatlazala, Atatlahuca)
with /v/ and /kʷ/: Mixtec (Mixtepec, Ayutla[2], Ocotepec[2], Jamiltepec, Colorado, Chayuco)
3) Languages with /w/ and /y/:
Tarahumara[1,2], Yaqui[1], Mayo, Cora[1,2], Huichol[1], Nahuan (15 dialects), Cuitlatec[1], Paipai[2], Kiliwa[2], Cocopa[2], Tarasco[1,2], Totonac (Xicotepec, Papantla), Tepehua (Teachichilco, Huehuetla), Central Pame, South Pame, Matlatzinca, Ocuiltec, Otomi (Mezquital[1], Temoayan, Tenango, Sierra), Mazahua, Tlapanec[1], Ixcatec, Western Popoloc[1], Eastern Popoloc, Mazatec (Jalapa de Diaz, Soyaltepec), Amuzgo (San Pedro[1], Xochistlahuaca), Mixtec (Acatlan, Jicaltepec), Trique (Copala), Zapotec (Rincon, Cajonos, Yatee, Albarradas, Mitla[2], Guelavia[1], Chichicapan, Quioquitani, Ayoquesco, Lachixio, Isthmus[1]), Chatino (Yaitepec, Tataltepec[1]), Chinantec (Quiotepec, Palantla, Tepetotutla, Tlacoatzintepec), Huave, Zoque (Copainala, Leon, Chimalapa), Sierra Popoluca, Sayula Popoluca, Oluta Popoluca, Mixe (Coatlan, Paraiso, Tlahuitoltepec), Huastec (Veracruz, Potosi), Yucatec[2], Itza[2], Lacandon, Mopan, Chol[1], Chontal, Chorti, Tzeltal, Tojolabal, Chuj, Jacaltec, Kanjobal, Acatec[1,2], Tectitec, Mam, Aguacatec, Ixil[1,2], Kekchi, Pocomchi[1,2], Pocomam, Uspantec, Quiche[2,3], Sacapultec, Sipacapeño, Tzutujil[1,2], Xinca[2], Garifuna, Miskitu, Sumu, Rama, Boruca, Teribe, Cuna
of which languages having /β/ furthermore are;
Tarahumara[1], Cuitlatec[1], Huastec (Veracruz),
of which language having /v/ furthermore is;
Paipai[2],

of which languages having /k^w/ furthermore are;
Cora[2], Huichol[1], Nahuan (13 dialects), Otomi (Temoayan), Mazahua, Mazatec (Jalapa de Diaz), Amuzgo (Xochistlahuaca), Zapotec (Albarradas, Mitla[2], Chichicapan, Quioquitani, Ayoquesco, Quioquitani),
of which languages having both /β/ and /k^w/ furthermore are;
Matlatzinca, Ocuiltec, Zapotec (Lachixio),
of which language having both /v/+/k^w/ furthermore is;
Mixtec (Acatlan).
4) Language with /w/+/y/+/ɨ/:
Tol
5) Languages with no /w/ and /y/:
Zapotec (Choapan), Chinantec (Comaltepec), Guatuso, Cabecar, Bribri[1], Terraba, Guaymi, Bocota
with /v/: Northern Tepehuan[1], Chinantec (Lealao)
with /β/: Chocho, Chinantec (Sochiapan)
with /k^w/: Mixtec (Peñoles), Zapotec (Ixtlan, Yatzachi),
with /β/ and /k^w/: Mixtec (El Grande, Diuxi[2], Coatzospan)
with /v/ and /k^w/: Mixtec (Molinos)
6) Languages with contrasts in voicing:
/w/ and /W/+/y/ and /Y/: Pomaro Nahual
/w/ and /W/+/y/: Nahuatl (Huautla), Tequistlatec[1,2]
/W/+/y/+/k^w/: Seri[1]
7) Languages with contrasts of fortis and lenis:
w y $\underline{w}$ $\underline{y}$: Trique (Chicahuaxtla), Zapotec (Guevea)
w y $\underline{y}$: Zapotec (Juarez)
8) Language with contrasts of plain vs. glottalic:
w y w' : Huamelultec Chontal

/v/ or /β/ in (2) and (5) is perhaps regarded as the alternative to /w/, but /k^w/ is not. Most /k^w/ in the list are from Mixtec, in which */k^w/ is not related to *w* but *p*.

IV. VOWEL SYSTEM TYPOLOGY

When we attempt to study vowel-system typology, we run up against two basic problems, that is, normalization and quality-modification (quantity, nasalization) problems. For example, most Nahuatl languages have a four-vowel system as follows:

i		i:	
e	o	e:	o:
a		a:	

We may, however, normalize the Nahuatl system as does Hockett. He normalizes the Fox system which also has /i e a o/ as a simple 2+2 system, saying that two of the shorts are high, and two low; two of them front, and two back; and the same classifications apply to the longs [HOCKETT 1955: 76][5]. Following his normalization, the Nahuatl system figured above is rewritten as follows:

i	o	i:	o:
e	a	e:	a:

This chart seems to be neat and more systematic but disregards the vowel height which each individual phoneme has. If this normalization is admitted, it fails to differentiate between such systems as /i e a o/ and /i e a u/. I think that phonological systems are always in a state of change and an asymmetrical system is one of the factors that trigger sound changes. In a series of the studies where I try to obtain some time perspective on the cultural-linguistic history of Middle America, therefore, I do not normalize them but respect the original values. It is important to respect the original system even if it is asymmetrical. Of course, for typological studies some normalization is inevitable, but I have tried to restrict myself to assigning given phonemes to the chart given in Appendix 2.

Vowel systems can be separated into three subsystems: normal length oral vowels, long oral vowels, and nasal vowels [CROTHERS 1978: 99–100]. For vowel system typology, however, only the quality of vowels, that is, normal length oral vowels, has been utilized, or it may be better to say that number and quality of normal length oral vowels have been used at least as a basis for vowel system typology. In fact, most languages with a length contrast have the same quality and it may not be necessary to include long oral vowels, but some have an asymmetrical set. Languages with nasalized vowels show more asymmetry. About 20% of my data have an asymmetrical set. This percent is too high to neglect them. For example, Orizaba Nahuatl has five short vowels and four long vowels and Temoayan Otomi has nine vowels with three nasalized and Tenango Otomi has nine vowels with four nasalized.

i u	i:		i	ə	u	į	ų	i ï u		į	ų
e o	e:	o:	e	ʌ	o			e ʌ o			
a	a:		ɛ	a	ɔ	ą		æ a ɔ		æ̨ ą	
Orizaba Nahuatl			Temoayan Otomi					Tenango Otomi			

If we call the Nahuatl system mentioned first in this chapter "4V+4L (long vowels)," then we can call the Orizaba Nahuatl system "5V+4L" and the Temoayan Otomi system "9V+3N (nasal vowels)." The Tenango Otomi system is "9V+4N." These examples show that if we type vowel systems only

5) The phonemes /i e a o/ are phonetically manifested as [ɪ ɛ ʌ ʊ] and the corresponding longs are [i: æ: a: o:].

by normal length oral vowels (normally short vowels), we miss out the difference between five-vowel system with symmetrical 5 long vowels and five-vowel system with 4 long vowels or between Tenango Otomi and Temoayan Otomi. Therefore we must treat not only vowel quality but also vowel quantity, although based primarily on vowel quality.

All the vowels found in the data are summed up in Appendix 4. Eighteen different vowel qualities are utilized in Middle American Indian languages. Every language has more oral vowels than nasalized or lengthened vowels, or else has the same number of oral vowels as that of nasalized or lengthened vowels. Nasalized and lengthened vowels have their oral counterparts, but Silacayoapan Mixtec and Comaltepec Chinantec have a nasalized vowel different from the oral counterpart.

IV–1. Statistical Survey

The types of vowel systems found in the sample are given in Table 20. I have excluded the languages marked by ※ in Appendix 4.

As can be seen from Table 20, five- and six-vowel systems account for 68% (118/174) of the sample languages. If we take from four- to seven-vowel systems, 90% (157/174) of the sample languages are included. In other

Table 20. Distribution in terms of number of vowels in the system

	(1)	(2)	(3)	(4)	(5)	(6)
3 vowel systems	7		+3L: 7			
4 vowel systems	21	4V: 3	+4L:15	+4N: 1	+4N+L:1	T&LX:1
5 vowel systems	77	5V:19	+4L: 1, +5L:29, +5G: 6	+3N: 1, +4N: 4, +5N:15	+5N+L:1	5L3S8N:1
6 vowel systems	41	6V:18	+5L: 2, +6L: 5, +6G: 2, +L+EL: 2,	+4N: 1, +5N: 2, +6N: 8	+6N+L:1	
7 vowel systems	18	7V: 3	+5L: 1, +7L: 2,	+5N: 5, +6N: 1, +7N: 6,		
8 vowel systems	4			+7N: 1, +8N: 1	+7N+L:1 +8N+L:1	
9 vowel systems	6		+9L: 1	+3N: 1, +4N: 3, +6N: 1		
Total	174	43	73	51	5	2

Notes: The column (1) indicates the number of languages. The column (2) indicates the number of languages with only short vowels (normal length oral vowels). The columns (3), (4), and (5) indicate the number of languages with short vowels plus long vowels, nasal vowels, and long and nasal vowels, respectively. L, G and N stand for long vowels, geminate vowels and nasalized vowels, respectively. The number prefixed to them represents their number and the number after the colon (:) is that of languages. The column (6) is for some aberrant systems, in which T and LX represent tense and lax vowels, respectively and 5L3S8N means that the system has 5 long, 3 short and their nasalized eight vowels.

Table 21. Symmetrical and asymmetrical systems

	Normal length oral	Symmetrical systems				Asymmetrical systems				Total
	vowels only (V)	V+L	V+N	V+L+N	V+L+EL	V+L	V+N	V+L+N	T+LX	
	43	67	31	4	2	4	20	2	1	
Subtotal	43(24.7%)	104(59.8%)				27(15.5%)				174

words, the more frequent types cluster around the five-vowel systems. Fourteen of four-vowel systems come from Nahuan dialects and if they are represented by one dialect, the number of four-vowel systems is reduced to only 8, which include further 4 Zapotec dialects.

Table 21 gives another classification in terms of symmetry vs. asymmetry. 15.5% of the data show asymmetry. About 39% (22/57) of the languages having nasalized vowels show asymmetry, while only 8.5% (4/43) of the languages having long vowels show asymmetry. From this it would be said that languages having nasalized vowels show more asymmetry than languages having long vowels. The table also indicates that 24.7% of the languages have only normal length oral vowels.

IV–2. Typological Survey

I will survey vowel systems, dividing them according to the number of quality. The number of quality ranges from three to nine. Vowel systems may have lengthend and/or nasalized vowels, which show asymmetry.

IV–2–1. Three-Vowel Systems

Three-vowel systems in Middle American languages show only one pattern. It is a high-low triangular system; two high vowels and one low vowel, and the length is added.

```
i   u   i:   u:
  a        a:
```

This system is seen in Kiliwa[2], Cocopa[2], Totonac (Papantla), Tepehua (Huehuetla), Miskitu, Sumu, and Rama.

IV–2–2. Four-Vowel Systems

Four-vowel systems show a positional aysmmetry. The system with only normal length oral vowels has only one pattern and so does the system with nasal vowels. The systems having length contrasts show two patterns, one is /i e a o/ and the other is /i e a u/. Tetelcingo Nahuatl has a very rare vowel system; four tense (/i ie ɔ u/) and four lax (/ɪ e a o/). Language samples and vowel positional schema of each pattern are as follows:

4V: Zapotec (Zoogocho, Cajonos, Yatee)

4V+4L: Nahuan (12 dialects), Pipil, Seri[1], Zapotec (Lachixio)
4T&4LX: Nahuatl (Tetelcingo)
4V+4N: Huautla Mazatec
4V+4N+L: Tlacoyalco Popoloc

i　　i　　i:　　i　u　i:　u:　　i　　į
e　o　e　o　e:　o:　e　　e:　　e　o　ę　ǫ
a　　a　　a:　　a　　a:　　a　　ą
4V system　　4V+4L　　4V+4L (Lachixio Zapotec)　　4V+4N

IV–2–3. Five-Vowel Systems

Five-vowel systems without length and/or nasalization contrasts show three patterns. Zapotec vowel systems may be glottalized or laryngealized.

i　u　　i　　i　ï
e　o　　e　ə　o　　e　o
a　　a　　a
　　Zapotec (Yatzachi)　　Zapotec (Villa Alta)

The languages taking the first pattern are; Tarahumara[1,2], Pomaro Nahual, Zapotec (Juarez, Ixtlan, Yalalag, Guevea, Isthmus[1]), Tequistlatec Chontal[1,2], Chorti, Tzeltal, Tzotzil[1], Tojolabal, Chuj, Jacaltec, Kanjobal, and Boruca.

Lengthened or nasalized vowels may be added to the corresponding vowels.

i　u　i:　u:　į　ų
e　o　e:　o:　ę　ǫ
a　　a:　　ą

5V+5L: Pochutec, Paipai[2], Totonac (Xicotepec), Tepehua (Teachichilco) Huamelultec Chontal, Huastec (Veracruz, Potosi), Yucatec[2], Acatec[1,2], Tectitec, Mam, Aguacatec, Ixil[1,2,3], Kekchi, Pocomchi[1,2], Pocomam, Uspantec, Quiche[2,3], Sipacapeño, Tzutujil[1,2], Guatuso, Cuna
5V+5G: Yaqui[1], Mayo
5V+5N: Ixcatec, Western Popoloc[1], Eastern Popoloc, Chocho, Mazatec (Soyaltepec), Mixtec (Acatlan, Mixtepec, Alacatlazala, Molinos, Ocotepec[2], Jicaltepec), Cuicatec[2], Garifuna

This pattern is most common, but if a length or nasalization contrast is added, other patterns occur:

i　ɨ　u　ii　ɨɨ　uu　　i　ï　u　ii　ïï　uu　　i　ɨ　u　ii　ɨɨ　uu
　o　　oo　　e　　ee　　e　　ee
a　　aa　　a　　aa　　a　　aa
Papago, Northern Tepehuan[1]　　Huichol[1]　　Cora[1]

i ɨ i: ɨ:	i į	i u į ų
e o e: o:	e o ę ǫ	o ǫ
a a:	ɛ ɛ̨	æ a æ̨ ą
	a ą	
Huave	Central Pame	Mazatec (Jalapa)

There are some languages with asymmetrical sets.

5V+4L:	5V+3N:
i u i:	i u į ų
e o e: o:	e o
a a:	a ą
Nahuatl (Zongolica)	Chatino (Tataltepec[1])

5V+4N:

i ü į	i ʉ į ų	i u į ų	i u į ų
e o ę ǫ	e o ę	e o (ę)	e o ę ǫ
a ą	a ą	a ą	a
Huahuapan Mixtec	Silacayoapan Mixtec	Ayutla Mixtec[2]	Yaitepec Chatino

Tlapanec[1] has both length and nasalization contrasts.

5V+5N+20L:

i	u	i:	u:	į	ų	į:	ų;
e	o	e:	o:	ę	ǫ	ę:	ǫ:
a		a		ą		ą:	

Copala Trique has five long, three short and their nasalized vowels.

5L+3S+8N:

i:	u:			į:	ų:		
e:	o:	e	o	ę:	ǫ:	ę	ǫ
a:		a		ą:		ą	

IV–2–4. Six-Vowel Systems

The following is the most common pattern for six-vowel systems, but a central vowel may be substituted by /ə/ or /ʌ/. The sixth vowel may be /ï/ instead of a central vowel as is attested in Ayoquesco Zapotec. When only one central vowel occurs, it is not always easy to decide which symbol is appropriate. The sound fluctuates between [ɨ] and [ʌ] and the feature of centrality is important in this case.

i ɨ u
e o
a

6V: Cuitlatec[1], Tarasco[1,2], Zapotec (Tlacochahuaya, Guelavea[1], Chichicapan), Zoque (Copainala, Leon, Chimalapa), Chol[1], Chontal, Cakchiquel[1], Xinca[2], Tol

6V+6L: Sierra Popoluca, Sayula Popoluca, Oluta Popoluca, Lacandon, Mopan

6V+6N: South Pame, Mixtec (Diuxi[2], Peñoles, Jamiltepec, Colorado, Chayuco)

Somewhat different systems are observed as follows:

i	u	i	u	i	ï	u	
e	o	e	o	e		o	
ɛ	a	æ	a		a		
Zapotec (Choapan)		Zapotec (Mitla[2], Quioquitani)		Zapotec (Ayoquesco)			

In Mixe (Coatlan, Paraiso) extra long vowels are reported.

6S+6L+6EL: Mixe (Coatlan, Paraiso)

When there is a contrast of length or nasalization, other patterns appear:

i	ï	u	ii	ïï	uu	i	u	ii	uu	i	u	į	ų	
	ë	o		ëë	oo	e	ə	ee	əə	ɛ	o	ę	ǫ	
a			aa			æ	a	ææ	aa	æ	a	æ̨	ą	

Southeastern Tepehuan[1] — Cora[2] — Mazatec (Chiquihuitlan)

i	ï	u	į	į̈	ų
e		o	ę		ǫ
a			ą		

Mixtec (Atatlahuca)

Asymmetrical patterns are as follows:

6V+5L:

i	ɨ	u	i:	u:	i		u	i:	u:
e		o	e:	o:	e	ə	o	e:	o:
a			a:			a		a:	

Izta[2] — Sacapultec

6V+5N:

i	ï	u	į	į̈	ų	i	ɨ	u	į	ɨ̨	ų
e		o			ǫ	e		o	ę		
a			ą			a			ą		

Mixtec (San Miguel) — Mixtec (Coatzospan)

6V+4N:

i	ɨ	u	į	ɨ̨	ų
e		o			
	a			ą	

Mixtec (Chalcatongo)

Lealao Chinantec has both length and nasalization contrasts. Length is added to both simple and nasalized vowels.

6V+6N+12L:

i	ï	u	į	į̈	ų
e		o	ę		ǫ
	a			ą	

Lealao Chinantec

IV–2–5. Seven-Vowel Systems

Seven-vowel systems with no contrast are attested in Matlatzinca and two Zapotecan languages. However, Ocuiltec, a closely related language, has a contrast of length.

7V:

Matlatzinca			Zapotec (Rincon)			Zapotec (Albarradas)		
i	ɨ	u	i	ï	u	i	ü	u
e	ʌ	o	e		o	e		o
	a		æ	a		ɛ	a	

Seven-vowel systems with length are attested only in two languages.

7V+7L:

Ocuiltec						Tlahuitoltepec Mixe					
i	ɨ	u	i:	ɨ:	u:	i		u	i:		u:
ɛ	ʌ	ɔ	ɛ:	ʌ:	ɔ:	e	ʌ	o	e:	ʌ:	o:
	a			a:			a	ɔ		a:	ɔ:

Seven-vowel systems with nasalization are of three subtypes; five, six, and seven nasalized vowels. Seven nasalized vowels correspond to the oral vowels and constitute the symmetrical set.

7V+5N:

Amuzgo (San Pedro[1], Xochistlahuaca)				Cabecar, Bribri[1]				Terraba			
i	u			i	u	į	ų	i	u	į	ų
e	o	ę	ǫ	ɪ	ʊ			ɪ	ʊ		
ɛ/æ	ɔ	ɛ̨/æ̨	ɔ̨	e	o	ę	ǫ	ɛ	ɔ	ɛ̨	ɔ̨
a		ą		a		ą		a		ą	

7V+6N:

i ɨ u　į ɨ̨ ų
e ʌ o　ę　ǫ
a　ą
Trique (Chicahuaxtla)

7V+7N:

Chichimec[1]	Chinantec (Palantla, Tepetotutla, Tlacoatzintepec, Sochiapan)	Bocota
i ü u	i ï u	i u
e o	e ë o	e o
æ a	a	ɛ ɔ
		a

Cakchiquel (Comalapa) has the following system, which is regarded as 7S+5L:

short: i e a o u ie uo
long: i: e: a: o: u:

IV–2–6. Eight-Vowel Systems

The languages with 8 oral vowels are classified into two types; eight vowels nasalization, and eight vowels with length and nasalization.

Eight-vowel systems with nasalized vowels are of two types, one is symmetrical and the other is asymmetrical.

8V+8N:

i u　į ų
ɪ ʊ　ɪ̨ ʊ̨
e o　ę ǫ
a ɔ　ą ɔ̨
Teribe

8V+7N:

i ï u　į į̈ ų
e ë o　ę ǫ
a ɔ　ą ɔ̨
Guaymi

The languages with 8 vowels with both nasalization and length are Chinantec languages.

8V+7N+L:

i	ï	u	i:	ï:	u:	į	į̈	ų	į:	į̈:	ų:
e	ë	o	e:	ë:	o:	ę		ǫ	ę:		ǫ:
æ			æ:			ę̈			ę̈:		
a			a:			ą			ą:		

Chinantec (Comaltepec) Note that /æ/ becomes higher, when nasalized.

8V+8N+L:

i	ü	ï	u	i:	ü:	ï:	u:	į	ų̈	į̈	ų	į:	ų̈:	į̈:	ų:
e		ë	o	e:		ë:	o:	ę		ę̈	ǫ	ę:		ę̈:	ǫ:
a				a:				ą				ą:			

Chinantec (Quiotepec)

IV–2–7. Nine-Vowel Systems

The languages with 9 oral vowels are classified into three types; nine vowels with length and nine vowels with nasalization.

Nine-vowel system with length is attested only in Totontepec Mixe[1]. Long vowels are matched by the oral vowels.

9V+9L:

i ɨ u
e ə/ʌ o
æ a ɔ

Mixe (Totontepec[1])

Nine-vowel systems with nasalization can be divided into three subtypes. They do not form a symmetrical set.

9V+3N:

i ə u   į ų
e ʌ o
ɛ ɔ
a   ą

Temoayan Otomi

9V+4N:

i ï u   į ų
e ə o
æ a ɔ   æ̨ ą

Otomi (Tenango, Sierra)

i ï u   į ų
e ʌ o   ę
ɛ ɔ
a   ą

Otomi (Mezquital[1])

9V+6N:

i ɨ u   į ų
e ə o   ę ə̨ ǫ
ɛ ɔ
a   ą

Mazahua

So far I have discussed segmental phonemes. Now I will sum up the survey briefly and then treat suprasegmental phonemes such as tones and stress.

Although there are eighteen different phonemes encountered in the data, the number of basic vowel qualities in a system ranges from three to nine. The maximum number of height and front-back distinction are four and three, respectively. They may be lengthened and/or nasalized. Most languages form symmetry but about 20% of the data show the lack of parallelism between the oral and the nasal set, or between the oral and the long set. The number of lengthened or nasalized vowels is never greater than the number of oral vowels.

From an areal point of view, vowel systems as well as consonant systems show interesting patterns. I will consider the general tendency and then some features at the genetic level.

Almost 90% of the languages in Middle America have from four- to seven-vowel systems. They are distributed all over Middle America. Three-vowel systems are attested in Yuman, Totonacan and Chibchan. In Mesoamerica, which is a culturaly defined area and occupies the central part of Middle America, only Totonacan have three-vowel systems. Fourteen of 21 four-vowel systems are Nahuan and 4 are Zapotecan languages, and the other three are Seri[1], Huautla Mazatec and Tlacoyalco Popoloc. Eight-vowel systems are found in Teribe and Guaymi other than two Chinantec languages. Nine-vowel systems are attested in Otomian and Totontepec Mixe.

Turning to the diversities at the genetic level, I will take up some major language groups. The Uto-Aztecan have five-vowel sytems with the exception that almost all Nahuan have four-vowel systems and the Southeastern Tepehuan and Cora[2] have six-vowel systems. The Mixtec languages manifest either five or six oral vowel contrasts. Roughly speaking, five-vowel systems are distributed in the southern part of Western Oaxaca, whereas six-vowel systems, which are supposed to reflect proto systems, are in the northern part. The Zapotec languages have four different vowel qualities from four to seven. Roughly speaking, five-vowel systems are distributed in the northern and eastern part of Oaxaca, while the six-vowel system occupies the central part. Four- and seven-vowel systems are minor systems. Four-vowel systems area attested in Zoogocho, Cajonos, Yatee, and Lachixio, and seven-vowel systems are in Rincon and Albarradas. Chinantec languages also show internal diversity. Their vowel systems vary from 5 to 8 vowels. Mayan languages can be divided geographically in terms of length contrasts and the number of vowels. Those with no length contrast are distributed in Western Lowland Mayan. Most languages have five-vowel system, and six-vowel systems are restricted geographically. The latter is seen in Lacandon, Itza, Mopan, Chol, and Chontal, of which Itza has only five long vowels. They occupy the central part of the Maya region (Maps 2, 3).

IV–3. Tone Systems

With regard to vowel systems, consideration of suprasegmental phonemes will also contribute to an areal-typological study. There are many tone languages, but they are restricted geographically. Tone languages are concentrated in Otomanguean and Chibchan. Although they are also observed in other languages and regions, they are sporadically distributed.

Tone languages are generally divided into two major types, register (level) systems and contour (glide) systems [PIKE, K. L. 1948]. Most Middle American tone systems are of the type called register systems, but usually accompany some combinations of tones besides level tones. I am not sure, however, whether languages with register systems have some combinations of tones or not, because I found in Tlapanec, for example, only three tone levels are registered in the inventory, but some combinations occur in the examples. Such cases may occur in other languages, because I utilized some data without exhaustive examples to examine them. Moreover, Alacatlazala Mixtec, for example, has three tone contrasts, but in syllable finals some vowel clusters occur, on which different tones sometimes fall. Such languages, which are interpereted as having geminate vowels with tones, are classified as level-tone languages. On the contrary, in some other Mixtec dialects they are analyzed as one syllable with tone combinations. A difference of analysis may affect typology.

Although tone systems have not been adequately described in some languages, I present all the available data below, in which the value "1" represents the highest tone in a system. Languages having geminate vowels with tones are marked by an asterisk *. This means that a given language could be analyzed as having tones and their combinations.

Two tones:

- 1, 2: *Northern Tepehuan[1], Cuitlatec[1], Chichimec[1], Boruca, Cabecar, Terraba (accent), Teribe, Guaymi, Bocota
- 1, glide: Ocuiltec

Two tones plus combinations:

- 1, 2, 12: Kiliwa[2], Central Pame, South Pame, Mazahua, Mixtec (Coatzospan), Zapotec (Cajonos, Tlacochahuaya)
- 1, 2, 21: Otomi (Mezquital[1], Temoayan, Tenango), Zapotec (Guevea, Isthmus[1])
- 1, 2, 12, 21: Otomi (Sierra), Bribri[1]

Three tones:

- 1, 2, 3: *Ixcatec, Mixtec (*Acatlan, *Huajuapan, *Silacayoapan, *Alacatlazala, *Ayutla[2], *Ocotepec[2], *Molinos, *San Miguel, *Chalcatongo, *Peñoles, *Jamiltepec, *Colorado, *Chayuco, *Jicaltepec), *Cuicatec[2]

Three tones plus combinations:

1, 2, 3, 13: Mixtec (*Diuxi[2], 12, 13, 21, 23, 32, 31 on vowel geminates)
1, 2, 3, 23: Zapotec (Yalalag)
1, 2, 3, 23, ?: Mazatec (Jalapa)
1, 2, 3, 13, 31: Zapotec (Yatee, Juarez: rising, falling)
1, 2, 3, 12, 21, 23, 31, ?: Zapotec (Choapan)
1, 2, 3, 12, 21, 32: Chocho (/high-falling, mid-rising, low-rising/)
1, 2, 3, 13, 21, 32: Amuzgo (Xochistlahuaca)
1, 2, 3, 13, 31, 32: Chinantec (Palantla)
1, 2, 3, 12, 13, 32, 31: Chinantec (Comaltepec)
1, 2, 3, 23, 21, 31, 32+accent: Chinantec (Quiotepec)
1, 2, 3, 13, 23, 31, 32: Mixtec (Mixtepec)
1, 2, 3, 13, 21, 23, 32: Chinantec (Sochiapan)
1, 2, 3, 12, 21, 23, 31, 32: Chinantec (Tepetotutla)
1, 2, 3, 12, 13, 21, 23, 31, 32, 323: Tlapanec[1]
1, 2, 3, 12, 13, 21, 31, 32, 132, 312, 323 ?: *Western Popoloc[1]

Cocopa[2], whose system is described as high, midium, emphatic low stress, may be included here.

Four tones:

1, 2, 3, 4, 42, 43: Chinantec (Lealao)
1, 2, 3, 4, 12, 21, 23, 32, 34, 43: Chatino (Yaitepec)
1, 2, 3, 4, 12, 21, 23, 24, 31, 32, 34, 41, 42, 43: Mazatec (Soyaltepec)
1, 2, 3, 4, 13, 14, 21, 23, 24, 32, 34, 43, 42, 424, 423: Mazatec (Huautla)
1, 2, 3, 4, 11, 14, 21, 24, 31, 34, 41, 42, 214, 314, 414, 424: Mazatec (Chiquihuitlan)
1, 2, 3, 4, 12, 13, 14, 21, 23, 24, 31, 32, 34, 41, 42, 43, 412, 142, 313, 442: Eastern Popoloc, Tlacoyalco Popoloc
1, 2, 3, 4, some tone sequences: Mixtec (Atatlahuca)
1, 2, 3, 4, various glides: Zapotec (Lachixio)

Five tones plus combinations:

1, 2, 3, 4, 5, 12, 21: Zapotec (Ayoquesco)
1, 2, 3, 4, 5, 12, 13, 21, 23, 32, 34, 35, 43, 45, 51, 52, 53, 54, 343, 354: Trique (Chicahuaxtla)

The following languages may be considered contour systems or mixed systems. I represent such systems in terms of sequences of levels, but I am not sure whether it is appropriate or not to decompose contour systems into sequences of levels.

1, 3, 21, 32: Zapotec (Quioquitani)
(high, low, mid-rising, low-rising)
21, 23, 2: Zapotec (Albarradas)
(rising, falling, low)
2, 3, 21, 32, 34: Zapotec (Chichicapan)
(high, low, high-rising, low-rising, low-falling, high-falling)
2, 4, 21, 32, 43, 23, 45: Chatino (Tataltepec[1])
3, 4, 5, 21, 32, 34, 35, 53: Trique (Copala)
1, 3, 5, 12, 34, 35, 31, 53: Amuzgo (San Pedro[1])

The following languages may be considered of two-tone systems.
Stress: Tarahumara[1], Tol
Accent: Guatuso
Tone: Cora[1], Cuitlatec[1], Yucatec[2], Huave (Only a few words)
The languages with two-tone systems other than the reported here are Tzotzil of San Bartolo and Uspantec [SUÁREZ 1983b: 51].

As can be seen from the survey above, the number of tones ranges from two to five. Except for two- and three-tone systems, tones can occur in combinations. However, even two- and three-tone systems without tone combinations have vowel geminates on which different tones fall. These systems are marked by an asterisk in the above survey. They can be analyzed as level tones plus a combination of them. If so, all three-tone systems can be said to have tone combinations. Only Guelavia[2] may be exceptional, but the data is not enough to deny tone combinations. On the contrary, if combinations of tones are interpreted as vowel geminate plus tones, it would not be necessary to admit the combinations.

Finally, I will mention some other characteristics in tone systems. South Pame (Jiliapan) has three tones; high (´), low (`) and falling (^), but one of these and only one is found in each word.

kudû "devil" kudù "stone"
tikí' "arrow" tikî "rubber" [MANRIQUE C. 1967: 334]

The Chatino tone system is also contrastive only on the last syllable. These syllables are stressed syllables. Tone is closely related to stress in some other languages such as the Chinantecan, too. In the above examples the part of a word carries contrastive tone. On the other hand, forms differentiated only by tones are very rare in some languages, such as Yucatec and Huave. In these systems tones function restrictedly.

Terraced-tone languages have been reported in some Mixtecan. Within the limits of the sentence or the phrase, the downstepping terraced system with two levels occurs in Coatzospan Mixtec [PIKE and SMALL 1974] and upstepped terracing with three levels in Acatlan Mixtec [Pike and Wistrand 1974].

V. AREAL FEATURES

Phonologically, there is a wide diversity among Middle American Indian languages, but the languages also show a great deal of similarity. From statistic survey, an average-type phonological system can be set up as follows, although the phonemes common to all languages are only two stops /t/ and /k/:

p	t	c	č	k	?
	s		š		h
m	n				
	l r				
w		y			

Five subsystems, that is, stops, fricatives, nasals, liquids and glides, are well established. However, languages lacking one of the subsystems exist. For example, some Chibchan languages are reported to have no nasals, though they have nasalized vowels instead. Rama, Miskitu and Sumu do not have affricates, and Zoque (Leon) and Mixe (Coatlan, Paraiso, Totontepec[1]) have no liquids and some languages are reported to have no glides.

Some phonological units have peculiar geographical distribution. For example, glottalized consonants are restricted to Mayan, Tepehua, Xinca, Tol, and Oaxaca Chontal. Traits which are relatively rare in language, such as glottalized stops, are useful in the determination of linguistic areas. On the contrary, traits which are extremely common in language, as is shown above, rarely lead to interesting results. However, a lack of common traits is also useful to investigate areal features. For example, /p/ is lacking in several Otomangean languages. Accordingly, I will discuss areal features in terms of two factors, possession of rare traits and lack of common traits. All of these traits do not show areal peculiarity, and only some traits contribute to areal linguistics. Although many traits show sporadic distribution, they are useful for the investigation of features of Middle American languages.

V-1. Possession of Rare Traits

V-1-1. Glottalized Consonants

Glottalized consonants are registerd as phoneme in Mayan, Huehuetla Tepehua, Oaxaca Chontal, Xinca[2], and Tol. They are observed in stop series, but Tequistlatec Chontal has glottalized fricative in addition and Huamelultec Chontal has glottalized laterals and nasals furthermore. Campbell notes that most Otomanguean languages have glottalized consonants [Campbell 1979: 956], but they are interpreted as consonant clusters (Map 4).

V–1–2. Aspirated Consonants

There are many languages having consonant plus /h/, but they are regarded as consonant clusters. The typical case is of Tlapanec, where one analysis records aspirated stops, whereas the other analysis interprets aspirated stops as consonant clusters.

Aspirated consonant phonemes are reported in Tarasco, Tol, Terraba and Teribe. All aspirated phonemes attested in the sample are given in the following:

/p^h t^h c^h $č^h$ k^h/: Tarasco[1] (Ichupio)
/p^h t^h k^h k^{wh}/: Terasco[2] (San Jeronimo)
/p^h t^h c^h k^h/: Tol
/t^h k^h/: Terraba lacks /p^h/.
/p^h t^h k^h/: Teribe

V–1–3. Prenasalized Stops

Prenasalized stops are one of the characteristics of Mixtecan languages. Although prenasalized stops are not registered in Molinos Mixtec, they are due to a difference of interpretation. Other than Mixtec, Xochistlahuaca Amuzgo and Lachixio Zapotec have prenasalized stops as phoneme (Map 4).

V–1–4. Fortis vs. Lenis Consonants

Fortis vs. lenis contrasts in consonant systems are observed in Chichimec[1], Trique (Chicahuaxtla), and Zapotecan. Chichimec[1] has only this contrast in nasal series. The domain in which fortis vs. lenis are contrastive depends on individual language. Stops and fricatives have fortis vs. lenis contrasts, but glides have hardly this contrast. Nasal and liquid series are in the intermediate stage (See Appendix 3 and Map 4).

V–1–5. Voiced Fricatives

Voiced stops are rare except Otomanguean.

V–1–6. Postvelar or Uvular Stop /q/

/q/ is attested in Paipai[2], Kiliwa[2], Cocopa[2], Totonac, Tepehua, Central Pame, Highland Mayan. Among them, Cocopa[2] has a labialized uvular /q^w/ and Huehuetla Tepehua and Highland Mayan have a glottalized counterpart /q'/ (Map 5).

V–1–7. Retroflexed Consonants

Retroflexion is found in sibilants and affricates.

ṣ: Seri[1], Mazatec (Chiquihuitlan), Mixtec (Mixtepec), Sayula Popoluca
ṣ̌ ẓ̌: Zapotec (Yatee, Albaradas, Chichicapan, Ayoquesco, Yalalag, Zoogocho, Yatzachi, Cajonos, Guelavia[1], Juarez)

ș: Cocopa[2], Papago, Xinca[2]
ẓ: Huichol[1]
č̣: Mazatec (Soyaltepec)
č̣ ṣ̌: Eastern Popoloc, Tlacoyalco Popoloc, Mazatec (Huautla)
č̣ ṣ̌ ẓ̌: Western Popoloc[1], Chocho, Trique (Copala)
č̣ č̣' ṣ̌: Jacaltec, Kanjobal, Acatec[1,2], Tectitec, Mam, Aguacatec, Ixil[1,3]
c̣ č̣ č̣' ș ṣ̌: Ixil[2] (Chajul)

Retroflexed alveopalatal fricative /ṣ̌/ is found in two regions, Oaxaca-Puebla and western Highland Guatemala. Only Seri is apart from two diffusion centers. In Oaxaca-Puebla it is most concentrated in northern Zapotec, from which it seems to have spread toward the south and northwest. Retroflexed alveopalatal affricate /č̣/ is found in northwestern Oaxaca-Southern Puebla and western Highland Guatemala. Not only /ṣ̌/ but also /č̣/ occur in both areas and form a regional feature. /ș/ is an areal feature of Californian languages and is found in Cocopa[2], and Papago, contiguous to California. Other than languages in California, /ș/ is reported only in Xinca[2]. Retroflexed affricate /č̣/ is less common than /ṣ̌/ (Map 5).

V-1-8. Interdental Sibilant /θ/

Otomi (Mezquital), Tlacoyalco Popoloc, Chocho, Mixtec (Chayuco), Zapotec (Ixtlan, Juarez), Chinantec (Sochiapan, Tlacoatzintepec), Huastec (Veracruz, Potosi)

/θ/ is found in two contiguous regions: Northern Oaxaca-Southern Puebla and Otomi-Huastec region.

V-1-9. /f/ or /ϕ/

/f/ and /ϕ/ never co-occur and have areally interesting distributions.

/f/: Nahuatl (Zongolica), Otomi (Mezquital[1]), Zapotec (Mitla[2], Lachixio), Chinantec (Lealao, Tepetotutla, Quiotepec), Huamelultec, Tequistlatec[1,2], Sacapultec, Cakchiquel[1,2], Terraba

/ϕ/: Seri[1], Otomi (Tenango), Tlapanec[1], Tlacoyalco Popoloc, Chocho, Ixcatec, Mixtec (Peñoles), Chinantec (Palantla, Sochapan), Guatuso

Although it seems they are found in a random geographical distribution, one of the diffusion center seems to be Chinantec.

V-1-10. Velar Fricative /x/ Contrasting with Glottal Fricative /h/

Otomi (Mezquital[1], Tenango)

Mayan (Jacaltec, Kanjobal, Chuj, Kekchi, Pocomchi[1,2], Pocomam, Quiche[2])

The contrast of /x/ vs. /h/ is found in Otomian and northern Highland Guatemala.

V–1–11. Uvular Fricative /X/

/X/: Zapotec (Rincon)

/X $\underline{X}$/: Zapotec (Cajonos, Zoogocho)

/X $\bar{X}^w$/: Seri[1], Zapotec (Yalalag, Yatzachi)

Uvular fricative /X/ is distributed in northern Zapotec and Seri.

V–1–12. Lateral Affricate /ƛ/

/ƛ/ is found in Nahuatl languages, Totonac, and Tequistlatec.

V–1–13. Voiceless Sonorants

V–1–13–1. Voiceless lateral /ɬ/

Nahuatl (Zongolica), Paipai[2], Cocopa[2], Seri[1], Cuitlatec[1], Totonac, Tepehua (Huehuetla), Tequistlatec[1,2], Huamelultec, Xinca[2]

V–1–13–2. Voiceless nasal /N/

Tequistlatec, Mixtec (Atatlahuca)

V–1–13–3. Voiceless glides

/W/: Nahuatl (Huautla), Tequistlatec, Seri[1]

/W Y/: Pomaro Nahual

V–1–14. Velar Nasal /ŋ/ and Palatalized Nasal /ñ/ (/n^y/)

/ŋ/ extends eastward centering around Chinantecan, whereas /ñ/ seems to spread northward, focusing on Otomanguean. See Chapter III–4 for full information.

V–1–15. Palatalized Consonants

I list all the palatalized consonants and the languages having them.

/t^y/: Northern Tepehuan[1], Cora[1], Ixcatec, Mazatec (Chiquihuitlan), Amuzgo (San Pedro[1], Xochistlahuaca), Mixtec (Ayutla[2], Jamiltepec, Jicaltepec, Chayuco, Colorado), Zapotec (Chichicapan), Chatino (Tataltepec[1]), Chinantec (Quiotepec), Huamelultec, Sierra Popoluca, Zoque (Copainala), Chol[1]

/d^y/: Northern Tepehuan[1], Ixcatec, Amuzgo (San Pedro[1]), Zapotec (Chichicapan), Chatino (Tataltepec[1]), Chinantec (Quiotepec), Zoque (Copainala), Sierra Popoluca

/$^nd^y$/: Amuzgo (Xochistlahuaca; n^{ty}), Mixtec (Ayutla[2], Jamiltepec, Colorado, Chayuco, Jicaltepec)

/$\check{c}^y$/: Cora (Jesus Maria)

/k^y/: Amuzgo (Xochistlahuaca), Mixtec (Ayutla[2]), Zapotec (Lachixio), Tectitec, Mam, Aguacatec, Sacapultec, Sipacapeño

/s^y/: Mixtec (Ayutla[2])

/h^y/: Chatino (Tataltepec[1])
/$ð^y$/: Mixtec (Coatzospan)
/l^y/: Cocopa[2], Central Pame, Chatino (Tataltepec[1]), Huamelultec
/$ɬ^y$/: Cocopa[2], Huamelultec
/n^y/: Cora[1], Paipai[2], Cocopa[2], Amuzgo (Xochistlahuaca), Chatino (Tataltepec[1])

As for /t^y/, one contiguous region is southern Oaxaca which includes Chatino, Mixtec, and Amuzgo. Huamelultec Chontal may be included. Chatino has palatalized series in /t d n l h/ and seems to be the center of diffusion. The other contiguous region across a genetic boundary is Chiapas, including Zoque and Chol. /$^nd^y$/ may be an areal feature of Southwestern Oaxaca. The languages in western Highland Guatemala have /k^y/ as an areal feature.

V-1-16. Labialized Consonants

/p^w/: Cora[2], Ixil[2]
/b^w/: Mayo, Nahua (Jalupa)
/k^w/: Cocopa[2], Seri[1], Cora[2], Huichol[1], Nahua (all except Pajapan, Jalupa and Pochutec), Cuitlatec[1], Tarasco[2], Matlatzinca, Ocuiltec, Otomi (Temoayan), Mazahua, Mazatec (Jalapa), Mixtec (all), Amuzgo (Xochistlahuaca), Zapotec (Juarez, Ixtlan, Yatzachi, Yalalag, Albarradas, Mitla[2], Tlacochahuaya, Chichicapan, Quioquitani, Ayoquesco, Lachixio), Chatino (Tataltepec[1]), Huastec, Ixil[3], Cuna
/g^w/: Mazatec (Jalapa de Diaz), Zapotec (Juarez, Ixtlan, Yatzachi, Yalalag, Mitla[2], Tlacochahuaya, Chichicapan, Quioquitani, Ayoquesco), Chatino (Tataltepec[1])
/$^ng^w$/: Mixtec (Ayutla[2], Peñoles, Coatzospan)
/q^w/: Cocopa[2]
/h^w/: Kiliwa[2], Chatino (Tataltepec[1])
/x^w/: Cocopa[2], Mixtec (Diuxi[2])
/X^w/: Seri[1], Zapotec (Yatzachi, Yalalag)

/k^w/ occurs in most of Uto-Aztecan and Otomanguean. Possibly Huastec and Tarasco acquired it from neighbours (Map 5).

V-1-17. Coarticulation

Coarticulation phoneme is reported only in Cabecar and Bribri. The phoneme is dento-velar stop /tk/.

V-1-18. Tones

Tone contrasts are reported in many languages as indicated below, but representatives of tone languages are Otomanguean.

Northern Tepehuan[1], Tarahumara[1,2], Cora[1], Cuitlatec[1,2], Cocopa[2], Kiliwa[2], Otomanguean, Huave, Yucatec, Uspantec, Tzotzil (San Bartolo), Boruca, Guatuso, Cabecar, Bribri, Terraba, Teribe, Cuaymi, Bocota

V–1–19. Nasalized Vowels
Otomanguean except Matlatzinca, Ocuiltec, Zapotecan
Chibchan (Cabecar, Bribri, Terraba, Teribe, Guaymi Movere, Bocota)

V–2. Lack of Common Traits

V–2–1. No Bilabial Stop /p/

Lack of bilabial consonants is one of the characteristics of Otomanguean, but some have /p/, which is supposed to have developed from /kʷ/ [CAMPBELL 1979: 914]. The following languages are reported to have no bilabial stop.

Ixcatec, Popoloc, Mazatec (Chiquihuitlan, Jalapa), Amuzgo (San Pedro[1], rare), Mixtec (Huajuapan, Alacatlazala, Chalcatongo, Diuxi[2], Peñoles) Cuicatec[1] Boruca is a language having no bilabial stop /p/, but has /b/.

V–2–2. No Affricates

The following languages have no affricates in the inventory but affricates do exist phonetically, and they are interpreted as consonant clusters.

Southern Tepehuan[1], Seri[1], Mixtec (Ayutla[2], Chayuco), Chatino (Yaitepec), Chinantec (Quiotepec), Terraba, Teribe

However, Miskitu, Sumu, and Rama seem to have no affricates.

V–2–3. No Glottal Stop /ʔ/

Glottal stop /ʔ/ is a common phoneme, but the following languages lack it:

Nahuan (Tetelcingo, Amilcingo, Zongolica, Matlapa, Coscatlan, Cuamelco, Zacapoaxtla, Pajapan, Jalupa, Pipil, Pochutec), Tarasco[1,2], Huave, Garifuna, Miskitu, Sumu, Rama, Guatuso, Terraba, Teribe, Guaymi, Bocota, Cuna

It is attested only in Tarasco, Huave and Garifuna other than Nahuan and Chibchan.

V–2–4. No Velar or Uvular or Glottal Fricatives: /x/ or /X/ or /h/

Some languages have a contrast between /x/ and /h/, but usually /x/ and /h/ do not contrast. The following languages have no velar or uvular or glottal fricatives:

Nahuatl (Classical, Tlaxpanaloya), Mixtec (Huajuapan, Coatzozpan, Peñoles, Mixtepec, Jicaltepec, Chayuco), Zapotec (Juarez, Yatee, Albarrada, Guelavia[1], Chichicapoan, Ayoquesco, Choapan, Tlacochahuaya, Guevea, Isthmus[1]), Rama, Cuna

V–2–5. No Nasals
Bribri[1], Bocota

V–2–6. No Labial Nasal /m/
Zapotec (Rincon, Yatee), Cabecar

V–2–7. No Liquids
Zoque (Leon), Mixe (Coatlan, Paraiso, Totontepec[1])

V–2–8. No Glides /w y/
Zapotec (Choapan), Chinatec (Comaltepec), Guatuso, Cabecar, Bribri[1], Terraba, Guaymi, Bocota

VI. LINGUISTIC UNIVERSALS

Whoever studies linguistic typology tends to fall into the temptation of trying to make some generalizations. Although I have only treated geographically restricted Middle American phonology, I also wish to contribute somewhat to linguistic universals. However, the data is areally so biased that it is inadequate for purposes of deriving a set of linguistic universals from these data. It is, however, possible to discuss linguistic universals, utilizing the generalizations proposed so far. These generalizations or probalistic statements are based on sampled languages of the world and are of course tentative universals. It is therefore significant to apply them to my data and to test if my data supports the statements or not. By doing so we may find some counterexamples. The counterexamples are in other words areal or genetic features. So this chapter is related to the previous chapter.

VI–1. Stops and Fricatives

Many generalizations concerning phonological systems have been proposed so far. I will utilize the statements proposed by Nartey and Maddieson on consonants and by Crothers on vowels and apply them to my data.

Nartey set up 22 universals about fricatives and stops [Nartey 1979]. Almost all his statements are valid in my data. I will discuss 16 generalizations, utilizing partly the summation by Lass [1984] whose remarks are based on Nartey. The corresponding number of Nartey's statement is parenthesized after each statement.

VI–1–1. Languages usually have at least three simple oral stops, most likely /p t k/ (Nartey Nos. 12, 13).

My data reveals that Middle American Indian languages have three to nine voiceless stops. Therefore the first part of the statement is valid, but some

Otomanguean languages lack /p/, which are treated in V–3.

VI–1–2. If a language has an affricate, it most likely also has at least three plain stops (Nartey 14).

There is one exception to the statement (Here I regard Western Popoloc and Eastern Popoloc as a single language for convenience). Western Popoloc[1] has two stops and three affricates. The system is /t c č ç̌ k ʔ/. Eastern Popoloc is also regarded as having the same system, although /p/ is found as a rare phoneme.

The voiceless stop series of Guaymi and Bocota is /t č k/ but both languages have voiced stops. Guaymi has /b ð ǰ g/ and Bocota has /b d ǰ g/.

VI–1–3. If there is only one affricate, it is most likely /č/ (Nartey 15).

According to Nartey, the number of languages with only /č/ is 55, while languages with only /c/ are 20. The probability of encountering a language having /c/ is about 27% (20/75). My data reveals that languages with only /c/ are 12, while languages with only /č/ are 15. It is too high to set up the statement.

VI–1–4. The number of voiceless stops is usually greater than the number of voiced, or equal to it (Nartey 16).

There are three exceptions to the statement:

Papago	p t č k // b d ḍ ǰ g
Chinantec (Lealo)	p t k // b d j g
Bocota	t č k // b d ǰ g

VI–1–5. The presence of a voiced primary oral stop in a language is highly likely to imply the presence of its voiceless equivalent (Nartey 17).

This is valid. All languages in my data have voiceless stops.

VI–1–6. The number of affricates is less than the number of plain stops (Nartey 18).

There is one exception. As is shown in generalization 3, Popoloc has two stops and three affricates. Boruca's voiceless series is /t c č k/ (excluding /ʔ/) and so the number is the same. But since the voiced series is /b d ǰ g/, the statement is barely valid.

VI–1–7. The preferred number of primary oral stops is between four and eight (Nartey 19).

The number of oral stops and number of languages in my data is as Table 22.

Table 22. Number of oral stops and number of languages

Number of phonemes	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Number of languages	0	7	11	32	16	18	17	25	12	22	3	5	0	5	1
Number of languages with primary stops	8	19	41	44	19	27	7	8	0	1	0	0	0	0	0

Table 22 reveals that the preferred number of oral stops is between four and twelve, when secondary (labialized, palatalized, aspirated, prenasalied, and glottalized) stops are included, but the preferred number of primary oral stops is between three and ten. If we cut the number under ten, the preferred number of primary oral stops is between four and eight. The data supports the statement.

VI–1–8. A language is highly unlikely to have secondary stops (i.e. labialized, palatalized, nasalized, aspirated, glottalized, etc.) unless it has primary plain stops (Nartey 20).

This conforms to my data, because all languages have voiceless plain stops.

VI–1–9. The number of secondary oral stops in a given language is not likely to be greater than that of primary oral stops (Nartey 21).

There are many exceptions. Tol has 4 plain, 4 glottalized, and 4 aspirated stops. Xinca[2] has 3 plain, and 4 glottalized stops. In many Mayan languages the number of secondary glottalized stops is equal to that of primary oral stops. In some Mixtecan languages the number of secondary stops is greater than that of primary stops or equal to it, as is shown below.

Mixtecan languages	Primary stops	Prenasalized stops
Acatlan	4 (excluding /k^w/)	5
Silacayoapan	4 (excluding /k^w/)	4
Mixtepec	5	5 (excluding /$^ng^w$/)
Ayutla[2]	3 (excluding /t^y k^y k^w/)	3 (excluding /$^nd^y$ $^ng^w$/)
Atatlahuca	4 (excluding /k^w/)	4
San Miguel El Grande	4 (excluding /k^w/)	4
Peñoles	3 (excluding k^w/)	4 (excluding /$^ng^w$/)
Chayuco	3 (excluding /t^y k^w/)	3 (excluding /$^nd^y$/)

VI–1–10. A language is highly likely to have at least one primary fricative (Nartey 1).

Nartey's primary fricatives do not include /h/. Middle American Indian languages have one to six voiceless and voiced fricatives, when /h/ is excluded.

VI–1–11. If a language has only one, it is most likely /s/, next most likely /f/ (Nartey 2, 3).

/s/ is the most frequent occurring phoneme in my data and the second most is /š/. The frequency of /f/ is less than one-fifth of that of /s/. This situation may be an areal feature.

VI–1–12. The number of voiceless fricatives is likely to be greater than that of voiced; and there is likely to be an implicational relation between a voiced fricative and its voiceless cognate. The second statement is more weakly predictive than the first, and truer for fricatives than for stops (Nartey 4, 5).

There are three exceptions to the first statement.

Cuitlatec[1]	š h // β ð γ
Mixtec (Huajuapan)	s š // β ð ž
Mixtec (Coatzospan)	s š // β ð $ð^y$

The second statement is valid, because all languages in my data have voiceless fricatives.

VI–1–13. The number of primary fricatives is unlikely to be greater than that of stops (Nartey 7).

There is one exception to the statement. Seri has 8 fricatives (/ϕ W s ɬ ṣ̌ x X X^w/ in which /X^w/ may be regarded as a secondary fricative) and five stops.

VI–1–14. The preferred number of primary fricatives is two (Nartey 6).

The following table presents the number of fricatives and the number of languages. Since /h/ is excluded from Nartey's primary fricatives, I give the number excluding /h/, too.

From Table 23 the preferred number of fricatives is two, when /h/ is not considered.

VI–1–15. No language has secondary fricatives unless it has primary; and primary normally outnumber secondary (Nartey 8, 9).

This statement is valid.

VI–1–16. A language is very unlikely to have /h/ unless it also has a primary fricative (Nartey 11).

This is confirmed by my data.

Table 23. Number of fricatives and number of languages

(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	1		1	15	1	16
2	18		18	51	3	54
3	55	6	61	19(1)	15	34(1)
4	17(4)	27	44(4)	10(2)	25	35(2)
5	3(2)	19(2)	22(4)	0(2)	14(2)	14(4)
6	1	8	9	0(1)	5	5(1)
7		3(2)	3(2)		1(3)	1(3)
8		2(1)	2(1)		1	1
9		0(1)	0(1)		0(1)	0(1)
10					1	1
11		1	1		0	0
12		1	1		1	1

Notes: The column (1) indicates the number of fricatives. The columns (2) to (4) are for languages including /h/ and columns (5) to (7) for languages excluding /h/. The columns (2) and (5) indicate the number of languages with voiceless fricatives and columns (3) and (6) the number of languages having voiceless and voiced fricatives. The columns (4) and (7) indicate total number of languages including /h/ and languages excluding /h/, respectively. Parenthesized is the number of languages with secondary (labialized, palatalized, prenasalized and glottalized) fricatives.

VI–2. Nasals

As for nasals, I will utilize the observations proposed by Nartey [1979].

VI–2–1. There is a very highly significant tendency for languages to have at least one primary nasal consonant in its inventory.

There are two languages, Bribri and Bocota, without nasal stops. Both have nasal vowels.

VI–2–2. If a language has only one primary nasal consonant, its primary allophone is most likely to be /n/.

There are two languages with only one nasal consonant. One (Rincon Zapotec) has /n/ and the other has /ŋ/. The language with /ŋ/ is Cabecar, where [m n ñ] are interpreted as nasalized /b d g/. The closely related language, Bribri is reported to have no nasals. Both have nasalized vowels.

VI–2–3. The preferred number of primary nasal consonants in a language is between two and four.

As can be seen from Table 24, this statement is valid, although secondary nasals are also included in Table 24.

VI–2–4. A language is very highly unlikely to have secondary nasal consonants unless it also has one or more primary nasal consonants.

Table 24. Number of nasals and number of languages

Number of nasals	0	1	2	3	4	5	6
Number of languages	2	2	83	64	19	2	2

VI–2–5. In a given language the number of secondary nasal consonants is unlikely to be greater than the number of primary nasal consonants.

As is demonstrated in Chapter III–4, these two statements are valid.

VI–3. Liquids

For liquids I discuss the following generalizations proposed by Maddieson [1980a], referring Lass [1984].

VI–3–1. Languages with two or more liquids are likely to have at least one lateral (228/231=99% of Maddieson's data), and a lateral/non-lateral contrast (198/231=86%).

In this study Tarasco[1,2] are exceptional (99% of my data are sustainable). They have /r r̥/ and lack a lateral.

VI–3–2. A language with one or more laterals has a voiced lateral approximant (233/243=96%).

98% of my data support the statement and only three languages lack a voiced lateral approximant. Papago has only lateral flap /ɺ/. Seri[1] has /ɬ/ and Zongolica Nahuatl has /ɬ ƛ/.

VI–3–3. Languages with two or more laterals may contrast them either in place or in manner and voicing, but not both (96/97=99%). (e.g. a language will not have a voiced lateral flap vs. voiceless approximant).

In my data 27 of 174 samples have two or more laterals. It is difficult to specify places of articulation, but it seems that almost all laterals are produced in dental-alveolar regions. If this is correct, two or more laterals in my data are naturally distinguished by manner or voicing.

VI–3–4. Languages with two or more r-types are unlikely to restrict the contrast to place alone (unlike laterals).

Since it is regarded that flap and retroflex types of r-sounds are produced in different places, this statement is valid. Tarasco[1,2] have flap and retroflexed r-sounds.

VI–3–5. A liquid with both lateral and r-sound allophones is the likeliest candidate for the single liquid in a system.

My data is not clear for this statement. See Chapter III–5.

VI–3–6. A language most often has two liquids (one lateral and one r-sound).

In Maddieson's data 35% (111/321) support the statement, while in my data 47% (83/174) support it.

VI–4. Vowels

Crothers set up 15 statements and Nartey proposed 9 universals about vowel systems. Crothers' first seven statements are those concerning specific vowel qualities such as "all languages have /i a u/" or "all languages with four or more vowels have /ɨ/ or /ɛ/." Vowel qualities are relative in a system and it seems less suitable to linguistic universals. Suppose that a system has /i e a o/. /e/ may be /ɛ/. What is requested in the system is front- and mid-ness represented by /e/, which distinguishes /e/ from other phonemes such as /i/ or /a/. Crothers utilized 9 Middle American Indian languages in the data base. Compare some of them with my data. We immediately understand how different they are, although they are from the same sources.

	Crothers [1978]	This study
Mazatec	i ɛ a o	i e a o
	į ɛ ą ǫ [Pike & Pike 1947]	į ę ą ǫ [Pike 1967]
Tzeltal	i E a O U [Kaufman 1971]	i e a o u [Kaufman 1971]
Zoque	i ɛ a O u [Wonderly 1951]	i e a o u ʌ [Wonderly 1951]
Otomi	i e æ a ɔ o u ɨ ə	i e æ a ɔ o u ə ï
	į æ̨ ą ų	į æ̨ ą ų
	[Blight & Pike 1976]	[Blight & Pike 1976]

This fact makes us notice how ridiculous it is to try to derive linguistic universals from vowel qualities. However it is worthwhile clarifying the relationship between vowel qualities and their number in my data. I sum up vowels qualities as follows:

Languages with three vowels: 7
  /i a u/.
Languages with four vowels: 21
  /i e a/+/o/ or /u/.
Languages with five vowels: 77
  /i e a o u/
  /i e a o/+central /ɨ/ or /ə/ or /ʉ/
  /i e a o/+back /ï/
  /i e a o/+front /ü/ or /ɛ/
  /i e a u/+central /ɨ/ or /ə/

/i e a u/+back /ï/
/i a o u/+central /ɨ/
/i a o u/+front /æ/.

Languages with six vowels: 41
/i e a o u/+central /ɨ/ or /ə/
/i e a o u/+back /ï/
/i e a o u/+front /ɛ/ or /æ/
/i a o u/+back /ï ë/ or front /ɛ æ/
/i e a u/+/æ ə/.

Languages with seven vowels: 18
/i e a o u/+central /ɨ/+/ʌ/ or /ə/
/i e a o u/+back /ï ë/
/i e a o u/+front /ü æ/
/i e a o u/+front /ɛ/ or /æ/ or /ɪ/+back /ɔ/ or /ʊ/
/i e a o u/+central /ʌ/+back /ɔ/
/i ɛ a ɔ u/+/ɨ ʌ/ or /ɪ ʊ/.

Languages with eight: 4
/i e a o u/+front /æ/ or /ü/+back /ï ë/
/i e a o u/+front /ɪ/+back /ɔ ʊ/
/i e a o u/+back /ï ë ɔ/.

Languages with nine: 6
/i e a o u/
+front /ɛ/ or /æ/+central /ɨ ə/ or /ɨ ʌ/ or /ə ʌ/+back /ɔ/
+front /ɛ/ or /æ/+central /ə/ or /ʌ/+back /ï ɔ/.

From the above summation we can state the following:
1) All languages with three vowels in my data have /i a u/.
2) All languages with four or more vowels have /o/ or /u/.
3) Languages with eight or more vowels have /e/ and /o/.

Now we discuss Crothers' remaining statements.
4) A contrast between five basic vowel qualities is the norm for human language, and in general, the most common systems are those with close to this number of basic vowels (Crothers 8).

My data is presented in Table 25. 44% (77/174) of my data have 5 normal length vowels. Languages with 4 to 6 vowels occupy 80% of all. This data supports the statement.

Table 25. Number of normal length vowels and number of languages

Number of vowels	3	4	5	6	7	8	9
Number of languages	7	21	77	41	18	4	6

5) The number of height distinctions in a system is typically equal to or greater than the number of backness distinctions (Crothers 9).

This is valid.

6) Languages with two or more interior vowels always have a high one (Crothers 10).

There is one exception to the statement. Temoayan Otomi has two central vowels, but these two are mid /ə ʌ/.

7) The number of vowels in a column of interior vowels cannot exceed the number in the front or back columns (Crothers 11).

By definition interior vowels include back unrounded, front rounded and non-low central or centralized vowels. The maximum number of interior vowels in my data is three (Quiotepec Chinantec). Southeastern Tepehuan has /i a o u ï ë/. These two are exceptions to the statement.

8) The number of height distinctions in front vowels is equal to or greater than the number in back vowels (Crothers 12).

Although /a/ can be either included in both front or back series, it is regarded here as central and excluded from both. Then there are five exceptions as follows:

	Front	Back
Papago and Northern Tepehuan with /i a o u ɨ/	1	2
Southern Tepehuan with /i a o u ï ë/	1	2
Tlahuitoltepec Mixe with /i e a ɔ o u ʌ/	2	3
Guaymi with /i e a ɔ o u ï ë/	2	3

9) There is a tendency for high and low vowels of a short vowel system to be more central than the corresponding long vowels (Crothers 13).

I don't hesitate to admit this tendency but my data does not reflect it. 71 languages in my data have a short and long contrast, in which 67 have a symmetrical set. In 5 languages the short-vowel system is larger than the long-vowel system. These are as follows:

Ahuacatlan Nahuatl (4S : 3L)
Zongolica Nahuatl (5S : 4L)
Itza[2], Sacapultec (6S : 5L)
Comalapa Cakchiquel (7S : 5L)

In Tetelcingo Nahuatl, a tense and lax system is reported.

10) The number of vowels in a nasal vowel system is equal to or less than the number in the corresponding oral vowel system (Crothers 14).

This statement is confirmed by my data. In 20 languages the number of vowels in a nasal vowel system is smaller than the number in the oral vowel system. In 31 languages the vowels of the two systems are equal in number and arrangement. Furthermore, six languages have both length and nasalization contrasts, in which four have symmetrical systems and two have asymmetrical systems. In the latter systems, the number of nasal vowels is also smaller than the number of oral vowels.

Nasalized and lengthened vowels have their oral counterparts, even if the number is smaller than that of oral vowels, but Silacayoapan Mixtec has a nasalized vowel different from the oral counterpart.

Silacayoapan Mixtec i e a o ʉ // į ę ą ų

11) If a nasal vowel system is smaller than the corresponding basic vowel system, it is most often a mid vowel that is missing from the nasal system (Crothers 15).

There are some exceptions. In Chatino (Yaitepec) /ą/ is missing instead of /ę ǫ/. In Trique (Copala) and Amuzgo (San Pedro[1], Xochistlahuaca) /į ų/ are missing. Mixtec (San Miguel) lacks /ę/, having /ǫ/, whereas Mixtec (Coatzospan) lacks /ǫ/ having /ę/.

I suggest one more generalization from my data.

12) There is a tendency that languages having nasalized vowels show more asymmetry than languages having long vowels.

39% of the languages having nasalized vowels show asymmetry, while only 8% of the languages having long vowels show asymmetry (See Chapter IV).

In this chapter I have discussed phonological systems of Middle American Indian languages from a different point of view, that is, linguistic universals. Before closing the study, I would like to note some remarks obtained through this study.

The phoneme is generally regarded as a minimal unit of sound capable of distinguishing words of different meanings [HYMAN 1975: ch. 3]. To distinguish one word from another, by definition, phonemes must be constant. Nevertheless, it is ironical that there is not a single inventory which consists of the same phonemes. Even the same author reports the different inventory from the previous one, and even when the same language of the same informant is analyzed, a different investigator makes a different inventory. See Northern Tepehuan, Tlapanec, Amuzgo, and other inventories in Chapter II.

While I was typologically comparing the phonological systems of the Middle American Indian languages, I had encountered many problems such as those described above. And I thought it was impossible to discuss phonological systems typologically. To compare something, objects to be compared must be in the same level of description. On the contrary, the phonemes to be compared are not objective but subjective constructions. In other words, phonemes are language-particular and constitute abstract systems. Phonological interpretations cannot be the same. Although I have pointed out many difficulties here and in the previous chapters, I ventured to compare phonological systems typologically. The reason is that phonemes are one of the most important concepts to understand a language. It is not too much to say that the phonemes are inevitable for the investigation of a language.

Although phoneme inventories leave room for different interpretations, the comparison of them leads to many insights about phonological traits of Middle American Indian languages. The size of the sample is 233 languages (which include many dialects and different interpretation(s) of the same language). The statistical survey shows that the number of consonants ranges from 11 to 35, clustering between 14 and 27, and the number of vowels from 3 to 9, which may be lengthened or nasalized or both. The variations of phonemes are shown in Appendix 2. Within these limits, Middle American Indian languages form the phonological systems. Phoneme inventory varies from language to language, but we can see general similarities in inventories. Middle American Indian languages seem to share a common core of structural phonological units as is shown in Chapter V. The preferred set of consonants is as follows:

p	t	c	č	k	?
	s		š		h
m	n				
	l	r			
w			y		

They usually add some additional phonological units. Some add voiced series, and others add glottalized series, and so on. The most abberant system is of Oaxaca Chontal. Seri is rich in fricative series.

Some different units have peculiar geographical distribution. For example, retroflexed affricates and sibilants are restricted in two areas; one is in Western Highland Guatemala, the other is in Oaxaca. These two areas yield some other peculiar phonemes.

In my previous studies, I tried to obtain a time perspective on the cultural-linguistic history of Middle America, but it is difficult to do this without consideration of proto systems. To combine an areal-typological study with comparative linguistics will contribute to the understanding of cultural-linguistic history. Such a study deserves future research.

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Appendix 1. Classification of Middle American Indian Languages

The genetic classification of Middle American languages is organized, based on the previous studies, but is still provisional. I referred to Campbell [1979], Kaufman [1974a, 1974b] and Suárez [1983b] on the overall classification. At language family level, however, I have given priority to the recent classifications by the specialists, that is, Uto-Aztecan is based on Langacker [1977] and Miller [1984], Otomanguean on Rensch [1977] and Súarez [1983b], Mixe-Zoquean on Campbell [1979] and Mayan on Yasugi [1980]. The classification of Supanec, Huave, Tol and Central American languages are based on my typological studies [YASUGI 1989a, 1989b, 1990]. These and other languages are arranged geographically from north to south and from west to east. The distinction between the terms such as family, language, dialect, etc. is not considered seriously, but a rough distinction is made in terms of Roman numbers, capital letters, Arabic numerals, and small letters. The identification number in square brackets corresponds to that in Map 1. The number of speakers in Mexico is based on the censuses of 1970 and 1980. The number before a slash is of 1970's census [HORCASITAS DE BARRIOS and MARÍA CRESPO 1979] and the number after the slash is of 1980's census [MUNTZEL and PÉREZ GONZÁLEZ 1987]. The number of speakers in Guatemala is based on 1964's census [KAUFMAN 1976], but since the number is old, I took the highest number, if available in a source, because the population tends to increase. The number of speakers in Central America is based mainly on Turpana [1987] and García Segura and Zúñiga Muñoz [1987]. The number rounds up the fractions under one hundred. Extinct languages are marked by an asterisk * before a language name and D before the identification number. A sharp # marked before the number of Opata indicates the language is extinct but the people called Opata still exist.

Family, Branch, Language, Dialect	Location	Number of speakers
I. Uto-Aztecan		
Northern Uto-Aztecan (Shoshonean, Yutan, Oregonian)		
A. Numic (Plateau Shoshonean)		
1. Western Numic		
Mono (=Monachi)	California	100～ 500
Paviotso	California, Nevada, Oregon, South Idaho	1000～2000
(Northern Paiute, Bannock)		
2. Central Numic		
Shoshoni-Goshiute	Southwest Nevada-Wioming	1500
Comanche	Oklahoma	10
Panamint (Koso)	California, Nevada	10～ 100
3. Southern Numic		
Ute	South Nevada, Uta, Colorado	1000～3000
(Chemehuevi, Southern Paiute)		
Kawaiisu	California	20

Family, Branch, Language, Dialect	Location	Number of speakers
B. Tübatulabal	California	10
C. Takic (California Shoshonean)		
1. Serranan		
Serrano	California	10
*Kitanemuk, *Vanyume, *Alliklik		
2. Cupan		
a. Luiseño (*Juaneño)	California	100~ 200
b. *Gabrieleño	California	
*Gabrieleño, *Fernandeño		
*Nicoleño		
c. Cahuilla		
Cahuilla	California	10~ 100
Cupeño	California	10
D. Hopi	Northeast Arizona	3000~5000
Southern Uto-Aztecan (Sonoran)		
A. Tepiman (Pimic)		
1. Piman		
Pima Alto	[1]	10,000
Papago	[2]	15,000
Pima Bajo (Nevome, Ure, Yecora)	[3]	2,000?
2. Tepehuan (Odami/Odame)		5,600/ 17,900
Northern Tepehuan	[4]	1,200
Southern Tepehuan	[5]	4,400
*Tepecano	D1	0
B. Taracaitan (Taracahitic)		
1. Tarahumaran		25,500/ 62,500
Tarahumara (Rarámuri)	[6]	
Guarijío (Varohío)	[7]	3,000?
2. Opatan		
*Opata (Teguima)	D2	#(800)
*Jova	D3	0
*Eudeve (Heve, Dehema)	D4	0
3. Cahitan		
Yaqui (Cahita)	[8]	7,100/ 9,300
Mayo (Cahita)	[9]	27,900/ 56,400
4. *Tubar	D5	0
C. Corachol		
Cora	[10]	6,300/ 12,300
Huichol	[11]	6,900/ 51,900
(Aztecan)		
D. Nahuan		
1. Aztec (General Aztec)		800,000/1,377,000

Family, Branch, Language, Dialect	Location	Number of speakers
Central, Huasteca: Nahuatl	[12]	
Western Peripheral: Nahual	[13]	
Eastern Peripheral: Nahuat	[14]	
Pipil	[15]	2,000?～ 200
2. *Pochutec	D6	0
II. *Cuitlatec	D7	0
III. Yuman		/ 600
Pai Pai	[16]	250
Cochimi (Kumyai, Kimiai)	[17]	250
Kiliwa	[18]	200
Cocopa (Cucapa)	[19]	200
IV. Seri	[20]	500/ 500
V. Tarasco (Purepecha)	[21]	60,500/118,700
VI. Totonacan		
Totonac	[22]	124,900/196,100
Tepehua	[23]	5,600/ 8,500
VII. Otomanguean		
A. Chichimec (Meco, Jonaz)	[24]	1,000?
B. Oto-Pamean		
1. Pamean	[25]	5,000/ 5,700
North Pame		
Central Pame		
South Pame		
2. Matlatzincan		
Matlatzinca (Pirinda)	[26]	1,800
Ocuiltec (Tlahuica)	[27]	400
3. Otomian		
a. Otomí	[28]	221,100/306,200
Northwestern Otomí (Mesquital)		
Northwestern Otomí (Sierra)		
Southwestern Otomí		
Ixtenco Otomí		
b. Mazahua	[29]	104,800/194,200
C. Supanec		
1. Tlapanec (Yope)	[30]	30,900/ 55,100
2. *Subtiaba	D8	0
(*Maribio El Salvador)		
D. Popolocan		
1. Chochoan		
a. Ixcatec	[31]	200?

Family, Branch, Language, Dialect	Location	Number of speakers
b. Chochoan		/ 12,400
Popoloc	[32]	6,800
Chocho	[33]	1,000?
2. Mazatec	[34]	101,600/124,200
E. Amuzgo	[35]	13,900/ 18,700
F. Mixtecan		
1. Mixtecan		
Mixtec	[36]	233,300/323,200
Cuicatec	[37]	10,200/ 14,200
2. Trique	[38]	8,000/ 8,500
G. Zapotecan		
1. Zapotec	[39]	283,400/423,000
(*Papabuco		0)
2. Chatino	[40]	11,800/ 20,600
H. Chinantec	[41]	54,200/ 77,100
I. Manguean (Chorotegan, Chiapanec-Mangue)		
1. *Chiapanec	D9	0
2. *Mangue	D10	0
(*Diria Nicaragua)		
(*Chorotega Honduras)		
(*Nicoya Costa Rica)		
VIII. Huave	[42]	7,500/ 10,000
IX. Oaxaca Chontal (Tequistlatec)	[43]	10,300/ 8,100
Lowland Chontal (Huamelultec)		
Highland Chontal (Tequistlatec)		
X. Mixe-Zoque (Zoquean, Mixean)		
1. Zoque	[44]	27,200/ 31,000
a. Chiapas Zoque		
b. Oaxaca Zoque (San Miguel Chimalapa, Santa María Chimalapa)		
c. Tabasco Zoque (Ayapa)		
d. Veracruz Zoque (Zoque Popoluca)	[45]	18,700/ 23,800
Sierra Popoluca (Soteapan etc.)		
Texistepec Popoluca		
2. Mixe		
a. Veracruz Mixe (Mixe Popoluca)	[46]	
Sayula Popoluca		
Oluta Popoluca		
b. Mixe	[47]	54,500/ 74,100
Eastern Mixe		
Western Mixe		

Family, Branch, Language, Dialect	Location	Number of speakers
c. *Tapachultec	D11	0
XI. Mayan		
A. Huastecan		
1. Huastec	[48]	66,100/103,800
2. *Chicomuceltec	D12	0
B. Northern Lowland Maya		
1. Yucatecan		
a. Yucatec	[49]	454,700/665,400
b. Lacandón	[50]	300
c. Itzá	[51]	500
d. Mopán	[52]	8,000
C. Southern Lowland Maya		
1. Cholan		
a. Chol	[53]	73,300/ 96,800
b. Chontal	[54]	20,000/ 29,000
c. Chortí	[55]	33,000
d. *Choltí	D13	0
2. Tzeltalan		
a. Tzotzil	[56]	95,400/133,400
b. Tzeltal	[57]	99,500/215,200
c. Tojolabal (Chaneabal)	[58]	35,000/ 22,400
D. Western Highland Maya		
1. Kan jobalan		
a. Chuj	[59]	21,000
b. Jacaltec	[60]	27,000
Kanjobal (Solomec)	[61]	43,000
Acatec	[62]	18,000
c. Motocintlec (Mochó)	[63]	600
Tuzantec	[64]	
2. Mamean		
a. Tectitec (Teco)	[65]	3,000
Mam	[66]	439,000
b. Aguacatec	[67]	15,000
3. Ixil	[68]	46,000
E. Eastern Highland Maya		
1. Kekchí	[69]	300,000
2. Pocom		
a. Pocomchí	[70]	61,000
b. Pocomam	[71]	42,000
3. Quichean		

Family, Branch, Language, Dialect	Location	Number of speakers
a. Uspantec	[72]	1,600
b. Quiché	[73]	500,000
Sacapultec	[74]	3,000
Sipacapa	[75]	3,000
Cakchiquel	[76]	400,000
Tzutujil	[77]	50,000
XII. Xinca	[78]	100?
XIII. Arawakan		
Garífuna (Black Carib)	[79]	60,000~70,000
XIV. Tol (Jicaque)	[80]	300
XV. Lencan		
Lenca	D14	0
Chilanga	D15	0
XVI. Misumalpan (Misuluan)		
A. Miskitu	[81]	67,000
B. Sumu (Ulwa=Southern Sumu)	[82]	4,900
Bawihka, Tawahka, Kukra, Panamaka		
C. Matagalpan		
*Matagalpa	D16	0
*Cacaopera	D17	0
XVII. Chibchan		
A. Paya	[83]	300
B. Rama	[84]	650
C. Guatuso (Malecu)	[85]	300
D. Boruca (Brunca)	[86]	5
E. *Huetar (Guetar)	D18	0
F. Viceita		
Cabecar (Chiripo, Estrella)	[87]	6,000
Bribri	[88]	5,000
G. Teribe (Terraba)	[89]	1,100
H. Guaymi	[90]	56,500
I. Bocota	[91]	15,000?
J. Cuna	[92]	36,500

Appendix 2. Phoneme Charts

1 Consonant Symbols

Stops	Bilabial			Alveolar								Palatal	Velar		Uvular		Glottal	
Voiceless	p		p^{w}	t	t	t^{y}	t^{w}	c	ç	č	ç̌	k^{y}	k	k^{w}	q	q^{w}	'	ʔ
Voiced	b		b^{w}	d	ḍ	d^{y}		j		ǰ			g	g^{w}				
Glottalized	p'	b'	ɓ	t'		t^{y}'		c'	ç'	č'	ç̌'	k^{y}'	k'	k^{w}'	q'			
Aspirated	p^{h}			t^{h}				c^{h}		č^{h}			k^{h}	k^{wh}				
Prenasalized	^{m}b			^{n}d		^{n}d^{y}		^{n}j		^{n}ǰ			^{n}g	^{n}g^{w}				

Note: /t ḍ ç̌ ç̌'/ are retroflexed. /tk/ appears in Cabecar and Bribri. /č^{y}/ is reported in Jesús Maríia Cora. /ć ć'/ are apico-alveolo-palatal affricates reported only in Chajul Ixil.

Fricatives	Bilabial	Labio-dental	Inter-dental		Lamino-alveolar		Apico-alveolar	Palato-alveolar		Palatal	Velar		Uvular		Glottal		
Voiceless	ɸ	f	θ		s	s^{y}	ṣ	š	ṣ̌	x	x	x^{w}	X	X^{w}	h	h^{y}	h^{w}
Voiced	β	v	ð	ð^{y}	z		ẓ	ž	ẓ̌	ɣ							
Glottalized		f'															

Nasals	Bilabial			Alveolar	Palatal		Velar
Voiceless		M		N			
Voiced	m	m^{w}	m^{y}	n	ñ	(n^{y})	ŋ
Glottalized		m'		n'	ñ'		

Laterals	Alveolar approximant		Alveolar fricative		Alveolar affricate	Retrofexed	Flap
Voiceless			ɬ	ɬ^{y}	ƛ		
Voiced	l	l^{y}				ɭ	ɺ
Glottalized	l'		ɬ'		ƛ'		

R-Sounds	Non-specified	Alveolar trill	Alveolar flap	Retroflex
	r	r̃	ř	ṛ

Glides	Labio-velar	Palatal	
Voiceless	W	Y	
Voiced	w	y	ɨ
Lenis	$\underline{w}$	$\underline{y}$	

Fortis	p	t	c	č	k	k^w	θ	s	š	ş	X	m	n	ñ	l	r	w	y
Lenis	b	d	g	ᴊ	g	g^w	$\underline{θ}$	z	ž	ž̧	$\underline{X}$	$\underline{m}$	$\underline{n}$	$\underline{ñ}$	$\underline{l}$	$\underline{r}$	$\underline{w}$	$\underline{y}$

Note: Juarez Zapotec has a fortis vs. lenis contrast in both voiceless and voiced consonants and furthermore voiced consonants. See Chapter II.

2 Vowel Symbols

<table>
<tr><th colspan="2"></th><th colspan="2">Front</th><th colspan="2">Central</th><th colspan="2">Back</th></tr>
<tr><th colspan="2"></th><th>Unround</th><th>Round</th><th>Unround</th><th>Round</th><th>Unround</th><th>Round</th></tr>
<tr><td rowspan="2">High</td><td>Higher</td><td>i</td><td>ü</td><td>ɨ</td><td>ʉ</td><td>ï</td><td>u</td></tr>
<tr><td>Lower</td><td>ɪ</td><td>(ʊ̈)</td><td>(ɨ)</td><td>(ʉ)</td><td>(ɪ̈)</td><td>ʊ</td></tr>
<tr><td rowspan="2">Mid</td><td>Higher</td><td>e</td><td>ö</td><td colspan="2">ə</td><td>ë</td><td>o</td></tr>
<tr><td>Lower</td><td>ɛ</td><td rowspan="2">(ɔ̈)</td><td colspan="3">ʌ</td><td rowspan="2">ɔ</td></tr>
<tr><td colspan="2">Low</td><td>æ</td><td colspan="3">a/ɑ</td></tr>
</table>

Note: Parenthesized phonemes do not appear in Middle American Indian languages.

Appendix 3. Distribution of Number of Consonants in Middle American Indian Languages

The number in each column indicates the number of phonemes. Glottal stop and lateral affricate are marked directly by ʔ and ƛ, respectively. The number of lenis consonants is underlined. Some terms are abbreviated to save space. Below is a listing of the abbreviations used in the table.

A: aspirated

G: glottalized

PN: prenasalized

VL: voiceless

VD: voiced

		Obstruents Stops					Fricatives			Sonorants Nasals		Liquids l			r	Glides (Semivowels) wy		Number of Phonemes
		VL	VD	A	G	ʔ	VL	VD	G	VD	VL	VD	VL			VD	VL	
[2]	Papago	4	5			ʔ	3			3		1				1		18
[4]	Northern Tepehuan[1]	5	4			ʔ	3	1		3		1			1			19
[5]	Southeastern Tepehuan[1]	3	3			ʔ	2	1		2					1	1		14
[6]	Tarahumara[1]	4				ʔ	2	2		2		1			1	2		15
	Tarahumara[2]	4	3			ʔ	2			2		1			1	2		16
[7]	※Varohio	4	2			ʔ	2			2					1	2		14
	Guarijío	4	2			ʔ	3			2		2			1	2		17
[8]	Yaqui[1]	4	3			ʔ	2			2		1			1	2		16
	※Yaqui[2]	4	1			ʔ	2			2		1			1	2		14
	※Yaqui[3] Arizona	5	1			ʔ	2	1		2		1			1	2		16
[9]	Mayo	4	2			ʔ	2			2		1			1	2		15
[10]	Cora[1] Jesus Maria	7				ʔ	3			3		1			1	2		18
	Cora[2] Ixcatan	7				ʔ	2	1		3		1			1	2		18
[11]	Huichol[1]	5				ʔ	1	1		2					1	2		13
	※Huichol[2]	6				ʔ	1	1		2		1			1	2		15
[12]	Nahuatl Classical	6				ʔ	2			2		1		ƛ		2		15
	Nahuatl San Jerónimo	6				ʔ	3			2		1		ƛ		2		16
	Nahuatl Tetelcingo	6					3			2		1		ƛ		2		15
	Nahuatl Amilcingo	6	1				3			2		1		ƛ		2		16
	※Nahuatl Guapa	6					3			2		1		ƛ		2		15
	※Nahuatl Ixcatepec	6				ʔ	3			2		1		ƛ		2		16
	※Nahuatl Ahuacatlan	6				ʔ	2			2		1		ƛ		2		15
	Nahuatl Tlaxpanaloya	6				ʔ	2			2		1		ƛ		2		15
	Nahuatl Zongolica	6	1				4			2			1	ƛ		2		17
	Nahuatl Matlapa	6					3			2		1		ƛ		2		15
	Nahuatl Coscatlan	6	1				3			2		1		ƛ	1	2		17
	※Nahuatl Cuamelco	6					3			2		1		ƛ		2		15
	Nahuatl Acaxochitlan	6				ʔ	3			2		1		ƛ	1	2		17
	※Nahuatl Huazalinguillo	6				ʔ	3			2		1		ƛ	1	2		17
	Nahuatl Huautla	6	1			ʔ	3			2		1		ƛ		2	1	18
[13]	Nahual Pomaro	6				ʔ	3			2		1				2	2	17
[14]	※Nahuat Nauzontla	6				ʔ	3			2		1				2		15
	Nahuat Zacapoaxtla	6	1				3			2		1				2		15
	※Nahuat Xalacapan	6	1				3			2		1				2		15
	Nahuat Mecayapan	6	2			ʔ	3			2		1				2		17
	Nahuat Pajapan	5	2				3			2		1				2		15
	Nahuat Jalupa	5	1				3			2		1				2		14
[15]	Pipil	6					3			2		1				2		14
D6	Pochutec	5	3				3			3		1				2		17
D7	Cuitlatec[1]	5				ʔ	2	3		2		1	1			2		17
	※Cuitlatec[2]	5	4			ʔ	2			2		1	1			2		18
[16]	※Paipai[1]	7	3			ʔ	4			4		1	1		1	2		24
	Paipai[2]	5				ʔ	3	1		3		1	1		1	2		18
[17]	※Cochimi	5	1	1		ʔ	5			2		1	1		2	2		21
[18]	※Kiliwa[1]	6	1	1		ʔ	5			4		1			1	2		22
	Kiliwa[2]	6				ʔ	4			3		1			1	2		18

	Obstruents Stops					Fricatives			Sonorants Nasals			Liquids l			r	Glides (Semivowels) w y		Number of Phonemes
	VL	VD	A	G	ʔ	VL	VD	G	VD	VL	G	VD	VL			VD	VL	
[19] ※Cocopa¹	5	1			ʔ	5			3			1	1		1	2		20
Cocopa²	8				ʔ	5			3			2	2		1	2		24
[20] Seri¹	4				ʔ	6			2				1			1	1	16
※Seri²	4				ʔ	6			3			1	1			1	1	18
[21] Tarasco¹ Ichupio	5		5			3			2						2	2		19
Tarasco² Purenchecuaro	6		4			3			2						2	2		19
[22] Totonac Xicotepec	6				ʔ	3			2			1	1	ƛ		2		17
※Totonac Zapotitlan	6				ʔ	3			2			1	1	ƛ		2		17
Totonac Papantla	6				ʔ	3			2			1	1	ƛ		2		17
※Totonac Coatepec	7				ʔ	7			2			1	1	ƛ	1	2		23
※Totonac Ahuacatlan	6				ʔ	(3)			2			1	1	ƛ		2		17
[23] Tepehua Teachichilco	6				ʔ	3			2			1				2		15
Tepehua Huehuetla	6			6	ʔ	3			2			1	1			2		22
[24] Chichimec¹	5	4			ʔ	2	1		2	$\underline{2}$		1			1	1		20
※Chichimec²	5	3			ʔ	2	1		2			1			1	1		17
[25] Pame Central	6	3			ʔ	3			3			2			1	2		21
Pame South	5	5			ʔ	3			2						1	2		19
[26] Matlatzinca	6				ʔ	3	1		2			1				2		16
[27] Ocuiltec	6				ʔ	3	1		2			1			1	2		17
[28] Otomi Mezquital¹	5	3			ʔ	6	1		3			1			1	2		23
※Otomi Mezquital²	4				ʔ	6	4		3						1	2		21
Otomi Temoayan	6	4			ʔ	3	2		3			1			1	2		23
Otomi Tenango	3	3			ʔ	5	1		2						1	2		18
Otomi Sierra	4	4			ʔ	2			2						1	2		16
[29] Mazahua	6	4			ʔ	3	2		3			1			1	2		23
[30] Tlapanec¹	5	4			ʔ	4			2			1			1	2		20
※Tlapanec²	4	4	3		ʔ	4			3			1			1	2		23
[31] Ixcatec	5	5			ʔ	4			3			1			2	2		23
[32] Popoloc Western¹	5				ʔ	4	4		3			1			1	2		21
※Popoloc Western²	5	3			ʔ	4	2		2			1			1	1		20
Popoloc Eastern	6				ʔ	4	1		2			1			1	2		18
Popoloc Tlacoyalco	6				ʔ	6	5		3			1			2	1		25
[33] Chocho	6				ʔ	6	6		2			1			2			24
[34] Mazatec Chiquihuitlan	5				ʔ	3	1		3						1	1		15
Mazatec Jalapa de Diaz	5	5			ʔ	3			3			1			1	2		21
Mazatec Huautla	6				ʔ	3	1		3			1			1	1		17
Mazatec Soyaltepec	6				ʔ	3			3			1			2	2		18
[35] Amuzgo San Pedro¹	6	3			ʔ	3			3			1			2	2		21
※Amuzgo San Pedro²	6				ʔ	3	1		2			1				2		16
Amuzgo Xochistlahuaca	8	4(PN)			ʔ	3	1		3			1			2	2		25
[36] Mixtec Acatlan	5	5(PN)			ʔ	3	2		3			1				2		22
Mixtec Huajuapan	4	2(PN)			ʔ	2	3		3			1				1		17
Mixtec Silacayoapan	5	4(PN)			ʔ	3	2		3			1				1		20
Mixtec Mixtepec	6	6(PN)			ʔ	2	1		3			1			1	1		22
Mixtec Alacatlazala	4	2(PN)			ʔ	3	1		3			1			1	1		17
※Mixtec Ayutla¹	6	5(PN)			ʔ	4	1		3			1			1	1		23

	Obstruents Stops VL	VD	A	G	ʔ	Fricatives VL	VD	G	Sonorants Nasals VD	VL	G	Liquids l VD	VL	r	Glides (Semivowels) wy VD	VL	Number of Phonemes
Mixtec Ayutla[2]	6	5(PN)			ʔ	4	1		4			1		1	1		24
※Mixtec Ocotepec[1]	5				ʔ	3	4		3			1			1		18
Mixtec Ocotepec[2]	5	3(PN)			ʔ	3	2		3			1			1		19
Mixtec Molinos	5	1			ʔ	3	2		4			1		1			18
Mixtec Atatlahuca	5	4(PN)			ʔ	3	3		3	1		1		1	1		23
Mixtec El Grande	5	4(PN)			ʔ	3	3		3			1		1			21
Mixtec Chalcatongo	4 1	1(PN)			ʔ	3	1		3			1		1	1		17
※Mixtec Diuxi[1]	4	1			ʔ	4	3		3			1		1			18
Mixtec Diuxi[2]	4	2(PN)			ʔ	4	3		3			1		1			19
Mixtec Peñoles	4	5(PN)			ʔ	3	2		3			1		1			20
Mixtec Coatzospan	6	6(PN)			ʔ	2	3		3			1		1			23
Mixtec Jamiltepec	6	4(PN)			ʔ	3	1		3			1		1	1		21
Mixtec Colorado	6	3(PN)			ʔ	3	1		3			1		1	1		20
Mixtec Chayuco	5	4(PN)			ʔ	3	1		3			1		1	1		20
Mixtec Jicaltepec	6	4(PN)			ʔ	2			3			1		1	2		20
[37] ※Cuicatec[1]	4				ʔ	2	2		2			1		1	1		14
Cuicatec[2]	5				ʔ	2	2		2			1		1	1		15
[38] Trique Chicahuaxtla	5	$\underline{3}$			ʔ	3	$\underline{2}$		2	$\underline{2}$		1	$\underline{1}$	1	2	$\underline{2}$	25
Trique Copala	6	$\underline{3}$			ʔ	4	$\underline{3}$		2			1			2		22
[39] ※Zapotec Sierra	6				ʔ	5	5		2			1		2	1		23
Zapotec Juarez	6 $\underline{6}$	1 $\underline{1}$	3VD		ʔ	3	$\underline{3}$		2	$\underline{2}$		1	$\underline{1}$	1 $\underline{1}$	2	$\underline{1}$	35
Zapotec Ixtlan	7	$\underline{4}$			ʔ	4	$\underline{1}$		2	$\underline{1}$		1	$\underline{1}$	1 $\underline{1}$			24
Zapotec Rincon	5	$\underline{5}$			ʔ	3	$\underline{2}$		1			1		1	2		21
Zapotec Zoogocho	4	$\underline{4}$			ʔ	5	$\underline{3}$		2	$\underline{2}$		1	$\underline{1}$	1	1		25
Zapotec Yatzachi	5	$\underline{5}$			ʔ	6	$\underline{3}$		2	$\underline{1}$		1	$\underline{1}$	1			26
※Zapotec Villa Alta	5	$\underline{5}$			ʔ	5	$\underline{3}$		2	$\underline{1}$		1	$\underline{1}$		1		25
Zapotec Cajonos	5	$\underline{5}$			ʔ	3	$\underline{3}$		2	$\underline{2}$		1	$\underline{1}$	1 $\underline{1}$	2		27
Zapotec Yalalag	5	$\underline{5}$			ʔ	4	$\underline{3}$		2	$\underline{1}$		1	$\underline{1}$	1	1		25
Zapotec Yatee	4	$\underline{4}$			ʔ	2 1	$\underline{2}$		1	$\underline{1}$		1	$\underline{1}$		2		20
Zapotec Choapan	5	$\underline{5}$			ʔ	2	$\underline{2}$		2			1		1			19
Zapotec Albarradas	5	$\underline{4}$			ʔ	2	$\underline{2}$		2	$\underline{1}$		1	$\underline{1}$	1 $\underline{1}$	2		23
※Zapotec Mitla[1]	4	$\underline{4}$			ʔ	5	$\underline{2}$		2	$\underline{2}$		1	$\underline{1}$	2	2		26
Zapotec Mitla[2]	6	$\underline{6}$			ʔ	4	$\underline{2}$		2	$\underline{2}$		1	$\underline{1}$	1 $\underline{1}$	2		29
Zapotec Tlacochahuaya	5	$\underline{5}$			ʔ	2	$\underline{2}$		2	$\underline{1}$		1		1	1		21
Zapotec Guelavia[1]	5	$\underline{5}$			ʔ	2	$\underline{2}$		2	$\underline{2}$		1	$\underline{1}$		2		23
※Zapotec Guelavia[2]	6	$\underline{5}$			ʔ	3	$\underline{3}$		2	$\underline{2}$		1	$\underline{1}$	1	2		27
Zapotec Chichicapan	6	$\underline{6}$			ʔ	2	$\underline{2}$		3	$\underline{3}$		1	$\underline{1}$		2		27
Zapotec Quioquitani	6	$\underline{6}$			ʔ	3	$\underline{2}$		3			1		1	2		25
Zapotec Ayoquesco	5	$\underline{5}$			ʔ	2	$\underline{2}$		2			1		1	2		21
Zapotec Lachixio	7	3(PN)			ʔ	4	3	1(PN)	3			1		1	2		26
Zapotec Guevea	5	$\underline{5}$			ʔ	2	$\underline{2}$		2	$\underline{2}$		1	$\underline{1}$	1	2	$\underline{2}$	26
Zapotec Isthmus[1]	4	$\underline{4}$			ʔ	2	$\underline{2}$		3	$\underline{2}$		1	$\underline{1}$	1	2		23
※Zapotec Isthmus[2]	4	$\underline{4}$			ʔ	4	$\underline{2}$		3			1		2	2		23
[40] Chatino Yaitepec	3	3			ʔ	3			2			1		1	2		16
Chatino Tataltepec[1]	7	4			ʔ	5			3			2		1	2		25
※Chatino Tataltepec[2]	6				ʔ	4			3			2			2		18

	Obstruents Stops					Fricatives			Sonorants Nasals			Liquids l			r	Glides (Semivowels) wy			Number of Phonemes
	VL	VD	A	G	ʔ	VL	VD	G	VD	VL	G	VD	VL			VD	VL		
※Chatino Zozontepec	6				ʔ	5			3			2				2			19
[41] Chinantec Lealao	3	4			ʔ	3	1		3			1			1				17
※Chinantec Lalana	3	4			ʔ	3	1		4			1			1	2			20
Chinantec Comaltepec	4	4			ʔ	2			3			1			1				16
※Chinantec Yolox	3	3			ʔ	4	1		4			1			1	2			20
Chinantec Quiotepec	4	4			ʔ	4	2		4			1			1	2			23
※Chinantec Ozumacín	4	3			ʔ	2	1		4			2				2			19
※Chinantec Valle	4	2			ʔ	1	1		3			1				2			15
Chinantec Palantla	4	4			ʔ	3			3			1			1	2			19
Chinantec Tepetotutla	4	4			ʔ	3			3			1			1	2			19
Chinantec Sochiapan	4				ʔ	4	3		3			1			1				17
※Chinantec Usila	5	4			ʔ	3			4			1			1				19
Chinantec Tlacoatzin	4	1			ʔ	3	1		3			1			1	2			17
※Chinantec Ojitlan	5				ʔ	2			4			1			1	2			16
※Chinantec Chiltepec	4	2			ʔ	3			3			1			1	2			17
[42] Huave	5	3				3			2			1			2	2			18
[43] Chontal Huamelultec	6	3		3	ʔ	4		1	3		3	2	2	2	2	2		1	35
Chontal Tequistlatec[1]	4	3		3	ʔ	4		1	4	1		1	1		1	2	1		27
Chontal Tequistlatec[2]	5	3		3	ʔ	4		1	3	1		1	1	1		2	1		27
[44] ※Zoque Ostucan	6	5			ʔ	3			4			1				2			22
※Zoque Rayon	6	5			ʔ	3			4			1				2			22
Zoque Copainala	6	5			ʔ	3			4			1				2			22
Zoque Leon	4				ʔ	2			3							2			12
Zoque Chimalapa	4				ʔ	2			3			1			1	2			14
[45] Sierra Popoluca	6	4			ʔ	3			4			1			1	2			22
[46] Sayula Popoluca	5	3			ʔ	3			2			1			1	2			18
Oluta Popoluca	5				ʔ	3			2			1				2			14
[47] Mixe Coatlan	4	3			ʔ	2			3							2			15
Mixe Paraiso	4				ʔ	2			3							2			12
Mixe Tlahuitoltepec	4				ʔ	3			2			1			1	2			14
Mixe Totontepec[1]	5	2			ʔ	3	1		3							1			16
※Mixe Totontepec[2]	4	2			ʔ	3	2		2							1			15
[48] Huastec Veracruz	6			5	ʔ	3	1		2			1				2			21
Huastec Potosi	6	1		5	ʔ	4			2			1			1	2			23
[49] ※Yucatec[1]	5	1		5	ʔ	3			2			1			1	2			21
Yucatec[2]	5	1		5	ʔ	3			2			1				2			20
[50] Lacandon	5	1		5	ʔ	3			2			1				2			20
[51] ※Itza[1]	5	1		5	ʔ	3			2			1			1	2			21
Itza[2]	5	1		5	ʔ	3			2			1				2			20
[52] Mopan	5	2		5	ʔ	3			2			1			1	2			22
[53] Chol[1]	6	1		6	ʔ	3			3			1				2			23
※Chol[2]	5	1		5	ʔ	3			3			1			1	2			22
[54] Chontal	5	1		5	ʔ	3			2			1			1	2			21
[55] Chorti	5			5	ʔ	3			2			1			1	2			20
[56] Tzotzil[1]	5	1		5	ʔ	3	1		2			1			1	1			21
※Tzotzil[2]	5			5	ʔ	3			2			1			1	2			20

	Obstruents Stops					Fricatives			Sonorants Nasals		Liquids l		r	Glides (Semivowels) wy		Number of Phonemes
	VL	VD	A	G	ʔ	VL	VD	G	VD	VL G	VD	VL		VD	VL	
[57] Tzeltal	5	1		5	ʔ	3			2		1		1	2		21
[58] Tojolabal	5			5	ʔ	3			2		1		1	2		20
[59] Chuj	5			5	ʔ	4			3		1		1	2		22
[60] Jacaltec	6			7	ʔ	5			3		1		1	2		26
[61] Kanjobal	7			7	ʔ	5			2		1		1	2		26
[62] Acatec[1] San Rafael	7			7	ʔ	4			2		1		1	2		25
Acatec[2] San Miguel	6			6	ʔ	4			2		1		1	2		23
[65] Tectitec	8			8	ʔ	4			2		1			2		26
[66] Mam	8			8	ʔ	4			2		1			2		26
[67] Aguacatec	8			8	ʔ	4			2		1		1	2		27
[68] Ixil[1] Nebaj	7			7	ʔ	4			2		1		1	2		25
Ixil[2] Chajul	8			8	ʔ	5			2		1		1	2		28
Ixil[3] Cotzal	9			7	ʔ	4	1		2		1		1	1		27
[69] Kekchi	6			6	ʔ	4			2		1		1	2		23
[70] Pocomchi[1]	6	1		6	ʔ	4			2		1		1	2		24
Pocomchi[2]	6			6	ʔ	4			2		1		1	2		23
[71] Pocomam	6			6	ʔ	4			2		1		1	2		23
[72] Uspantec	6			6	ʔ	3			2		1		1	2		22
[73] ※Quiche[1] Totonicapan	6			6	ʔ	3			2		1		1	2		22
Quiche[2] Zunil	6			6	ʔ	4			2		1		1	2		23
Quiche[3] Nahuala	6			6	ʔ	3			2		1		1	2		22
[74] Sacapultec	7			7	ʔ	4			3		1		1	2		26
[75] Sipacapeño	7			7	ʔ	3			2		1		1	2		24
[76] Cakchiquel[1] Patzicia	6			6	ʔ	4	1		2		1		1	1		23
Cakchiquel[2] Comalapa	6			6	ʔ	4	1		2		1		1	1		23
[77] Tzutujil[1] Santiago	6			6	ʔ	3			2		1		1	2		22
Tzutujil[2] San Pedro	6			6	ʔ	3			2		1		1	2		22
[78] ※Xinca[1]	5	2			ʔ	5			2		1	1	1	2		20
Xinca[2]	3			4	ʔ	2			2		1	1	1	2		17
[79] Garifuna	4	3				3			2		1		1	2		16
[80] Tol	4		4	4	ʔ	2			3		1			3		22
[81] Miskitu	3	3				2			3		1		1	2		15
[82] Sumu (Ulwa)	3	3				2			3		1		1	2		15
[84] Rama	3	2				2			3		1		1	2		14
[85] Guatuso	4	1				3			3		1	1	2			15
[86] Boruca	4	4			ʔ	3			4				1	2		19
[87] Cabecar	6	3			ʔ	3			1				1			15
[88] Bribri[1]	6	3			ʔ	3							1			14
※Bribri[2]	6	3	5		ʔ	2					1			2		20
※Bribri[3]	4	3			ʔ	3							3	2		16
[89] Terraba	3	3	2			4	2		4		1		2			21
[89] Teribe	3	3	3			3	2		4				2	2		23
[90] Guaymi	3	3				2	1		4		1		1			15
[91] Bocota	3	4				2					1		1			11
[92] Cuna	5					1			2		1		1	2		12

Appendix 4. Vowel Inventories of Middle American Indian Languages

If a language has a contrast in the vowel system, it is presented by a set of lines. The first line of each language (or dialect) data is for normal length oral vowels or tense vowels (abbreviated to T). They are indicated by the phonemic symbols. Note that normal length oral vowels are normally short vowels (S), but as is noted in Chapter II, in San Juan Copala Trique the long vowels constitute the simple, unmarked vowels. The second line is for long (L), geminate, nasalized (N), lax (LX) vowels. If a language has more contrast, the third line gives the information. (EL) means extra long vowels. The presence of them is marked by the plus sign. The number of vowel phonemes is given in the right column. The rightmost number indicates the total number of phonemes. In Zapotecan phonology simple, checked (glottalized), interrupted (laryngealized or low-intensity) and aspirated (high-intensity) vowels are distinguished. I have given only two examples in Cajonos and Lachixio, and the distinctions for other dialects, if reported, are given in abbreviated forms such as G (glottalized), L (laryngealized), A (aspirated) after a dialect name.

	Vowels i	ɪ	e	ɛ	æ	a	ɔ	o	ʊ	u	ɨ	ə	ʌ	ü	ö	ʉ	ï	ë	Number of Phonemes	
[2] Papago	i					a		o		u	ɨ								5	
(geminate)	+					+		+		+	+								5	10
[4] Northern Tepehuan	i					a		o		u	ɨ								5	
(geminate)	+					+		+		+	+								5	10
[5] Southeastern Tepehuan	i					a		o		u							ï	ë	6	
(geminate)	+					+		+		+							+	+	6	12
[6] Tarahumara[1,2]	i		e			a		o		u									5	
[7] ※Varohio	i		e			a		o		u									5	
(geminate)	+		+			+		+		+									5	10
※Guarijío	i		e			a		o		u									5	
[8] Yaqui[1,2]	i		e			a		o		u									5	
(geminate)	+		+			+		+		+									5	10
※Arizona Yaqui	i		e			a		o		u									5	
(geminate)	+		+			+		+		+									5	10
[9] Mayo	i		e			a		o		u									5	
(geminate)	+		+			+		+		+									5	10
[10] Cora[1]	i		e			a				u	ɨ								5	
(geminate)	+		+			+				+	+								5	10
Cora[2]	i		e		æ	a				u		ə							6	
(geminate)	+		+		+	+				+		+							6	12
[11] Huichol[1]	i		e			a				u							ï		5	
(geminate)	+		+			+				+							+		5	10
※Huichol[2]	i		e			a				u	ɨ								5	
(geminate)	+		+			+				+	+								5	10
[12] Nahuatl Classical	i		e			a		o											4	

	i	ɪ	e	ɛ	æ	a	ɔ	o	ʊ	u	ɨ	ə	ʌ	ö	ü	ʉ	ï	ë	Number of Phonemes	
(L)	+		+			+		+											4	8
Nahuatl San Jeronimo	i		e			a		o											4	
(L)	+		+			+		+											4	8
Nahuatl Tetelcingo (T)	i		ie				ɔ			u									4	
(LX)		ɪ	e			a		o											4	8
Nahuatl Amilcingo	i		e			a		o											4	
(L)	+		+			+		+											4	8
※Nahuatl Guapa	i		e			a		o											4	
(L)	+		+			+		+											4	8
※Nahuatl Ixcatepec	i		e			a		o											4	
※Nahuatl Ahuacatlan	i		e			a		o											4	
(L)	+		?			+		?											3	7
Nahuatl Tlaxpanaloya	i		e			a		o											4	
(L)	+		+			+		+											4	8
Nahuatl Zongolica	i		e			a		o		u									5	
(L)	+		+			+		+											4	9
Nahuatl Matlapa	i		e			a		o											4	
(L)	+		+			+		+											4	8
Nahuatl Coscatlan	i		e			a		o											4	
(L)	+		+			+		+											4	8
※Nahuatl Cuamelco	i		e			a		o											4	
(L)	+		+			+		+											4	8
Nahuatl Acaxochitlan	i		e			a		o											4	
(L)	+		+			+		+											4	8
※Nahuatl Huazalonguillo	i		e			a		o											4	
(L)	+		+			+		+											4	8
Nahuatl Huautla	i		e			a		o											4	
(L)	+		+			+		+											4	8
[13] Nahual Pomaro	i		e			a		o		u									5	
[14] ※Nahuat Nauzontla	i		e			a		o											4	
Nahuat Zacapoaxtla	i		e			a		o											4	
(L)	+		+			+		+											4	8
※Nahuat Xalacapn	i		e			a		o											4	
(L)	+		+			+		+											4	8
Nahuat Mecayapan	i		e			a		o											4	
(L)	+		+			+		+											4	8
Nahuat Pajapan	i		e			a		o											4	
(L)	+		+			+		+											4	8
Nahuat Jalupa	i		e			a		o											4	
(L)	+		+			+		+											4	8
[15] Pipil	i		e			a		o											4	
(L)	+		+			+		+											4	8

			i	ɪ	e	ɛ	æ	a	ɔ	o	ʊ	u	ɨ	ə	ʌ	ö	ü	ʉ	ï	ë	Number of Phonemes		
D6	Pochutec		i		e			a		o		u									5		
		(L)	+		+			+		+		+										5	10
D7	Cuitlatec[1]		i		e			a		o		u	ɨ								6		
	※Cuitlatec[2]		i		e		æ		ɔ	o		u	ɨ		ʌ						8		
[16]	※Paipai[1]		i		e			a		o		u	ɨ								6		
			+		+			+		+		+	+									6	12
	Paipai[2]		i		e			a		o		u									5		
			+		+			+		+		+										5	10
[17]	※Cochimi		i		e			a		o		u									5		
[18]	※Kiliwa[1]		i		e			a		o		u	ɨ								6		
		(L)	+		+			+		+		+	+									6	12
	Kiliwa[2]		i					a				u									3		
		(L)	+					+				+										3	6
[19]	※Cocopa[1]		i		e			a		o		u	ɨ								6		
		(L)	+		+			+		+		+	+									6	12
	Cocopa[2]		i					a				u									3		
		(L)	+					+				+										3	6
[20]	Seri[1]		i				æ	a		o											4		
		(L)	+				+	+		+												4	8
	※Seri[2]		i			ɛ		a		o											4		
[21]	Tarasco[1,2]		i		e			a		o		u	ɨ								6		
[22]	Totonac Xicotepec		i		e			a		o		u									5		
		(L)	+		+			+		+		+										5	10
	※Totonac Zapotitlan		i					a				u									3		
		(L)	+					+				+										3	6
	Totonac Papantla		i					a				u									3		
		(L)	+					+				+										3	6
	※Totonac Coatepec		i					a				u									3		
		(L)	+					+				+										3	6
	※Totonac Ahuacatlan		i					a				u									3		
		(L)	+					+				+										3	6
[23]	Tepehua Teachichilco		i		e			a		o		u									5		
		(L)	+		+			+		+		+										5	10
	Tepehua Huehuetla		i					a				u									3		
		(L)	+					+				+										3	6
[24]	Chichimec[1]		i		e		æ	a		o		u					ü				7		
		(N)	+		+		+	+		+		+					+					7	14
	※Chichimec[2]		i		e		æ	a		o		u					ü				7		
		(N)	+		+			+				+					+					5	12
[25]	Pame Central		i		e	ɛ		a		o											5		
		(N)	+		+	+		+		+												5	10
	Pame South		i		e			a		o		u	ɨ								6		

		i	ɪ	e	ɛ	æ	a	ɔ	o	ʊ	u	ɨ	ə	ʌ	ö	ü	ʉ	ï	ë	Number of Phonemes		
	(N)	+		+			+		+		+	+									6	12
[26]	Matlatzinca	i		e			a		o		u	ɨ		ʌ						7		
[27]	Ocuiltec	i			ɛ		a	ɔ			u	ɨ		ʌ						7		
	(L)	+			+		+	+			+	+		+							7	14
[28]	Otomi Mezquital[1]	i		e	ɛ		a	ɔ	o		u			ʌ				ï		9		
	(N)	+		+			+				+										4	13
	※Otomi Mezquital[2]	i		e		æ	a	ɔ	o		u	ɨ		ʌ						9		
	Otomi Temoayan	i		e	ɛ		a	ɔ	o		u		ə	ʌ						9		
	(N)	+					+				+										3	12
	Otomi Tenango	i		e		æ	a	ɔ	o		u		ə					ï		9		
	(N)	+				+	+				+										4	13
	Otomi Sierra	i		e		æ	a	ɔ	o		u		ə					ï		9		
	(N)	+				+	+				+										4	13
[29]	Mazahua	i		e	ɛ		a	ɔ	o		u	ɨ	ə							9		
	(N)	+		+			+		+		+		+								6	15
[30]	Tlapanec[1,2]	i		e			a		o		u									5		
	(N)	+		+			+		+		+										5	
	(L)	+		+			+		+		+										5×2	20
[31]	Ixcatec	i		e			a		o		u									5		
	(N)	+		+			+		+		+										5	10
[32]	Popoloc Western[1,2]	i		e			a		o		u									5		
	(N)	+		+			+		+		+										5	10
	Popoloc Eastern	i		e			a		o		u									5		
	(N)	+		+			+		+		+										5	10
	Popoloc Tlacoyalco	i		e			a		o											4		
	(N)	+		+			+		+												4	
	(L)	+		+			+		+												4×2	16
[33]	Chocho	i		e			a		o		u									5		
	(N)	+		+			+		+		+										5	10
[34]	Mazatec Chiquihuitlan	i			ɛ	æ	a		o		u									6		
	(N)	+			+	+	+		+		+										6	12
	Mazatec Jalapa	i				æ	a		o		u									5		
	(N)	+				+	+		+		+										5	10
	Mazatec Huautla	i		e			a		o											4		
	(N)	+		+			+		+												4	8
	Mazatec Soyaltepec	i		e			a		o		u									5		
	(N)	+		+			+		+		+										5	10
[35]	Amuzgo San Pedro[1]	i		e	ɛ		a	ɔ	o		u									7		
	(N)			+	+		+	+	+												5	12
	※Amuzgo San Pedro[2]	i		e	ɛ		a	ɔ	o		u									7		
	(N)	+		+			+		+		+										5	12
	Amuzgo Xochistlahuaca	i		e		æ	a	ɔ	o		u									7		

	i	ɪ	e	ɛ	æ	a	ɔ	o	ʊ	u	ɨ	ə	ʌ	ö	ü	ʉ	ï	ë	Number of Phonemes	
(N)			+		+	+	+	+											5	12
[36] Mixtec Acatlan	i		e			a		o		u									5	
(N)	+		+			+		+		+									5	10
Mixtec Huajuapan	i		e			a		o							ü				5	
(N)	+		+			+		+											4	10
Mixtec Silacayoapan	i		e			a		o								ʉ			5	
(N)	+		+			+				+									4	9
Mixtec Mixtepec	i		e			a		o		u									5	
(N)	+		+			+		+		+									5	10
Mixtec Alacatlazala	i		e			a		o		u									5	
(N)	+		+			+		+		+									5	10
※Mixtec Ayutla[1]	i		e			a		o		u									5	
(N)	+		(+)			+				+									4	9
Mixtec Ayutla[2]	i		e			a		o		u									5	
(N)	+					+				+									3	8
Mixtec Ocotepec[1,2]	i		e			a		o		u									5	
(N)	+		+			+		+		+									5	10
Mixtec Molinos	i		e			a		o		u									5	
(N)	+		+			+		+		+									5	9
Mixtec Atatlahuca	i		e			a		o		u							ï		6	
(N)	+		+			+		+		+							+		6	12
Mixtec San Miguel	i		e			a		o		u							ï		6	
(N)	+					+		+		+							+		5	11
Mixtec Chalcatongo	i		e			a		o		u	ɨ								6	
(N)	+					+				+	+								4	10
※Mixtec Diuxi[1]	i		e			a		o		u	ɨ								6	
(N)	+		+			+		+		+	+								6	12
Mixtec Diuxi[2]	i		e			a		o		u	ɨ								6	
(N)	+		(+)			+		+		+	+								6	12
Mixtec Peñoles	i		e			a		o		u	ɨ								6	
(N)	+		+			+		+		+	+								6	12
Mixtec Coatzospan	i		e			a		o		u	ɨ								6	
(N)	+		+			+				+	+								5	11
Mixtec Jamiltepec	i		e			a		o		u	ɨ								6	
(N)	+		+			+		+		+	+								6	12
Mixtec Colorado	i		e			a		o		u	ɨ								6	
(N)	+		+			+		+		+	+								6	12
Mixtec Chayuco	i		e			a		o		u	ɨ								6	
(N)	+		+			+		+		+	+								6	12
Mixtec Jicaltepec	i		e			a		o		u									5	
(N)	+		+			+		+		+									5	10
[37] ※Cuicatec Concepcion[1]	i		e	ɛ		a	ɔ			u									6	

	i	ɪ	e	ɛ	æ	a	ɔ	o	ʊ	u	ɨ	ə	ʌ	ö	ü	ʉ	ï	ë	Number of Phonemes		
(N)	+		+	+		+	+			+										6	12
※Cuicatec Concepcion[2]	i		e			a		o		u									5		
(N)	+		+			+		+		+										5	10
※Cuicatec Santa Maria	i		e			a	ɔ	o		u									6		
(N)	+		+			+		+		+										5	11
[38] Trique Chicahuaxtla	i		e			a		o		u	ɨ		ʌ						7		
(N)	+		+			+		+		+	+									6	13
Trique Copala (L)	i		e			a		o		u									5		
(S)			e			a		o												3	
(N)	+		+			+		+		+										5+3	16
[39] ※Zapotec Sierra	i		e			a		o		u									5		
(N)	+					+				+										3	8
Zapotec Juarez GL	i		e			a		o		u									5		
Zapotec Ixtlan	i		e			a		o		u									5		
Zapotec Rincon	i		e		æ	a		o		u							ï		7		
Zapotec Zoogocho	i		e			a		o											4		
Zapotec Yatzachi	i		e			a		o				ə							5		
※Zapotec Villa Alta	i		e			a		o									ï		5		
Zapotec Cajonos GL	i		e			a		o											4		
glottalized	i'		e'			a'		o'													
laryngealized	i'i		e'e			a'a		o'o													
Zapotec Yalalag	i		e			a		o		u									5		
Zapotec Yatee GL	i		e			a		o											4		
Zapotec Choapan GL	i		e	ɛ		a		o		u									6		
Zapotec Albarradas GLA	i		e	ɛ		a		o		u					ü				7		
Zapotec Mitla[1,2]	i		e		æ	a		o		u									6		
Zapotec Tlacochahuaya	i		e			a		o		u	ɨ								6		
Zapotec Guelavia[1,2] GL	i		e			a		o		u	ɨ								6		
Zapotec Chichicapan GA	i		e			a		o		u	+								6		
Zapotec Quioquitani L	i		e		æ	a		o		u									6		
Zapotec Ayoquesco GL	i		e			a		o		u							ï		6		
Zapotec Lachixio	i		e			a				u									4		
lengthened	ii		ee			aa				uu										4	8
checked	i'		e'			a'				u'											
interrupted	i'i		e'e			a'a				u'u											
Zapotec Guevea GA	i		e			a		o		u									5		
Zapotec Isthmus[1,2] GL	i		e			a		o		u									5		
[40] Chatino Yaitepec	i		e			a		o		u									5		
(N)	+		+					+		+										4	9
Chatino Tataltepec[1]	i		e			a		o		u									5		
(N)	+					+				+										3	8
※Chatino Tataltepec[2]	i		e			a		o		u									5		

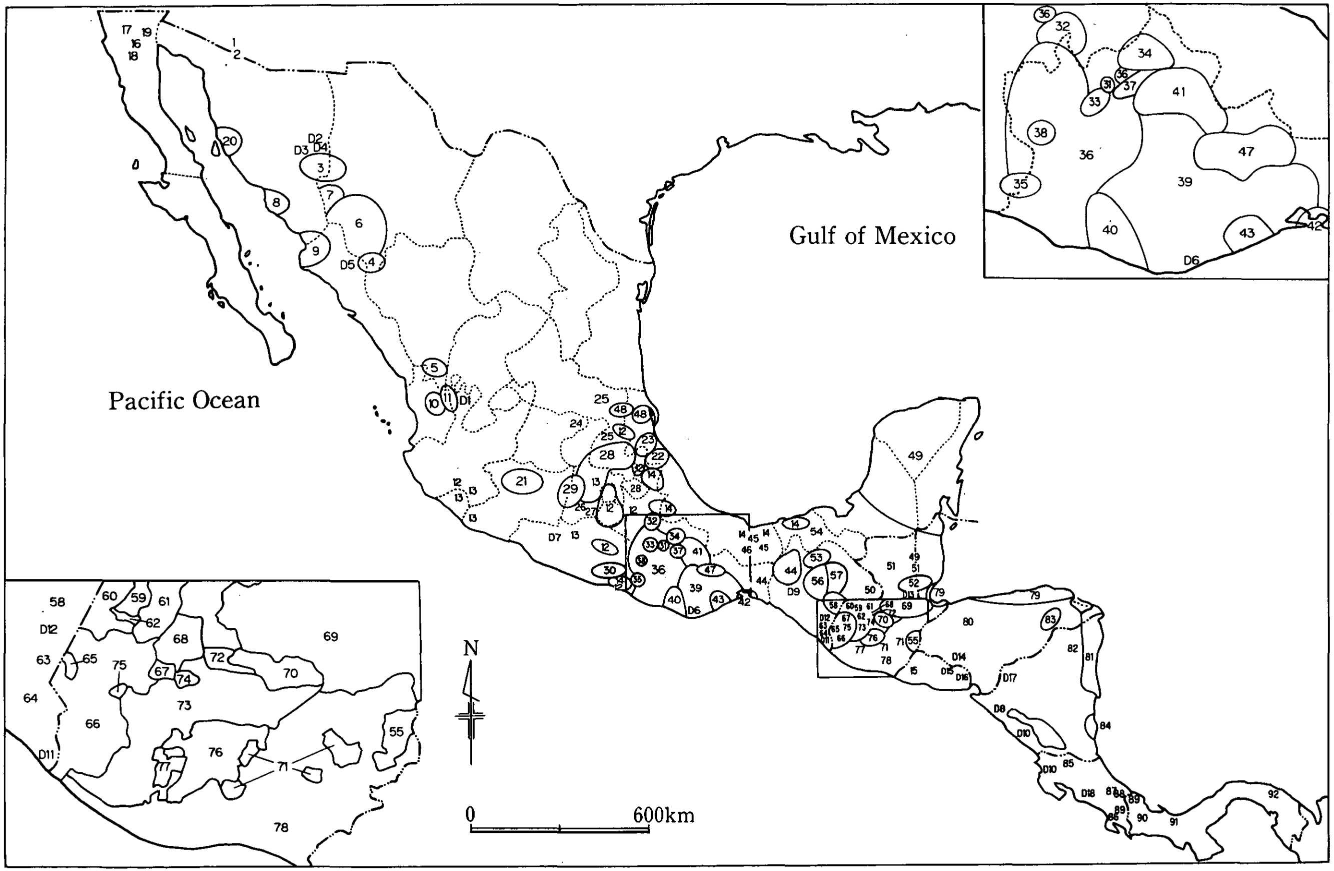
	i	ɪ	e	ɛ	æ	a	ɔ	o	ʊ	u	ɨ	ə	ʌ	ö	ü	ʉ	ï	ë	Number of Phonemes
(N)	+		+					+		+									4
(L)	+		+			+		+		+									9×2 18
※Chatino Zozontepec	i		e			a		o		u									5
(L)	+		+			+		+		+									5
(N)	+		+			+		+		+									5×2 20
[41] Chinantec Lealao	i		e			a		o		u							ï		6
(L)	+		+			+		+		+							+		6
(N)	+		+			+		+		+							+		6×2 24
※Chinantec Lalana	i		e			a		o		u	ɨ	ə		ö					8 +N +L
Chinantec Comaltepec	i		e		æ	a		o		u							ï	ë	8
(N)	+		+		+	+		+		+							+		7
(L)	+		+	+		+		+		+							+	+	8+7 30
※Chinantec Yolox	i		e			a		o		u	ɨ	ə			ü				8 +N
Chinantec Quiotepec	i		e			a		o		u					ü		ï	ë	8
(N)	+		+			+		+		+					+		+	+	8
(L)	+		+			+		+		+					+		+	+	8×2 32
※Chinantec Ozumacin	i		e			a		o		u	ɨ			ö					7 +N
※Chinantec Valle	i		e			a		o		u	ɨ	ə							7 +N
Chinantec Palantla	i		e			a		o		u							ï	ë	7
(N)	+		+			+		+		+							+	+	7 14
Chinantec Tepetotutla	i		e			a		o		u							ï	ë	7
(N)	+		+			+		+		+							+	+	7 14
Chinantec Sochiapan	i		e			a		o		u							ï	ë	7
(N)	+		+			+		+		+							+	+	7 14
※Chinantec Usila	i		e			a		o		u									5 +N
Chinantec Tlacoatzin	i		e			a		o		u							ï	ë	7
(N)	+		+			+		+		+							+	+	7 14
※Chinantec Ojitlan	i		e			a		o		u	ɨ	ə							7 +N
※Chinantec Chiltepec	i		e			a		o		u	ɨ	ə							7 +N
[42] Huave	i		e			a		o			ɨ								5
(L)	+		+			+		+			+								5 10
[43] Chontal Huamelultec	i		e			a		o		u									5
(L)	+		+			+		+		+									5 10
Chontal Tequistlatec[1,2]	i		e			a		o		u									5
[44] ※Zoque Ostucan	i		e			a		o		u	ɨ								6
※Zoque Rayon	i		e			a		o		u	ɨ								6
Zoque Copainala	i		e			a		o		u			ʌ						6
Zoque Leon	i		e			a		o		u	ɨ								6
Zoque Chimalapa	i		e			a		o		u	ɨ								6
[47] Sierra Popoluca	i		e			a		o		u			ʌ						6
(L)	+		+			+		+		+			+						6 12
[48] Sayula Popoluca	i		e			a		o		u			ʌ						6

	i	ɪ	e	ɛ	æ	a	ɔ	o	ʊ	u	ɨ	ə	ʌ	ö	ü	ʉ	ï	ë	Number of Phonemes	
(L)	+		+			+		+		+			+						6	12
Oluta Popoluca	i		e			a		o		u	ɨ								6	
(L)	+		+			+		+		+	+								6	12
[49] Mixe Coatlan	i		e			a		o		u	ɨ								6	
(L)	+		+			+		+		+	+								6	
(EL)	+		+			+		+		+	+								6	18
Mixe Paraiso	i		e			a		o		u	ɨ								6	
(L)	+		+			+		+		+	+								6	
(EL)	+		+			+		+		+	+								6	18
Mixe Tlahuitoltepec	i		e			a	ɔ	o		u			ʌ						7	
(L)	+		+			+	+	+		+			+						7	14
Mixe Totontepec[1]	i		e		æ	a	ɔ	o		u	ɨ	ə							9	
(L)	+		+		+	+	+	+		+	+	+							9	18
※Mixe Totontepec[2]	i		e		æ	a		o	ʊ	u	ɨ		ʌ						9	
(L)	+		+		+	+		+	+	+	+		~~+~~						9	18
[48] Huastec Veracruz	i		e			a		o		u									5	
(L)	+		+			+		+		+									5	10
Huastec Potosi	i		e			a		o		u									5	
(L)	+		+			+		+		+									5	10
[49] ※Yucatec[1]	i		e			a		o		u									5	
Yucatec[2]	i		e			a		o		u									5	
(L)	+		+			+		+		+									5	10
[50] Lacandon	i		e			a		o		u		ə							6	
(L)	+		+			+		+		+		+							6	12
[51] Itza[1,2]	i		e			a		o		u	ɨ								6	
(L)	+		+			+		+		+									5	10
[52] Mopan	i		e			a		o		u	ɨ								6	
(L)	+		+			+		+		+	+								6	12
[53] Chol[1]	i		e			a		o		u			ʌ						6	
※Chol[2]	i		e			a		o		u	ɨ								6	
[54] Chontal	i		e			a		o		u	ɨ								6	
[55] Chorti	i		e			a		o		u									5	
[56] Tzotzil[1,2]	i		e			a		o		u									5	
[57] Tzeltal	i		e			a		o		u									5	
[58] Tojolabal	i		e			a		o		u									5	
[59] Chuj	i		e			a		o		u									5	
[60] Jacaltec	i		e			a		o		u									5	
[61] Kanjobal	i		e			a		o		u									5	
[62] Acatec[1,2]	i		e			a		o		u									5	
(L)	+		+			+		+		+									5	10
[65] Tectitec	i		e			a		o		u									5	
(L)	+		+			+		+		+									5	10

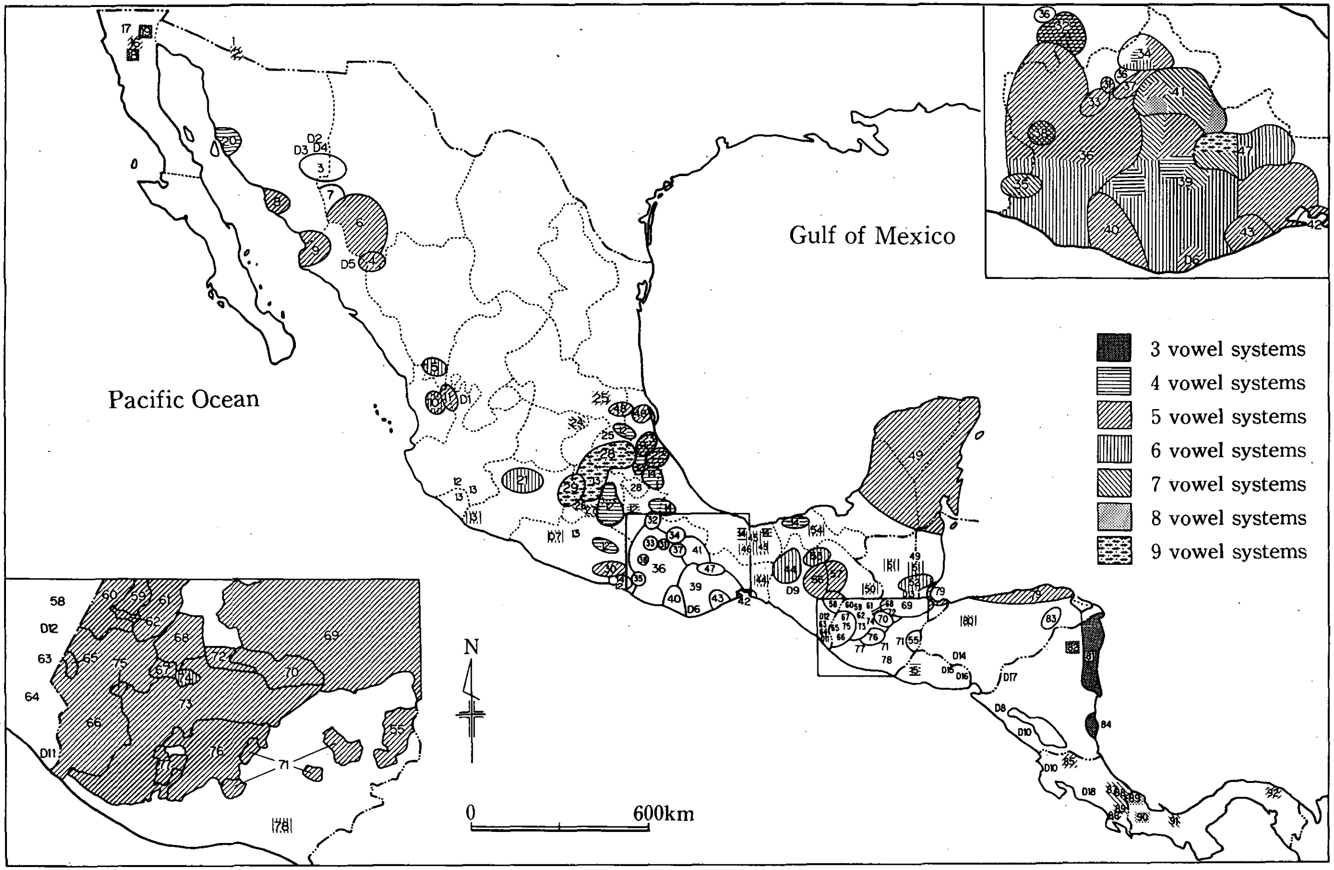
		i	ɪ	e	ɛ	æ	a	ɔ	o	ʊ	u	ɨ	ə	ʌ	ö	ü	ʉ	ï	ë	Number of Phonemes		
[66] Mam		i		e			a		o		u									5		
	(L)	+		+			+		+		+										5	10
[67] Aguacatec		i		e			a		o		u									5		
	(L)	+		+			+		+		+										5	10
[68] Ixil[1,2,3]		i		e			a		o		u									5		
	(L)	+		+			+		+		+										5	10
[69] Kekchi		i		e			a		o		u									5		
	(L)	+		+			+		+		+										5	10
[70] Pocomchi[1,2]		i		e			a		o		u									5		
	(L)	+		+			+		+		+										5	10
[71] Pocomam		i		e			a		o		u									5		
	(L)	+		+			+		+		+										5	10
[72] Uspantec		i		e			a		o		u									5		
	(L)	+		+			+		+		+										5	10
[73] ※Quiche[1]		i		e			a		o		u		ə							6		
Quiche[2,3]		i		e			a		o		u									5		
	(L)	+		+			+		+		+										5	10
[74] Sacapultec		i		e			a		o		u		ə							6		
	(L)	+		+			+		+		+										5	11
[75] Sipacapeño		i		e			a		o		u									5		
	(L)	+		+			+		+		+										5	10
[76] Cakchiquel[1] Patzicia		i		e			a		o		u		ə							6		
Cakchiquel[2] Comalapa (T)		i		e			a		o		u									5		
	(LX)		ɪ		ɛ			ɔ		ʊ											4	9
[77] Tzutujil[1]		i		e			a		o		u	ie	uo							7		
	(L)	+		+			+		+		+										5	12
Tzutujil[2]		i		e			a		o		u									5		
	(L)	+		+			+		+		+										5	10
[78] Xinca[1,2]		i		e			a		o		u	ɨ								6		
※Xinca[3]		i		e			a		o		u	ɨ								6		
	(L)	(+)		+			+		+		+										5	11
[79] Garifuna		i		e			a		o		u									5		
[80] Tol		i		e			a		o		u	ɨ								6		
	(N)	+		+			+		+		+										5	10
[81] ※Miskitu[1]		i		e			a		o		u									5		
	(L)	+		+			+		+		+										5	10
Miskitu		i					a				u									3		
	(L)	+					+				+										3	6
[82] Sumu (Ulwa)		i					a				u									3		
	(L)	+					+				+										3	6
[84] Rama		i					a				u									3		
	(L)	+					+				+										3	6

			i	ɪ	e	ɛ	æ	a	ɔ	o	ʊ	u	ɨ	ə	ʌ	ö	ü	ʉ	ï	ë	Number of Phonemes		
[85]	Guatuso		i		e			a		o		u									5		
		(L)	+		+			+		+		+										5	10
[86]	Boruca		i		e			a		o		u									5		
[87]	Cabecar		i	ɪ	e			a		o	ʊ	u									7		
		(N)	+		+			+		+		+										5	12
[88]	Bribri[1,2,3]		i	ɪ	e			a		o	ʊ	u									7		
		(N)	+		+			+		+		+										5	12
[89]	Terraba		i	ɪ		ɛ		a	ɔ		ʊ	u									7		
		(N)	+			+		+	+			+										5	12
[89]	Teribe		i	ɪ	e			a	ɔ	o	ʊ	u									8		
		(N)	+	+	+			+	+	+	+	+										8	16
[90]	Guaymi		i		e			a	ɔ	o		u							ï	ë	8		
		(N)	+		+			+	+	+		+							+			7	15
[91]	Bocota		i		e	ɛ		a	ɔ	o		u									7		
		(N)	+		+	+		+	+	+		+										7	14
[92]	Cuna		i		e			a		o		u									5		
		(L)	+		+			+		+		+										5	10

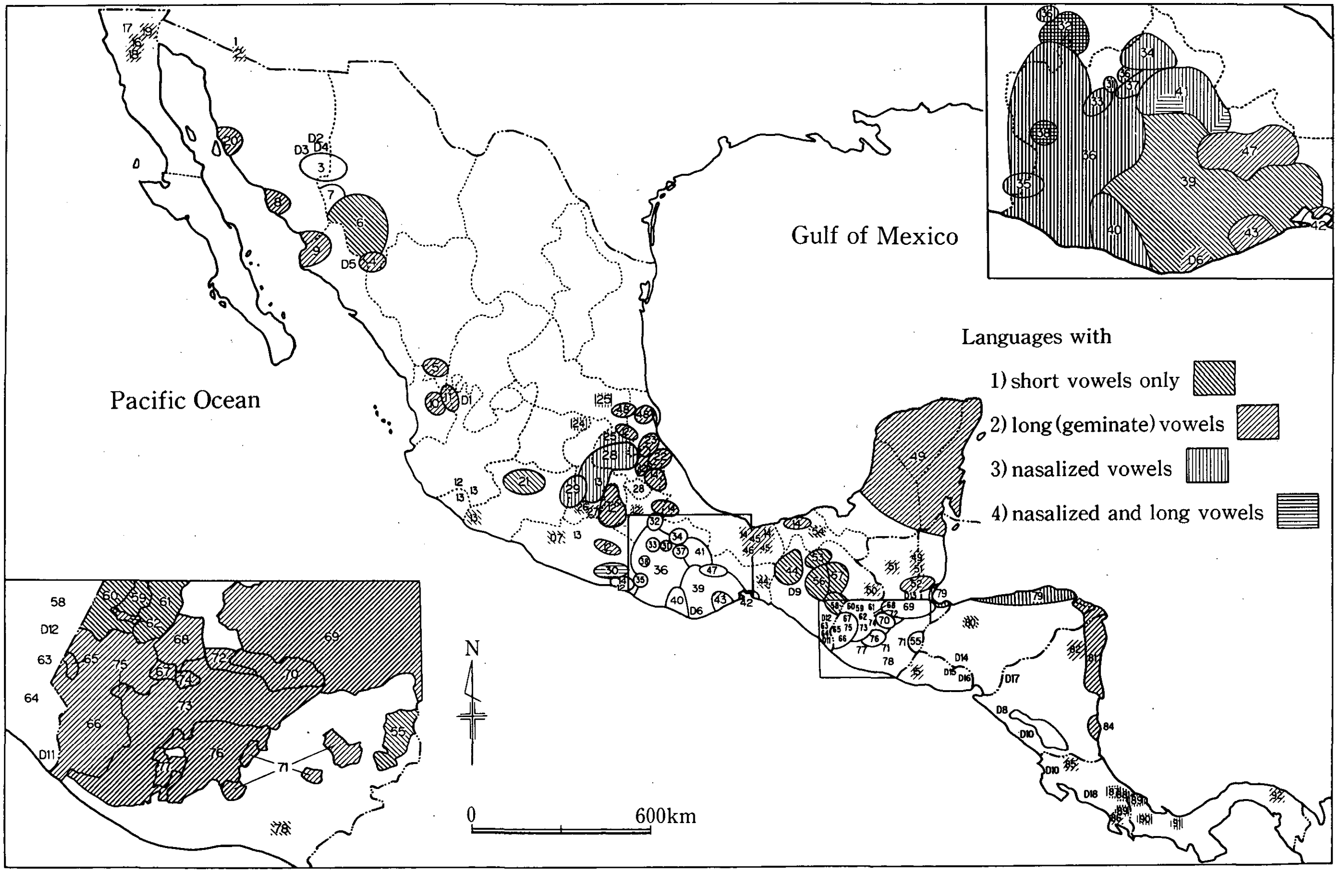
Appendix 5. Map



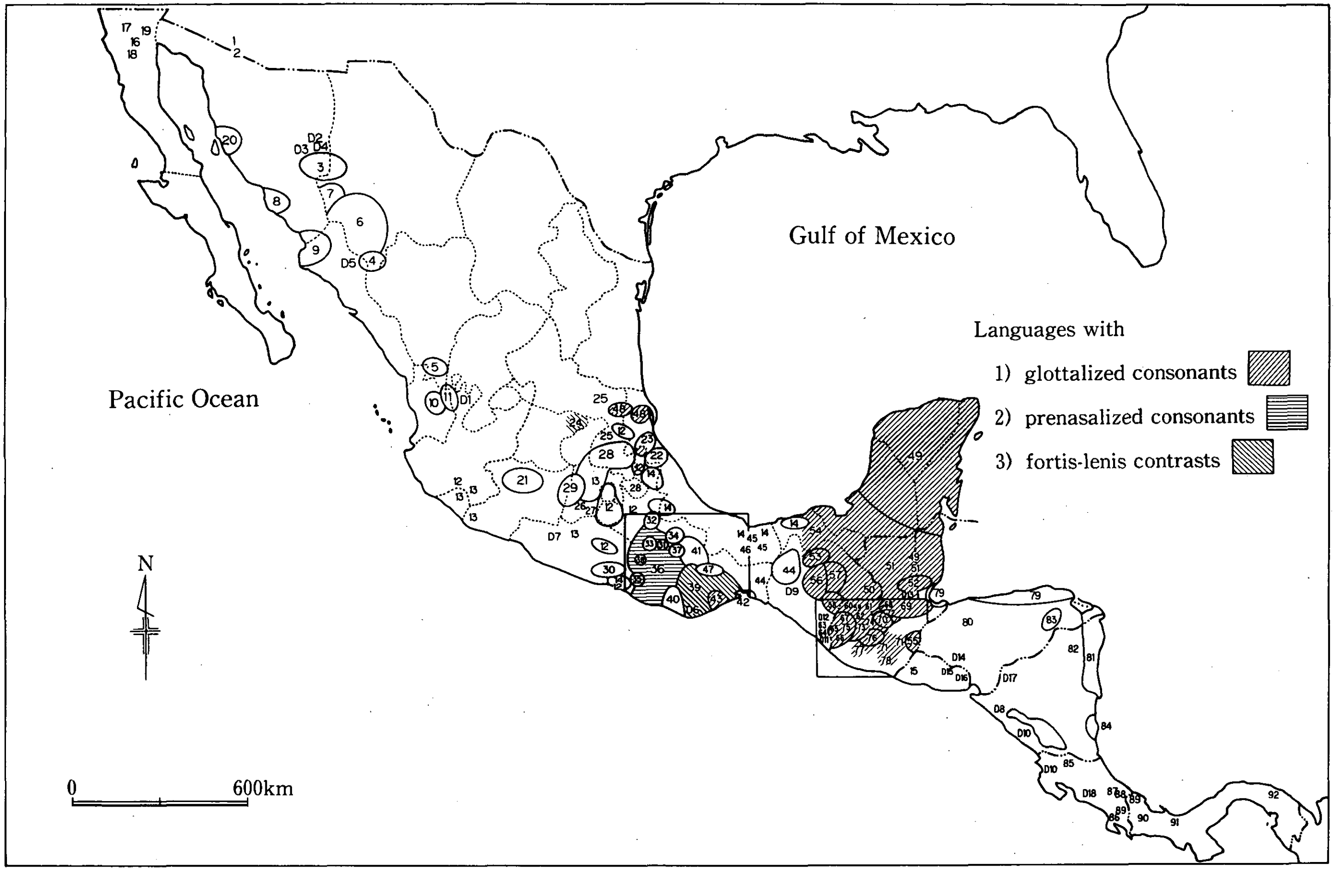
Map 1. Distribution Middle American Indian languages



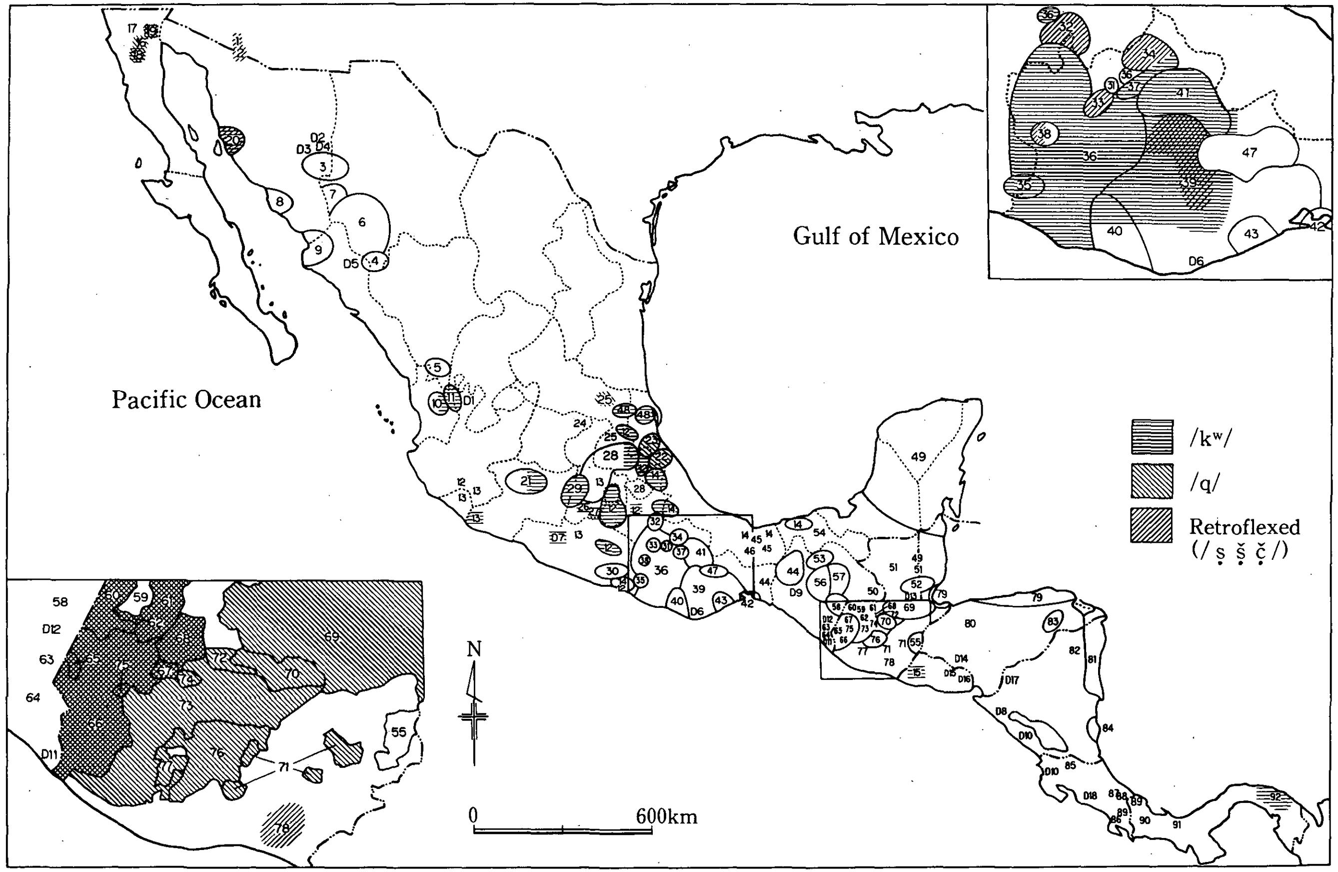
Map 2. Distributional map of number of vowel quality



Map 3. Distributional map of vowel quantity and nasality



Map 4. Distribution of glottalized, prenasalized, and fortis-lenis consonants



Map 5. Distribution of /kʷ/, /q/, and retroflexed consonants

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中米諸語の音韻体系の類型地理論的研究

八 杉 佳 穂

音韻の類型論的な研究はこれまでにも試みられてきたが，音韻解釈の違いにより，言語を理解するための基本ともいえる音素の数が研究者によって異なるため，満足のいく結果を得るのがたいへん難しい分野である。音素は言語の研究に必須の概念であるが，抽象的なものでもあり，研究者により解釈の違いが生まれ，そのため比較の対象の均一化が難しいのである。

本研究では中米のインディオ諸語の音韻の類型地理論的な比較研究を試みた。音韻体系の統一的な解釈が難しいため，各言語に対して提案されている音韻体系を尊重することにした。比較しやすいよう表記法を統一した233の資料のうち，独自の判断に基づき比較的信頼度の低いものを除いた174を比較の対象とした。まず子音と母音に分け，子音については，閉鎖音，摩擦音，流音，鼻音，わたり音の5つの下位類に分けて論じた。母音は音質の違いに基礎をおき，鼻母音，長母音，さらには声調の有無を利用し，類型論的な考察を行なった。次に，中米諸語の音韻的な地域特徴を探るため，2つの観点から，すなわち，珍しい音素があるかどうかということと，一般的にみられるたとえば /p/ のような音素が欠けているかどうかということを利用して，地域的な特徴を考察した。本研究は中米という限られた地域の音韻の類型論的な比較研究であるため，それだけを利用して言語普遍論へ貢献しようとしても不可能である。そこでこれまで提案されてきたうち，子音については主に Nartey [1979], Maddieson [1984], 母音については Crother [1978] を利用して，考察を行なった。

中米諸語は変化に富んでいるが，それでも共通する音素をもとに，中米諸語の中核となる音素を取り出すことが可能であった。しかし，音素は体系をなすものであるが，比較の対象としたのは共時的なものであり，また言語資料から切り離されたものであるので，その類型論的な研究から言語間の関係を類推することは難しかった。それには比較言語学から得られる祖語の音韻体系からの変化をあわせて利用する必要がある。