

NATIVE MIDDLE AMERICAN LANGUAGES : AN AREAL-TYPOLOGICAL PERSPECTIVE

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NATIVE MIDDLE AMERICAN LANGUAGES

AN AREAL-TYPOLOGICAL PERSPECTIVE

by

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Since English is not my native language, I frequently do not perceive subtle differences in meaning and cannot always choose the best possible phrasing. Even worse, I feel that my logic significantly differs from that of native English speakers. Although faced with these difficulties, I elected to write this monograph in English given the predominance of English in the academic world, with the result that at times I felt linguistically handicapped. Jaan Ingle aided me in overcoming these obstacles, and I wish to acknowledge her help in editing and proofreading the final version of this monograph.

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Key to Abbreviations and Symbols

ABS	:	absolutive
ACC	:	accusative
ACT	:	active
AG	:	agent
ART	:	article
AUX	:	auxiliary
C	:	consonant(s)
CL	:	clitic
COMP	:	completive
CONJ	:	conjunction
DEF	:	definite article
DEM	:	demonstrative
DEP	:	dependency marking
DIMIN	:	diminutive
DIR	:	directional
DIS	:	distal
DISTR	:	distributor
ERG	:	ergative
EXP	:	experiencer
FEM	:	feminine
FUT	:	future
G	:	geminated vowel(s)
GEN	:	genitive
HAB	:	habitual
IMPERF	:	imperfect
INCOMP	:	incompletive
L	:	long vowel(s)
LOC	:	locative

MASC	:	masculine
MOOD	:	mood
N	:	nasalized vowel(s)
NCL	:	noun classifier
NUCL	:	numeral classifier
NONREFL	:	non-reflexive
OBJ	:	object
PASS	:	passive
PAST	:	past
PERF	:	perfective
PL	:	plural
POSS	:	possessive
POSSD	:	possessed
PRON	:	pronoun
PROX	:	proximate (past, future)
REALIZED	:	realized
REC	:	recent past
REF	:	reflexive
SG	:	singular
SUBJ	:	subject
TP	:	topicalization
V	:	vowel(s)
/ /	:	phonemic transcription
[]	:	phonetic transcription

PART I

Chapter 1

Introduction

Middle America is a multilingual region, where various indigenous languages are still spoken by more than eight million people. The most populous group among them are the speakers of Mayan languages, followed by speakers of Uto-Aztec and Otomanguean languages. These groups speak many languages altogether. Smaller groups include the Mixe-Zoquean and the Totonacan, and there are many other isolated languages and small language families. In Central America there is one Arawakan (Garífuna) and a few Chibchan languages which belong with South American language families linguistically; other Central American languages include Misumalpan, Xinca, Lencan and Tol (commonly called Jicaque). Most of these are in danger of extinction or are already dead.

Middle America is a politico-geographical construct. As commonly viewed, it includes Mexico and Central America, although northern Mexico is sometimes excluded while the Antilles are sometimes included. Central America extends from Guatemala through Panama. Mesoamerica is another term used in anthropology and linguistics in connection with Middle America. Mesoamerica is, roughly speaking, the central part of Middle America, extending from north central Mexico through the western part of El Salvador and Honduras. It was designated a cultural area by Kirchhoff on the basis of its many shared cultural features [KIRCHHOFF 1943].

In this study I have chosen the languages of Middle America from the northern Mexican border to the south of Panama. However, it should be noted that, linguistically speaking, Middle America is arbitrarily designated a geographical area. Neither genetic nor areal linguistic classifications coincide with these boundaries. On the other hand, it has been shown that Mesoamerica is a linguistic area. Campbell *et al.* have demonstrated that Mesoamerica is a linguistic area in the sense of others recognized in the literature, such as the Balkans or South Asia [CAMPBELL, KAUFMAN, and SMITH-STARK 1986]. They list five features, based on tight constraints for defining a linguistic area: (1) nominal possession (of the type *his-dog the man*), (2) relational expressions composed of a noun root and possessive pronominal clitics (these compounds, called relational nouns, function like prepositions in many other languages of the world), e.g., Tzutujil *r-uma:l xar a:či* "by the man" < *r-* "his", *-uma:l* "by", *xar* "the", *a:či* "man"); (3) vigesimal numeral systems, (4) non-verb-final basic word order, to which absence of switch-reference is correlated, (5) several widespread semantic calques.

In this monograph I will treat the languages of Middle America equally,

although the resource materials vary widely in quality and quantity. But, naturally, attention will be concentrated largely on Mesoamerican languages, since most of the languages are distributed within this more restricted region, and the Mesoamerican civilizations of the last 3000 years permit us to suppose that the peoples of Mesoamerica have had a long history of contact. The languages of Central America outside Mesoamerica are linguistically as connected to South American language groups as the cultures of Central America are [KIRCHHOFF 1943: 18]. Languages distributed through the northern part of Mexico, such as Yuman and Uto-Aztecan, are genetically linked with North American language groups, but the Nahuatl group of Uto-Aztecan has intruded deeply into Mesoamerica and some Nahuatl dialects have also reached far into Central America. I have included these non-Mesoamerican languages for two reasons: 1) Some of them are claimed to have been influenced by Mesoamerican languages. For example, the Nahuatl branch of Uto-Aztecan has come to be a member of the Mesoamerican group, a finding which could have been made only by comparing it with non-Mesoamerican languages. 2) The characteristics of the non-Mesoamerican languages help delimit the Mesoamerican group proper.

The purpose of the present study is to investigate Native Middle American languages from an areal-typological point of view. The immediate goal of the research is to present available descriptive materials and analyze them, since a detailed study of the distribution of the phonological, morphological, and syntactical characteristics of Native Middle American languages as a whole has not yet been done. The ultimate goal of the investigation is to clarify Middle American areal features and to contribute to linguistic universals research. Regional traits across language boundaries are useful for establishing and investigating language contact. I emphasize that formal or structural borrowings can easily occur in these situations. In the concluding section, therefore, I draw brief inferences as to Mesoamerican history.

In Chapter 2 I discuss the phonological systems of Native Middle American languages. I present available descriptive materials, arranging them according to the classification utilized in this monograph. On the basis of the data brought together here, I analyze the consonant and vowel systems.

Following this, in Chapter 3, I treat areal features, investigating the diffusion of particular phonemes across language boundaries. Then I discuss linguistic universals. From these perspectives I attempt to clarify the phonological characteristics of the languages of Middle America.

In the areal-typological investigation of morphological traits in Chapter 4, I choose numerals among several categories such as pronominals, gender, number, and tense-aspect markers. The reasons for this choice are that (1) the numeral systems of Native Middle American languages show an enormous variety in ways of forming number words, (2) number words are formed from combinations of the rank- or base-word and the digit or minor numbers, (3) the way of forming number

words seems to change easily under the influence of neighboring languages, (4) the class of number words is considerably larger than that of other word classes. The different combinations and large quantity of number words make them particularly well suited to an areal-typological study. In addition, the structural borrowings are useful for investigating contact history linguistically.

In Chapter 5 I will choose seven parameters upon which to investigate word order typology; (1) the order of S (subject)/O (object)/V (verb); (2) adposition order, i.e. the existence of Pr (prepositions) vs. Po (postpositions); (3) the relative order of G (genitive) and N (noun); (4) of A (adjective) and N; (5) of P (personal pronoun or affix) and N; (6) of D (definite article or demonstrative) and N; (7) of Q (numeral or quantitative) and N. Six of the seven parameters involve noun phrases, but the orders of these noun phrases have close connections with the order of S/O/V.

In Chapter 6 I attempt to propose a new typology, based primarily on the syntactic relations of cross-referencing pronominals. I discuss the four categories, A (transitive subject), O (transitive object), S (intransitive subject), and G (genitive or possessive), placed in a square, and deduce some implicational universals therefrom.

The order of presentation of the languages (including dialects) considered here follows the language classification. The number in square brackets following a language's name corresponds to its number in the classification (Table 1) and on the map (Map 1).

The genetic classification of Middle American languages is based on the previous studies, but is still provisional. I have referred to Campbell [1979], Kaufman [1974a, 1974b] and Suárez [1983b] for the overall classification. At the 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 Suárez [1983b], Mixe-Zoquean on Campbell [1979] and Mayan on Yasugi [1980]. The classification of Supanec, Huave, Tol and Central American languages is based partly on my typological studies, which appear in Chapter 5. The languages are arranged geographically from north to south and from west to east. The distinction between such terms as family, language, dialect, and so forth is not considered here to be important, but a rough distinction is indicated through the use of Roman numbers, capital letters, Arabic numerals, and small letters. The identification numbers in square brackets correspond to those on Map 1. In Guatemala a new spelling system has been recently proposed by the Academy of Mayan Languages, and therefore the new spellings are enclosed in square brackets after the more familiar language names.

The numbers of speakers of the languages in Mexico (from [4] to [58] except [7] and [15]) are based on the census report of 1990 [ANONYMOUS 1992]. However, the census report does not distinguish Popoloc (Otomanguean) from Popoluca (Mixe-Zoquean), and Oaxaca Chontal from Tabasco Chontal (Mayan). Therefore I provi-

Table 1. Classification of Native Middle American languages

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 (Northern Paiute, Bannock)	California, Nevada, Oregon, South Idaho	1,000~2,000
2. Central Numic		
Shoshone-Goshiute	Southwest Nevada-Wyoming	1,500
Comanche	Oklahoma	10
Panamint (Koso), Tümpisa	California, Nevada	10~100
3. Southern Numic		
Ute (Chemehuevi, Southern Paiute)	South Nevada, Utah, Colorado	1,000~3,000
Kawaiisu	California	20
B. Tübatulabal	California	10
C. Takic (California Shoshonean)		
1. Serranan		
Serrano	California	10
*Kitanemuk, *Vanyume, *Alliklik		0
2. Cupan		
a. Luiseño (*Juaneño)	California	100~200
b. *Gabrieleño	California	0
*Gabrieleño, *Fernandeño		0
*Nicoleño		0
c. Cahuilla		
Cahuilla	California	10~100
Cupeño	California	10
D. Hopi	Northeast Arizona	3,000~5,000
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)		18,470
Northern Tepehuan	[4]	
Southern Tepehuan	[5]	
*Tepecano	D1	0
B. Taracaitan (Taracahitic)		
1. Tarahumaran		54,430
Tarahumara (Rarámuri)	[6]	
Guarijío (Varohío)	[7]	3,000?
2. Opatan		
*Opata (Teguima)	D2	#12
*Jova	D3	0
*Eudeve (Heve, Dohema)	D4	0
3. Cahitan		
Yaqui (Cahita)	[8]	10,990
Mayo (Cahita)	[9]	37,410
4. *Tubar	D5	0
C. Corachol		
Cora	[10]	11,920

Table 1-continued.

Family, Branch, Language, Dialect	Location	Number of speakers
Huichol	[11]	19,360
(Aztec)		
D. Nahuatl		
1. Aztec (General Aztec)		1,197,330
Central, Huasteca: Nahuatl	[12]	
Western Peripheral: Nahuatl	[13]	
Eastern Peripheral: Nahuatl	[14]	
Pipil	[15]	2,000?~200
2. *Pochutec	D6	0
II. *Cuitlatec	D7	0
III. Yuman (includes only Yuman languages of Mexico)		
Paipai	[16]	220
Cochimi (Kumyai, Kimiai)	[17]	160
Kiliwa	[18]	40
Cocopa (Cucapa)	[19]	140
IV. Seri	[20]	560
V. Tarascan (Purepecha)	[21]	94,840
VI. Totonacan		
Totonac	[22]	207,880
Tepehua	[23]	8,700
VII. Otomanguean		
A. Chichimec (Meco, Jonaz)	[24]	1,640
B. Otopamean		
1. Pamean	[25]	5,730
North Pame		
Central Pame		
South Pame		
2. Matlatzincan		
Matlatzinca (Pirinda)	[26]	1,450
Ocuiltec (Tlahuica)	[27]	760
3. Otomian		
a. Otomí	[28]	280,240
Northwestern Otomí (Mesquital)		
Northeastern Otomí (Sierra)		
Southwestern Otomí		
Ixtenco Otomí		
b. Mazahua	[29]	127,830
C. Supanec		
1. Tlapanec (Yope)	[30]	68,480
2. *Subtiaba	D8	0
(*Maribio)	El Salvador	
D. Popolocan		
1. Chochoan		
a. Ixcatec	[31]	1,220
b. Popoloc	[32]	1,730
Chocho	[33]	12,550
2. Mazatec	[34]	168,370
E. Amuzgo	[35]	28,290
F. Mixtecan		
1. Mixtecan		
Mixtec	[36]	386,870
Cuicatec	[37]	12,680
2. Trique	[38]	14,980

Table 1-continued.

Family, Branch, Language, Dialect	Location	Number of speakers
G. Zapotecan		
1. Zapotec (*Papabuco)	[39]	403,460
2. Chatino	[40]	28,990
H. Chinantecan	[41]	109,100
I. Manguen (Chorotegan, Chiapanec-Mangue)		
1. *Chiapanec	D9	180
2. *Mangue (*Diria) (*Chorotega) (*Nicoya)	D10 Nicaragua Honduras Costa Rica	0
VIII. Huave	[42]	11,960
IX. Oaxaca Chontal (Tequistlatec)	[43]	4,670
Lowland Chontal (Huamelultec)		
Highland Chontal (Tequistlatec)		
X. Mixe-Zoquean		
1. Zoquean	[44]	43,160
a. Chiapas Zoque		
b. Oaxaca Zoque (San Miguel Chimalapa, Santa María Chimalapa)		
c. Tabasco Zoque (Ayapa)		
d. Veracruz Zoque (Zoque Popoluca)	[45]	
Sierra Popoluca (Soteapan etc.)		29,030
Texistepec Popoluca		170
2. Mixean		
a. Veracruz Mixe (Mixe Popoluca)	[46]	
Sayula Popoluca		
Oluta Popoluca		3
b. Mixe	[47]	95,260
Eastern Mixe		
Western Mixe		
c. *Tapachultec	D11	0
XI. Mayan		
A. Huastecan		
1. Huastec	[48]	120,740
2. *Chicomuceltec	D12	20
B. Northern Lowland Maya		
1. Yucatecan		
a. Yucatec	[49]	713,520
b. Lacandón	[50]	100
c. Itzá [Itzaj]	[51]	3,000
d. Mopán	[52]	8,000
C. Southern Lowland Maya		
1. Cholan		
a. Chol	[53]	128,240
b. Chontal	[54]	30,140
c. Chortí [Ch'orti']	[55]	52,000
d. *Choltí	D13	0
2. Tzeltalan		
a. Tzotzil	[56]	229,200
b. Tzeltal	[57]	261,080
c. Tojolabal (Chaneabal)	[58]	36,010

Table 1—continued.

Family, Branch, Language, Dialect	Location	Number of speakers
D. Western Highland Maya		
1. Kanjobalan		
a. Chuj [Chuj]	[59]	29,000
b. Jacalteco [Jakalteko/Popti']	[60]	32,000
Kanjobal [Q'anjob'al]	[61]	112,000
Acatec [Akateko]	[62]	20,000
c. Motocintlec (Mochó)	[63]	600
Tuzantec	[64]	?
2. Mamean		
a. Tectitec (Teco) [Tektiteko/Teko]	[65]	2,500
Mam [Mam]	[66]	686,000
b. Aguacatec [Awakateko]	[67]	16,000
3. Ixil [Ixil]	[68]	71,000
E. Eastern Highland Maya		
1. Kekchí [Q'eqchi']	[69]	361,000
2. Pocom		
a. Pocomchí [Pokomchi']	[70]	50,000
b. Pocomam [Pokomam]	[71]	32,000
3. Quichean		
a. Uspantec [Uspanteko]	[72]	2,000
b. Quiché [K'iche']	[73]	1,000,000
Sacapultec [Sakapulteko]	[74]	21,000
Sipacapa [Sipakapeño]	[75]	3,000
Cakchiquel [Kaqchikel]	[76]	405,000
Tzutujil [Tz'utujil]	[77]	85,000
XII. Xinca	[78]	100?
XIII. Arawakan (includes only a Central American language.)		
Garífuna (Black Carib)	[79]	70,000
XIV. Lenca		
Lenca (Honduran Lenca)	D14	0
Chilanga (Salvadoran Lenca)	D15	0
XV. Tol (Jicaque)	[80]	300
XVI. Misumalpan (Misuluan)		
A. Mískitu	[81]	67,000
B. Sumu (Ulwa = Southern Sumu)	[82]	4,900
Bawihka, Tawahka, Kukra, Panamaka		
C. Matagalpan		
*Cacaopera	D16	0
*Matagalpa	D17	0
XVII. Chibchan (includes only Central American Chibchan languages.)		
A. Paya (Pech)	[83]	300
B. Rama	[84]	650
C. Guatuso (Malecu)	[85]	300
D. Boruca (Brunca)	[86]	5
E. *Huetar (Guetar)	D18	0
F. Viceita		
Cabécar (Chiripó, Estrella)	[87]	6,000
Bribri	[88]	5,000
G. Teribe/Térraba	[89]	1,100
H. Guaymí	[90]	56,500
I. Bocotá	[91]	15,000?
J. Cuna	[92]	36,500

sionally calculated the numbers of speakers of those languages in the following way.

	Oaxaca	Tabasco	Other States	Total
Chontal	2,889	20,033	857	23,779
Chontal de Oaxaca	1,781	8	443	2,232
Chontal de Tabasco	1	10,110	145	10,256

(Number of speakers extracted from Anonymous 1992)

Since Oaxaca Chontal is spoken in Oaxaca, I chose the number 5,121 (2,889 + 1,781 + 8 + 443) in the first column and the second row of the above table. The number of speakers of Tabasco Chontal was calculated as 30,288 (20,033 + 10,110 + 145) and 857 was excluded.

	Puebla	Oaxaca	Veracruz	Other States	Total
Popoluca	1,543	191	29,032	313	31,079
Popoluca de Oluta	0	0	1	2	3
Popoluca de Texistepec	0	0	170	2	172

(Number of speakers extracted from Anonymous 1992)

Since Popoloc is spoken in Puebla and the northwestern part of Oaxaca, I adopted the number 1,734 (1,543 plus 191) for Popoloc. Popoluca de Veracruz seems to be Sierra Popoluca, so I took the number 29,032 for Sierra Popoluca.

The number of speakers in Guatemala is based on Cojti Macario [1988] (cited from England 1993). The number is approximate, since there is no reliable census. The number of speakers in Central America is based mainly on Turpana [1987] and García Segura and Zúñiga Muñoz [1987]. Fractions have been rounded off to the nearest even number.

Extinct languages are marked by an asterisk * before a language name and D before the identification number. A sharp sign # before the number indicates that the language is extinct but that there are still people who identify themselves by the language name.

Chapter 2

Phonological Systems

There is much variation in the phonological systems of Native Middle American languages. In Otomanguean languages, for example, Zapotecan and Trique have a fortis vs. lenis contrast. Mixtecan, Xochistlahuaca Amuzgo and Lachixio Zapotec have prenasalized consonants. Some of the languages have nasalized vowels, while others do not. A survey of the whole of Middle America reveals that the total number of consonants in an inventory ranges from 11 to 35. Although the number of segmental phonemes does not vary excessively when compared with the total range of variation in the languages of the world, which varies between 6 and 95 phonemes [MADDIESON 1986: 109], the consonant inventories show a great deal of variety, and we also encounter some cross-linguistically rare phonemes such as glottalized fricatives and both alveolar and palatal retroflex sibilants. As for vowels, 18 of the 23 vowels distinguished as the so-called "American Usage" symbols occur, with some of them being lengthened, nasalized and even laryngealized. There are also a number of tone languages, with from two to five contrasts. Although the phonological systems are remarkably divergent, they also display some similarities that can be called areal characteristics.

Typological studies of phonological systems started with the Prague School [TRUBETZKOY 1969(1939)], followed by Hockett [1955]. Since the period beginning in the late 1950's when structuralism gave way to universalism in linguistics, there have been two trends. One of these, generative theory, focuses on in-depth studies of particular languages; the other, linguistic typology, approaches language universals from a broader, cross-linguistic perspective. The generative school has made important contributions in phonological typology. These works, chiefly by Halle [1959, 1962, 1963, 1964a, 1964b], Postal [1968] and Chomsky and Halle [1968] owe much to the Prague School, and were primarily concerned with concepts such as distinctive features, markedness, and implicational universals. Linguistic typology, on the other hand, became popular with the publication of *Universals of Language* [1966], edited by Greenberg, who also stimulated typological investigations in phonology. Much important work treating phonology typologically appeared in *Stanford Working Papers on Language Universals* and *UCLA Working Papers in Phonetics*. General work on phonological typology based on the segmental inventory is found in Hockett [1955] and Lass [1984]. Sedlak [1969] and Crothers [1978] have contributed to vowel-system typology, while Maddieson [1980a, 1980b, 1984], Nartey [1979] and others associated with the Stanford Phonology Archive (SPA) and UCLA Phonological Segment Inventory Database

(UPSID) have contributed to consonant-system typology. However, the phonological systems of Middle American languages have not yet been studied extensively, although some scholars have treated them on a less extensive scale [KAUFMAN 1973, ESCALANTE 1975, SUÁREZ 1983b].

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

2.1. Phonological Descriptions

Although there exist many descriptive schemes for presenting phonological inventories, this monograph follows the traditional framework, partly because almost all investigators of Native Middle American languages utilize this framework and partly because it is convenient to utilize this scheme for typological studies of phonological systems, i.e., a typical chart consists of places of articulation from left to right and manners of articulation from top to bottom. The phonetic symbols used in this study, however, are not from the IPA but are "American Usage" symbols with some modifications [cf. PULLUM and LADUSAW 1986]. Using such charts for each language, we can make a typological comparison of 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; rather, all symbols have been transliterated into a standard set. (See Appendix 1 for the full set of symbols used here.) We may say that these tables represent the full range of phonological units found in Native Middle American languages.

Accounts of the phonological systems of almost all the languages (including many dialects) in Middle America have now been published, but their descriptions vary from publication to publication. However, they differ considerably, with theoretical orientations ranging from structuralist to generative, and as to the quality of their analyses as well. For example, in Mixe-Zoquean linguistics, a distinction between marginal and full phonemes is usually made; this yields voiced obstruents as so-called taxonomic phonemes without underlying voiced obstruents in generative treatments. In addition, some Costa Rican linguists tend to set up nasalized vowels which cause adjacent stops to become nasals instead of admitting primary nasal consonants.

In the inventory of each language, some sounds represented are fully phonemic while others, on the other hand, are phonetic. Sometimes determination of their phonemic status is needed [for example, KAUFMAN 1967]. Cuna provides an exam-

ple. Cuna has only twelve consonants according to the source report (see Database 1), but geminate consonants occur frequently in intervocalic position. The plain stops tend to be voiced, while the geminated stops are always voiceless. The plain and geminate consonants correspond to one another 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 the fortis and lenis consonants distinguished in several varieties of Zapotecan. The quality of phonological analysis varies depending on the individual researcher. Nevertheless, I have generally accepted the inventories proposed by authors who deal primarily with the languages in question and I utilize them in the database of my study. This raises questions about the reliability of the data, and makes it difficult to compare the data equally, but having neither sufficient data nor knowledge of the languages in question, I have chosen not to reanalyze them.

It is occasionally difficult to determine appropriate symbols for the phonemes from phonological descriptions when certain conventional symbols have been used. In such cases detailed description is needed. It is necessary to consider not only phonemes but also allophones and morphophonemic rules. However, I have not attempted to include information on allophonic variation, syllable structure, or phonological-morphophonological rules, although I recognize the importance of improving data of uneven quality for typological studies. In some cases only phoneme lists are available, while in others detailed descriptions are given. Where detailed information is available, I add notes on relevant descriptions. Some notations given have been changed according to the language's description; for example, /š/ is replaced by /ʃ/ when the /š/ is described as being retroflexed.

In some instances it happens that even the same author has changed his or her previous analysis and presented a new system, in which case I take the phonemic inventory from the most recent publication. Otherwise, I add comments. When data on a given language are available from two or more sources whose descriptions are different, I present all of them and utilize them for this study. In some cases, however, I select the most reliable data or add some comments, evaluating the author's experience with the language under consideration, since some of the studies were done over short periods by authors with limited exposure to the language in question.

In describing the segmental inventories for typological studies, one encounters the problems mentioned above, and more besides. In the phonemic inventories some phonemes are more problematic than others. For example, in some instances it is difficult to decide whether a single segment or a consonant cluster is the more appropriate interpretation for affricates, prenasalized stops, geminates, diphthongs, labialized consonants, palatalized consonants, and so forth. The glottal stop /ʔ/ has been treated as a consonant, but in some of the 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 regular-

ized, the phonological systems will be difficult to compare. However, phonemes are language-particular and as a result, total comparability is impossible by definition. Even if one tries to achieve a uniform level of description, it is not practically feasible to do so, given the information available. For example, the Otomí and Chatino data in Maddieson [1984: 376, 378] can be compared with my data. Maddieson tried to regularize phonological systems. In Otomí, he set up many phonemes not present in the original work 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 example illustrates why it is wise 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 the phonemic inventories. However, I have excluded foreign (borrowed) phonemes.

The order of presentation of the phonemic inventories follows the language classification in Table 1. The number in square brackets following a language name corresponds to the number in the classification and on the map. The number of consonants and vowels is given after the source(s) examined for the phonological data, where C represents consonants and V vowels. For example, (20C, 5V+5L) means a given language has 20 consonants, and 5 short and 5 long vowels. The symbols L, G, and N represent long, geminate, and nasalized vowels, respectively. Languages marked by ✕ before their names are eliminated from this study, because sources on them are unreliable. Although data from 59 languages or varieties are eliminated from the whole database, I have included the data from many dialects of Nahuatl, Mixtecan, Zapotecan and so forth, because I am more interested in language variation than in typology itself. Such treatment may skew the statistical and typological survey.

I follow the usual convention of enclosing phonetic citations between square brackets ([]) and phonemic ones between slashes (/ /). I represent length with /:/, geminate with double letters and nasalized vowels with a hook (/ɣ/). For other symbols, see Appendix 1.

(See Database 1.)

2.2. Consonant System Typology

Since consonantal systems show a high degree of variability, they present difficulties when treated as a whole. However, different subsystems of consonants can be separated from one other on the basis of phonetic features. Following the traditional division, I will discuss stops, fricatives, nasals, liquids, and glides (vocal approximants). The first two of these are obstruents, the rest, sonorants. I use "liquids" here as a cover term for so-called *l* and *r* sounds. Before discussing the consonantal systems in detail, I will treat them statistically.

2.2.1. Statistical Survey

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

2.2.1.1. The Number of Contrasting Units

I include in this study many dialects, especially Nahuatl, Mixtecan and Zapotecan ones. It is, however, notoriously difficult to distinguish between languages and dialects. The classification of language as opposed to dialect is also strongly influenced by academic tradition. For example, the Mayan family is minutely classified when compared with the Mixtecan, Zapotecan, Chinantecan, Mazatecan and several other language families. Many so-called dialects of Mixtecan, Zapotecan and some others are in fact languages, if we apply the same standards of the Mayan family classification to them. The criteria used for classification are not the same. I collected as much data as I could, and left these issues unsettled due to the difficulties inherent in distinguishing languages from dialects. Accordingly, many dialects are included in the data. The data for each language (or dialect) must be regarded naturally as a sampling unit. Since both dialects and languages (depending on the definition) are counted, the resulting sum may bias the findings. For example, I described the phonological systems of 22 dialects of Nahuatl in Database 1. If I cite all the Nahuatl data, the number of consonants and the number of dialects are as follows (I have included two different interpretations for the Tlaxpanaloya dialect by the same author, which increases the total data sets to 23):

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

However, if I select only representative dialects, since their phonological systems are very similar, I may end up with the following extreme case, where only one dialect is cited for each different phoneme number:

Number of phonemes	14	15	16	17	18
Number of dialects	1	1	1	1	1

It can be seen that the languages having 15 consonant phonemes, for example, have been reduced from 12 to 1. Or, I might choose only one dialect as representative of its group's phonological system, for example, Classical Nahuatl for Nahuatl, with a similar, if less extreme, skewing of results. These variations in data presentation have a considerable impact in a statistical survey.

For typological studies it is preferable to obtain data from at least one language for each genetic group or major subgroup as well as from each language isolate; however, this study attempts to synthesize the phonological systems of Native Middle American languages. It is not designed to contribute to typological universals per se but rather to study Native Middle American languages from a typological point of view, as I noted in the introduction to this chapter.

I must note that the number of phonemes depends on a somewhat subjective interpretation by the individual analyst and that that number often varies from publication to publication, even in treatments of the same language. Although I have eliminated 59 data sets marked by ✕ in Database 1, there remain instances of inadequate data. Therefore, the following number must be regarded as a sample based on my data (Appendix 2). Distribution in terms of number of consonants in the system is as follows:

Table 2. Distribution in terms of number of consonants in the system¹⁾

Number of phonemes	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
Number of languages ²⁾	1	3	1	8	17	11	18	12	10	13	14	15	18	6	10	
Number of phonemes	26	27	28	29	35							Total				
Number of languages	7	6	1	1	2							174				

Table 2 may not accurately reflect the characteristics of Middle American languages. Even if the frequency gives a false picture, the range of the number of consonants is more or less delimited. The upper and lower limits of the number are 35 and 11 respectively, and we can say that almost all languages (95% in this data) have between 14 and 27 consonant phonemes.

2.2.1.2. Manner Contrast

2.2.1.2.1. 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 3.

Table 3. Number of stop series

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

In languages with a single series, the one stop is voiceless. Two-way manner contrasts are of five types, that is, voiceless vs. voiced, voiceless vs. prenasal, 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 of the 13 languages with voiceless vs. voiced vs. glottalized contrasts are Mayan. /b/ is their only voiced stop with the exception of Mopán, 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 contrast type from 13 to 3. In fact, all the other Mayan languages have /b'/ as a voiced glottalized phoneme in-

stead 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 languages with a voiceless vs. glottalized contrast increases from 28 to 38. Note that I have included Chalcatongo Mixtec in the voiceless vs. prenasal group, although it has a voiced stop and a prenasalized stop; I have included Juárez Zapotec in the fortis vs. lenis type, although it has voiceless and voiced lenis and voiced stops.

Table 4. 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	

We have 9 types of manner contrasts in stops, but some types are seen only in specific language groups. This means that some types of manner contrast exert limited distributions geographically. For example, glottalized consonants are characteristic of the Mayan family. Besides Mayan, only Tepehua, Oaxaca Chontal, Xinca and Tol have them. Tol, however, has aspirated consonants in addition to glottalized consonants, so that it has a triple contrast of voiceless vs. aspirated vs. glottalized stops. Although the glottalized consonants of the languages are limited to stops, Oaxaca Chontal is the exception, with contrasts not only in stops (mostly affricates) but also in nasals, laterals and glides. As is indicated in the Note on Totonacan in Database 1, Tepehua's glottal stops seem to have developed from the historical process of CV? > CṼ > 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 Térraba-Teribe. Languages with voiceless stops only represent 21% of the total, and those with a voiceless vs. voiced contrast 30%. However, a distinction between these two types is not clear-cut, but depends on the phonemic analysis in some of the languages. In the Mixe-Zoquean group, for example, four dialects have a voiceless vs. voiced contrast, while five have voiceless stops only. The latter do have voiced consonants phonetically, but these are generated by morphophonemical rules, that is, voiceless consonants become voiced before or after

nasals and between vowels. On the other hand, in the four dialects with a voiceless vs. voiced contrast, voiced consonants are regarded as phonemes, but only as marginal ones. Therefore, when we discuss voiceless vs. voiced contrasts, we must treat them for every language family. More detailed discussion will be given in Section 2.2.2.

2.2.1.2.2. 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 seen only in Oaxaca Chontal. More than half of the data are of the voiceless only type.

Table 5. 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

Note that although Yatee Zapotec has a non-contrastive /ɣ/, in addition to fortis and lenis fricatives, it is included in the fortis vs. lenis type. One language, Lachixio Zapotec, is excluded from the above table, because its prenasalized fricative /ⁿz/ seems to be uncommon. Thus Lachixio Zapotec has a voiceless vs. voiced vs. prenasalized contrast.

2.2.1.2.3. Manner Contrasts in Sonorant Series

Manner contrasts in sonorants are somewhat less common than in fricatives, but some languages display the following contrasts. Other distinctions will be treated in Sections 2.2.4 to 2.2.6.

2.2.1.2.3.1. Nasals

Voiced vs. Voiceless:

Tequistlatec Chontal, Mixtec(Atatlahuca)

Fortis vs. Lenis:

Chichimec¹, Trique(Chicahuaxtla), Zapotec(Juárez, Ixtlán, Zoogocho, Yatzachí, Cajonos, Yalalag, Yatee, Albarradas, Mitla², Guelavia¹, Chichicapan, Guevea, Isthmus¹)

Voiced vs. Glottalized:

Huamelultec Chontal

2.2.1.2.3.2. Liquids (/l-sound)

Voiced vs. Voiceless:

Cuitlatec¹, Paipai², Cocopa², Seri¹, Totonac(Xicotepec, Papantla), Tepehua(Huehuetla), Te-

quistlatec Chontal¹, Xinca², Guatuso

Fortis vs. Lenis:

Trique (Chichahuaxtla), Zapotec (Juárez, Ixtlán, Zoogocho, Yatzachi, Cajonos, Yalalag, Yatee, Albarradas, Mitla², Guelavia¹, Chichicapán, Guevea, Isthmus¹)

Voiced vs. Voiceless vs. Glottalized:

Huamelultec Chontal, Tequistlatec Chontal²

2.2.1.2.3.3. Glides

Voiced vs. Voiceless:

Nahuatl (Hautla), Nahual (Pómaro), Seri¹, Tequistlatec^{1,2}

Fortis vs. Lenis:

Trique (Chichahuaxtla), Zapotec (Juárez, Guevea)

Voiced vs. Glottalized:

Huamelultec Chontal

2.2.1.3. Position Contrast

2.2.1.3.1. Stop Series

The three-position contrast in stops is the simplest in Middle America, and it conforms to the simplest contrast that has been identified cross-linguistically. Stop series here include affricates but exclude lateral affricates. The glottal stop /ʔ/ is given individual treatment in some cases. The glottal stop /ʔ/ is common in Middle America, but is not found in 23 languages.

Table 6. Voiceless stops: number of places of articulation and number of languages

Voiceless stops								Total
Number of places 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)

If we take into consideration only voiced stops, the number of places of articulation ranges from 0 to 5. In Table 7 there are 68 languages with voiceless stops only, representing 39% of the total.

Table 7. Voiced stops: number of places of articulation and number of languages

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

The number of places of articulation for prenasalized and lenis stops is as follows:

Table 8. Prenasalized stops: number of places of articulation and number of languages

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

Table 9. Lenis stops: number of places of articulation and number of languages

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

Juárez Zapotec is not included in these Tables. Juárez Zapotec is reported to have 6 voiceless fortis and 6 voiceless lenis, 1 voiced fortis and 3 voiced lenis stops.

2.2.1.3.2. Fricative Series

Fricative series have from 1 to 6 position contrasts. Voiced fricative series have from 0 to 6 position contrasts. Voiced fricatives include the lenis fricatives found in two Trique dialects and in 18 Zapotecan languages/dialects, as well as a prenasalized fricative found only in Lachixio Zapotec.

Table 10. Fricatives: number of places of articulation and number of languages

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

101 (58%) languages have voiceless fricatives only. Languages with a voicing contrast are mainly Otomanguean (57 of the 73 languages having voiced fricatives).

2.2.1.3.3. Nasal Series

Nasals have four position contrasts.

Table 11. Nasals: number of places of articulation and number of languages

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

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, all Mixtec and Bribrí nasals are not registered as phonemes, but Tepetotutla Chinantec is recorded as having prenasalized stops rather than 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 Section 2.4).

2.2.2. Stop Systems

I treat affricates (except lateral affricate /ʎ/) as positions as do HOCKETT [1955] and LASS [1984]. However, some languages with a voice contrast lack the corresponding voiceless affricates; furthermore, it is often argued that there is a strong correlation between the occurrence of affricates and that of sibilants. Therefore, I will delay discussing them further until after I have treated the stops.

Among voiceless stop types the simplest known is a 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 12, along with the number of languages which have the glottal stop /ʔ/.

Table 12. 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	
(Number of languages with /ʔ/)	0	5	29	45	54	11	5	1	150)	

The resultant table differs somewhat from Table 6 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	Mískitu, Sumu, Rama, Térraba, Teribe
3 t č k	Guaymí, Bocotá
4 p t č k	Garífuna, Guatuso
4 p t k ʔ	Southern Tepehuan ¹ , Otomí (Tenango), Chinantec (Lealao), Chatino (Yaitepec)
5 p t tʰ k ʔ	Chinantec (Quiotepec)
5 p t c č k	Nahuat (Pajapan, Jalupa), Pochutec, Tarasco ¹ , Huave
5 p t c k ʔ	Otomí (Sierra), Chinantec (Palantla, Tepetolutla, Sochiapan, Tlacoatzintepec), Tequistlatec ¹ , Zoque (León, Chimalapa), Mixe (Coatlán, Paraíso, Tlahuitoltepec), Tol
5 p t č k kʷ	Cuna

5 p t č k ?

5 p t k k^w ?

5 t c č k ?

5 t č k k^w ?

6 p t tʲ k k^w ?

6 p t tʲ č k ?

6 p t c č k ?

6 p t c č k k^w

6 p t c k k^w ?

6 p t č k k^w ?

6 p t č k q ?

6 t tʲ c č k ?

6 t c č č k ?

6 t c č k k^w ?

7 p t tʲ c č k ?

7 p t tʲ č k k^w ?

7 p t tʲ kʲ k k^w ?

7 p t c k k^w q ?

7 p t c č tk k ?

7 p t c č k k^w ?

7 p t c č k q ?

7 p t c č č k ?

Papago, Tarahumara^{1,2}, Yaqui¹, Mayo, Zapotec (Zoogocho, Yatee, Isthmus¹), Chinantec (Comaltepec)

Seri¹

Boruca

Mixtec (Huaquapan, Alacatlazala, Chalcatongo, Diuxi², Peñoles)

Mixtec (Chayuco)

Northern Tepehuan

Chichimec¹, South Pame, Mezquital Otomí¹, Tlapanec¹, Trique (Chichahuaxtla), Tequistlatec², Zapotec (Cajonos, Rincón, Choapan, Guelavia¹, Guevea), Sayula Popoluca, Oluta Popoluca, Mixe (Totontepec¹), Mayan (Yucatec², Lacandón, Itzá², Mopán, Chontal, Chortí, Tzotzil¹, Tzeltal, Tojolabal, Chuj)

Nahuatl (Tetelcingo, Amilcingo, Zongolica, Matlapa, Coscatlán), Nahuatl (Zacapoaxtla, Mecayapan), Pipil, Tarasco²

Huichol¹

Cuitlatec¹, Mixtec (Acatlán, Molinos, Ocotepec², Silacayoapan, Atlatluha, El Grande), Cuicatec², Zapotec (Yatzachí, Yalalag, Albarradas, Tlacochahuaya, Ayoquesco)

Paipai²

Ixcatec, Mazatec (Chiquihuitlán)

Western Popoloc¹

Jalapa Mazatec

Amuzgo (San Pedro¹), Huamelultec Chontal, Sierra Popoluca, Zoque (Copainalá), Chol¹

Mixtec (Jamiltepec, Jicaltepec, Colorado), Zapotec (Chichicapan)

Mixtec (Ayutla²)

Kiliwa²

Cabécar, Bribri¹

Nahuatl (Classical, San Jerónimo, Tlaxpanaloya, Acaxochitlan, Huautla), Pómaro Nahual, Matlatzinca, Ocuiltec, Otomí (Temoayán), Mazahua, Mixtec (Mixtepec, Coatzacoapán), Zapotec (Juárez, Mitla², Quioquitani), Huastec (Veracruz, Potosí)

Totonac (Xicotepic, Papantla), Tepehua (Teachichilco, Huehuetla), Central Pame, Mayan (Jacaltepec, San Miguel Acatepec, Kekchí, Pocomchi^{1,2}, Pocomam, Uspantec, Quiché^{2,3}, Cakchiquel^{1,2}, Tzutujil^{1,2})

Eastern Popoloc, Tlacoyalco Popoloc, Chocho,

8	p	p ^w	t	c	č	k	k ^w	?	Mazatec (Huautila, Solaytepec), Copalá Trique
8	p	t	t ^y	c	č	k	k ^w	?	Cora ² (Ixcatán)
8	p	t	t ^y	c	č	č ^y	k	?	Chatino (Tataltepec ¹)
8	p	t	tt	c	č	k	k ^w	?	Cora ¹ (Jesús María)
8	p	t	c	č	č	k	q	?	Zapotec (Ixtlán)
8	p	t	c	č	k ^y	k	k ^w	?	Kanjobal, Acatec ¹ (San Rafael), Ixil ¹ (Nebaj)
8	p	t	c	č	k ^y	k	q	?	Zapotec (Lachixio)
8	t	c	t ^y	č	k	k ^y	k ^w	?	Sacapultec, Sipacapeño
9	p	t	t	c	k	k ^w	q	q ^w	Amuzgo (Xochistlahuaca)
9	p	t	c	č	č	k ^y	k	q	Cocopa ²
9	p	t	c	č	č	k	q	?	Tectitec, Mam, Aguacatec
10	p ^w	t	c	č	č	k	k ^w	q	Ixil ² (Chajul)
									Ixil ³ (Cotzal)

Middle American languages have from 3 to 10 voiceless stops and can be classified into 42 types. The frequency of occurrence of phonemes that appear in the 42 types is as follows. I count only the phonemes in each type, as a way of controlling the statistical impact of dialects, such as Nahuatl, which are over-represented in the data.

p	p ^w	t	ṭ	tt	tʸ	c	ć	č	čʸ	č̣	tk	kʸ	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

The hierarchy of occurrence can be implicationaly represented as follows:

t, k > ? > p > č > c > k^w > t^y > q > k^y, č > p^w > t, tt, č, č^y, tk, q^w

Every language has /t/ and /k/, but /p/ is lacking in some Otomanguean and Chibchan languages. In the Chibchan group, however, Boruca, Guaymí and Bocotá 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 terms of frequency, the normal stops /p t k ʔ/ are followed by the affricates /č/ and /c/; /k^w/ and /t^y/ follow them. /q/ is not found at all until 5 position contrast types and shows a geographically restricted distribution, being found only in Highland Mayan, Totonacan (including Tepehua), Central Pame, and Yuman. /č/ is restricted to two regions, northwestern Oaxaca (mainly in Popolocan, but Copalá Trique and Guelavia Zapotec have it too) and western Highland Guatemala (Kanjobal, Acatec, Tectitec, Mam, Aguacatec, Ixil). Other phonemes, such as /p^w t tt č č^y tk q^w/ have a very restricted occurrence. They are unusual phonemes and are probably 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 also found but are quite rare. Palatalization is observed in alveolar /t^y/, palato-alveolar /č^y/ and velar /k^y/, /t^y/ being more common than /k^y/. /č^y/ is very rare.

I have already briefly discussed manner contrasts in Section 2.2.1.2. Since the relationship between voiceless stops and voiced or other articulatory manners is very revealing, I treat it here in detail.

2.2.2.1. Manner Contrasts

2.2.2.1.1. Voiceless Only

Languages with only voiceless stops number 37; in these, the number of phonemes ranges from 5 to 9.

Table 13. Number of phonemes and languages in regards to voiceless stops

						Total
Number of phonemes	5	6	7	8	9	
Number of languages	8	9	17	2	1	37
(Number of languages with /ʔ/)	7	7	17	2	1	34)

One language with 5 phonemes lacks /ʔ/; among languages with 6 phonemes, 2 lack /ʔ/. All other languages have /ʔ/.

2.2.2.1.2. Voiceless vs. Voiced

I separate /ʔ/ from voiceless stops, because a voiced counterpart for it does not exist.

Table 14. Number of voiceless and voiced stops and number of languages

																			Total	
Number of voiceless stops	4	5	6	3	4	5	6	3	4	5	6	3	4	5	6	7	4	5	6	
Number of voiced stops	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	
Number of languages	2	2	5	1	1	2	1	6	4	4	4	2	6	3	3	1	1	3	1	52

Only 15 of the sets have an identical number of voiced and voiceless stops, but only 12 of these are symmetrical. They are given below.

3:3 Southeastern Tepehuan¹, Otomí (Tenango), Chatino (Yaitepec), Miskitu, Sumu

4:4 Otomí (Sierra), Chinantec (Comaltepec, Quiotepec, Palantla, Tepetotutla)

5:5 Pame South, Mazatec (Jalapa)

Boruca has an asymmetrical stop series of 4 voiceless (t c č k) and 4 voiced (b d ĵ g) stops, while both Guaymí, with 3 voiceless (t č k) and 3 voiced (b ĵ g) stops, and Ixcatec, with 5 voiceless (t tʰ c č k) and 5 voiced (b d dʰ ĵ g) stops, have asymmetrical series as well.

Three languages have more voiced stops than voiceless stops. They are Chinantec (Lealao), Bocotá and Papago. Chinantec (Lealao) and Papago have /ʔ/.

Chinantec (Lealao)

Bocotá

Papago

p t k

t č k

p t č k

b d ĵ g

b d ĵ g

b d ɖ ĵ g

2.2.2.1.3. Voiceless vs. Prenasal

Prenasal consonants are found in Mixtecan, Xochistlahuaca Amuzgo, and

Lachixio Zapotec.

Table 15. Number of voiceless and prenasal stops and number of languages

													Total
Number of voiceless stops	4	4	5	6	7	5	6	8	4	5	6	6	
Number of prenasal stops	1	2	3	3	3	4	4	4	5	5	5	6	
Number of languages	1	3	1	1	1	4	2	1	1	1	1	2	19

The languages with a symmetrical set are only two, Mixtepec Mixtec and Coatzospán Mixtec. Note that Chalcatongo Mixtec, which is classified as having 4 voiceless stops vs. one prenasal stop, has /b/ in addition to /ⁿd/. Acatlán Mixtec has 5 voiceless and 5 prenasal stops, but the system is asymmetrical (p t č k k^w // ^mb ⁿd n_j n_j ⁿg).

2.2.2.1.4. Voiceless vs. Aspirated

This contrast is found only in Tarascan. Tarasco¹ (Ichupio) has a symmetrical set, while Tarasco² (Purenchécuaro) has no aspirated affricates corresponding to /c/ and /č/.

2.2.2.1.5. Fortis vs. Lenis

A fortis vs. lenis contrast is reported in Zapotecan and Trique. Fifteen of 19 languages have a symmetrical series. Fortis stops having no lenis counterparts are /c/, /č/, /č̣/ or /k^w/. These phonemes, except /č̣/, occasionally have lenis counterparts in other languages that have a symmetrical series. Note that Juárez 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.

Table 16. Number of fortis and lenis stops and number of languages

													Total
Number of fortis stops			5	6	4	5	7	5	6				
Number of lenis stops			3	3	4	4	4	5	6				
Number of languages			1	1	3	1	1	9	3				19

2.2.2.1.6. Voiceless vs. Glottalized

Glottalized stops are characteristic of the Mayan language family. They have a symmetrical series except for bilabial consonants. For example, Mam's stop series is as follows:

p t c č č̣ kʷ k q
b' t' c' č' č̣' kʷ' k' q' ?

Two different systems of bilabials are observed, namely, /p p' b^(c)/ and /p b^(c)/.

Roughly speaking, the former is found in Lowland Mayan, and the latter in Highland Mayan. However, Cotzal Ixil is reported to have /p b' pʷ/, and Mopán has /d/ in addition to /t'/.

Huehuetla Tepehua has a system similar to the Mayan one, but in a perfectly symmetrical series, /p t c č k q/ vs. /p' t' c' č' k' q'/.

In Xinca² there are more glottalized stops than plain stops, /p' t' c' k'/ vs. /p t k/.

2.2.2.1.7. Voiceless vs. Voiced vs. Glottalized

Only Oaxaca Chontal has a contrast of voiceless vs. voiced vs. glottalized, if the Mayan languages having /b'/ as their only voiced consonant are excluded. Both Huamelultec and Tequistlatec Chontal have asymmetrical systems.

2.2.2.1.8. Voiceless vs. Voiced vs. Aspirated.

Térraba and Teribe are the only languages in the data to have the contrast voiceless vs. voiced vs. aspirated. Although they are 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 Térraba lacks /p^h/ in the same series.

2.2.2.1.9. Voiceless vs. Aspirated vs. Glottalized

Tol has a triple contrast of voiceless vs. glottalized vs. aspirated in stops, which form a symmetrical series.

2.2.2.2. Affricates and Sibilants

I have grouped affricates with the stops, but affricates also bear some relation to sibilants in their articulation. Accordingly, the following serves to clarify the relationship of affricates to sibilants. There are theoretically 16 combinations of plain affricates and sibilants, of which 8 combinations are found in Middle America.

Table 17. Types of affricate and sibilant combinations

	Affricates		Sibilants		Types	Number of attested languages
	VL	VD	VL	VD		
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

Note that there is one language which completely lacks a voiceless corresponding affricate (Lealao Chinantec) and also one language which lacks a voiceless corresponding sibilant (Huichol¹). Acatlán Mixtec lacks the voiceless counterpart of /ⁿj/ but has /č ⁿj/. There are, furthermore, 3 types having aspirated and/or glottalized affricates. These 3 types comprise 42 languages, which have only voiceless sibilants.

I will describe the types following the classification above. The languages below have sibilants only. They can be divided into two types, languages having voiceless sibilants only and those having a voiceless-voiced contrast.

2.2.2.2.1.1. Languages with Sibilants Only

s		Mískitu, Sumu, Southern Tepehuan
s	š	Chatino (Yaitepec), Chinantec (Quiotepec), Rama
s	ṣ̌	Seri ¹
θ	s	Mixtec (Chayuco)
s	sʷ	Mixtec (Ayutla ²)

2.2.2.2.1.2. Languages with a Voiceless vs. Voiced Contrast in Sibilants

s	š	z	Otomí (Tenango)	
s	š	z	ž	Térraba, Teribe

[c] and [č] are interpreted as consonant clusters [ts] and [tš] in Yaitepec Chatino. In Southern Tepehuan [č j š] are interpreted as palatalized /t d s/ contiguous to /i/. Affricates may also occur in other languages, (excepting Mískitu, Sumu and Rama), but they are interpreted not as the phonemes /c č/ but as consonant clusters or palatalized consonants.

2.2.2.2.2. The Relationship between Affricates and Sibilants

The relationship between affricates and sibilants is more complex than initially expected. I identify 7 major combinations; voiceless only, voiceless affricates with voiced sibilants, voiceless affricates with a voiceless-voiced contrast in sibilants, voiced affricates with voiceless sibilants, a voiceless-voiced contrast in affricates with voiceless sibilants, a voiceless-voiced contrast in both affricates and sibilants, and a voiceless-aspirated/glottalized contrast in affricates. These combinations have been subdivided into various types, of which I will focus only on the symmetrical ones.

2.2.2.2.2.1. Voiceless Types: 60 languages

c	s	Kiliwa ² , Zoque (León, Chimalapa), Garífuna
c	š	Mixe (Coatlán, Paraíso)
c	s	Mixtec (Colorado), Mixe (Tlahuitoltepec)
c	θ s	Chinantec (Sochiapán, Tlacoatzintepec)
c	s	Cocopa ²
č	s	Tarahumara, Yaqui ¹ , Mayo, Cuicatec ² , Cuna
č	š	Cuitlatec ¹
č	s	Northern Tepehuan, 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		š	Mazatec (Chiquihuitlán), Sayula Popoluca
c	č ^y	č	s	š	Cora ¹
c	č	č	s	š	Eastern Popoloc
c	č	č	s	š	Mazatec (Soyaltepec)
c	č	č	s	š	Mazatec (Huautila)

There are 60 sampling languages (including dialects) in 15 combinations, of which /c s/ (4 samples), /č š/ (1), /c č s š/ (31) and /c č č s š š/ (1) are perfectly symmetrical. The symmetrical type makes up 37 languages (62%) out of the 60. If we include near symmetrical series such as /c š/, /č s/, and /c č s š/, the total reaches 46 (77%). /č s š/ is observed in 5 languages. Other combinations are attested in only a few languages.

2.2.2.2.2.2. Voiceless Affricates and Voiced Sibilants: 1 language

This type is attested in only one language.

c		z	Huichol ¹
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2.2.2.2.2.3 Voiceless vs. Voiced in Sibilants: 13 languages

This type has voiceless affricate(s) and voiceless vs. voiced sibilants. It can be further subdivided into 9 subtypes, which are attested in only a few languages.

č	s	š	ž	Mixtec (Huahuapan, Molinos, Chalcatongo, Diuxi ²)
c	č	s	š	Zapotec (Lachixio)
c	č	s	š	Temoayan Otomí, Mazahua
c	č	s	š	Trique (Chicahuaxtla)
c	č	θ	s	Zapotec (Ixtlán)
c	č	θ	s	Mezquital Otomí ¹
c	č	č	s	Tlacoyalco Popoloc
c	č	č	s	Western Popoloc ¹ , Chocho
c	č	č	s	Trique (Copalá)

There are only two types of symmetrical voiceless vs. voiced sibilants, /s š z ž/ (including lenis sibilants) and /s š š z ž ž/. If affricates are taken into consideration, the following two types also show symmetry: /c č s š z ž/ and /c č č s š š z ž ž/.

2.2.2.2.2.4. Voiced Affricates and Voiceless Sibilants: 1 language

Lealao Chinantec is reported to have only a voiced affricate and a voiceless sibilant.

j	s	Chinantec (Lealao)
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2.2.2.2.2.5. Voiceless vs. Voiced in Affricates: 20 languages

This type has a voiceless vs. voiced contrast in affricates, but has only voiceless sibilants.

c	j	š	Sierra Otomí			
c	j	s	Chinantec (Palantla, Tepetotutla)			
č	ǰ	s	Chinantec (Comaltepec), Guatuso, Guaymí, Bocotá			
č	ǰ	s	š	Papago		
č	ɲǰ	s	š	Mixtec (Ocotepéc ²)		
č	ɲǰ	ǰ	s	š	Mixtec (Acatlán)	
c	č	ǰ	s	š	Tlapanec ¹ , Ixcatec, Zoque (Copainalá), Boruca, Cabécar, Bribri ¹	
c	č	j	ǰ	s	š	South Pame, Mazatec (Jalapa de Díaz)
c	č	ɲǰ	s	š	Mixtec (Coatzospán)	
c	č	ɲǰ	ǰ	s	š	Mixtec (Mixtepec)

Symmetrical systems in affricates are of 5 subtypes, /c j/, /č ǰ/, /č ɲǰ/, /c č j ǰ/, and /c č ɲǰ ǰ/. If sibilants are taken into consideration, then there are 3 subtypes of symmetrical systems, /c j s/, /c č j ǰ s š/, and /c č ɲǰ s š/.

2.2.2.2.6. Voiceless vs. Voiced in Both Affricates and Sibilants: 22 languages

Languages having a voiceless vs. voiced contrast in both affricates and sibilants can be divided into 9 subtypes, of which 2 subtypes, /c č ǰ ǰ s š z ʒ/ and /c č ǰ ǰ s š z ʒ/ show symmetry.

c	č		ǰ	s		z		Chichimec ¹
	č		ɲǰ	s	š		ž	Mixtec (Silacayoapan, Atatlahuca, El Grande, Peñoles)
	č		ǰ	s	š		z ž	Zapotec (Tlacoachahuaya, Isthmus ¹)
	č		ǰ	s		š	<u>z</u> <u>ž</u>	Zapotec (Yatee, Albaradas, Chichicapan, Ayoquesco)
	č		ǰ	s		š	<u>z</u> <u>ž</u> <u>ž</u>	Zapotec (Yalalag)
	č		ǰ	s	š	š	<u>z</u> <u>ž</u> <u>ž</u>	Zapotec (Zoogocho, Yatzachí)
c	č		j ǰ	s	š		<u>z</u> <u>ž</u>	Zapotec (Rincón, Choapan, Mitla ² , Quiquitani, Guevea)
c	č		j ǰ	s	š		<u>z</u> <u>ž</u>	Zapotec (Cajonos, Guelavia ¹)
c	c	č	č	θ	s	š	θ š ž	Zapotec (Juárez)

2.2.2.2.3. Voiceless vs. Glottalized and/or Aspirated in Affricates: 42 languages

This type includes aspiration and glottalization in its affricates. Aspirated affricates are seen in Tarasco and Tol; the latter also has a glottalized affricate. Glottalized affricates are seen in Huehuetla Tepehua, Oaxaca Chontal, Mayan and Xinca. They form symmetry with the plain affricates and sibilants, except in Huastec, Xinca² and Tequistlatec¹.

c	č	c ^h č ^h	s š	Tarasco ¹
c		c ^h c'	s	Tol
		c'	š	Xinca ²
c		c' č'	s š	Tequistlatec ¹
c	č	c' č'	s š	Huehuetla Tepehua, Tequistlatec ² , Huamelultec, Mayan (Yucatec ¹ , Lacandón, Itzá ² , Mopán, Chol ¹ , Chontal, Chortí, Tzotzil ¹ , Tzeltal, Tojolabal, Chuj, Kekchí, Pocomchí ^{1,2} , Pocomam, Uspantec, Quiché ^{1,2,3} , Sacapultec, Sipacapeño, Cakchiquel ^{1,2} , Tzutujil ^{1,2})
c	č	c' č'	θ š	Huastec (Veracruz)
c	č	c' č'	θ s š	Huastec (Potosí)

c ċ ċ' c' ċ' ċ' s š š Jacaltepec, Kanjobal, Acatepec, Tectitepec, Mam, Aguacatepec, Ixil^{1,3}
 c é ċ ċ' c' é' ċ' ċ' s š š Ixil² (Chajul)

The hierarchy of occurrence can be described as follows:

Voiceless sibilants:

s (55) > š (40) > ʃ (15) > θ (6) > ɬ (4) > ʈ (1), ʂ (1), sʲ (1)

Voiced sibilants:

z (9), ʒ (9) > ɹ (6) > ʐ (5), ʑ (5) > ʝ (2) > ɹ (1), or z ɹ > ʒ ʑ > ʝ ʝ

Voiceless affricates:

č (42) > c (39) > ɟ (8) > c' (8) > č' (6) > c^h, č' (2)
 > ɟ, č^y, č^h, é, é' (1)

Voiced affricates:

ʝ (7) > ɟ, ɲ (5) > j (4) > ɲ (3) > ɟ (1), or ʝ, ɟ > j ɟ > ɲ > ɲ

In the above series of voiceless sibilants, voiced sibilants, voiceless affricates and voiced affricates, the number in parentheses indicates the frequency of the individual phonemes in the sets.

The phonemes which occur in more than 70% of the languages are /s š c č/. In other words, they constitute the most common phonemes.

2.2.3. Fricative Systems

The fricative series, both voiceless and voiced, show the greatest variability of all the consonant series. There are 26 types of voiceless fricative series and 54 types of fricative systems with both voiceless and voiced fricatives.³⁾ All languages except Huichol have /s/. Voiceless fricatives may include, besides /s/, any of the following: /θ š ʃ h x f/; other fricatives are exceedingly rare.

/h/ is often called a glottal fricative, although the turbulent air stream, characteristic of fricatives, is scarcely audible; hence some linguists exclude /h/ from the fricatives altogether [cf. Maddieson 1984, chap.3]; however, /h/ is discussed here with the other fricatives, since 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/ also bears some relationship to /ʔ/, and is sometimes placed in a special class of laryngeals along with /ʔ/. This is recognized in Nahuatl languages, where 2 dialects have only /ʔ/, and 10 dialects have only /h/, while 5 other dialects have /h ʔ/.

I was embarrassed to find when I found that the retroflexed sibilant is transcribed by either ʃ or ʂ in my data. Bright notes that the sound ʃ is between s and š, and š is strongly retroflexed [BRIGHT 1984]. These two sounds, ʃ and š, are in fact different, although they are not distinguished even in the IPA scheme, in which only one retroflexed sibilant is given. Generally speaking, the lamino-alveolar sibilant is transcribed as s while the apico-alveolar one is represented by ʃ; however, retroflex is also expressed by ʃ. That is, ʃ is used for either the retroflex or the apico-alveolar sibilant. Moreover, š is sometimes transcribed as ʃ. The confused state of the conventions governing the transcription of retroflex sibilant(s) was unavoidably

reflected in my data.

Turning to the Middle American languages, ς is used for Papago, Guarijío, Cocopa and Xinca. ς is interpreted as an apico-domal retroflexed sibilant. This ς represents an areal feature of Californian languages [BRIGHT 1984]. On the other hand, southern languages such as Zapotecan and Mayan have an alveo-patalal retroflex \check{s} . Chajul Ixil, a dialect of Ixil, has an apico-alveolo-palatal \acute{s} in addition to s , \check{s} , and \acute{s} . This \acute{s} may be the same as ς . Therefore I distinguish two retroflexed sibilants as follows:

Alveolar	Retroflexed	Alveo-palatal	Retroflexed
s	ς	\check{s}	\acute{s}

I was also perplexed to find that $/\delta/$ is used to represent a fricativized $/\acute{d}/$. $/\delta/$ is a voiced interdental fricative with $/\theta/$ as its voiceless counterpart. $/\acute{d}/$ is distinct from $/\delta/$. Nevertheless, the two are not distinguished in either IPA or American Usage. Since it is difficult to distinguish them ($/\delta/$ is fricative and $/\acute{d}/$ is approximant), I use $/\delta/$ for all fricativized d sounds.

The following list contains each variety of fricative type. I exclude lateral fricatives and spirantized W from the fricative data, as they will be treated with the laterals and the glides, respectively. Fricative series can be classified into two groups, voiceless only, and voiceless vs. voiced. These two major classes can be further subdivided.

$/f/$ and $/\phi/$ do not co-occur, and are regarded as allophones of one and the same phoneme. Their voiced counterparts $/v \beta/$ are also interchangeable. Thus $/f \phi/$ and $/v \beta/$ can be divided into two classes, voiceless bilabial/labial and voiced bilabial/labial, respectively. Moreover, in many cases $/x/$ does not contrast with $/h/$, although some languages do have this contrast. Finally $/\check{s}/$ and $/\acute{s}/$ are interchangeable in some cases. As a result, the following list can be simplified so that, for example, $/s h/$ and $/s x/$ are grouped together. Curly brackets enclose similar (interchangeable) sets below.

2.3.1. Languages with Voiceless Fricatives Only

2.2.3.1.1. Language with One Fricative

s	Cuna
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2.2.3.1.2. Languages with Two Fricatives

{	s	h	Tarahumara ¹ , Yaqui ¹ , Mayo, Zoque (León, Chimalapa), Chinantec (Comaltepec), Tol, Miskitu, Sumu, Bocotá
	s	x	Tarahumara ²
{	\check{s}	h	Sierra Otomí, Mixe (Coatlán, Paraíso)
	ς	h	Xinca ²
	s	\check{s}	Nahuatl (Classical, Tlaxpanaloya), Mixtec (Jicaltepec), Rama

2.2.3.1.3. Languages with Three Fricatives

{	s	ς	h	Papago
	s	\check{s}	h	Cora ¹ , Nahuan (14: Jerónimo, Tetelcingo, Amilcingo,

{	s	š	x	Matlapa, Coscatlán, Acaxochitlán, Huautla, Pómaro, Zacapoaxtla, Mecayapán, Pajapán, Jalupa, Pipil, Pochutec), Totonacan (Xicotepec, Papantla), Tepehua ^{1,2} , Central Pame, South Pame, Mazatec (Jalapa, Soyaltepec), Amuzgo (San Pedro ¹), Chatino (Yaitepec), Huave, Zoque (Copainalá), Sierra Popoluca, Oluta Popoluca, Mixe (Tlahuitoltepec), Yucatec ² , Lacandón, Itzá ² , Mopán, Chol ¹ , Chontal, Chortí, Tzeltal, Tojolabal, Cabécar, Bribri ¹
	s	š		Tarasco ^{1,2} , Uspantec, Quiché ³ , Sacapultec, Sipacapeño, Tzutujil ^{1,2} , Boruca
	s		h	Sayula Popoluca
	φ	s	h	Chinantec (Palantla)
	f	s	h	Chinantec (Tepetotutla), Garífuna
φ	s		x	Guatuso

2.2.3.1.4. Languages with Four Fricatives

s		x	x ^w	h	Kiliwa ²
s	š	x		h	Chuj, Kekchí, Pocomchí ^{1,2} , Pocomam, Quiché ²
s	š	š	x		Acatec ^{1,2} , Tectitec, Mam, Aguacatec, Ixil ¹
θ	s	š		h	Huastec (Potosí)
f	s	š		h	Nahuatl (Zongolica)
φ	s	š		h	Tlapanec ¹ , Ixcatec

2.2.3.1.5. Languages with Five Fricatives

s	š		h	h ^y	h ^w	Chatino (Tataltepec ¹)
s	š	š	x	x ^w		Cocopa ²
s	š	š	x		h	Jacaltepec, Kanjobal
s	š	š	š		h	Ixil ² (Chajul)
f	f ^r	s	š	x		Huamelultec, Tequistlatec ²
f	f ^r	s	š		h	Tequistlatec ¹

2.2.3.1.6. Language with Six Fricatives

φ	s	š	x	X	X ^w	Seri ¹
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2.2.3.2. Languages with Voiceless vs. Voiced Fricatives

2.2.3.2.1. Language with One Voiceless and One Voiced Fricatives

h	z	Huichol ¹
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2.2.3.2.2.1. 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	δ	Guaymí
s	š		v	Mixtec (Mixtepec)

2.2.3.2.2. Languages with Two Voiceless and Two Voiced Fricatives

{ s		h		β	ð	Tarahumara ¹
{ s		x		v	ð	Cuicatec ²
{ s	š			<u>z</u>	<u>ž</u>	Zapotec (Choapan, Tlacoahuaya, Guevea, Isthmus ¹)
{ s	š			<u>z</u>	<u>ž</u>	Zapotec (Albarradas, Guelavia ¹ , Chichicapán, Ayoquesco)

2.2.3.2.3. Languages with Two Voiceless and Three Voiced Fricatives

	š	h		β	ð	γ	Cuitlatec ¹
s	š		ž	β	ð		Mixtec (Huaquapan)
s	š			β	ð	ð ^v	Mixtec (Coatzospan)
s	š		<u>z</u>	<u>ž</u>		γ	Zapotec (Yatee)

2.2.3.2.3.1. 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), Cakchiquel ^{1,2}
s	š	h		β		Mazatec (Chiquihuitlán)
s	š	h		v		Mazatec (Huautila)
θ s		h			ð	Chinantec (Tlacoatzintepec)
θ s	š			v		Mixtec (Chayuco)
θ s	š	h		β		Huastec (Veracruz)
f s		h		v		Chinantec (Lealao)

2.2.3.2.3.2. 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	<u>z</u>	<u>ž</u>		Temoayan Otomí, Mazahua, Teribe
{ s	š	h	<u>z</u>	<u>ž</u>		Trique (Chichahuaxtla), Zapotec (Quio- quitani)
s	š	X	<u>z</u>	<u>ž</u>		Zapotec (Rincón)
φ s	š		<u>z</u>	<u>ž</u>	ð	Mixtec (Peñoles)

2.2.3.2.3.3. Languages with Three Voiceless and Three Voiced Fricatives

s	š	h	ž	β	ð	Mixtec (Atlatlahuca, El Grande)
s	š	X	<u>z</u>	<u>ž</u>	<u>X</u>	Zapotec (Cajonos)
θ s	š		<u>θ</u>	<u>š</u>	<u>ž</u>	Zapotec (Juárez)

2.2.3.2.4.1. Languages with Four Voiceless and One Voiced Fricatives

s	s ^v	š	x	v		Mixtec (Ayutla ²)
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s	š	ṣ̌	h	ð	Eastern Popoloc
s	š	ṣ̌	h	v	Ixil ³
θ	s	ṣ̌	x	ž	Zapotec (Ixtlán)

2.2.3.2.4.2. Languages with Four Voiceless and Two Voiced Fricatives

f	s	ṣ̌	h	ð	γ	Chinantec (Quiotepec)
f	s	ṣ̌	h	z	ž	Zapotec (Mitla ²)
f	s	ṣ̌	h	z	ž	Térraba

2.2.3.2.4.3. Languages with Four Voiceless and Three Voiced Fricatives

	s		ṣ̌	x	x ^w	ž	β	ð	Mixtec (Diuxi ²)
	s		ṣ̌	X	X ^w	$\frac{z}{z}$	$\frac{\tilde{z}}{\tilde{z}}$	$\frac{\tilde{z}}{\tilde{z}}$	Zapotec (Yalalag)
	s		ṣ̌		h	$\frac{z}{z}$	$\frac{\tilde{z}}{\tilde{z}}$	$\frac{\tilde{z}}{\tilde{z}}$ (=r)	Trique (Copalá)
φ	θ	s			h		β	ð	γ
f	s	ṣ̌			h	ž	β	ð	Zapotec (Lachixio)

2.2.3.2.4.4. Language with Four Voiceless and Four Voiced Fricatives

s	ṣ̌	ṣ̣̌	h	z	ž	ẓ̌	γ	Western Popoloc ¹
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2.2.3.2.5.1. Language with Five Voiceless and One Voiced Fricatives

φ	s	ṣ̌	x	h	z	Tenango Otomí
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2.2.3.2.5.2. Language with Five Voiceless and Three Voiced Fricatives

s	ṣ̌	ṣ̣̌	x	X	z	ž	ẓ̌	Zapotec (Zoogocho)
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2.2.3.2.6.1. Language with Six Voiceless and One Voiced Fricatives

f	θ	s	ṣ̌	x	h	z	Mezquital Otomí ¹
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2.2.3.2.6.2. Language with Six Voiceless and Three Voiced Fricatives

s	ṣ̌	ṣ̣̌	x	X	X ^w	z	ž	ẓ̌	Zapotec (Yatzachi)
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2.2.3.2.6.3. Language with Six Voiceless and Five Voiced Fricatives

φ	θ	s	ṣ̌	ṣ̣̌	h	z	ž	β	ð	γ	Tlacoyalco Popoloc
---	---	---	----	-----	---	---	---	---	---	---	--------------------

2.2.3.2.6.4. Language with Six Voiceless and Six Voiced Fricatives

φ	θ	s	ṣ̌	ṣ̣̌	x	z	ž	ẓ̌	β	ð	γ	Chocho
---	---	---	----	-----	---	---	---	----	---	---	---	--------

Using the preceding sets, the frequency of occurrence was deduced as follows: (Parenthesized numbers indicate frequency. Phonemes only were counted for each type.)

s (75) > ṣ̌ (51) > h (50) > x (22) > ṣ̣̌ (21) > ð (18) > β (15) > v (13) > ẓ̌ (12) > z (11) > f (10) > ẓ̣̌, θ (10) > z, φ (9) > ẓ̣̣̌ (8) > γ (7) > X (6) > ṣ̣̣̣̌ (4) > ẓ̣̣̣̣̌, x^w, X^w (3) > f' (2) > θ̣ z h^w h^y X ð^y s^y (1)

The most common set is /s ṣ̌ h/. In fact, there are 42 languages having /s ṣ̌ h/. If we include /s ṣ̌ x/ and /s ṣ̣̌ h/, this total rises to 51.

Some phonemes such as /θ š/ show an areal bias. Languages having /θ/ or /š/ are as follows:

/θ/: Otomí (Mezquital¹), Tlacoyalco Popoloc, Chocho, Mixtec (Chayuco), Zapotec (Ixtlán, Juárez), Chinantec (Sochiapán, Tlacoatzintepec), Huastec (Veracruz, Potosí)

/š/: Seri¹, Eastern Popoloc, Tlacoyalco Popoloc, Western Popoloc¹, Chocho, Mazatec (Chiquihuitlán, Huautla), Mixtec (Mixtepec), Zapotec (Juárez, Yalalag, Yatee, Cajonos, Yatzachí, Albarradas, Zoogocho, Guelavia¹, Chichcapan, Ayoquesco), Trique (Copalá), Sayula Popoluca, Mayan (Jacaltepec, Kanjobal, Acatec^{1,2}, Tectitepec, Mam, Aguacatec, Ixil^{1,2,3})

/θ/ is found in two areas, the Otomí-Huastec region and the area stretching from northern Oaxaca to southern Puebla. The areal distribution of /š/ partially overlaps with that of /θ/, but with a wider extension. There are two centers of diffusion; one is in Oaxaca and the other is in western Highland Guatemala. Only Seri is isolated from the others.

/š/ is said to be an areal feature of Californian languages, and languages geographically close to them, such as Papago, Paipai and Cocopa, also have /š/. In Middle America, /š/ is found only in Xinca². Ixil² has an apico-alveolo-palatal /š/ which may be the same as /š/.

/f/ and /ɸ/ also have interesting distributions from the areal perspective. The distributional center in Oaxaca extends north to the Otomí region. The languages far from the center are Seri, Guatuso and Terraba.

/f/: Nahuatl (Zongolica), Otomí (Mezquital¹), Zapotec (Mitla², Lachixio), Chinantec (Lealao, Tepetotutla, Quiotepec), Huamelultec, Tequistlatec^{1,2}, Terraba

/ɸ/: Seri¹, Otomí (Tenango), Tlapanec¹, Tlacoyalco Popoloc, Chocho, Ixcatec, Mixtec (Peñoles), Chinantec (Palantla, Sochiapán), 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/: Otomí (Mezquital¹, Tenango), Mayan (Jacaltepec, Kanjobal, Chuj, Kekchí, Pocomchí^{1,2}, Pocomam, Quiché²)

The contrast may well be a genetic feature in Mayan, but it is perhaps significant that the Mayan languages having this feature turn out to be delimited areally.

Fricatives from velar to glottal with lip-rounding also show only a limited distribution. Uvular fricatives /X X^w/ are found only in northern Zapotec and Seri.

/x^w/: Kiliwa², Cocopa², Mixtec (Diuxi²)

/h^w/: Chatino (Tataltepec¹)

/X^w/: Seri¹, Zapotec (Yalalag, Yatzachí)

/X/: Seri¹, Zapotec (Rincón, Yalalag, Cajonos, Zoogocho, Yatzachí)

As is indicated in Section 2.2.1.2.2, more than half the Middle American languages in the database have only a voiceless fricative series. Most of the languages with a contrast of voiceless vs. voiced fricatives belong to the Otomanguean family. Fifty-seven Otomanguean languages (including dialects) have voiced fricatives while 20 of the surveyed languages have a fortis and lenis contrast. Non-Otomanguean languages having voiced fricative(s) number 16 in all; Northern Tepehuan¹, Southern Tepehuan¹, Tarahumara¹, Cora², Huichol¹,

Cuitlatec¹, Paipai², Mixe (Totontepec¹), Huastec (Veracruz), Tzotzil¹, Ixil³, Cakchiquel^{1,2}, Térraba, Teribe, and Guaymí; of these, Northern Tepehuan¹, Southern Tepehuan¹, Mixe (Totontepec¹), Tzotzil¹, Ixil³ and Cakchiquel^{1,2} are limited to either /v/ or /β/, which correspond to /w/ in other members of their respective families. This means that /w/ became /v/ or /β/ in these languages. Cuitlatec¹ has /β ð γ/, which are fricativized /b d g/. /ð/ of Guaymí seems to fill a gap in the stop series /t č k b ĵ g/. Note that Bocotá's stop series is /t č k b d ĵ g/. If we eliminate Cuitlatec and Guaymí, we are left with Tarahumara¹, Cora², Huichol¹, Paipai², Huastec (Veracruz), Térraba, and Teribe as languages which are claimed to have fricatives, but it should be noted that they are limited to only one or two fricatives as follows:

/β/	Cora ² , Huastec (Veracruz)
/v/	Paipai ²
/β ð/	Tarahumara ¹
/z/	Huichol ¹
/z ž/	Teribe, Térraba

Furthermore, we have data from other languages closely related to Cora², Huastec (Veracruz), Tarahumara¹, and Paipai², which show an absence of voiced fricatives. If these preceding languages are also eliminated, only Huichol¹, Teribe and Térraba remain. From these considerations, I conclude that no Middle American languages except Otomanguean have developed a voiced fricative series.

2.2.4. Nasal Systems

The number of places of articulation for nasals ranges from one to four. There are, however, some Chibchan languages such as Bribrí and Cabécar for which no nasals are reported (although /ŋ/ is registered for Cabécar). They have both oral and nasal vowels, with nasal consonants being interpreted as nasalized stops. Nasalized vowels are set up instead of /m n ñ ŋ/, so that [m n ñ ŋ] are considered allophones of /b d ĵ g/ which occur before a nasalized vowel. This analysis is not an ad hoc solution. It is an attempt to extract in the most economical way those factors which are maximally independent of each other in their occurrence, non-occurrence, and co-occurrence [HOCKETT 1955:120]. However, even in Bribrí and Cabécar *m n ñ* are used for practical considerations in dictionaries, tales, and even in academic papers, and this calls into question the naturalness of the analysis described above. In fact, in Tepetotutla Chinantec, /m n ŋ/ have actually been analyzed as /b d g/ with simultaneous nasalization, because of the fact that [m n ŋ] occur before nasalized vowels and [b d g] before oral vowels so that the two groups are in complementary distribution. However, /m n ŋ/ are now recognized as phonemes [WESTLEY 1991, RENSCH 1989].

Now the nasal position lacking a position contrast is not the expected bilabial /m/ but alveolar /n/ instead. In Cabécar only /ŋ/ is registered as nasal, but Cabécar and Bribrí may be regarded as the same language. As is stated above, other nasals are interpreted as stops plus nasalized vowels. Yatee Zapotec has both

fortis /n/ and lenis /n/.

All systems with a two position contrast have /m n/. This is the most common type, attested in a total of 82 languages. Two subtypes are observed, both of which include corresponding lenis nasals. One is /m n m n/ and the other is /m n 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 can be seen in 38 and in 20 languages, respectively. The /m n ñ/ type has four subtypes. Each subtype is seen in only one sampling unit. Chichicapan Zapotec has /m n ñ m n ñ/, but Isthmus¹ Zapotec lacks the lenis /m/. Huamelultec Chontal has glottalized nasals /m' n' ñ'/ corresponding to /m n ñ/. Atlatluha Mixtec has voiceless /N/ besides /m n ñ/. The other major type, /m n ŋ/, has one subtype which has a voiceless /N/. Cora² has labialized /m^w/ in addition to /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 two are rare. The major type /m n ñ ŋ/ is attested in 8 languages. Tequistlatec Chontal as 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/ are attested in Mixtec (Ayutla²). Although /n^y/ is treated as a place of articulation here, it is also possible to interpret it instead as a manner of articulation. In general, palatalized [n] is treated in the same way as /ñ/, but Ayutla² Mixtec gives both /n^y/ and /ñ/, while Ayutla¹ Mixtec has only /m n ñ/. Only a phoneme list is supplied for Ayutla² Mixtec, so it is difficult to see how /n^y/ and /ñ/ are different, although I have found /n^y/ (written as ny in the text by Hills) in some morphemes such as n^yq³ "they, their," n^yq³q³ "come," n^yq³q² "evil," q²n^yq³ "eight" [HILLS 1990]. Incidentally, /ny/ or /n^y/ is used in the inventories of the following languages:

ny = Xochistlahuaca Amuzgo, Tataltepec¹ Chatino

n^y = Kiliwa², Cocopa^{1,2}, Cora¹, Chatino (Tataltepec², Zenzontepec)

They are represented by /ñ/ in this paper.

In the following I classify nasals in terms of position.

1) No nasal

Zero Bribri¹, Bocotá

2) One position contrast types:

n Zapotec (Rincón)

ŋ Cabécar

n n Zapotec (Yatee)

3) Two position contrast types:

m n Southern Tepehuan¹, Tarahumara^{1,2}, Yaqui¹, Mayo, Huichol¹, Nahuatl (15 dialects), Pipil, Cuitlatec¹, Seri¹, Tarasco^{1,2}, Totonac (Xicotepec, Papantla), Tepehua (Teachichilco, Huehuetla), South Pame, Matlatzinca, Ocuiltec, Otomí (Tenango, Sierra), Tlapanec¹, Eastern Popoloc, Chocho, Cuicatec², Trique (Copalá), Zapotec (Choapan, Ayoquesco), Chatino (Yatepec), Huave, Sayula Popoluca, Oluta Popoluca, Mixe (Tlahuitoltepec), Mayan (Veracruz Huastec, Potosí Huastec, Yucatec², Lacandón, Itzá², Mopán,

m n <u>m</u> <u>n</u>	Chontal, Chortí, Tzotzil ¹ , Tzeltal, Tojolabal, Kanjobal, Acatec ^{1,2} , Tectitec, Mam, Aguacatec, Ixil ^{1,2,3} , Kekchi, Pocomchi ^{1,2} , Pocomam, Uspantec, Quiché ^{2,3} , Sipacapeño, Cakchiquel ^{1,2} , Tzutujil ^{1,2} , Xinca ² , Garífuna, Cuna
m n <u>n</u>	Chichimec ¹ , Trique (Chichahuaxtla), Zapotec (Juárez, Cajonos, Zoogocho, Mitla ² , Guelavia ¹ , Guevea)
	Zapotec (Ixtlán, Yatzachí, Yalalag, Albarradas, Tlacoachahuaya)

4) Three position contrast types:

m n ñ	Papago, Northern Tepehuan ¹ , Cora ¹ , Pochutec, Paipai ² , Kiliwa ² , Cocopa ² , Otomí (Temoayan, Mezquital ¹), Mazahua, Ixcatec, Tlacoyalco Popoloc, Western Popoloc ¹ , Mazatec (Chiquihuitlán, Díaz, Huautla, Soyaltepec), Amuzgo (San Pedro ¹ , Xochistlahuaca), Mixtec (Acatlán, Huajuapán, Silacayoapan, Mixtepec, Alacatlazala, Ocotepec ² , El Grande, Chalcatongo, Diuxi ² , Peñoles, Coatzospan, Jamiltepec, Colorado, Chayuco, Jicaltepec), Zapotec (Quiquitani, Lachixio), Chatino (Tataltepec ¹), Tila Chol ¹
m n ñ m' n' ñ'	Huamelultec Chontal
m n ñ <u>m</u> <u>n</u> <u>ñ</u>	Zapotec (Chichicapan)
m n ñ <u>n</u> <u>ñ</u>	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 (León, Chimalapa), Mixe (Coatlán, Paraíso, Totontepec ¹), Chuj, Jacaltepec, Sacapultec, Tol, Mískitu, 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 (Copainalá), Sierra Popoluca, Boruca, Térraba, Teribe, Guaymí
m n ñ ŋ N	Tequistlatec ¹
m n n ^y ñ	Mixtec (Ayutla ²)

The above list is summarized in Table 18. In the list above and in Table 18, nasals which are voiceless, glottalized, or lenis (or fortis, where fortis nasals are considered as being in the marked category of long nasals) are treated as having the same positions as their corresponding plain voiced nasals, because the former never occur unless their plain voiced counterpart also occurs. Palatalized nasals, on the other hand, are treated as having an independent position, that is one lacking corresponding plain nasals.

Table 18. Nasal types

Number of position contrasts	Number of languages	Nasal inventory	Number of languages
Zero	2		2
One	3	n	1
		ŋ	1
		n <u>n</u>	1
Two	95	m n	82

Table 18—continued.

Number of position contrasts	Number of languages	Nasal inventory	Number of languages
Three	64	m n <u>m</u> <u>n</u>	8
		m n <u>n</u>	5
		m n ñ	38
		m n ñ m' n' ñ'	1
		m n ñ <u>m</u> <u>n</u> ñ	1
		m n ñ <u>n</u> ñ	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		

In the following table, the number of nasals and the number of languages are correlated; all languages were included.

Table 19. 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

Maddieson makes the following generalizations:

“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].

However, this study is concerned primarily with Middle American languages

rather than with generalizations. In this respect it is areal traits that contribute more to the understanding of the features of Middle American languages than do theoretical generalizations. It is difficult to delineate the precise geographical distribution of nasals, but we can see a tendency for /ñ/ to occur in Otomanguean from Otomí to western Oaxaca, while /ŋ/ begins in the eastern part of Oaxaca (including Mixe and the Chinantecan group), and extends farther eastward.

2.2.5. Liquid Systems

It is a general characteristic of American languages that the sounds *l* and *r* are not distinguished. Some languages have only the *l* sound, a few have only the *r* sound, while a much larger number use various intermediate sounds; further, certain languages lack *l* and *r* altogether [HOLMER 1947:16]. This holds true to some extent for liquids in Middle American languages; however, the liquid situation in Middle America is even more complicated than in America as a whole. Amuzgo data provide us with a typical example. There are two analyses for the same informant's data; both analyses recognize one liquid, but it is written as /r/ in one inventory and as /l/ in the other. Yucatec provides another illustrative example. One source registers both /l/ and /r/, but the other has only /l/. In the former source, however, /r/ is restricted to intervocalic position in about a dozen words. How are we to treat such a rare phoneme? Furthermore, in some cases it is possible that what the inventory is actually registering is the [r] from Spanish.

There are various sorts of liquids. The phonetic value of some liquids can be determined, but other liquids defy specification 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 the Guatemalan Central Highlands, such as Quiché and Kekchí, /r/ is pronounced like an alveopalatal retroflexed voiceless fricative, but it is designated by /r/ in the literature. Therefore, /r/ will be used here to represent an exotic sound which is unspecified as a result of its fluctuating nature.

r sounds found in Native Middle American languages are as follows:

Unspecified	Trill	Flap/Tap	Retroflex	Lenis
r	ř	ɾ	ɻ	ɺ

Since it is difficult to specify the *r* sounds in many cases, I divide the languages into types based solely on the number of *r* sounds a given language has, although in the following list I have also classified them as well as I can. Note that I have eliminated rare phonemes from this section but that all the *r* sounds registered in each inventory were included (although care had to be exercised to distinguish native *r* sounds from borrowed *r* sounds).

In contrast to *r* sounds, *l* sounds can be specified in almost all languages,

although in some cases / is not distinguished from r. The varieties of / sounds are as follows:

Laterals	Approximant	Fricative	Affricate	Retroflexed	Flap
Voiceless		t tʰ	ʎ		
Voiced	l lʲ			ɭ	ɾ
Glottalized	lʰ	tʰ	ʎʰ		
Lenis	l				

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 reveal that Seri¹ and Zongolica Nahuatl have a voiceless lateral, but that other languages with a voiceless lateral also have a voiced lateral approximant. If we apply Maddieson’s rule, the voiceless lateral of Seri¹ and Zongolica Nahuatl is actually a lateral fricative and the voiceless lateral of the other languages is a lateral approximant. But *Seri² also has /l/, so that in its case /t/ must be the lateral approximant. Since the sources do not distinguish them reliably, I classify all voiceless laterals as fricatives for the time being. Determining the places of articulation for laterals presents additional obstacles. It appears that almost all laterals are produced in the dental-alveolar region. Only two languages (Tarahumara¹ and *Guarijio) have a retroflex lateral.

The number of r- and l-sounds and the number of languages are given below:

Number of r/l sounds	Number of languages
None	5
1 r-sound	12
2 r-sounds	2
1 lateral and 1 r-sound	83
1 lateral and 2 r-sounds	7
2 laterals and 1 r-sound	11
2 laterals and 2 r-sounds	6
1 ɾ	1
1 lateral	27
2 laterals	5
1 lateral + ʎ	8
1 lateral + 1 r-sound + ʎ	2
2 laterals + ʎ	2
2 laterals + ʎʰ	1
4 laterals + 1 r-sound	1
6 laterals + 2 r-sounds	1
Total	174

The following lists *r*- and *l*-sounds in reported inventories for the languages which have them.

0		Zoque (León), Mixe (Coatlán, Paraíso, Totontepec ¹), Mixtec (Ocotepéc ²)
r		Huichol ¹ , South Pame, Otomí (Tenango, Sierra), Amuzgo (San Pedro ¹), Boruca
ɾ		Cabécar
ĩ		Southern Tepehuan ¹ , Mazatec (Chiquihuitlán), Western Popoloc ¹ , Otomí (Temoayan), Bribrí ¹
r ɾ		Tarasco ^{1,2}
ɹ		(Alveolar lateral flap) Papago
l		Pómaro Nahuatl, Nahuatl (Zacapoaxtla, Mecayapán, Pajapán, Jalapa), Pipil, Pochutec, Tepehua (Teachichilco), Ocuiltec, Matlatzinca, Mazatec (Huautla), Mixtec (Acatlán, Huajuapán, Silacayoapan), Chinantec (Palantla), Zoque (Copainalá), Oluta Popoluca, Veracruz Huastec, Yucatec ² , Lacandón, Itzá ² , Mopán, Chol ¹ , Tectitec, Mam, Tol
l r		Northern Tepehuan ¹ , Yaqui ¹ , Mayo, Cora ^{1,2} , Kiliwa ² , Chichimec ¹ , Otomí (Mezquital ¹), Mazahua, Tlapanec ¹ , Eastern Popoloc, Mazatec (Jalapa de Díaz), Amuzgo (Xochistlahuaca), Mixtec (Molinos, Atlatlahuca, El Grande, Chalcatongo, Diuxi ² , Jamiltepec, Colorado), Cuicatec ² , Trique (Copalá, r = ž), Zapotec (Rincón, Choapan, Tlacoahuaya, Quioquitani, Ayoquesco), Chatino (Yaitepec), Chinantec (Lealao, Tepetotutla, Tlacoatzintepec), Zoque (Chimalapa), Sierra Popoluca, Mixe (Tlahuitoltepec), Potosí Huastec, Chontal, Chortí, Tzotzil ¹ , Tzeltal, Tojolabal, Chuj, Jacaltepec, Kanjobal, Acatec ^{1,2} , Aguacatec, Ixil ^{1,2} , Kekchí, Pocomchí ^{1,2} , Pocomam, Uspantec, Quiche ^{2,3} , Sacapultec, Sipacapeño, Cakchiquel ^{1,2} , Tzutujil ¹ , Garífuna, Mískitu, Sumu, Rama, Bocotá, Cuna
l ɹ̃		Mixtec (Peñoles, Coatzacoapan, Alacatlazala, Ayutla ² , Mixtepec, Chayuco, Jicaltepec), Zapotec (Lachixio), Ixil ³ , Tzutujil ²
l ɹ̃		Chinantec (Quiotepec), Sayula Popoluca
l ɾ		Cora ² , Chinantec (Comaltepec, Sochiapán), Guaymí
l ɾ		Tarahumara ¹
l	R (ɾ)	Tarahumara ² (r = a voiced stop)
l	r ɹ̃	Chocho
l	ɹ̃ ɾ	Térraba, Teribe
l	ɹ̃ ɹ̃	Ixcatec, Tlacoyalco Popoloc, Mazatec (Soyaltepec), Huave
l ɹ̃	r	Central Pame, Chatino (Tataltepec ¹)
l ɹ̃		Zapotec (Yatee, Chichicapan, Guelavia ¹)
l ɹ̃	r	Trique (Chichahuaxtla), Zapotec (Yalalag, Guevea, Isthmus ¹)
l ɹ̃	ɹ̃	Zapotec (Zoogocho, Yatzaquí)
l ɹ̃	r ɹ̃	Zapotec (Ixtilan, Juárez, Cajonos, Albarradas, Mitla ²)
l	ɹ̃	Seri ¹
l	ɹ̃	Cuitlatec ¹ , Tepehua (Huehuetla),
l	ɹ̃ r	Paipai ² , Tequistlatec ¹ , Xinca ²
l	ɹ̃ r ɹ̃	Guatuso
l	ɹ̃ ɹ̃ ɹ̃ r	Cocopa ²
l	ɹ̃	Nahuatl (Classical, Jerónimo, Tetelcingo, Amilcingo, Tlaxpanaloya, Matlapa, Huautla)
l	r ɹ̃	Nahuatl (Coscatlán, Acaxochitlán)
l	ɹ̃	Nahuatl (Zongolica)

l	ɬ	λ	Totonac (Xicotepec, Papantla)
l	ɬ	λ'	Tequistlatec ²
l	ɬ' ɬ̥ ɬ̥' ɬ̥̃ ɬ̥̃'	ɬ̥̃̃ ɬ̥̃̃'	Huamelultec

The most common combination in languages investigated here was to have one /- and one r-sound; this holds for nearly half of them. The next most frequent combination is the one /l/ system, found in only 16% of the surveyed languages.

/λ/ is a specific feature for Nahuatl and Totonac. /λ/ functions as a marker to divide Nahuatl from other Nahuan languages and Totonac from Tepehua. /ɬ/, too, is found in restricted languages (namely Paipai, Cocopa, Seri, Cuitlatec, Tepehua, Totonac, Oaxaca Chontal and Xinca, Guatuso), but not in any cohesive geographical distribution. Zongolica Nahuatl may have borrowed /ɬ/ from Totonac.

2.2.6. Glide Systems

Glides are generally represented by /w/ and /y/. They are also termed vocoid approximants, semivowels, and even semiconsonants. Interpreted as semivowels, /y/ and /w/ are not recognized as phonemes in such languages as Cabécar and Bribri, and the high vowels /i/ and /u/ are used in their stead, respectively. In Tol even /i/ is interpreted as a semivowel. The phonemes /v/ and /β/ sometimes correspond with /w/, further complicating the glide systems.

Below I give the frequency of occurrence of the glides. The percentage of languages having one or more glides is markedly similar to that of Maddieson's survey [MADDIESON 1984:92].

Table 20. 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%)

The majority of the surveyed languages has both /w/ and /y/, but a relatively high percentage, 26%, lacks one of the segments or both. I 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, Kekchí /w/ and /y/ are manifested by [k^w ~ g^w ~ w] and [d^y ~ k^y ~ y], respectively. (2) It is also possible that /w/ has been replaced by /v/ or /β/. I have heard a Quiché informant pronounce three distinct versions of the word "paper" [wux] ~ [vux] ~ [βux] (labio-dental approximant) ~ [βux]. Each time he pronounced this one word, his pronunciation fluctuated. Tzotzil and Cakchiquel have /v/ instead of /w/. Mayan comparative linguistics makes it clear that this /v/ is derived from Proto-Maya */w/. (3) The vowels [i] and [u] are typical approximants similar to semivowels, except for the fact that the

latter are ultra-short [CATFORD 1988:71-72]. The absence of semivowels in Cabécar and Bribrí mentioned above may be related to this particular feature of semivowels. Therefore it is necessary to examine the relationship between glides and the individual segments concerned. In the following I present every case found in the data.

1) Languages with /w/

/w/ only:

Papago, Chichimec¹, Zapotec (Zoogocho)

with both /β/ and /k^w/ also:

Mixtec (Huajuapán)

with /k^w/ also:

Mixtec (Chalcatongo)

2) Languages with /y/

with /v/ also:

Southern Tepehuan¹, Mazatec (Huautila), Cuicatec², Mixe (Totontepec¹), Tzotzil¹, Cakchiquel^{1,2}

with /β/ also:

Tlacoyalco Popoloc, Mazatec (Chiquihuitlán)

with /k^w/ also:

Zapotec (Yalalag, Tlacoachahuaya), Ixil³

with both /β/ and /k^w/ also:

Mixtec (Silacayoapan, Alacatlazala, Atatlauca)

with both /v/ and /k^w/also:

Mixtec (Mixtepec, Ayutla², Ocoatepec², Jamiltepec, Colorado, Chayuco)

3) Languages with /w/ and /y/:

Tarahumara^{1,2}, Yaqui¹, Mayo, Cora^{1,2}, Huichol¹, Nahuatl (15 dialects), Cuitlatec¹, Paipai², Kiliwa², Cocopa², Tarasco^{1,2}, Totonac (Xicotepec, Papantla), Tepehua (Teachichilco, Huehuetla), Central Pame, South Pame, Matlatzinca, Ocuiltec, Otomí (Mezquital¹, Temoayan, Tenango, Sierra), Mazahua, Tlapanec¹, Ixcatec, Western Popoloc¹, Eastern Popoloc, Mazatec (Jalapa de Díaz, Soyaltepec), Amuzgo (San Pedro¹, Xochistlahuaca), Mixtec (Acatlán, Jicaltepec), Trique (Copalá), Zapotec (Rincón, Cajonos, Yatee, Albarradas, Mitla², Guelavia¹, Chichicapán, Quiquitaní, Ayoquesco, Lachixio, Isthmus¹), Chatino (Yaitepec, Tataltepec¹), Chinantec (Quiotepec, Palantla, Tepetotutla, Tlacoatzintepec), Huave, Zoque (Copainalá, León, Chimalapa), Sierra Popoluca, Sayula Popoluca, Oluta Popoluca, Mixe (Coatlán, Paraíso, Tlahuitoltepec), Huastec (Veracruz, Potosí), Yucatec², Itzá², Lacandón, Mopán, Chol¹, Chontal, Chortí, Tzeltal, Tojolabal, Chuj, Jacaltepec, Kanjobal, Acatec^{1,2}, Tectitepec, Mam, Aguacatec, Ixil^{1,2}, Kekchí, Pocomchí^{1,2}, Pocomam, Uspantec, Quiché^{2,3}, Sacapultec, Sipacapeño, Tzutujil^{1,2}, Xinca², Garífuna, Mískitu, Sumu, Rama, Boruca, Teribe, Cuna

with /β/ also:

Tarahumara¹, Cuitlatec¹, Huastec (Veracruz)

with /v/ also:

Paipai²

with /k^w/ also:

Cora², Huichol¹, Nahuatl (13 dialects), Otomí (Temoayan), Mazahua, Mazatec (Jalapa de Díaz), Amuzgo (Xochistlahuaca), Zapotec (Albarradas, Mitla², Chichicapán, Ayoquesco,

Quioquitani)

with both /β/ and /k^w/ also:

Matlatzinca, Ocuiltec, Zapotec (Lachixio)

with both /v/ + /k^w/ also:

Mixtec (Acatlán)

4) Language with /w/ + /y/ + /i/:

Tol

5) Languages with neither /w/ or /y/:

Zapotec (Choapan), Chinantec (Comaltepec), Guatuso, Cabécar, Bribri¹, Térraba, Guaymí, Bocotá

with /v/:

Northern Tepehuan¹, Chinantec (Lealao)

with /β/:

Chocho, Chinantec (Sochiapán)

with /k^w/:

Mixtec (Peñoles), Zapotec (Ixtlán, Yatzachí)

with both /β/ and /k^w/:

Mixtec (El Grande, Diuxi², Coatzospán)

with both /v/ and /k^w/:

Mixtec (Molinos)

6) Languages with contrasts in voicing:

/w/ and /w/ + /y/ and /ɣ/: Pómaro Nahuatl

/w/ and /w/ + /y/: Nahuatl (Huatla), Tequistlatec^{1,2}

/w/ + /y/ + /k^w/: Seri¹

7) Languages with contrasts of fortis and lenis:

w y w y : Trique (Chicahuaxtla), Zapotec (Guevea)

w y y : Zapotec (Juárez)

8) Language with contrasts of plain vs. glottalic:

w y w' : Huamelultec Chontal

/v/ and /β/ in (2) and (5) are perhaps regarded as alternatives to /w/, but /k^w/ is not. Most languages with /k^w/ in the list are Mixtecan, in which *k^w/ is related not to /w/ but rather to /p/.

2.3. Vowel System Typology

When we attempt to study vowel system typology, we encounter two basic problems, namely, normalization and quality-modification (quantity, nasalization). 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 Hockett does with Fox, which, like Nahuatl, has an /i e a o/ system. He normalizes the Fox vowels as a simple 2+2 system, claiming 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].⁴⁾ Following his normalization, the Nahuatl system depicted above would be rewritten as follows:

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

This chart appears neater and more systematic, but it disregards the vowel height of each individual phoneme. If this normalization is admitted, it will fail to differentiate between such systems as /i e a o/ and /i e a u/. I think that phonological systems are in a continual state of flux, with an asymmetrical system being one of the factors that trigger sound changes. Therefore, in a study such as this, where the aim is to obtain a time perspective on cultural-linguistic history, I do not normalize the vowel systems but rather respect their original values. It is important to respect the original system even when asymmetrical. Of course, some normalization is inevitable in a typological study, but I have tried to limit it to assigning given phonemes to the chart given in Appendix 1.

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 vowel quality (that is, normal length oral vowels), has been utilized; more precisely, only the number and quality of normal length oral vowels have been used as a basis for vowel system typology. In fact, most languages with a length contrast have vowels of the same quality and it may not be necessary to include long oral vowels; however, some languages do have an asymmetrical set. Languages with nasalized vowels show more asymmetry. About 20% of the languages in my data have an asymmetrical set. This percentage is too high to neglect. For example, Orizaba Nahuatl has five short vowels and four long vowels; Temoayan Otomí has nine vowels with three nasalized vowels; and Tenango Otomí has nine vowels with four nasalized vowels.

i	u	i:		i	ə	u	j	u	i	ĩ	u	j	u
e	o	e:	o:	e	Λ	o			e	Λ	o		
a		a:		ε	a	ɔ	a		æ	a	ɔ	æ	a
Orizaba Nahuatl				Temoayan Otomí				Tenango Otomí					

If we call the Nahuatl system mentioned first in this section "4V+4L (long vowels)," then we can call the Orizaba Nahuatl system "5V+4L" and the Temoayan Otomí system "9V+3N (nasal vowels)." The Tenango Otomí system is "9V+4N" using the same terminology. These examples show that if we type vowel systems only according to normal length oral vowels (typically short vowels), we ignore the differences between 5 vowel systems with 5 symmetrical long vowels and 5 vowel systems with 4 long vowels; furthermore, we ignore the difference in nasal vowels between Tenango Otomí and Temoayan Otomí. It is for these reasons that, although this investigation is based primarily on vowel quality, it is not limited to quality alone, but extends to include vowel quantity as well.

All the vowels found in the data are listed in Appendix 3. Eighteen different

vowel qualities are utilized in Native Middle American languages. Every language has either more oral vowels than nasalized or lengthened vowels, or else has the same number of oral vowels as that of nasalized or lengthened vowels. Both nasalized and lengthened vowels have oral counterparts, except for Silacayoapan Mixtec and Comaltepec Chinantec, both of which have a nasalized vowel different from its oral counterpart.

2.3.1. Statistical Survey

The types of vowel systems found in the sample are given in Table 21. I have excluded the languages marked by ✕ in Appendix 3.

Table 21. 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	78	5V: 19	+4L: 1, +5L: 30, +5G: 9	+3N: 1, +4N: 4, +5N: 15	+5N+L:1	5L3S8N:1
6 vowel systems	40	6V: 18	+5L: 1, +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: Column (1) indicates the number of languages. Column (2) indicates the number of languages with only short vowels (normal length oral vowels). 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 represents how many there are in respect to the number of languages, indicated by the number which follows the colon (:). Column (6) accounts for some aberrant systems, in which T and LX represent tense and lax vowels, respectively; 5L3S8N means that the system has 5 long and 3 short vowels with 8 corresponding nasals.

As can be seen from Table 21, five- and six-vowel systems account for 68% (118/174) of the sample languages. If we take four- to seven-vowel systems, 90% (157/174) of the sample languages fall into this group. In other words, the more frequent types cluster around the five-vowel systems. Fourteen of the four-vowel systems are from Nahuatl dialects; if we limit their representation to that of one typical dialect, we reduce the number of four-vowel systems to 8, 4 of which are Zapotecan dialects.

Table 22 presents the vowel classification in terms of the symmetry vs. asymmetry of the systems. 15% of the data show asymmetry. About 39% (22/57) of

Table 22. Symmetrical and asymmetrical systems

i i i: i u i: u: i i
e o e o e: o: e e: e o e o
a a a: a a: a a
4V system 4V+4L 4V+4L 4V+4N
Zapotec (Lachixio)

2.3.2.3. 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	ĩ
e	o	e ə	o	e	o
a		a		a	

Zapotec (Yatzachi) Zapotec (Villa Alta)

The languages with the leftmost pattern are: Tarahumara^{1,2}, Pómaro Nahuatl, Zapotec (Juárez, Ixtlán, Yalalag, Guevea, Isthmus¹), Tequistlatec Chontal^{1,2}, Chortí, Tzotzil¹, Tzeltal, Tojolabal, Chuj, Jacaltepec, Kanjobal, and Boruca.

Plain vowels may have corresponding lengthened or nasalized counterparts.

i	u	i:	u:	i	u	ii	uu	i	u	ĩ	ũ
e	o	e:	o:	e	o	ee	oo	e	o	ẽ	õ
a		a:		a		aa		a		ã	

5V+5L

5V+5G

5V+5N

5V+5L: Pochutec, Paipai², Totonac (Xicotepec), Tepehua (Teachichilco), Huamelultec Chontal, Huastec (Veracruz, Potosí), Yucatec², Acatepec^{1,2}, Tectitec, Mam, Aguacatec, Ixil^{1,2,3}, Kekchí, Pocomchí^{1,2}, Pocomam, Uspantec, Quiché^{2,3}, Sacapultec, Sipacapeño, Tzutujil^{1,2}, Guatuso, Cuna

5V+5G: Yaqui¹, Mayo

5V+5N: Ixcatec, Western Popoloc¹, Eastern Popoloc, Chocho, Mazatec (Soyaltepec), Mixtec (Acatlán, Mixtepec, Alacatlazala, Molinos, Ocotepec², Jicaltepec), Cuicatec², Garífuna

These are the most common patterns, but others occur where there is a contrast in length or nasalization.

i	ĩ	u	ii	ũ	uu	i	ĩ	u	ii	ũ	uu	i	ĩ	u	ii	ũ	uu
		o		oo		e		ee				e		ee			
a			aa			a		aa				a		aa			

Papago,

Huichol¹

Cora¹

Northern Tepehuan¹

i	ĩ		i:	ĩ:	i		ĩ		i	u	ĩ	ũ
e	o		e:	o:	e	o	ẽ	õ		o		õ
a			a:		ɛ		ẽ		æ	a		ã

Huave

Central Pame

Mazatec (Jalapa)

The following languages have asymmetrical sets.

5V+4L:

5V+3N:

i	u	i:		i	u	ĩ	ũ
e	o	e:	o:	e	o		
a		a:		a		ã	

Nahuatl (Zongolica)

Chatino (Tataltepec¹)

5V+4N:

i	ü	ɨ		i	u	ɨ	ʉ	i	u	ɨ	ʉ	i	u	ɨ	ʉ
e	o	ɛ	ɔ	e	o	ɛ		e	o	(ɛ)		e	o	ɛ	ɔ
a		ä		a		ä		a		ä		a			
Mixtec				Mixtec				Mixtec (Ayutla ²)				Chatino			
(Huahuapan)				(Silacayoapan)								(Yaitepec)			

Tlapanec¹ has both length and nasalization contrasts.

5V+5N+20L:

i	u	i:	u:	ɨ	ʉ	ɨ:	ʉ:
e	o	e:	o:	ɛ	ɔ	ɛ:	ɔ:
a		a		ä		ä:	

Copalá Trique has five long and three short vowels, with corresponding nasalized versions.

5L+3S+8N:

i:	u:			ɨ:	ʉ:		
e:	o:	e	o	ɛ:	ɔ:	ɛ	ɔ
a:		a		ä:		ä	

2.3.2.4. Six-Vowel Systems

The leftmost pattern below represents the most common one for six-vowel systems, but /ə/ or /ʌ/ may replace a central vowel. The sixth vowel may be /i/ instead of a central vowel, as is attested in Ayoquesco Zapotec. When only one central vowel occurs, it is frequently difficult to decide which symbol is most appropriate to represent it. The sound fluctuates between [i] and [ʌ], so that it is the feature of centrality that becomes important here.

i	i	u	i	i	u	i:	i:	u:	i	i	u	ɨ	ɨ	ʉ
e		o	e		o	e:		o:	e		o	ɛ		ɔ
a			a			a:			a			ä		
6V			6V+6L			6V+6N								

6V: Cuitlatec¹, Tarasco^{1,2}, Zapotec (Tlacoahuaya, Guelavia¹, Chichicapán), Zoque (Copainalá, León, Chimalapa), Chol¹, Chontal, Cakchiquel¹, Xinca², Tol

6V+6L: Sierra Popoluca, Sayula Popoluca, Oluta Popoluca, Lacandón, Mopán

6V+6N: South Pame, Mixtec (Diuxi², Peñoles, Jamiltepec, Colorado, Chayuco)

Somewhat different systems are also observed:

i	u		i	u		i	ĩ	u
e	o		e	o		e		o
ɛ	a		æ	a			a	

Zapotec (Choapan) Zapotec (Mitla², Quioquitani)

Zapotec (Ayoquesco)

In Mixe (Coatlán, Paraíso) extra long vowels are reported.

6S+6L+6EL: Mixe (Coatlán, Paraíso)

Other patterns appear where there is contrasting length or nasalization:

i	ĩ	u	ii	ĩĩ	uu	i	u	ii	uu	i	u	ĩ	ʊ
	ẽ	o		ẽẽ	oo	e	ə	ee	ee əə	ɛ	o	ɛ	ɔ
a			aa			æ	a	æ-		æ	a	æ	a
						æ		aa		æ	a	æ	a
Southeastern Tepehuan ¹						Cora ²				Mazatec (Chiquihuitlán)			

i	ĩ	u	ĩ	ʊ
e		o	ɛ	ɔ
a			ɶ	

Mixtec (Atatlahuca)

Asymmetrical patterns are as follows:

6V+5L:

i	ĩ	u	i:	u:
e		o	e:	o:
a			a:	

Izta²

6V+5N:

i	ĩ	u	ĩ	ʊ	i	ĩ	u	ĩ	ʊ
e		o		ɔ	e		o	ɛ	
a			ɶ		a			ɶ	

Mixtec (El Grande)

Mixtec (Coatzospán)

6V+4N:

i	ĩ	u	ĩ	ʊ
e		o		
a			ɶ	

Mixtec (Chalcatongo)

Lealao Chinantec has both length and nasalization contrasts. Length is added to both simple and nasalized vowels.

6V+6N+12L:

i	ĩ	u	ĩ	ʊ
e		o	ɛ	ɔ
a			ɶ	

Lealao Chinantec

2.3.2.5. Seven-Vowel Systems

Seven-vowel systems with no contrast are attested in Matlatzinca and two Zapotecan languages. However, closely related Ocuiltec has a contrast in length.

7V:

i	ĩ	u	i	ĩ	u	i	ũ	u
e	ʌ	o	e		o	e		o
a			æ	a		ɛ		a

Matlatzinca

Zapotec (Rincón)

Zapotec (Albarradas)

Seven-vowel systems with length are attested in only two languages.

7V+7L:

i	i	u	i:	i:	u:	i	u	i:	u:		
ɛ	ʌ	ɔ	ɛ:	ʌ:	ɔ:	e	ʌ	o	e:	ʌ:	o:
a			a:			a	ɔ		a:	ɔ:	
Ocuiltec						Tlahuitoltepec Mixe					

Seven-vowel systems with nasalization are of three subtypes: those with 5, 6, or 7 nasalized vowels. In the Bocotá set, the seven nasalized vowels correspond to the oral ones, constituting the one symmetrical set of this type.

7V+5N:

i	u			i	u	i	u	i	u	i	u
e	o	ɛ	ɔ	ɪ	ʊ			ɪ	ʊ		
ɛ/æ	ɔ	ɛ/æ	ɔ	e	o	ɛ	ɔ	ɛ	ɔ	ɛ	ɔ
a		a		a		a		a		a	
Amuzgo (San Pedro ¹ , Xochistlahuaca)				Cabécar, Bribri ¹				Térraba			

7V+6N:

i	i	u	i	i	u
e	ʌ	o	ɛ		ɔ
a			a		
Trique (Chicahuaxtla)					

7V+7N:

i	ü	u	i	ü	u	i	ĩ	u	i	ĩ	u	i	u	i	u
e		o	ɛ		ɔ	e	ẽ	o	ɛ	ẽ	ɔ	e	o	ɛ	o
æ	a	æ	a			a		a				ɛ	ɔ	ɛ	ɔ
												a		a	
Chichimec ¹						Chinantec (Palantla, Tepetotutla, Tlacoa- tzintepec, Sochiapán)						Bocotá			

Cakchiquel (Comalapa) has the following system, which is regarded as 7V+5L:

short:	i	e	a	o	u	ie	uo
long:	i:	e:	a:	o:	u:		

2.3.2.6. Eight-Vowel Systems

The languages with 8 oral vowels are classified into two separate types: 8 vowels with nasalization, and 8 vowels with both length and nasalization.

Eight-vowel systems with nasalized vowels are of two types, one symmetrical and the other asymmetrical.

8V+8N:

i	u	i	u
ɪ	ʊ	ɪ	ʊ
e	o	ɛ	ɔ
a	ɔ	a	ɔ
Teribe			

8V+7N:

i	ĩ	u	ɨ	ĩ	ʉ
e	ẽ	o	ɛ		ɔ
a	ɔ		ɐ	ɔ	

Guaymí

The languages having 8 vowels with both nasalization and length are both Chinantecan.

8V+7N+L:

i	ĩ	u	i:	ĩ:	u:	ɨ	ĩ	ʉ	j:	ĩ:	ʉ:
e	ẽ	o	e:	ẽ:	o:	ɛ		ɔ	ɛ:		ɔ:
æ			æ:			ɛ			ɛ:		
a			a:			ɐ			a:		

Chinantec (Comaltepec)

Note that /æ/ becomes higher when nasalized.

8V+8N+L:

i	ü	ĩ	u	i:	ü:	ĩ:	u:	ɨ	ü	ĩ	ʉ	j:	ü:	ĩ:	ʉ:
e		ẽ	o	e:		ẽ:	o:	ɛ		ẽ	ɔ	ɛ:		ẽ:	ɔ:
	a				a:			ɐ				a:			

Chinantec (Quiotepec)

2.3.2.7. Nine-Vowel Systems

The languages with 9 oral vowels are classified into three types: 9 vowels with length and 9 vowels with nasalization.

A nine-vowel system with length is attested only in Totontepec Mixe¹. Long vowels have corresponding oral vowels.

9V+9L:

i	i	u	i:	i:	u:
e	ə/ʌ	o	e:	ə:/ʌ:	o:
æ	a	ɔ	æ:	a:	ɔ:

Mixe (Totontepec¹)

Nine-vowel systems with nasalization can be divided into three subtypes. They form asymmetrical sets.

9V+3N:

i	ə	u	ɨ	ʉ
e	ʌ	o		
ɛ	ɔ			
a			ɐ	

Otomí (Temoayan)

9V+4N:

i	ĩ	u	ɨ	ʉ	i	ĩ	u	ɨ	ʉ
e	ə	o			e	ʌ	o	ɛ	
æ	a	ɔ	æ	ɐ	ɛ		ɔ		
					a			ɐ	

Otomí (Tenango, Sierra)

Otomí (Mezquital¹)

9V+6N:

i	i	u	j	ɥ
e	ə	o	ɛ	ɤ
ɛ	ɔ			
a			a	

Mazahua

2.3.3. Tone Systems

So far I have discussed segmental phonemes. With regard to vowel systems, consideration of suprasegmental phonemes also contributes to an areal-typological study. There are many tone languages in Middle America, but they occur in geographically restricted areas, being concentrated in the Otomanguean and Chibchan groups. Although phonemic tone is also observed in other language groups and regions in addition to these two, it is distributed sporadically.

Tone languages are generally divided into two major types, register (level) systems and contour (glide) systems [PIKE 1948]. Most Middle American tone systems are of the register type, but normally have some combination of tones in addition to level ones. I cannot be sure, however, whether or not all the languages with register systems do in fact have tone combinations; in Tlapanec, for example, I found only three tone levels registered in the inventory, but some combinations occur in the examples [SUÁREZ 1983a]. Such cases may also occur in other languages, since I utilized some data that lacked exhaustive examples. Moreover, in Alacatlazala Mixtec, for example, there are three tone contrasts, but different tones sometimes fall on syllable final vowel clusters. Such languages, which are interpreted as having geminate vowels with tones, are classified as level-tone languages. On the other hand, some other Mixtec dialects are analyzed as having one syllable with tone combinations. A difference in analysis can affect typological conclusions.

Although tone systems have not been adequately described for all languages, I present all the data available in the survey 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 can be identified as having both tones and their combinations.

Two tones:

1, 2: *Northern Tepehuan¹, Cuitlatec¹, Chichimec¹, Boruca, Cabécar, Térraba (accent), Teribe, Guaymí, Bocotá

1, glide: Ocuiltec

Two tones plus combinations:

1, 2, 12: Kiliwa², Central Pame, South Pame, Mazahua, Mixtec (Coatzacoapan), Zapotec (Cajonos, Tlacoachahuaya)

1, 2, 21: Otomí (Mezquitán¹, Temoayan, Tenango), Zapotec (Guevea, Isthmus¹)

1, 2, 12, 21: Otomí (Sierra), Bribrí¹

Three tones:

1, 2, 3: *Ixcatec, Mixtec (*Acatlán, *Huajuapán, *Silacayoapan, *Alacatlazala, *Ayutla²,

*Ocotepéc², *Molinos, *El Grande, *Chalcatongo, *Peñoles, *Jamiltepec, *Colorado,
 *Chayuco, *Jicaltepec), *Cuicatec²

Three tones plus combinations:

- 1, 2, 3, 13: Mixtec (*Diuxi², 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, Juárez: 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: Tlapanec¹
- 1, 2, 3, 12, 13, 21, 31, 32, 132, 312, 323 ? : *Western Popoloc¹

Cocopa², whose system is described as high, medium, and emphatic low stress, can be included here.

Four tones plus combinations:

- 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 (Huautila)
- 1, 2, 3, 4, 11, 14, 21, 24, 31, 34, 41, 42, 214, 314, 414, 424: Mazatec (Chiquihuitlán)
- 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 to have either contour systems or mixed systems. I represent such systems in terms of sequences of levels, but I am not sure whether or not it is appropriate 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 (Chichicapán)
 (high, low, high-rising, low-rising, low-falling, high-falling)
- 2, 4, 21, 32, 43, 23, 45: Chatino (Tataltepec¹)
- 3, 4, 5, 21, 32, 34, 35, 53: Trique (Copalá)
- 1, 3, 5, 12, 34, 35, 31, 53: Amuzgo (San Pedro¹)

The following languages may be considered two-tone systems.

Stress: Tarahumara¹, Tol

Accent: Guatuso

Tone: Cora¹, Cuitlatec¹, Yucatec², Huave (only a few words)

Languages other than the ones reported here which have two-tone systems are Tzotzil of San Bartoló 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 per se may have vowel geminates on which two different tones fall. These systems are marked by an asterisk in the survey above. They can be analyzed as having level tones plus some combination of them, so that all three tone systems can be said to have tone combinations. Only Guelavia² Zapotec may be the exception, although there is not enough data to rule out its having tone combinations. On the other hand, if combinations of tones are interpreted as vowel geminates plus tones, it becomes unnecessary to admit the combinations.

To conclude, I want to mention some other characteristics of tone systems. South Pame (Jiliapan) has three tones: high, low and falling, but one and only one of these is found per word.

kudû	"devil"	kudù	"stone"
tiki'	"arrow"	tikî	"rubber"

[MANRIQUE C. 1967: 334]

The Chatino tone system also is contrastive only in the last syllable, which, moreover, carries the stress accent. In addition, tone is closely related to stress in some other languages such as the Chinantecan group. Note that in the examples above it is the stressed syllable which carries contrastive tone. In contrast, every syllable in Huautla Mazatec carries contrastive tone, as in $\nu\text{?e}^2\text{?sko}^1$ - "to gather," $\nu\text{?e}^2\text{?sko}^1\text{i}^3$ "you (sing.) gather" [PIKE 1949: 161]. Forms differentiated only by tones are very rare in some languages, such as Yucatec and Huave; in these systems tones are restricted in function.

Tone sandhi or perturbation, that is, changes in tones when morphemes and/or words are combined, is reported in Northern Tepehuan, Huave, Soyaltepec Mazatec, and notably, Mixtecan and Zapotecan languages [SUÁREZ 1983b: 53]. The following examples are from Jicaltepec Mixtec [BRADLEY 1970: 27-36], in which it can be seen that the basic high-high tones of $\tilde{n}i^1wi^1$ "people" change according to the tone patterns of preceding words.

$\tilde{n}i^1wi^1$	"people"
$dú^3wa^2 \tilde{n}i^2wi^1$	"The people are falling."
$dé^3ku^2 \tilde{n}i^3wi^2$	"The people are sitting."

Two Mixtecan languages have been reported to have terraced-tone systems. The downstepping terraced system with two levels occurs in Coatzacoapan Mixtec [Pike and Small 1974], and upstepped terracing with three levels in Acatlán Mixtec [Pike and Wistrand 1974]. In both languages the terracing is restricted to the sentence or clause.

2.4. Summary

In this chapter I discuss the phonological systems of Middle American languages from primarily a typological point of view.

The number of data sets surveyed is 174 (which includes many dialects as well as several different analyses of the same language in some cases), although I presented a total of 233 languages in Database 1. The statistical survey shows that the number of consonants ranges from 11 to 35, clustering between 14 and 27. (The variations of phonemes are shown in Appendix 1). Middle American languages form their phonological systems within this range. The individual phoneme inventories may vary from language to language, but we can identify some general trends, since Middle American languages seem to share a common core of structural phonological units. The preferred set of consonants is as follows:

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

Many of the languages have other phonological units in addition to the ones listed above. For example, the Mixtecan languages add prenasal stops, while Zapotecan ones have a fortis-lenis contrast. Glottalized consonants are seen in Mayan, Huehuetla Tepehua, Oaxaca Chontal, Xinca, and Tol. Aspirated consonants are reported in Tarasco, Tol, Térraba and Teribe. The most aberrant system is that of Oaxaca Chontal. Seri is particularly rich in fricative series.

With regard to vowel systems, there are 18 different phonemes encountered in the data. The number of basic vowel qualities in a single system ranges from 3 to 9. The maximum numbers for height and front-back distinctions are 4 and 3, respectively. The vowels may be lengthened and/or nasalized. Most languages have symmetrical systems but about 20% of the data show a 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.

Tone languages are generally divided into two major types, register (level) systems and contour (glide) systems [Pike 1948]. Most Middle American tone systems are of the register type, but typically also have some combination of tones in addition to level ones. The number of tones ranges from 2 to 5. With the exception of two- and three-tone systems, tones can occur in combinations.

Chapter 3

Areal Features and Linguistic Universals

In the previous chapter I surveyed the phonological systems of Native Middle American languages from a typological standpoint. In this chapter I discuss areal features and linguistic universals, utilizing the data obtained in the previous chapter.

3.1. Areal Features of Phonological Systems

There is considerable phonological diversity among Native Middle American languages. However, some phonological units have only a limited geographical distribution. For example, glottalized consonants are restricted to the Mayan languages, Tepehua, Xinca, Tol, and Oaxaca Chontal. Traits which are relatively rare cross-linguistically, such as glottalized stops, are useful in the determination of linguistic areas, whereas the geographical delimitation of extremely common traits rarely leads to interesting results. However, the lack of common traits may also prove useful in defining areal features. For example, /p/ is lacking in several Otomanguean languages. Accordingly, I will discuss areal features in terms of two factors, the possession of rare traits and the lack of common traits. Not all of these traits are areally restricted, and only some traits contribute to areal linguistics. Although many traits show sporadic distribution, they are nevertheless useful for the investigation of the features of Middle American languages.

3.1.1. Possession of Rare Traits

3.1.1.1. Glottalized Consonants

Glottalized consonants are recorded as phonemic in Mayan, Huehuetla Tepehua, Oaxaca Chontal, Xinca², and Tol. They are observed primarily in the stop series, but Tequistlatec Chontal has glottalized fricatives in addition, while Huamelultec Chontal adds glottalized laterals and nasals. Campbell notes that most Otomanguean languages have glottalized consonants [CAMPBELL 1979: 956], but they are interpreted as consonant clusters (Map 4).

3.1.1.2. Aspirated Consonants

There are many languages (mostly Otomanguean) with clusters of individual consonants plus /h/, but they are considered consonant clusters rather than aspirated stops. A typical case is that of Tlapanec, where one analysis records aspirated stops, while the other interprets aspirated stops as consonant clusters.

Aspirated consonant phonemes are reported in Tarascan, Tol, Térraba and Teribe. All aspirated phonemes attested in the sample languages are presented in the following:

/p^h t^h c^h ʃ^h k^h/: Tarascan¹ (Ichupio)

/p^h t^h k^h k^{wh}/: Tarascan² (San Jerónimo)

/p^h t^h c^h k^h/: Tol

/t^h k^h/: Térraba lacks /p^h/

/p^h t^h k^h/: Teribe

3.1.1.3. Prenasalized Stops

Prenasalized stops are characteristic of Mixtecan languages. Although they are not recorded for Molinos Mixtec, this is due to differing analyses rather than their actual absence. Other than Mixtec, Xochistlahuaca Amuzgo and Lachixio Zapotec also have phonemic prenasalized stops (Map 4).

3.1.1.4. Fortis vs. Lenis Consonants

Fortis vs. lenis contrasts in consonant systems are observed in Chichimec¹, Trique (Chichahuaxtla), and Zapotecan. Chichimec¹ has this contrast only in the nasal series. The domain in which fortis vs. lenis is contrastive depends on the individual language, but the general tendency is for stops and fricatives to have a fortis vs. lenis contrast fairly frequently, but for glides to have it only rarely. Nasal and liquid series are in the intermediate frequency range (See Appendix 3 and Map 4).

3.1.1.5. Voiced Fricatives

Voiced fricatives are rare except in Otomanguean. As is stated in 2.3.2 and Table 5, 30% (52/174) of all the languages surveyed have voiced fricatives and 20 of these have a fortis vs. lenis contrast. Fifty-seven of these are Otomanguean languages. Languages other than Otomanguean ones having one or more voiced fricatives number only 16, 6 of which have only /v/ or /β/, as reflexes of /w/. /β ð γ/ of Cuiclatec¹ and /ð/ of Guaymí are fricativized stops. If these 2 languages are eliminated, only 7 languages (Tarahumara¹, Cora², Huichol¹, Paipai², Huastec (Veracruz), Térraba and Teribe) can be said to have fricative(s), but they are limited to only one or two. Therefore, we can conclude that Native Middle American languages, with the exception of the Otomanguean group, do not develop a voiced fricative series.

3.1.1.6. Postvelar or Uvular Stop /q/

/q/ is attested in Paipai², Kiliwa², Cocopa², Totonac, Tepehua, Central Pame, and Highland Mayan. Cocopa² has in addition a labialized uvular /q^w/, and Huehuetla Tepehua and Highland Mayan have a glottalized counterpart /q'/ (Map 5).

3.1.1.7. Retroflexed Consonants

Retroflexion is found in both sibilants and affricates.

ʃ : Seri¹, Mazatec (Chiquihuitlán), Mixtec (Mixtepec), Sayula Popoluca

ʒ : Zapotec (Yatee, Albaradas, Chichicapán, Ayoquesco, Yalalag, Zoogocho, Yatzachí, Cajonos, Guelavia¹, Juárez)

ʂ : Cocopa², Papago, Xinca²

ʐ : Huichol¹

ʧ : Mazatec (Soyaltepec)

ʧʃ : Eastern Popoloc, Tlacoyalco Popoloc, Mazatec (Huautila)

ʧʒ : Western Popoloc¹, Chocho, Trique(Copalá)

ʧʧ' : Jacaltec, Kanjobal, Acatec^{1,2}, Tectitec, Mam, Aguacatec, Ixil^{1,3}

č č' ʧ ʧ' : Ixil² (Chajul)

Retroflexed alveopalatal fricative /ʃ/ is found in two regions, Oaxaca-Puebla and western Highland Guatemala. Only Seri is isolated from the two diffusion centers. In the Oaxaca-Puebla region /ʃ/ is most concentrated in northern Zapotec, whence it seems to have emanated toward the south and northwest. Retroflexed alveopalatal affricate /ʧ/ is found in northwestern Oaxaca-southern Puebla and western Highland Guatemala. Not only /ʃ/ but also /ʧ/ occur in both areas and thus these two constitute a regional feature. /ʃ/ is an areal feature of Californian languages and is found in Cocopa², and Papago, which are contiguous to California. Other than languages in California, /ʃ/ is reported only in Xinca². Retroflexed affricate /ʧ/ is considerably rarer than /ʃ/ (Map 5).

3.1.1.8. Interdental Sibilant /θ/

Otomí (Mezquital), Tlacoyalco Popoloc, Chocho, Mixtec (Chayuco), Zapotec (Ixtlán, Juárez), Chinantec (Sochiapan, Tlacoatzintepec), Huastec (Veracruz, Potosí)

/θ/ is found in two contiguous areas: the northern Oaxaca-southern Puebla and Otomí-Huastec regions.

3.1.1.9. /f/ or /φ/

/f/ and /φ/ never co-occur and have areally interesting distributions.

/f/: Nahuatl (Zongolica), Otomí (Mezquital¹), Zapotec (Mitla², Lachixio), Chinantec (Lealao, Tepetotutla, Quiotepec), Huamelultec, Tequistlatec^{1,2}, Terraba

/φ/: Seri¹, Otomí (Tenango), Tlapanec¹, Tlacoyalco Popoloc, Chocho, Ixcatec, Mixtec (Peñoles), Chinantec (Palantla, Sochiapan), Guatuso

Although at first blush /f/ and /φ/ seem to be found in a random geographical distribution, closer analysis reveals that Chinantec is probably one of the diffusion centers.

3.1.1.10. Velar Fricative /x/ Contrasting with Glottal Fricative /h/

Otomí (Mezquital¹, Tenango), Mayan (Jacaltec, Kanjobal, Chuj, Kekchí, Pocomchí^{1,2}, Pocomam, Quiché²)

The contrast of /x/ vs. /h/ is found in two Otomian languages and in northern

Highland Guatemalan languages.

3.1.1.11. Uvular Fricative /x/

/X/ Zapotec (Rincón)

/X X/ Zapotec (Cajonos, Zoogocho)

/X X^w/ Seri¹, Zapotec (Yalalag, Yatzachi)

Uvular fricative /X/ is distributed throughout northern Zapotecan and is found in Seri.

3.1.1.12. Lateral Affricate /ɬ/:

/ɬ/ is found in Nahuatl languages, Totonac, and Tequistlatec.

3.1.1.13. Voiceless Sonorants

3.1.1.13.1. Voiceless Lateral /t̥/

Nahuatl (Zongolica), Paipai², Cocopa², Seri¹, Cuitlatec¹, Totonac, Tepehua (Huehuetla), Tequistlatec^{1,2}, Huamelultec, Xinca²

3.1.1.13.2. Voiceless Nasal /N/

Tequistlatec, Mixtec (Atatlahuca)

3.1.1.13.3. Voiceless Glides

/w/: Nahuatl (Huautla), Tequistlatec, Seri¹

/w y/: Pómaro Nahual

3.1.1.14. Velar Nasal /ŋ/ and Palatalized Nasal /ñ/(/nʲ/)

The following is the list of languages having /ŋ/ and/or /ñ/.

/ŋ/: Central Pame, Zapotec (Isthmus²), Chinantec (Comaltepec, Lealao, Tepetotutla, Palantla, Sochiapan, Tlacoatzintepec), Tequistlatec², Zoque (León, Chimalapa), Mixe (Coatlán, Paraíso, Totontepec¹), Chuj, Jacaltepec, Sacapultec, Tol, Miskitu, Sumu, Rama, Cabécar, Guatuso

/ñ/: Papago, Northern Tepehuan¹, Cora¹, Pochutec, Paipai², Kiliwa², Cocopa², Otomí (Temoayan, Mezquital¹), Mazahua, Ixcatec, Tlacoyalco Popoloc, Western Popoloc¹, Mazatec (Chiquihuitlán, Díaz, Huautla, Soyaltepec), Amuzgo (San Pedro¹, Xochistlahuaca), Mixtec (Acatlán, Huajuapán, Silacayoapan, Mixtepec, Alacatlazala, Ayutla², Ocotepec², Atatlahuca, El Grande, Chalcatongo, Diuxi², Peñoles, Coatzospán, Jamiltepec, Colorado, Chayuco, Jicaltepec), Zapotec (Quioquitani, Lachixio, Chichicapán, Isthmus^{1,2}), Chatino (Tataltepec¹), Huamelultec Chontal, Chol¹ (Tila)

/ñ ŋ/: Mixtec (Molinos), Chinantec (Quiotepec), Tequistlatec¹, Zoque (Copainalá), Sierra Popoluca, Boruca, Térraba, Teribe, Guaymí

/ŋ/ extends eastward centering around Chinantecan, whereas /ñ/ seems to spread northward, focusing on Otomanguean.

3.1.1.15. Palatalized Consonants

Below I list all the palatalized consonants with the languages having them.

/tʲ/: Northern Tepehuan¹, Cora¹, Ixcatec, Mazatec (Chiquihuitlán), Amuzgo (San Pedro¹, Xochistlahuaca), Mixtec (Ayutla², Jamiltepec, Jicaltepec, Chayuco, Colorado), Zapotec (Chichicapán), Chatino (Tataltepec¹), Chinantec (Quiotepec), Huamelultec, Sierra Popoluca, Zoque (Copainalá), Chol¹

/dʲ/: Northern Tepehuan¹, Ixcatec, Amuzgo (San Pedro¹), Zapotec (Chichicapán), Chatino (Tataltepec¹), Chinantec (Quiotepec), Zoque (Copainalá), Sierra Popoluca

/ⁿdʲ/: Amuzgo (Xochistlahuaca; nʲ), Mixtec (Ayutla², Jamiltepec, Colorado, Chayuco, Jicaltepec)

/čʲ/: Cora (Jesús María)

/kʲ/: Amuzgo (Xochistlahuaca), Mixtec (Ayutla²), Zapotec (Lachixio), Tectitec, Mam, Aguacatec, Sacapultec, Sipacapeño

/sʲ/: Mixtec (Ayutla²)

/hʲ/: Chatino (Tataltepec¹)

/ðʲ/: Mixtec (Coatzacoapan)

/lʲ/: Cocopa², Central Pame, Chatino (Tataltepec¹), Huamelultec

/ɬ/: Cocopa², Huamelultec

/nʲ/: Cora¹, Paipai², Cocopa², Amuzgo (Xochistlahuaca), Chatino (Tataltepec¹)

/tʲ/ appears to be an areal feature of two district regions. One is southern Oaxaca, including Chatino, Mixtec, Amuzgo, and perhaps Huamelultec Chontal; Chatino, with its palatalized series /t d n l h/, seems to be the center of diffusion here. The other region where /tʲ/ crosses a genetic boundary is Chiapas, which includes Zoque and Chol. /dʲ/ is /tʲ/'s voiced cognate here. /ⁿdʲ/ may turn out to be an areal feature of southwestern Oaxaca. /kʲ/ is found to be an areal feature in languages of western Highland Guatemala.

3.1.1.16. Labialized Consonants

The following comprises a list of labialized consonants with the languages which have them.

/pʷ/: Cora², Ixil²

/bʷ/: Mayo, Nahua (Jalapa)

/kʷ/: Cocopa², Seri¹, Cora², Huichol¹, Nahua (all except Pajapan, Jalapa and Pochutec), Cuitlatec¹, Tarasco², Matlatzinca, Ocuiltec, Otomí (Temoayan), Mazahua, Mazatec (Jalapa), Mixtec (all), Amuzgo (Xochistlahuaca), Zapotec (Juárez, Ixtlán, Yatzaquí, Yalalag, Albarradas, Mitla², Tlacoahuaya, Chichicapan, Quioquitani, Ayoquesco, Lachixio), Chatino (Tataltepec¹), Huastec, Ixil³, Cuna

/gʷ/: Mazatec (Jalapa de Díaz), Zapotec (Juárez, Ixtlán, Yatzaquí, Yalalag, Mitla², Tlacoahuaya, Chichicapan, Quioquitani, Ayoquesco), Chatino (Tataltepec¹)

/ⁿgʷ/: Mixtec (Ayutla², Peñoles, Coatzacoapan)

/qʷ/: Cocopa²

/hʷ/: Kiliwa², Chatino (Tataltepec¹)

/xʷ/: Cocopa², Mixtec (Diuxi²)

/Xʷ/: Seri¹, Zapotec (Yatzaquí, Yalalag)

/kʷ/ occurs in most Uto-Aztec and Otomanguean languages. Huastec and Tarasco may have acquired it from neighboring languages. /gʷ/ is /kʷ/'s voiced

cognate.

3.1.1.17. Coarticulation

A coarticulation phoneme is reported only for Cabécar and Bribí. The phoneme is dento-velar stop /tk/.

3.1.1.18. Tones

Tone contrasts are reported in many languages as indicated below, and are characteristic of the Otomanguean group in general.

Northern Tepehuan¹, Tarahumara^{1,2}, Cora¹, Cuicatec^{1,2}, Cocopa², Kiliwa², All Otomanguean, Huave, Yucatec, Uspantec, Tzotzil (San Bartoló), Boruca, Guatuso, Cabécar, Bribí, Térraba, Teribe, Guaymí, Bocotá

3.1.1.19. Nasalized Vowels

Otomanguean except Matlatzinca, Ocuiltec, Zapotecan

Chibchan (Cabécar, Bribí, Térraba, Teribe, Guaymí, Movere, Bocotá)

3.1.2. Lack of Common Traits

3.1.2.1. No Bilabial Stop /p/

The lack of bilabial consonants is characteristic of Otomanguean languages as a whole, but some do have /p/, which is supposed to have developed from /k^w/ [CAMPBELL 1979: 914]. The following languages are reported to have no bilabial stop.

Ixcatec, Popoloc, Mazatec (Chiquihuitlán, Jalapa), Amuzgo (San Pedro¹, rare), Mixtec (Hua-
juapan, Alacatlazala, Chalcatongo, Diuxi², Peñoles), Cuicatec¹

Boruca has no bilabial stop /p/, but does have /b/.

3.1.2.2. No Affricates

The following languages have no affricates in their consonant inventories; affricates do exist phonetically, however, and are interpreted as consonant clusters.

Southern Tepehuan¹, Seri¹, Mixtec (Ayutla², Chayuco), Chatino (Yaitepec), Chinantec (Quiotepec),
Térraba, Teribe

In addition, Miskitu, Sumu, and Rama seem to have no affricates either phonetically or in their inventories.

3.1.2.3. No Glottal Stop /ʔ/

Glottal stop /ʔ/ is a common phoneme, but the following languages lack it:
Nahuan (Tetelcingo, Amilcingo, Zongolica, Matlapa, Coscatlán, Cuamelco, Zacapoaxtla, Pajapan,
Jalapa, Pipil, Pochutec), Tarasco^{1,2}, Huave, Garífuna, Miskitu, Sumu, Rama, Guatuso, Térraba,
Teribe, Guaymí, Bocotá, Cuna

Tarasco, Huave and Garífuna are the only languages other than the Nahuatl and Chibchan groups in which the absence of /ʔ/ is attested.

3.1.2.4. No Velar, Uvular, or Glottal Fricatives: /x/ or /χ/ or /h/

Some languages have a contrast between /x/ and /h/ (cf. 3.1.1.10), but they are the exceptions. The following languages have no velar, uvular, or glottal fricatives:

Nahuatl (Classical, Tlaxpanaloya), Mixtec (Huajuapán, Coatzacoapan, Peñoles, Mixtepec, Jicaltepec, Chayuco), Zapotec (Juárez, Yatee, Albarrada, Guelavía¹, Chichicapan, Ayoquesco, Choapan, Tlacoahuaya, Guevea, Isthmus¹), Rama, Cuna

3.1.2.5. No Nasals

Bribri¹, Bocotá

3.1.2.6. No Labial Nasal /m/

Zapotec (Rincón, Yatee), Cabécar

3.1.2.7. No Liquids

Zoque (León), Mixe (Coatlán, Paraíso, Totontepec¹)

3.1.2.8. No Glides /w y/

Zapotec (Choapan), Chinantec (Comaltepec), Guatuso, Cabécar, Bribri¹, Térraba, Guaymí, Bocotá

3.2. Linguistic Universals

Students of linguistic typology tend to succumb to the temptation of attempting to generalize their findings. Although my research here has been limited to the phonological systems of a geographically restricted set of languages, those of Middle America, I want to extrapolate the results of my investigation to a broader context, and thereby to contribute to linguistic universals. However, my data are so areally biased as to prove inadequate for the purpose of deriving a set of linguistic universals. It is, however, possible to correlate linguistic universals with the generalizations from Native Middle American languages proposed so far. The universals or probabilistic statements are based on sampled languages of the world and are of course tentative. As a result, it will be revealing to apply them to my data as a means of finding out whether or not my data support them. This correlation of my findings with linguistic universals may uncover counterexamples to the latter, which will constitute areal or genetic features. In this way this section ties into the previous one on areal features.

3.2.1. Stops and Fricatives

Many generalizations concerning phonological systems have been proposed to date. For my data, I will concentrate on the statements proposed by Nartey and by Maddieson for consonants and by Crothers for vowels.

Nartey set up 22 universals concerning fricatives and stops [NARTEY 1979]. Almost all his statements are valid for my data. I will discuss 16 generalizations in all, referring in part to the summation by Lass [1984], whose remarks are based on

Nartey. The corresponding number of Nartey's statement is parenthesized after each statement.

3.2.1.1. Languages usually have at least three simple oral stops, most likely /p t k/ (Nartey 12, 13).

My data reveal that Middle American languages have from 3 to 9 voiceless stops, thus validating the first part of the statement above. However, my data do not support the second part of the statement, since /p/ is absent from some Otomanguean and Chibchan languages (treated in 3.1.2.1).

3.2.1.2. If a language has an affricate, it most likely also has at least three plain stops (Nartey 14).

Eastern and Western Popoloc constitute the single exception to this statement (here I regard Eastern and Western Popoloc as a single language for the sake of convenience). Western Popoloc¹ has 3 affricates but only 2 stops. Its system is /t c č k ʔ/. Eastern Popoloc is considered to have the same system, although it does have /p/, albeit rarely.

The voiceless stop series of Guaymí and Bocotá is /t č k/, but both languages also have a voiced series. Guaymí has /b ɖ j g/ and Bocotá has /b d j g/.

3.2.1.3. If there is only one affricate, it is most likely /č/ (Nartey 15).

According to Nartey, 55 languages have /č/ as their only affricate, while 20 have only /c/. The probability of encountering a language having /c/ is about 27% (20/75). My data reveal that 12 languages are restricted to /c/, whereas 15 languages have only /č/; these numbers do not seem to support Nartey's statement.

3.2.1.4. The number of voiceless stops is usually greater than the number of voiced, or equal to it (Nartey 16).

There are three exceptions to this statement:

Papago	p t č k //	b d ɖ j g
Chinantec (Lealo)	p t k //	b d j g
Bocotá	t č k //	b d j g

3.2.1.5. The presence of a voiced primary oral stop in a language is highly likely to imply the presence of its voiceless equivalent (Nartey 17).

Exceptions to this statement are Boruca, Guaymí and Bocotá, which have /b/ but lack its voiceless equivalent /p/.

3.2.1.6. The number of affricates is less than the number of plain stops (Nartey 18).

There is one exception. As is noted in generalization 3.2.1.2, Popoloc has 3 affricates but only 2 stops. Boruca's voiceless series is /t c č k/ (excluding /ʔ/), so that it has the same number of stops and affricates. However, since its voiced series is /b d j g/, the statement does roughly hold true.

3.2.1.7. The preferred number of primary oral stops is between four and eight (Nartey 19).

The correlation of the number of oral stops with the number of languages surveyed is shown in Table 23. Table 23 reveals that the preferred number of oral stops is between 4 and 12, when secondary (labialized, palatalized, aspirated, prenasalized, and glottalized) stops are included; the preferred number of primary oral stops is between 3 and 10. However, if we eliminate numbers under 10 for the number of languages with primary stops in Table 23, the preferred number of primary oral stops will range from 4 to 8, a result which supports Nartey's statement.

Table 23. Number of oral stops and number of languages

Number of phonemes	3	4	5	6	7	8	9	10	11	12	13	14	16	17
Number of languages	0	7	11	32	16	18	17	25	12	22	3	5	5	1
Number of languages with primary stops	8	19	41	44	19	27	7	8	0	1	0	0	0	0

3.2.1.8. 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, since all languages surveyed do indeed have plain stops.

3.2.1.9. 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 several exceptions to this statement. Xinka² has 3 plain, but 4 glottalized stops. In some Mixtecan languages the number of secondary stops is greater than that of primary stops or is equal to it, as shown below.

Mixtecan languages	Primary stops	Prenasalized stops
Acatlán	4 (excluding /k ^w /)	5
Silacayoapan	4 (excluding /k ^w /)	4
Mixtepec	5	5 (excluding / ⁿ g ^w /)
Ayutla ²	3 (excluding /t ^y k ^y k ^w /)	3 (excluding / ⁿ d ^y ⁿ g ^w /)
Atatlahuca	4 (excluding /k ^w /)	4
El Grande	4 (excluding /k ^w /)	4
Peñoles	3 (excluding k ^w /)	4 (excluding / ⁿ g ^w /)
Chayuco	3 (excluding /t ^y k ^w /)	3 (excluding / ⁿ d ^y /)

3.2.1.10. A language is highly likely to have at least one primary fricative (Nartey 1).

/h/ is not included in Nartey's primary fricatives. Native Middle American

languages have from 1 to 6 voiced and voiceless fricatives if we exclude /h/.

3.2.1.11. If a language has only one fricative, it is most likely /s/, next most likely /f/ (Nartey 2, 3).

/s/ is the most frequently occurring phoneme in my data, with /š/ the second most frequent. The frequency of /f/ is less than one-fifth that of /s/, and this may prove to be an areal feature of Middle America.

3.2.1.12. 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 3 exceptions to the first statement.

Cuitlatec ¹	č	h	//	β	ð	ɣ
Mixtec (Huajuapan)	s	š	//	β	ž	
Mixtec (Coatzacoapan)	s	š	//	β	ð	ð ^v

The second statement appears to be valid, since all the languages in my survey have voiceless fricatives.

3.2.1.13. The number of primary fricatives is unlikely to be greater than that of stops (Nartey 7).

Seri is an exception to this statement, since it has 8 fricatives (/φ W s ʃ š x x^w/, in which /x^w/ may be regarded as a secondary fricative) but only 5 stops /p t k k^w ʔ/.

3.2.1.14. The preferred number of primary fricatives is two (Nartey 6).

The following table presents the correlation of the number of fricatives with the number of languages surveyed. Since /h/ is excluded from Nartey's primary fricatives, I provide figures both with and without /h/ for the sake of comparability.

Table 24. 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: Column (1) indicates the number of fricatives. Columns (2) to (4) indicate the number of languages with /h/ counted; columns (5) to (7) the number with /h/ excluded. 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. Columns (4) and (7) indicate the total number of languages with /h/ counted and excluded, respectively. In parentheses is the number of languages which have secondary (labialized, palatalized, prenasalized and glottalized) fricatives.

The table shows that the preferred number of fricatives is two, when /h/ is not considered.

3.2.1.15. No language has secondary fricatives unless it has primary; and primary normally outnumber secondary (Nartey 8,9).

This statement is valid according to my data.

3.2.1.16. A language is very unlikely to have /h/ unless it also has a primary fricative (Nartey 11).

This statement is confirmed by my data.

3.2.2. Nasals

As in the previous analyses of stops and fricatives, I will also utilize the observations proposed by Nartey [1979] in my treatment of nasals.

3.3.2.1. There is a very highly significant tendency for languages to have at least one primary nasal consonant (Nartey 24).

Two languages, Bribrí and Bocotá, lack phonemic nasal stops. Both have

nasal vowels, however.

3.2.2.2. If a language has only one primary nasal consonant, its primary allophone is most likely to be /n/ (Nartey 25).

There are two languages with only one nasal consonant. Rincón Zapotec has /n/ while Cabécar has /ŋ/, since its [m n ñ] are interpreted phonetically as nasal variants of /b d g/ before nasal vowels. It should be noted that a closely related language, Bribrí, is reported to have no nasals. Both Cabécar and Bribrí, however, have nasalized vowels.

3.2.2.3. The preferred number of primary nasal consonants in a language is between two and four (Nartey 26).

This statement holds true, as Table 25 demonstrates. It should be noted that secondary nasals are included in the figures.

Table 25. 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

3.2.2.4. A language is highly unlikely to have secondary nasal consonants unless it also has one or more primary nasal consonants (Nartey 27).

3.2.2.5. In a given language the number of secondary nasal consonants is unlikely to be greater than the number of primary nasal consonants (Nartey 28).

As is demonstrated in section 2.4, these two statements hold true for the languages examined here.

3.2.3. Liquids

I discuss Maddieson's generalizations concerning liquids [1980a], with reference also to Lass [1984].

3.2.3.1. 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%) (Maddieson 1,2).

The Tarascan group proves to be this study's exception to the statement above, having /r ɾ/ but lacking a lateral. The statement is confirmed by 99% of my data.

3.2.3.2. A language with one or more laterals has a voiced lateral approximant (233/243=96%) (Maddieson 3).

Ninety-eight percent of my data support this statement with only three languages lacking a voiced lateral approximant: Papago has only lateral flap /ɾ/, Seri¹ /ɬ/, and Zongolica Nahuatl /ɬ ʎ/.

3.2.3.3. Languages with two or more laterals may contrast them either in place or in manner and voicing, but not both (96/97=99%), that is, a language will not have a voiced lateral flap vs. voiceless approximant (Maddieson 4).

In my data 27 of 174 samples have two or more laterals. It is difficult to specify their exact places of articulation, but almost all of them seem to be produced in the dental-alveolar region. If this interpretation is correct, languages in my data with two or more laterals distinguish them with contrasts in manner and voicing, while place of articulation stays the same.

3.2.3.4. Languages with two or more *r*-types are unlikely to restrict the contrast to place alone (unlike laterals) (Maddieson 5).

Tarascan, with both flap and retroflexed *r*-sounds, might at first seem an exception to this statement, but since these sounds are regarded as being produced in distinct places, the statement does in fact hold true for my data.

3.2.3.5. A liquid with both lateral and *r*-sound allophones is the likeliest candidate for the single liquid in a system (Maddieson 6).

My data are ambiguous as regards this claim. See Section 2.5.

3.2.3.6. A language most often has two liquids (one lateral and one *r*-sound) (Maddieson 7).

In Maddieson's data 35% of languages examined (111/321) support this statement, while in my data 47% (83/174) support it.

3.2.4. Vowels

Crothers set up 15 statements and Nartey proposed 9 universals concerning vowel systems. Crothers' first 7 statements concern specific vowel qualities, such as "all languages have /i a u/" or "all languages with four or more vowels have /i/ or /e/." Because vowel qualities are relative within an individual language's system, they seem ill-suited to cross-linguistic generalization. Suppose that a system has /i e a o/. /e/ can be /ɛ/. What is needed in the system is front- and mid-ness represented by /e/, which distinguishes /e/ from other phonemes such as /i/ or /a/. Crothers analyzed 9 Native Middle American languages which also happen to be in the database here. If we compare his analysis with mine, we see how different the two are, although both of us used the same sources.

	Crothers [1978]	This study
Mazatec	i e a o	i e a o

	ɨ ɛ ɐ ɔ [Pike & Pike 1947]	ɨ ɛ ɐ ɔ [Pike 1967]
Tzeltal	i ɛ a o u [Kaufman 1971]	i ɛ a o u [Kaufman 1971]
Zoque	i ɛ a o u ɛ̃ [Wonderly 1951]	i ɛ a o u ʌ [Wonderly 1951]
Otomí	i ɛ æ a ɔ o u i ə	i ɛ æ a ɔ o u ə i
	ɨ æ ɐ ʊ	ɨ æ ɐ ʊ
	[BLIGHT & PIKE 1976]	[BLIGHT & PIKE 1976]

The lack of agreement between Crothers' and my analyses of the same source materials underlies the inherent difficulties that surface in trying to derive linguistic universals from vowel qualities. Nevertheless, it is revealing to correlate the number of vowels and their qualities with the number of languages which have them, as follows:

Languages with three vowels: 7

/i a u/

Languages with four vowels: 21

/i ɛ a/ + /o/ or /u/

Languages with five vowels: 78

/i ɛ a o u/

/i ɛ a o/ + central /i/ or /ə/ or /ʊ/

/i ɛ a o/ + back /i/

/i ɛ a o/ + front /ü/ or /ɛ/

/i ɛ a u/ + central /i/ or /ə/

/i ɛ a u/ + back /i/

/i a o u/ + central /i/

/i a o u/ + front /æ/

Languages with six vowels: 40

/i ɛ a o u/ + central /i/ or /ə/

/i ɛ a o u/ + back /i/

/i ɛ a o u/ + front /ɛ/ or /æ/

/i a o u/ + back /ĩ ẽ/ or front /ɛ̃ ẽ/

/i ɛ a u/ + /æ ə/

Languages with seven vowels: 18

/i ɛ a o u/ + central /i/ + /ʌ/ or /ə/

/i ɛ a o u/ + back /ĩ ẽ/

/i ɛ a o u/ + front /ü æ/

/i ɛ a o u/ + front /ɛ/ or /æ/ or /ɪ/ + back /ɔ/ or /ʊ/

/i ɛ a o u/ + central /ʌ/ + back /ɔ/

/i ɛ a ɔ u/ + /i ʌ/ or /ɪ ʊ/

Languages with eight vowels: 4

/i ɛ a o u/ + front /æ/ or /ü/ + back /ĩ ẽ/

/i ɛ a o u/ + front /ɪ/ + back /ɔ ʊ/

/i ɛ a o u/ + back /ĩ ẽ ɔ/

Languages with nine vowels: 6

/i e a o u/

- + front /e/ or /æ/ + central /i ə/ or /i ʌ/ or /ə ʌ/ + back /ɔ/
- + front /e/ or /æ/ + central /ə/ or /ʌ/ + back /i ɔ/

Based on the summation above we can state the following:

- 1) All languages in my data with 3 vowels have /i a u/.
- 2) All languages with 4 or more vowels have /o/ or /u/.
- 3) Languages with 8 or more vowels have /e/ and /o/.

Now let us have a look at Crothers' remaining statements.

- 4) A contrast among 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 are presented in Table 26, where it can be seen that they support Crothers' claim, since 45% (78/174) of languages surveyed have 5 normal length vowels, and 80% have 4 to 6 vowels.

Table 26. Number of normal length vowels and number of languages

Number of vowels	3	4	5	6	7	8	9
Number of languages	7	21	78	40	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 claim is confirmed by my data.

- 6) Languages with two or more interior vowels always have a high one (Crothers 10).

There is one exception to this statement. Temoayan Otomí has two central vowels, but both 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 (Quioitepec Chinantec with /o e a o u ü i ö/). Southeastern Tepehuan has /i a o u i ë/, making it too an exception to this generalization.

- 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 included either in the back or the central series, it is regarded here as central, with 5 resulting counterexamples to this claim, as follows:

	Front	Back
Papago and Northern Tepehuan with /i a o u i/	1	2
Southern Tepehuan with /i a o u i ě/.	1	2
Tlahuitoltepec Mixe with /i e a ɔ o u ʌ/	2	3
Guaymí with /i e a ɔ o u i ě/	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 do not hesitate to accept this as a valid tendency but my own data do not actually reflect it. Seventy-one languages surveyed here have a length contrast, and among these 67 have a symmetrical set of short and long vowels. In 5 languages, moreover, the short vowel system is larger than the long vowel system. These are as follows:

Ahuacatlan Nahuatl (4S: 3L)

Zongolica Nahuatl (5S: 4L)

Itzá², 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 there are fewer vowels in the nasal vowel systems than in the oral systems. In 31 languages the vowels of the two systems are equivalent in number and arrangement. Furthermore, of the 6 languages which have both length and nasalization contrasts, 4 have symmetrical systems and 2 asymmetrical systems; in the latter, the number of nasal vowels is also smaller than that of the oral ones.

Nasalized and lengthened vowels typically have oral counterparts, even if there are fewer of them than of the corresponding oral vowels; however, Silacayoapan Mixtec is an exception to this tendency since it has a nasalized vowel different from the oral counterpart.

Silacayoapan Mixtec i e a o u // i ɛ ɤ ʉ

- 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).

My data offer some exceptions to this claim. In Chatino (Yaitepec) /ɤ/ is missing rather than mid /ɛ ɔ/. In Trique (Copalá) and Amuzgo (San Pedro¹, Xochistlahuaca) it is high /i ʉ/ that are missing. Mixtec (El Grande) lacks /ɛ/, having /ɔ/ instead, whereas Mixtec (Coatzacoapan) lacks /ɔ/, but has /ɛ/.

I suggest one additional generalization based on my own data.

- 12) There is a tendency for languages having nasalized vowels to show more asym-

metry than languages having long vowels.

Thirty-nine percent of the languages having nasalized vowels show asymmetry, while only 8% of the languages having long vowels show asymmetry (See Section 3, Chapter 2).

In this section I have discussed the phonological systems of Native Middle American languages from the point of view of linguistic universals.

3.3 Summary

This chapter has been concerned with detailing the areal features of phonological systems of Native Middle American languages and with the correlation of claims from research on linguistic universals with findings from my data.

Some phonemes have been found to have a peculiar geographical distribution. For example, retroflexed affricates and sibilants are restricted to two areas: roughly, western Highland Guatemala and Oaxaca. Moreover, these two areas yield additional phonemes particular to them.

From an areal point of view, both the vowel and the consonant systems of Middle American languages show interesting patterns.

Almost 90% of the languages in Middle America have from four- to seven-vowel systems; these languages are distributed all over Middle America. Three-vowel systems are attested in Yuman, Totonacan and Chibchan. In Mesoamerica only Totonacan languages have three-vowel systems. Fourteen of the 21 four-vowel systems belong to Nahuatl languages, 4 to Zapotecan ones, and the remaining 3 to Seri¹, Huastla Mazatec and Tlacoyalco Popoloc. Eight-vowel systems are found in Teribe and Guaymí as well as in 2 Chinantec languages. Nine-vowel systems are attested in Otomian and Totontepec Mixe (Map 2).

Turning to diversity at the genetic level, the Uto-Aztecan languages have five-vowel systems, with the exception of most Nahuatl varieties, which have four-vowel systems, while Southeastern Tepehuan and Cora² have six-vowel systems. The Mixtec languages manifest either 5 or 6 oral vowel contrasts. Roughly speaking, five-vowel systems are distributed through the southern part of Western Oaxaca, whereas six-vowel systems, which are supposed to reflect proto systems [JOSSEAND 1983: 268-448], are found in the northern part. The Zapotecan languages have vowel qualities ranging from 4 to 7. Roughly speaking, five-vowel systems are distributed through the northern and eastern part of Oaxaca, while six-vowel systems occupy the central part. Four- and seven-vowel systems are minor systems. Four-vowel systems are minor systems. Four-vowel systems are attested in Zoogocho, Cajonos, Yatee, and Lachixio, and seven-vowel systems in Rincón 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. Chol and Tzeltal-Tzotzil have no length contrast. Most Mayan languages have a five-vowel system, while six-vowel systems are restricted geographically. The latter are seen in Lacandón, Itzá,

Mopán, Chol, and Chontal; among these, Itzá forms an asymmetrical set with only 5 long vowels. These languages occupy the northern and central part of the Maya region (Maps 2, 3).

With regard to consonant system universals, I have discussed 16 claims about stops and fricatives, 5 about nasals and 6 about liquids, utilizing statements proposed by Nartey [1979] and Maddieson [1980a, 1984]. Turning to vowel system universals, I have evaluated 12 of Crothers' claims [1978].

Chapter 4

Numeral Systems

In Mesoamerica numerals were usually written with bars and dots, with the dots representing one, and the bars five. Stela 2 of Chiapa de Corzo, for example, which records the oldest date ever discovered, is inscribed with a vertical series of three dots, two dots, three dots and two bars, and below them one dot and one bar. This is a part of the calendar called the "Long Count," and consists of five orders. The system is vigesimal except for the third rank, and the values of the positions increase from bottom to top in vertical columns. Thus Stela 2 of Chiapa de Corzo records (7). (16).3.2.13 6 Ben (16 Xul), since the calendar can be regarded as having the same system as the Mayan system (36 12/6 B.C.). Here the parenthesized numbers are reconstructed. The numerical values of the five orders are as follows:

The fifth rank: $7 \times 20 \times 20 \times 20 \times 18 = 7 \times 20 \times 20 \times 360$

The fourth rank: $16 \times 20 \times 20 \times 18 = 16 \times 20 \times 360$

The third rank: $3 \times 20 \times 18 = 3 \times 360$

The second rank: 2×20

The first rank: 13

As is indicated above, the system is vigesimal except for the third rank, which is obtained by multiplying the value of the second rank by eighteen rather than by twenty. The Long Count system was inherited by the Maya (A.D. 292) and was used until A.D. 909. This particular system was used almost exclusively for recording dates. On the other hand, the vigesimal system was used and is still used in many languages of Middle America. However, not every language has the same structure. Some languages have quinary-vigesimal (five-twenty) systems, that is, quinary under twenty, so that the numbers 6 to 9 are formed by addition from 5, and the number 10 is represented by two-five or an independent word, for example. Some have decimal-vigesimal (ten-twenty) systems, that is, decimal under 20; some have quinary-decimal-vigesimal (five-ten-twenty) systems. There are also many variations in the order in which individual number words are combined. Fifteen, for example, is found in such forms as five-and-ten ($5+10$), ten-and-five ($10+5$), and three-five (3×5). In this chapter I will discuss the various indigenous systems, which show interesting typological variety and areal distribution. At

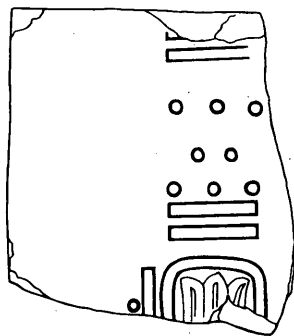


Fig. 1. Stela 2, Chiapa de Corzo.

[Coe 1976: 113, fig. 3]

times the formation of the number words differs from language to language even within the same family. This leads us to suppose that the difference may be a result of language borrowing through contact, which I will discuss after analyzing the numeral systems themselves.

Very few studies have been undertaken on numeral systems of Middle American languages as a whole, although the numeral systems of individual languages are usually described in their grammars or dictionaries. The most extensive work to date is *"Numeral Systems of Mexico and Central America"* by Thomas [1897-8], with Dixon and Kroeber's *"Numeral Systems of the Languages of California"* [1907] being another helpful reference on this subject. These sources are useful but not recent. With regard to surveys of numeral systems in general, the works of Menninger [1966], Corstius [1968], Hurford [1975], and Flegg [1983] are counted among the most important; one of the most insightful works for typological studies is that of Greenberg [1978].

With regard to numerals, I refer to ordinal numbers and numeral classifiers in addition to the cardinals. As is observed in the Zapotec and Mixtec languages, the difference between the cardinal and ordinal is represented by their order relative to the noun, that is, number-noun and noun-number, respectively. This formation is very interesting from a typological standpoint. Numeral classifiers, on the other hand, are related to the semantic domain, although the order relative to the noun is typologically interesting. In this chapter, however, I limit my discussion to the most unmarked of these three subsystems of the numerals, the cardinals.

4.1. Some Problems in the Description of Counting Methods

The treatment of numeral systems is fraught with problems. Take for example the term "vigesimal." "Vigesimal" is not used in any pure sense. For a vigesimal system to be pure would require 19 different number words. However, no Middle American language has such a system and there may be no purely vigesimal system in the world. Most of the numeral systems in Middle America are claimed to be vigesimal, but numbers up to 20 are not counted by a purely vigesimal system, which, as stated above, would give 19 different number words, but rather are typically counted by the quinary or decimal method. Beyond 20 the languages have words for the ranks of 20, 400, 8000 and so on. Instead of 19 different unit designations, gradations of 5 or 10 are used up to 20, and above 20 gradations of 20 are used, with further gradations of 5 or 10 between 20 and 40 and so on. Such terms as quinary, decimal and vigesimal have often been applied to the entire system. As is shown above, however, there are different principles at work governing the structure of the whole number sequence. Therefore, I will apply the terms of gradations of 5, 10 or 20, that is, quinary, decimal, or vigesimal to the corresponding parts of the systems as a whole.

Numeral words are generally formed by the combinations of additions and multiplications of a limited number of units. Japanese and English numbers pro-

vide an illustrative example of this process. In Japanese, the difference between 13 and 30 is expressed by the position of the multiplicative word or additional word *san* (3) relative to the rank or base word *juu* (10), that is, *san-juu* (30)/ *juu-san* (13). In English, the morphemes *-ty* and *-teen* express the difference between 13 and 30, with the morpheme *thir-* designating the unit 3 occurring before either *-ty* or *-teen*, that is, *thir-ty*/*thir-teen*. The formation of numeral words in Japanese and English, then, is by way of the position of a unit relative to the base or by means of some modifications to the morpheme itself. I have given above the 2 combinations of 3 and 10 as an example. Now let us consider the number 33. Both Japanese and English have the same structure, $\text{unit}(3) \times \text{base}(10) + \text{unit}(3)$. In German, however, 33 is expressed in terms of $\text{unit} + \text{unit} \times \text{base}$, *drei-und-drei-ßig* ($3 + 3 \times 10$).

The two terms unit and base used above are important to a description of numerals. The unit (or digit) is one of the succession of abstract numbers, for example, 1, 2, 3, ..., 9 in the decimal system. The number for 18 is formed from the rank level of 10 plus the unit 8. The ranks represent the higher levels specified in terms of powers of the base number. They may be expressed by exponentiation of the base (B), for example, 10 (B^1), 100 (B^2), 1000 (B^3) in the decimal and 20 (B^1), 400 (B^2), 8000 (B^3) in the vigesimal system. B^1 is of course equivalent to the fundamental base number.

The class of numerical expressions in any given language is theoretically almost infinite, but not every number word is unique. A small set of a language's vocabulary is combined on the basis of a few rules, with the result that we are able to count without unduly burdening our memories. The basic numbers for the formation of number words are units and bases. We call a numeral system decimal or vigesimal, based on the principles governing the combinations of units and bases in the number sequence. When powers of the base number are multiples of ten, we call the system decimal; when powers of the base number are multiples of twenty, we term it vigesimal. Since such designations are useful for discussing numeral systems, we use them, bearing in mind their limitations, namely, that these terms cannot always be appropriately applied to the systems as a whole.

Now let us return to the formation of the number words themselves. Suppose that several people without a knowledge of the language in question are shown the following number.

kan-lahun

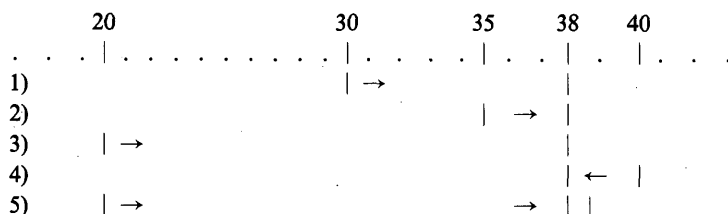
kan = 4, lahun = 10

Some may regard *kanlahun* as fourteen and others as forty. The fact that *kanlahun* is fourteen is due only to a rule of that language. Numbers are typically formed by the addition or multiplication of a unit (U) and a base number (B). The possible combinations are as follows:

- 1) $U \times B + U$
- 2) $B \times U + U$
- 3) $U + U \times B$
- 4) $U + B \times U$

The different combinations of the formations may be described as unit-prepositional or unit-postpositional, and coefficient-prepositional or coefficient-postpositional. English has the first type, that is, a coefficient-prepositional, unit-postpositional system.

There are various methods for forming number words. Let us take a look at the ways in which 38 is formed.



1) is a decimal or 10-count method. 2) is a quinary method, and 3) is a vigesimal one. These are adding methods, which place the units upon the lower rank level; adding methods in general are said to count from the lower level, or undercount. 4) and 5) are examples of counting from the upper rank level. In the case of 4), 38 is expressed by the subtraction of 2 from 40. The method of example 5) is 18 toward 40. 4) is called back-counting and 5) overcounting [MENNINGER 1969: 74-77]. The method of counting backward shown in 4) is often used in the formation of 9, "1 from 10" or "1 step down," or the like. In addition to these methods, it is also necessary for a full accounting of number systems to include minor ones such as half-counting and double-counting. The former can be considered a form of overcounting, and is seen, for example, in the number word 50, which may be expressed as half of 100. The latter is a form of multiplication and is found, for example, where 4 is expressed by two-double and 8 by four-double. These methods are typically applied to only a limited part of the numeral system. In addition to these minor number formation methods, it is also essential to include not only round numbers, namely 20, 30 in the decimal system and 20, 40 in the vigesimal one, but also the interval numbers, for example, from 21 to 29 in the decimal system and from 21 to 39 in the vigesimal.

We can actually construct a numeral system from a representative but limited set of numeral words such as dictionaries normally provide. Based on a list which includes a finite set of vocabulary, we can count high numbers almost to infinity, which indicates that the numeral system is generated by the combination of a small set of vocabulary items with some rules by which to operate it; in other words, it has a recursive mechanism. To understand the numeral system, therefore, it is necessary to describe both the basic words and the rules governing their combination. There may be many ways of describing the numeral system [HURFORD 1975], but this is also true of descriptions of grammatical systems. It seems impossible to create a complete grammar now, and this state of affairs shows no signs of change

for the future. Grammars of numeral systems are written in accordance with current theory, just as other grammars are.

4.2. Materials and Their Analysis

Here I will present the materials necessary to discuss the numeral systems. The order of presentation is the same as that of my classification (See Table 1 in Chapter 1).

As is shown above, different principles govern the structure of the whole number sequence, so that the numeral systems must be considered separately: ① below 10, ② from 10 to 20, ③ from 20 to the next higher order, ④ above the next higher order. I will analyze these individual ranks after presenting the numeral system of each language together with an analysis of each numerical expression.

The purpose of this chapter is to investigate both the principles regulating the numeral systems, that is, whether counting is done by fives, tens, twenties or mixed counting within the number sequences, and also the formation of the numbers themselves, that is, whether the unit (digit) precedes the base or the reverse order obtains, etcetera. In addition, the purpose here is to discuss the typological variety and areal distribution of the number systems in general. My aim is not to investigate the numerals linguistically by providing etymologies of the numeral words or word correspondences within a family. Limiting the object of study in this way is analogous to abbreviating the rules that describe morphological changes and including them in a derivative vocabulary.

The principles of forming numeral words may be formulated in terms of mathematical symbols. However, judging from my own personal experience, if the symbols seem too abstract, we will have to reconsider them in more concrete terms. I have come to doubt that abstract symbols have advantages over more concrete instantiations. It may well be the case that such abstract formulae are only the expressions of self-satisfaction in achieving superficial simplicity for the description, except when they are actually useful in interpreting new phenomena. Accordingly, I will present the structure of the numeral systems as concretely as possible. Nevertheless, it is true that numeral systems are full of repetition. We can at least contrive useful expressions to understand their characteristics; these expressions, in turn, must have the following rules set up for them:

- i) The analysis is given from the smallest unit to larger units.
 - ① the first rank, ② the rank level of 10,
 - ③ the rank level of 20, ④ higher rank level(s).
- ii) Each base number is represented by B^n and the numbers of the minimal rank by U. For example, the decimal system is expressed by the following:

$$U = \{1 \dots 9\}, B^1 = \{10\}, B^2 = \{100\}$$
- iii) Component numbers are enclosed in braces $\{ \}$, like $\{1,2,3,4\}$.
- iv) Basic vocabulary is not expressed by morphemes but by Arabic figures.

- v) Since the numerals are in strict ascending order, intervening numbers are omitted.

Example: $\{1...7\} = \{1,2,3,4,5,6,7\}$

- vi) A number is expressed by the selection of an element of the numbers in braces. The selection of the elements is expressed by $\{, \}$.

- vii) The numerical expression of a base is presented in parentheses $()$.

Example: 10 (baivušt'áma)

- viii) The expressed numbers are N_m-n . For example, the numbers from one to nine are N_{1-9} .

Example: $N_{1-9} = \{1...9\}$

- ix) Addition is expressed by the symbol $/+ /$.

Example: $18 = 10 + 8$

- x) Multiplication is expressed by $/\times /$.

Example: $40 = 2 \times 20$

- xi) To give an example, the number 12 is expressed by the base number in the rank level of 10 and 2 in the rank level of 1. The larger numbers are formed by the combination of the base number and the units. To express the recursive mechanism, I use the following symbols.

Example: $N_{10-19} = B^1 \pm \{N_{1-9}\}$

This formula may be written as $N_{10-19} = B^1 + \{N_{0-9}\}$, which introduces the symbol N_0 . However, since N_0 could be mis-interpreted as 0, I use the symbol $/+ /$ to avoid creating such a misunderstanding. In this case the symbol $/- /$ signifies that the numbers or vocabulary following the symbol $/- /$ do not exist. Thus the formula above of " $N_{10-19} = B^1 \pm \{N_{1-9}\}$ " is the same as " $N_{10} = B^1, N_{11-19} = B^1 + \{N_{1-9}\}$." However, when the concrete number word is nonexistent, I use the symbol $/\# /$.

Example: $\{\#, 2, 3, 4\} \times B^2 = \{B^2, 2 \times B^2, 3 \times B^2, 4 \times B^2\}$

- xii) Back-counting is in use where, for example, 9 is expressed as "one from 10."

This is written as follows:

The base number occurs before one: $/10-1 /$,

The base number occurs after one: $/-1+10 /$.

- xiii) When two or more elements are juxtaposed by means of a conjunction such as "and" or "with" or the like, the morpheme is given.

Example: 10 (baivušt'áma) + *dan* + $\{N_{1-9}\}$

- xiv) When double-counting is expressed by the two methods of either reduplication of the first syllable or by multiplying two, the former is expressed by $/"/$ and the latter by $/2 \times /$.

Example: $4'' = 8$ ($4 = gi'ik$, $8 = gigi'ik$),

$2 \times 4 = 8$ ($2 = wói$, $4 = náiki$, $8 = wónaiki$)

- xv) When the base number of the next higher level is different from the basic rank number, it is expressed as $/'/$.

Example: In the number sequence $1 = ce$, $2 = ome$, $5 = macuilli$, $6 = chicuace$, $7 = chicome$, it is clear that the numbers from 6 are formed from *chic*-(5) plus the numbers of 1, 2. The base number from 6 up is *chic*-, which is different

from the base number 5, *macuilli*. In this case 6 is analyzed as $5' + 1$.

xvi) Overcounting is expressed as $/ > /$. For example, 21 is expressed as "1 toward the next level 40 (2×20).". This is analyzed as $1 > 2 \times 20$.

See Database 2.

4.3. Discussion

In the preceding section, I analyzed the principles of the number sequences and the formation of number words. The number sequences were separately considered: 1) below 10, 2) from 10 to 20, and 3) above 20. The geographical distribution of the various methods of counting is shown in Maps 6, 7, and 8.

In Mesoamerica, which occupies roughly the central portion of Middle America, vigesimal systems predominate. The numerals above 20 are formed according to the vigesimal method, but below 20 there exist a variety of methods. Some languages show a decimal system throughout; some show a quinary system; some have 12 different roots up to 12 after which the numerals are formed on the decimal method; some have a quinary-decimal system. Above 20 the majority of the Mayan family have a system different from that of the other languages, namely, an overcounting method which counts from the upper level. We also find many differences regarding the formation of number words. In some languages, for example, the base word 10 occurs before a unit, and in others after it. In accounting for such variety in its numeral systems, we will first refer to some distinctive features of Middle America as a whole, utilizing the accompanying maps, and then discuss the differences in methods used by each language group both in their number sequences and in the formation of their number words.

In the northern portion of Middle America that extends beyond Mesoamerica, the vigesimal system is seen only in some few Uto-Aztecan languages and in the languages directly bordering Mesoamerica; since the decimal system prevails further north, it is assumed that these languages were influenced by neighboring Mesoamerican languages having the vigesimal system. In the southern part of Middle America, the vigesimal system is found in such language groups as Misumalpan and Chibchan, but their vigesimal system is different from that of Mesoamerica. Coefficients (or multipliers) are postfixed to 20, for example, 20×2 for 40, while coefficients are prefixed to 20 in Mesoamerica, for example, 2×20 for 40. Although vigesimal systems prevail in Mesoamerica, the systems also include overcounting and undercounting, with the result that interval numbers are counted differently. Overcounting is used in Lowland Mayan languages and spreads as far as some Highland Mayan ones.

Number formation from 1 to 10 is by either the quinary or decimal method. In some cases, however, the double-counting or duplicative method for the formation of 4 and 8 is also found, as well as back-counting for 9. The quinary method is observed in the northern group of Otomanguean, Mixe-Zoquean, Tarasco and Nahuan, and is found in the northern part of Middle America beyond

Mesoamerica, in Huichol, Cora and Tepecano. In the south, Sumu, Rama and Cabecar = Chiripo also have the quinary system, and Tol used it in the early 20th century. Other languages are decimal.

Number formation from 10 to 20 is somewhat complicated. There are two possible interpretations of the number words from 10 up in languages which have the quinary method up to 10. When numbers from 1 to 9 are added to the base number 10, we may regard the system either as quinary, since the formation of numbers up to 10 is quinary, or as decimal, since the numbers from 1 to 9 are added to 10. Different interpretations result in entirely different maps. If we regard these languages as the extension of the quinary system, roughly speaking, the western half of Mesoamerica turns out to be characterized by the use of the quinary method, and the eastern half by the use of the decimal system. To be precise, however, in addition to the languages which have the quinary system up to 10, we must also account for the languages which are quinary from 10 up, for example, the southern Otomanguean ones. Huastec, Totonac and Tepehua in northwest Mesoamerica are decimal.

According to the second interpretation above, even where a system is quinary up to 10, it must be regarded as decimal if its numbers from 10 up are formed from the base 10 plus the numbers from 1 to 9. To regard the system as quinary from 10 up, the third level rank 15 would have to be a new base number. In this study the map is figured based on this second interpretation, with the consequence that Otomí, Mazahua and Tarasco are regarded as decimal from 10 up. In Otomanguean, the northern group is quinary up to 10, while the southern group becomes quinary from 10 up.

The base number from 20 up is 100. There are two methods in use; one utilizes a Spanish word for 100, and the other retains the indigenous word. To use 100 as a base is contrary to the principle of the vigesimal system, but almost all languages utilize the word for 100 as a base. In these systems coefficients (or multipliers) are indigenous words and the intervals between 100 and 200 or 200 and 300 and so on are vigesimal. Thus the system is regarded as being in the transition of changing from the indigenous system to the Spanish decimal system. (Map 9)

Half-counting is observed in a few languages. In Chichimec 50 is expressed as half·100, and in Quichean 50 is expressed either as $2 \times 20 + 10$ or half·100. The numbers from 50 to 59 in modern Quiché may be expressed by half·100 + {1...9}. Yatzachí Zapotec also has the expression of half·100 in addition to an overcounting method ($10 > 60$) for 50. Sierra Otomí shows half-counting as well as the expression $2 \times 20 + 10$. Other languages with this special form of 50 are Palantla Chinantec and Mazatec. Half-counting is also observed in numbers above 50, for example in Mitla Zapotec, where 350 is analyzed as $3 \times 5 \times 20 + \text{half}$, and in Tarahumara, where 150 is represented as $1 \times 100 + \text{half}$.

So far we have referred but briefly to the formation of the numeral systems. If we discuss their formation in detail, we will discover more interesting phenomena. Therefore, we will now treat them in closer detail, separating the Middle American

languages into the following groups: 1) Uto-Aztecan, 2) Otomanguean, 3) Mayan, 4) Mixe-Zoquean, 5) Other languages.

4.3.1. Uto-Aztecan

Northern and southern Uto-Aztecan differ in their formation of the numerals above 20. In northern Uto-Aztecan it is the decimal system which predominates, while in southern Uto-Aztecan it is the vigesimal system. However, languages lying between the northern boundary of Mesoamerica and the Mexico-US border show either decimal or vigesimal systems. Tarahumara, for example, has the decimal system, while Mayo, Yaqui, Cora, and Huichol have the vigesimal system. Some languages show various other systems for the numbers below 10; the quinary method is seen in Cora and Huichol, the duplicative method in the formation of 8 and 10 in Yaqui and Mayo and so on. Languages in the United States further to the north have the duplicative method in the formation of 4 and 6 as well as of 8 and 10. By way of explicating these duplicative methods, I present the northern Uto-Aztecan numeral systems in Table 27.

In Table 27, we observe duplicative methods used in the formation of the numerals 4, 6, 8, and 10. The most clearest example is found in the formation of 6, where two distinct methods are seen. One is the prefixation method in which *na-* is prefixed to the root *pahi* (3), and the other is the reduplicative method by which *papai* is formed from *pa-*, the first syllable of *pai* (3), plus the root *pai*. *na-* is a reciprocal prefix according to Snapp and Anderson [SNAPP and ANDERSON 1982: 50]. Since this prefix is also found in the words of 4 and 8, it may be taken as equivalent to "multiplying by 2." In the words for 8, we find the reduplication method in Kitanemuk and Fernandño, while Northern Paiute has the prefixation method (2×4); the latter is also seen in Serrano and Cupan words for 10 (2×5). *simi-manoi* in Northern Paiute seems to be analyzed as 1×10 and since the word for 9 also contains the morpheme *simi* (1), the formation of the word 9 seems to be done by back-counting. In Cahuilla, the quinary method is observed, *kwanama-supli* and *kwanama-wi* being analyzed as $5 + 1$ and $5 + 2$, respectively. This method seems to apply also to 9, if *da* is taken as an allomorph of 5, but not to 8. Although this has been only a brief overview of the northern Uto-Aztecan numerals from 1 to 10, it is sufficient to show the various methods in use in their formation.

The data from 10 up are scarce. As Table 28 shows, the numeral system is decimal (Table 28).

If the numbers below 10 and the base number 10 are represented as N_{1-9} and B^1 respectively, then the numbers can be expressed by means of the following formula.

$$\{N_{1-9}\} \times B^1 + \{N_{1-9}\}$$

The ensuing analysis of the Uto-Aztecan languages in Middle America includes the northern Uto-Aztecan languages just discussed. To begin with 5, it is derived from the root for the word "hand" in almost all the languages except the following:

Table 27. The numerals from 1 to 10 in Northern Uto-Aztecan

	one	two	three	four	five	six	seven	eight	nine	ten
Western Numic										
Mono.N.Fork	šimu	waha-t	pahi	wacikwi-t	maniki	navahi	daciwi	wošwi	gwanigi-t	šiwano-t
Endimbich	šimu	wahai	pahi	wacikw	manük	naapai	dačiwi	wošwi	wanük	šiiwanü
Mono, Inyo	šwi	wahai	pahi	waciwi	manögi	navai	taciwi	wošwi	wanüki	šówano
Shikaviyam	šewi-te	waha-te	pahi-t	wacuwi-du	manögi-du	naavai	dacuwi-du	wošwi-du	wanöki-t	šiiwano
Northern Paiute ¹⁾	simi	waha	pahi	waci	manigi	naapahi	natakwasi	namiwaci	simi-kadupi	simi-manoi
Southern Numic										
Ute	šuis	waiini	paiini	waciwieni	manigin	navaiini	navaikavani	vavačuvini	soag ^h umsueni	tog ^h umesueni
Chemehuevi	šuy'	waix	pai	wacuw	manöx	nava	mukwiš	nac	yuwip'	mašiu
Kawaiisu	šui	wahai	pehei	wacui	munugi	navahai	nomac	nanaucui	šuukumaš	mōmašui
Tübatulabal	čiič	wo	pai	nanau	mahičña	napai	nomcin	nabunciña	laaki	amhaičiña
Tübatulabal ²⁾	čiič	woo	paai	naanaau	maahaijña	napaai	nomnjin	naabunjinja	laagiih	amhaijinja
Bankalachi	ciic	wo	paahi	nanau	mahičña	napai				
Serranan										
Serrano ³⁾	haukup	wör(wur)	pahi	wača	mahač	pavahai	wač'-kuvik	wa'-wuč	ma'kuvik	war-mahač
Serrano	aukup	wu	pahi	waja	mahaj	pabahi	wackuvi	waawuč	makui	wa'mač
Kitanemuk	haukup	wo	bahi	waca	mahač	pabahi	gwackawik	wa'waca	makawik	we'mahaj
Möhineyam	haukup	wahi	bahi	waja	mahač					
Cupan										
Luisefño	supul	we'	pahai	wasu	mahar					
Luisefño ⁴⁾	supul	we:x(we')	paahi	wasá'	mahár	paváhi	kavikvis	šólaš		
Juanefño ⁵⁾	supul	we ^h	pahai	we'sa	mahar					
Fernandefño	puku	wehe	pahai	waca	mahar	pabahai	kucakavya	wesweca	maaköwö	wehes-mahar
Gabrielefño	puku	wehe	pahi	wača	mahar	pabahi(?)	pukubaivi	wehebaiva	baiš	wehes-mahar
Cahuilla	supli	wi'	pa'	wicu	namakwanon	kwanama-supli		pitaba	dawicu	namicumi
Agua Caliente	suplawat	wi'	pa'	wicu	namaqwanafax					namadulwanut
Hopi	syuxke	leiwi	paahio	naalewi	čiwut	navai	čaañai	naanal	bept	bak ^u t
Hopi ⁶⁾	suuk'a'	lööyöm	paayom	naalöyöm	civot	navay	caje'	nanalt	pevt	pak ^u t

The data are based fundamentally on Kroeber [1906-7:71] and part of the transcription has been changed.

¹⁾Snapp and Anderson 1982:50, ²⁾Voegelin 1935:178-179, ³⁾Kroeber 1909:254, ⁴⁾Kroeber and Grace 1960:118-121, ⁵⁾Kroeber 1909:249, ⁶⁾Kalectaca 1978:173.

Table 28. Numeral systems in Northern Uto-Aztecan

Tübatulabal [VOEGELIN 1935:178-179]				
1	či:č	11	amhaijiŋ ti či:č	10+1
2	wo:	20	wo:m amhaijiŋa	2×10
3	pa:i	70	nomnjinam amhaijiŋa	7×10
4	na:na:u			
5	ma:haijiŋa			
6	napa:i			
7	nomnjin			
8	na:bunjiŋa			
9	la:gi:h			
10	amhaijiŋa			
Serrano [KROEBER 1909:254]				
1	haukup	11	pu'pa haupk	10+1
2	wor/ wur	12	pu'pa wör	10+2
3	pahi	15	pu'pa mahač	10+5
4	wača	20	wöhö wörmahač	2×10
5	mahač	30	pahi wörmahač	3×10
6	pavahai	40	wača wörmahač	4×10
7	wač'kuvik			
8	wa'wuč			
9	ma'kuvik			
10	war-mahač /waha-ma'hač			
Cahuilla [KROEBER 1906-7:71; 1909:237]				
1	supli			
2	wi'			
3	pa'			
4	wiču			
5	namu-qwan-añ / namakwanon			
6	qwan-supli / kwanama-supli		5+1	
7	qon-wi' / kwanama-wi		5+2	
8	qon-pa' / pitaba		5+3	
9	qon-wiču(qon-wičiw ^h) / dawiču		5+4	
10	/ namičumi			
11	peta-supli		10+1	
12	peta-wi'		10+2	
16	peta-qwan-supli		10+5+1	
20	wis namičumi		2×10	
21	wis namičumi peta-supli		2×10+11 (This should be 31.)	
30	pas namičumi		3×10	
40	wičius namičumi		4×10	
50	namuqwanañes namičumi		5×10	
60	kwansuplis namičumi		6×10	
70	qonwis namičumi		7×10	
80	qonpas namičumi		8×10	
90	qonwičius namičumi		9×10	
100	supli pisetiwenit		1×100	

Table 28 — continued.

Hopi [KALECTACA 1978:173]			
1	suuk'a'	20	sunat
2	lööyöm	30	payiv pak ^w t
3	paayom	31	payiv pak ^w t (niik ^ʷ aŋ) suk siik'a'ta
4	naalöyöm	32	payiv pak ^w t (niik ^ʷ aŋ) löqmuy siik'a'ta
5	civot	33	payiv pak ^w t (niik ^ʷ aŋ) paykomuy siik'a'ta
6	navay	34	payiv pak ^w t (niik ^ʷ aŋ) naalöqmuy siik'a'ta
7	caŋe'	35	payiv pak ^w t (niik ^ʷ aŋ) civot siik'a'ta
8	nanalt	36	payiv pak ^w t (niik ^ʷ aŋ) navay siik'a'ta
9	pevt	37	payiv pak ^w t (niik ^ʷ aŋ) caŋe' siik'a'ta
10	pak ^w t	38	payiv pak ^w t (niik ^ʷ aŋ) nanalt siik'a'ta
		39	payiv pak ^w t (niik ^ʷ aŋ) pevt siik'a'ta
		40	naalöv pak ^w t
		50	civot-sikiv pak ^w t
		60	navay-sikiv pak ^w t
		70	caŋe'-sikiv pak ^w t
		80	nanal-sikiv pak ^w t
		90	peve'-sikiv pak ^w t
		100	pakot-sikiv pak ^w t

Hopi:	civot
Papago:	hitasp
Pima Bajo:	utaspö
Northern Tepehuan:	taama
Tepecano:	iš-tuma:m

Seven is formed from 1 and 6 in Eudeve. A similar method is found in Yaqui and Mayo, but the formation does not agree with the calculation. Seven seems to be analyzed as 2·6.

Eudeve:	seniovusáni	1+6
Yaqui, Mayo:	wó-busani	2·6

In the formation of 8, two different methods are observed, reduplication of the first syllable, and the multiplication method.

Papago:	gigi:k	4"
Pima Bajo:	guiguico	4"
Northern Tepehuan:	maamákova	4"
Tarahumara:	osá-nawó	2×4
Eudeve:	gos-návoi	2×4
Yaqui, Mayo:	wó-naiki	2×4

Nine seems to be analyzed as /-1+10/ in languages near Tarahumara.

Pima Bajo:	tum-bustamama
Northern Tepehuan:	tu-vuš'áma
Tarahumara:	ki-makói

Eudeve: ves-macói

Ten is denoted by 2×5 only in Yaqui and Mayo.

Yaqui, Mayo: woh-mámni 2×5

The quinary system is found in southern Uto-Aztec.

Tepecano: 5' (šiv-) + {1,2,3,4}

Cora: 5' (ará-) + {1',2,3,4}

Huichol: 5' (ata-) + {1,2,3,4}

Nahuan: 5' (čik^(w)-) + {1,2,3,4}

The numbers from 10 to 19 are formed from the base 10 plus the numbers from 1 to 9 in Cora and Huichol, but a new base 15 was introduced in Classical Nahuatl, a language which had a perfectly quinary system.

In modern languages 100 becomes a base number for the next higher level from 20 and counting from 100 up is thus a mixed vigesimal and decimal system. The word for 100 is borrowed from Spanish in Papago, Northern Tepehuan, Tarahumara, and Sierra Nahuatl, but the coefficients prefixed to 100 are indigenous. In Yaqui, Mayo and Cora, on the other hand, 100 is expressed as 5×20 , based on the vigesimal principle (Map 9).

As is seen above, some characteristics observed in the northern branch of Uto-Aztec languages are also found in the southern ones. In some cases there is no clear correspondence in the words themselves, but the structure of formation is identical. In synthesizing these observations, we can draw the dividing line for number formation up to 20 between Cora-Huichol-Tepecano and Mayo-Northern Tepehuan. Above 20 the line moves further north, since the vigesimal system is also used in Pima Bajo and Eudeve. However, unlike its neighbors, Tarahumara uses the decimal method and so is situated among languages which have vigesimal systems. The materials for Pima Bajo and Eudeve date back to the 18th century, and we can safely say that there exist no modern language data now. Therefore we may suppose that Tarahumara would have had the vigesimal system up until that point. If this assessment is accurate, the peculiarity of Tarahumara having a decimal system while situated among vigesimal systems can be ascribed to influence from the north. But if Tarahumara was always decimal, we must assume that the vigesimal system spread, but avoided Tarahumara entirely. Classification in terms of the principles of numeral formation is distinct from the linguistic classification of Uto-Aztec languages. However, languages having the same counting methods do tend to cluster geographically. The dividing line between decimal and vigesimal systems may be a result of the degree of influence from Mesoamerican languages.

Many languages show identical formation principles, although they have different constituents, that is, numerical expressions. Languages having similar constructions are closely associated, geographically at least. Taking this phenomenon into consideration, we may assume that a numeral system is borrowed. In theory, there are three possibilities:

- 1) a system borrows both vocabulary and principles of number word formation;
- 2) a system borrows vocabulary only while conserving its own principles for the

formation of number words;

- 3) a system borrows only the foreign formation method but retains its native number words.

Borrowing may occur in a whole system or in only a part of the system. The three possibilities listed above allow for the replacement of part of the system. Take for example the word for 100. In some cases native words and a borrowed word are combined. In Tzutujil, a Mayan language, 100 and 200 are *xun-sye:nta*, and *ka'i-sye:nta*. The base is Spanish (*sye:nta* < *ciento* = 100), but both the coefficients are indigenous. In this case, a major numeral term is a foreign word and a minor numeral term is indigenous. Such borrowing is quite common and thus we may subdivide 1).

- 1-1) When a language borrows words and principles of number formation in part of its numeral system, the borrowing affects major terms before minor terms. In many cases the minor terms are conserved, whereas the major terms are readily borrowed. As a result, the system eventually becomes a mixed one.

Many languages in Middle America currently use the Spanish numeral system. They are in Case 1). As for language contact or influence, we must consider not only Spanish influence but also native indigenous influence, that is, the influence of neighboring languages. Languages such as this may be considered to be in Case 3), and will be discussed later.

If we suppose that there was only one proto Uto-Aztec numeral system, it had to have been either decimal or vigesimal above 20. If the proto system had been decimal, Uto-Aztec people moving from north to south must have come to Mesoamerica where the vigesimal system prevailed and replaced their system with the dominant vigesimal one. This analysis is based on the fact that decimal systems prevail in the US, while in Mesoamerica all languages use the vigesimal method. We can of course propose the reverse hypothesis and argue that the proto system was vigesimal; if we assume that North American languages overwhelmingly had the decimal system [KROEBER 1906-7: 671], then Uto-Aztec, under pressure from the dominant system, must have changed its vigesimal system for the decimal one. Hypotheses are never difficult to come by. Observing the different counting methods, decimal and vigesimal, in Uto-Aztec as well as its various methods up to 20, such as quinary, duplicative (2×3 for 6 and 2×4 for 8 and so on), make reconstructing a single system for Uto-Aztec quite difficult. Is the proto language's numeral system reconstructible on the basis of the comparison of the number words? Although we lack the space here to compare them in detail, it is readily apparent that the numerals from 1 to 5 are cognate but that the numerals above 5 are not, so that it becomes difficult to set up common forms. This means that proto Uto-Aztec might have had only 4 or 5 number words. It is, however, also possible to suppose that the numerals above 5 disappeared or that some Uto-Aztec languages conserve the proto system. Therefore we cannot definitively say that proto Uto-Aztec had only 4 or 5 numerals, but simply that we can reconstruct only the numbers up to 4 or 5.

As a consequence, only the pattern of distribution of numeral systems is uncontroversially known, for example, that decimal characterizes the north and vigesimal the south, or that quinary is found in Nahuatl, Cora, Huichol, and that the duplicative method such as 2×3 for 6 and 2×4 for 8 in the north has spread as far as Yaqui and Mayo, among others. However, these assorted different formations are no doubt due to language contact, since similar formations are found in neighboring languages, although it is difficult to pinpoint their precise origin. It is possible to investigate language contacts once they have occurred with evidence from the numeral systems themselves.

That the shared words are confined to the ones for the numbers up to 4 or 5 is quite suggestive, because the modern languages, whose numeral systems are borrowed from Spanish, also conserve their indigenous numerals only up to 4 or 5. Even within the Mayan family, whose elaboration of the numerals is robust, many languages conserve their native numerals only up to 4 or 5. For example, Yucatec, a direct descendant of the Ancient Mayas, has retained its native numerals only up to 3 [BLAIR and VERMONT-SALAS 1967: 61]. Mopán and Lacandón also retain the indigenous numerals only up to 3. Chontal and Chortí use their indigenous numerals up to 5, with subsequent numbers borrowed from Spanish. In general, when languages come into contact, the culturally prestigious language tends to influence other less prestigious ones. In Middle America Spanish, as the prestige language, has affected the indigenous languages, with the result that their higher numerals are readily replaced by Spanish ones, whereas their native number words up to 4 or 5 are retained. Taking this fact into consideration, we may say that the numerals up to 4 or 5 are basic and resist change. They are not affected even in situations of intense cultural contact, whereas the higher numbers are eminently borrowable.

In Middle America we can observe not only languages whose indigenous numeral systems are totally replaced by the Spanish one, but also languages in which it is not the numerals themselves but the formation principles that are borrowed. For example, the numeral words of Huastec, a Mayan language, are common to its family, although Huastec is geographically separated from the other Mayan languages. However, the formation of Huastec numerals from 10 up is $10 + U$, which is different from the formation $U + 10$ found in its Mayan relatives. This formation is the same as that of neighboring languages such as Otomí and Totonac. Since Huastec's numeral words are Mayan but the formation of those words is more like that of neighboring languages, we are led to attribute Huastec's formation techniques to borrowing in a language contact situation.

The Mayan languages Huastec and Chicomuceltec are separated geographically, but are very close linguistically, being grouped together for classification purposes. However, the formation of number words up to 15 in Chicomuceltec is the same as that of Highland Maya, that is, $U + 10$. On the other hand, the Huastec formation method is $10 + U$, which is the same as that of the neighboring languages and must be due to language contact. The formation from 15 up in Chicomuceltec is rather peculiar. Sixteen is $5 + 10 + 1$ and 17 is $5 + 10 + 2$ and the like; this forma-

tion is unknown in other Mayan languages. If we regard $5+10$ as a base 15, then 16 is $15+1$, and 17 is $15+2$. Chicomuceltec's formation of those numbers follows the same system as Mixe-Zoquean and Otomanguean. One hypothesis is that Chicomuceltec conserves some ancient method, but this cannot be supported by the data available. Rather, Chicomuceltec appears to be borrowing from a neighboring language, Chiapanec, whose formation from 10 up is quinary, for the following reasons: 1) other Mayan languages do not have such forms, 2) neighboring Chiapanec and Zoque both have a method similar to $15+1$ for 16, 3) the formation above 20 is undercounting, and 4) the numbers from 100 up are formed from the base 100. It is revealing, furthermore, to make mention of Chicomuceltec's two distinct formations for the numbers between 11 to 15 and 16 to 19. The numbers from 11 to 15 are $U+B$, for example, *jun i laju*, $1+10$, for 11, while the numbers from 16 to 19 are $B+U$, for example, *o la teeu nam jun*, $5+10+1$, for 16. The former method is the same as the Mayan one; the latter is the same as southern Otomanguean whose numbers from 15 up are formed from the base 15 plus the units ($B+U$). Chicomuceltec has obviously borrowed foreign formation principles for its numbers from 16 to 19.

In Otomanguean we also observe borrowing of formation principles. Southern Otomanguean languages are decimal up to 10 and then quinary from 10 to 20. However, each numeral word in these languages is too different from those in related languages for correspondences to be identified.

An interesting example of neighboring language influence is provided by Tlapanec and Subtiaba. Tlapanec is spoken in Guerrero, Mexico, and Subtiaba, now extinct, was spoken in Nicaragua. Both languages are geographically separated but show very close similarity linguistically. If the numeral systems of both languages are compared, the numerals from 1 to 6 and 10 correspond very well. However, 16 and 17 are $10+6$ and $10+7$ in Subtiaba, but in Tlapanec 17 is $10+5+2$ and 19 is $10+5+4$. The latter formation is similar to that of Tlapanec's neighbors such as Mixtec and Zapotec. Since the morpheme for 6 is the same in both languages, Tlapanec might have had the same construction as Subtiaba up to 20. Conversely, it is possible that Subtiaba replaced its system with the decimal one. Since data on these languages are scarce, the issue is difficult to resolve, but it is more economical to suppose that Tlapanec changed its system under the influence of neighboring languages, because the situation here is the same as is seen in Chicomuceltec.

As is shown above, there is conclusive evidence that the formation principle or syntax of number words has been borrowed in many instances in Uto-Aztecan, while native number morphemes have been retained. The conformity of number word formation observed in Uto-Aztecan may also be analyzed as being the result of borrowing.

4.3.2. Otomanguean

We begin with a look at the formation of the numbers up to 10. In Chichimec and Otopamean, 9 is expressed by back-counting. Chichimec *nánt'à pámeɸ* (9) means "one more" according to Angulo [ANGULO 1932]. The morphemes composing the word for 9 are of interest. Suppose the morphemes for 1 and 10 are represented by 1 and 10 and an unidentified morpheme is symbolized as X. Nine is then represented as follows:

1·X : Chichimec, Pame, Ocuiltec

X·10: Matlatzinca, Tlapanec

Since 9 is formed as 1·X or X·10, the meaning seems to be something like "one short of 10" or "one more until 10." In Database 2 all these types of forms are analyzed as /-1+10/. However, the expression /-1+10/ also includes different formations, as is seen in Database 2. Chichimec and Pame have the same /-1+10/ formation. They are close not only linguistically but also geographically. However, Pame's Acapulco dialect word for 9, *tənsənta*, cannot be analyzed as /-1+10/. In Ocuiltec 1 is *mbla*, 9 is *mbla-tylaht'a*, and 10 is *mblaht'a*; 9 has been analyzed as /1·X/ since it probably has the meaning "one short of 10."

Some northern Otomanguean languages have quinary systems. When the Otomí and Mazahua words from 1 to 5 are compared with the ones from 6 to 10, the relatedness of the two groups becomes apparent. The morphemes from 1 to 5 also appear in the coefficients attached to 20.

Otomí:

1	n'da	6	'da-to	1 × 20	'dɔ-te
2	yoho	7	yo-to	2 × 20	yo-te
3	hyu	8	hyə-to	3 × 20	hyə-te
4	goho	9	gi-to	4 × 20	goho-'dɔ-te
5	ki-t'a	10	'dæ-t'a		

Mazahua:

1	daha	6	na-n-tto	1 × 20	yho-tte
2	yehe	7	ye-n-cho	2 × 20	yhe-che
3	eñhij	8	ñi-n-cho	3 × 20	ñhi-che
4	zioho	9	zi-n-cho	4 × 20	zhi-che
5	zi-cha	10	de-cha	5 × 20	zhichi-che

From the coefficients prefixed to 20 and the formation of numbers from 6 up we can deduce that the latter are formed from *to*, *tto/cho* representing 5 affixed to the numbers from 1 to 4; the formation method, of course, is consistent with a quinary system.

Based on this analysis, we can extract *tho*, *do*, which seem to be of the same origin as *to*, *tto/cho*, from the data on Matlatzinca and Ocuiltec.

Matlatzinca:

1	huera-hui/n-da-wi	6	daha-tho-hui/n-da-to-wi	1+5
2	no-hui/te-no-wi	7	ne-tho-hui/ne-to-wi	2+5
3	in-yuu/rošu	8	nen-cuno-hui/nen-kunho-wi	2×4
4	cunno-hui/rokulho-wi	9	muratan-daha-tha/murata-n-da-t'a	-1+10
5	in-cu-tha/roku-t'a	10	daha-tha/n-da-t'a	1·10

Ocuiltec:

1	mbla	6	mbla-n-do-ho	1+5
2	mno	7	mnyeh-n-do-ho	2+5
3	phyu	8	mnyeh-n-guhno	2×4
4	gunhno	9	mbla-ty-lah-t'a	-1+10
5	kwi-t'a	10	mblah-t'a	1·10

However, *tho* and *do* are found only in 6, 7 and 10. The formations for 8 and 9 are different. Eight is formed by multiplication and 9 is counted backward from 10, methods reminiscent of those of Tarahumara and Eudeve. Since Matlatzinca and Ocuiltec 10 is regarded as /1·10/, the word for 5, which has the same morpheme (*tha/t'a*) found in 10, would seem to have the meaning, "half of 10."

These languages are regarded as quinary and the numerals from 6 to 9 are expressed by the formula $\{N_{1-4}\} + B^1 (5')$. Structurally, the units precede the base (U+B), but Pame has the reverse order, base before units (B+U).

Pame:

1	'na/nada	6	tik-yent	5+1
2	tii	7	tik-tí	5+2
3	hnjü'	8	tig-nyü	5+3
4	pyę	9	na-ųhwę	-1+10
5	śuthunt	10	sthú	

tig- in 8 seems to be a voiced form of the terminal *k* of *tik-*, resulting from the influence of the following *n*. *yent* and *nyü* found in 6 and 8 are different from the morphemes for 1 and 3, but *tí* postfixed to *tik-* for 7 is the same as 2. We may conclude, then, that *tik* represents 5. Classical Nahuatl offers a typical example of the morpheme for 5 differing from the affixed morpheme for 5 in the composed numbers from 6 up. Its affixed morpheme is *čik^(w)*-, which probably has the same origin *tik* has.

It is difficult to identify the morpheme for 5 in other dialects of Pame. Based on the number formation observed in Pame, however, it seems likely that Chichimec has *ta-/tša-* or *sa-* for 5 with its formation being identical to that of Pame.

As indicated above, there is ample evidence that the northern Otomanguean languages are quinary. However, they are divided into two subsystems in terms of their structural order, base(5)-unit or unit-base. Pame has the order base-unit. Its

system is very similar to that of Nahuatl; moreover, its base seems to have the same origin.

Although we have labelled northern Otomanguan languages as quinary, we are able to make this determination only through in-depth analysis of their number systems as a whole; it is very likely, however, that speakers of these languages actually regard their systems as decimal. In Otomí, for example, the numeral words from 10 up are formed from the base 10 (*'dæ'*) and the numbers from 1 to 9 by means of a conjunction, *ma*. The formation of the numbers from 16 to 19 is the same as that from 11 to 15. On the other hand, the numbers from 6 to 9 can be analyzed as $5+1$, $5+2$, $5+3$, $5+4$, and in none of these does the conjunction *ma* occur, since the morphemes are so tightly fused. Mazahua and Ocuiltec, on the contrary, use a conjunction *-n-* even in their numbers from 6 to 9; it may well be the same morpheme as the *-en-* which occurs in the numbers from 10 to 19 in Mazahua. Thus, it can be said that Mazahua conserves the quinary system more clearly; however, its numbers from 10 up are formed from repetitions of 1 to 9 in addition to the base 10, leading us to conclude that speakers seem to believe that they are using the decimal, rather than the quinary, system.

Languages below Ixcatec in my classification table display no vestiges of the quinary system in their numbers up to 10 (See Table 1 in Chapter 1); numbers from 10 up, however, do show signs of the quinary system. Moreover, 15 is not a combination of 10 and 5 in these languages but is instead a unique term. This is a remarkable difference between northern and southern Otomanguan, since in the northern languages 15 is composed of 10 and 5, and the numbers from 15 up are formed by adding 1, 2, etc., to that base ($10+5$), while in the southern languages the numbers from 15 up are formed from the new base 15. Otomanguan can be divided into northern and southern sections, then, on the basis of numeral formation. The typological study of word order undertaken in the next chapter also supports dividing Otomanguan languages into two major northern and southern subgroups. However, Chinantec has no vestige of the quinary system; its numeral system is decimal below 20. Chinantec therefore seems to occupy an independent position within the southern group. It is interesting to note that Subtiaba, situated far south in Nicaragua, is also decimal below 20. On the other hand, Chiapanec, geographically separated from the Oaxacan southern group to which it belongs, has the same system as its linguistic affiliate, namely quinary between 10 and 20, although the numeral words are not close genetically speaking.

The northern Otomanguan languages are quinary up to 20, but 15 and 16 are expressed as $10+5$ and $10+5+1$. The digits from 11 to 19 are the same as those from 1 to 9 and should therefore be regarded as decimal. The dialects of Pame show no evidence of a quinary system up to 9, perhaps as a consequence of phonological change. As phonological change progresses, the words become unanalyzable and eventually the system may begin to look decimal. Once words which were formerly compound become shortened due to phonological change, it is difficult to observe evidence of the quinary system, so that eventually we may come

to regard the system as a decimal one. If we assume that Chinantec underwent the same process as Pame did, its peculiarity would be accounted for, and we may say that the Otomanguean languages were almost all quinary. Nevertheless, it would be premature to deny the possibility that the decimal system became quinary between 10 and 20 due to linguistic innovation, as is seen in Tlapanec. With this assumption it could be said that only Chinantec had not undergone the innovation shared by its Otomanguean relatives.

Looking at Otomanguean's numeral formation above 20, we note that it is fundamentally vigesimal. Representing the base 20 as B (20), the numerals are expressed as follows:

$$\{N_{1-19}\} \times B(20) + \{N_{1-19}\}$$

Coefficients occur before the base and smaller units after the base. However, Amuzgo forms the interval numbers from 20 up according to the quinary method. Assuming that frequency in the use of numerals up to 10 is different from the frequency of the ones above 20, and that words in heavy use tend to be worn down by phonological changes while those in light use tend to be conserved, we might hope to see that Amuzgo has retained the quinary system in its numerals above 20. When we examine the numbers from 6 to 9, they appear to be composite words and hence are good candidates for having been formed by the quinary method. Since we cannot obtain data on the interval numbers from 20 up in Trique, Chatino and other relevant languages, we cannot conclusively determine whether or not there are other languages having the quinary system; however, it is quite probable that southern Otomanguean had a quinary system up to 20, judging from the Amuzgo data.

The Otomanguean numerals from 20 up follow the vigesimal system; most Middle American languages, however, do not strictly adhere to it until after the base for 400, since they use 100 as the base up to 400 instead. Three cases are observed, as follows:

- 1) Coefficient \times base: (Native words are retained but the base number is 100 rather than 400.)

úr'i	Chichimec
te'e	Pame
5 \times 20	Zapotec, Chinantec
- 2) Native words \times borrowed words (The borrowed Spanish word for 100 such as *syɛ'nto*³, *siænto*, *syɛ'ntu*¹, *siento*, etc. is used as the base and is combined with a native coefficient)

Otomí, Tlapanec, Ixcatec, Mixtec, Cuicatec, Trique, Chatino
- 3) Native systems are retained up to 400:

Classical Mazahua, Subtiaba, Classical Zapotec

As can be seen above, all modern Otomanguean languages use 100 as the base after 100, and many borrow the word for 100 (*ciento*) from Spanish, with native words used as coefficients. Some languages which use 5 \times 20 as a base express 100, 200, and 300 by adding their native words 1, 2, and 3 to that base. The former case

is an example of the borrowing of the formation principles and the high-base numbers, with the retention of the basic low numbers. In the latter case only the formation principles are borrowed from Spanish.

Strict adherence to vigesimal system up to 400 is observed only in the classical languages. As is demonstrated in the previous section (Database 2), a purely vigesimal system is found only in Classical Mazahua. In Classical Zapotec the next base after 20 is not 400 but 100; then 200 and 300 become the bases. This system does not continue until 1000, since 400 is the next base and 500 and 600 are expressed by adding 100 and 200 to the base 400. Subtiaba seems to be vigesimal, although sufficient data to demonstrate this conclusively are lacking. Subtiaba's word for 1000 is expressed as $10 \times 5 \times 20$ and 100 is translated as "great ten," so that it appears to be decimal, or rather to have a mixed system in which 100 is a base.

As the numerals between 20 and 40 show, Classical Zapotec has three distinct methods for forming the 5 numbers before the next rank-level. Two of them are the same as the quinary method in use between 10 and 20. Although technically classified as quinary, the formations are in fact very rare. In one method 35 is expressed as $40 - 5$ which then functions as a base to which 1, 2, 3, and 4 are added. The other method is overcounting: 36, 37, 38, and 39 are expressed by subtracting 4, 3, 2, and 1, respectively, from 40. The third method is decimal counting, according to which 37 is not $20 + 15 + 2$, but $20 + 10 + 7$, for example. The numerals above 40 are formed by overcounting only.

Some interesting formations are observed in dialects of Zapotec. Yatzachi Zapotec utilizes back-counting for 19 and overcounting for the numbers between 20 and 60; after 60 undercounting is used. Juárez Zapotec seems to be decimal between 10 and 20; for example, 16 is $10 + 6$ and 18 is $10 + 8$. Seventeen and 19, however, are unanalyzable. As is noted above, several different methods are in use, but it is not yet understood how they are derived. For the moment there are no data to account for the various methods in use in a single system, but it might be revealing to examine the Zapotec dialects for clues.

4.3.3. Mayan

The Mayan languages resemble one another quite closely in respect to their numeral systems as well as in their other systems (for example, phonologically), and it is evident, moreover, that their numerical words are derived from common roots. However, if we compare the formation principles of their number words, we immediately notice that it varies from group to group. On the basis of the numerals from 11 to 19, for example, we can divide the family into three groups. Huastec has the formation $10 + U$, whereas the Highland Mayan languages have the reverse order, $U + 10$. The Lowland Mayan languages have special forms for 11 and 12, contrary to expectation, while the numerals from 13 on pattern after their Highland Mayan counterparts. These differences are shown in Map 10.

The word for 11 in Lowland Mayan languages is reconstructed as **buluk*.

However, three languages do not conform to the reconstruction, Tojolabal with *huluč*, Chuj with *hušluč* and Chol with *hunluhun*. The Tojolabal and Chuj words are very similar to *buluk* (in the northern dialects) or *buluč* (in the southern dialects), but since *b* corresponds not to *h* but to *b*, we cannot relate *huluč* or *hušluč* directly to *buluč*. It is conceivable that *huluč* is a special form of *buluč* resulting from a process somewhat different from a common change, but it is also possible that *hun-luhun* and *buluč* merged, giving a new word, *huluč*, since 11 is *hunluhun* in Chol. The different formation structure observed in Huastec may be due to the influence of neighboring languages such as Otomí and Totonac, which have the same 10+U order. Chicomicelttec numerals support this analysis, as is shown in Section 4.3.1.

Let us now go on to consider the formations for numbers above 20. There are two distinct types of counting methods, undercounting where 38, for example, is expressed as "20+18," and overcounting where 38 is analyzed as "18 toward 40." These methods are shown in Map 11.

Overcounting is observed in every Lowland Mayan language having numerals above 20, and is also found in some Highland Mayan languages. What is most interesting is that Classical Quiché and Classical Cakchiquel had an overcounting method, while modern Quiché and Cakchiquel have an undercounting method; moreover, the Classical Quiché and Cakchiquel numerals from 40 up are formed by overcounting. In Ixil and Classical Mam the numerals from 40 up are also formed by overcounting. We may suppose that the old method was retained in the comparatively less used forms, in this case, the higher numbers; or, to put it another way, the last words to be affected are the less frequently used ones. It is likely that overcounting was in use from ancient times. In fact, we observe overcounting in use during the Classic period when the ancient Maya were developing their writing system to full extent. For example, the so-called Giant Ahau Glyph altars found in Caracol, Belize, record the preceding 20 years in terms of the terminal day, the Ahau, of the 20 year period Katun. In other words, the 20-year Katun period is referred to in terms of its final day, the Ahau. This can be considered a kind of overcounting. The earliest known monument is Altar 4, which marks the date 9.3.0.0.0 (495 A.D.) [BEETZ and SATTERTHWAITE 1981]. A method like this was in frequent use in the later period; it is called "Short Count" in the literature, and is also found in the books called Chilam Balam written in the Colonial period. Therefore a counting method much like overcounting came into use by at least the 5th century A.D. Cakchiquel replaced overcounting with undercounting after the grammars which Brinton cites were written in 1692 and 1753 [BRINTON 1894]. It is certain that Quiché replaced its old system with a new one in comparatively recent times, that is, after Brasseur de Bourbourg wrote his 1862 grammar. Moreover, Yucatec also replaced its overcounting method with undercounting. Overcounting was used in Beltran's time (1746), but in the 20th century it seems to have gone out of use; López Otero [1914] only cited Beltran's numerals without adding his own observations, and Alfred Tozzer's grammar (1921) shows numerals formed by

undercounting only. The replacement must have occurred after the end of the 18th century.

The words for 20 are divided into 4 types, *winaq*, *k'al*, *tab*, and *may*, respectively (Map 12).

The distribution of these 4 types almost completely overlaps with differences in the number words between 21 and 40, with a few notable exceptions. Kekchí replaces *may* with *k'al* beyond 21. Tzeltal and Tzotzil use the *tab* type word for twenty, after which *winik* is used. In Tojolabal 20 is expressed by *tahab*, *winik* and *tak'in*; from 21 up only does *winik* serve as the base. The most unusual case is seen in Jacaltec, where 20 is *k'al* and then up to 40 *winax* is used; upward from 40 *k'al* is again used up to until 60, *winax* appears up to 80 and finally *k'al* reappears up to 99. Thus *k'al* and *winax* alternate. Either the *k'al* or *winaq* type is typically used after 21, but in Pocomchí *k'al* and *winaq* are used alternately in every 20th interval as in Jacaltec (Maps 13, 14, 15, and 16).

The word for 80 is *muč'* or *muč'* in Mam, Ixil and the Quiché group. Interestingly, *muč'* or *muč'* is used differently depending on whether the language in question uses undercounting or overcounting. In Mam and Ixil *muč'* becomes the base between 61 and 80 (overcounting), whereas in the Quiché group *muč'* is used as the base between 80 and 99 (undercounting). In Classical Quiché and Cakchiquel *muč'* was also used from 61 to 80 (overcounting), while in modern Quiché and Cakchiquel *muč'* is used for the numerals from 80 to 99 (undercounting). It is clear, then, that the formation principle of the number words is more revealing than the individual words themselves and this is the reason we have analyzed numeral formations rather than numeral words per se.

We have noted above that undercounting began to come into use after the 19th century. Since Tzutujil is closely related to Quiché and Cakchiquel, it is probable that Tzutujil also originally had the overcounting method. We can surmise that the innovation replacing overcounting with undercounting may have emanated from Mam or Ixil.

muč' was used for 400, which was referred to as $5 \times \textit{muč'}$ in Classical Quiché and Cakchiquel. *k'al* and *tuk* were also used for the numbers multiplied by 5 as is shown below.

	Classical Mam	Classical Quiché	Classical Cakchiquel
o-k'al = $5 \times 20 = 100$	o-kal	o-qal	oqal (o-k'al)
o-tuk = $5 \times 40 = 200$	o-chuk	o-tuk	o-tuc
o-muč' = $5 \times 80 = 400$	o-mucx	o-much	omuqh (o-much')
	[THOMAS 1897-8: 903]	[THOMAS: 896-898]	[BRINTON 1884: 408]

However, *tuk* was not itself used as the number 40; it served only as the multiplier of 5 in certain formations. *tuk* is also used in Kekchí as part of the numbers for 600 and 1000. Forty shows up as a base in non-Mayan Lenca and Paya as well.

4.3.4. Mixe-Zoquean

The Mixe-Zoquean numeral system is quinary as far as 20, but in many Mixe-Zoquean languages the numbers from 6 to 9 seem to be formed on the base 6.

Copainalá Zoque:

	1-5	6-10 (-a'y)	11-15 (-a'y)	16-20 (yit-ko-)	21-100 (-ips)
1	tumi	tuht-a'y	mak-tum-a'y	yit-ko-tumi	
2	meca	ku'y-a'y	mak-wis-tihk-a'y	yit-ko-meca	wis-tihk-
3	tuk-a'y	tuku-tuht-a'y	mak-tuk-a'y	yit-ko-tuk-a'y	tuk-
4	mak-š-ku'y	mak-s-tuht-a'y	mak-mak-tasku'y	yit-ko-mak-š-ku'y	mak-tahs-
5	mohs-a'y	mahk-a'y	mak-yiht-a'y	ips	mohs-

Totontepec Mixe:

	1-5	6-10	11-15	16-20	21-100 (-i:'pš)
1	to'k	toht-ik	mak-to'k	mak-toht	
2	mehck	vuš-toht-ik	mak-mehck	mak-uš-toht	viš-ik-
3	to:hk	to-doht-ik	mak-to:hk	mak-to-doht	to:g-
4	mak-ta:šk	taš-toht-ik	mak-mahkc	mak-taš-toht	mahk-t-
5	mug-ɔ:šk	mahk	mak-məkš	i:'pš	mək-

In Copainalá Zoque 8 and 9 are 3+6 and 4+6. The same formation is observed in Totontepec Mixe, but it begins with 7, that is, 2+6. The math involved in these formations does not agree with the sums. However, Colonial Mixe and Tlahuitoltepec Mixe have the following structure. If *tuuc/tuhk* is regarded as 5', the formation is in conformity with the math involved.

	Colonial Mixe	Tlahuitoltepec Mixe
6	tu-duuc	tu-tuhk
7	huex-tuuc	waš-tuhk
8	tuc-tuuc	tuk-tuhk
9	tax-tuuc	təš-tuhk

Forms like these seem to be original, and it is probable that due to some heretofore undetected reasons the numbers from 7 to 9 came to be formed on the base 6. The rare phenomenon of the intrusion of the morpheme for 6 into the constituents of the numbers from 7 to 9 is observed not only in Zoque and Totontepec Mixe, but also in Sayula Popoluca. The Oluta numerals from 6 to 9 demonstrate additional restructuring: 6 (tuhtuhko) = 1+5 (tu'k-tuhko), 7 (huštukuhtuhko) = 2+3+5 (huštukuh-tuhko), 8 (tukutuhko) = 3+5 (tuku-tuhko), 9 (ta:stutuhko) = 4+1+5 (ta:s-tu-tuhko). As is seen above, the number words in many languages do not add up, so to speak, and this phenomenon may have arisen before the languages split into the various groups. However, if it occurred in the common Mixe-Zoquean language, the forms of Colonial Mixe and Tlahuitoltepec Mixe are impossible to in-

terpret. If, on the other hand, the change occurred after the split of Mixean and Zoquean, it is difficult to explain how it came to appear in geographically separated languages. Six becomes a base for the numbers from 7 up found in Miskitu, but the formation is in the reverse order, $7 = 6 + 1$, $8 = 6 + 2$. Yaqui and Mayo are other languages in which simple calculation does not apply to the formation, but in their case this happens only with 7. Although it is not impossible for such a phenomenon to occur independently many times, it is difficult to discover the motivations for it.

The Mixe-Zoquean numerals above 20 are vigesimal, but this holds true only as far as 99. The numerals above 100 are formed from a new base, 100. This innovated formation, however, is a relatively recent occurrence, since Colonial Mixe retained its vigesimal system. Although all the numerals above 100 are formed on the base 100, there are a variety of distinct formations found in the individual languages. In Zoque, 100, 200 and 300 are expressed as 5×20 , 10×20 , and 15×20 , respectively, and the interval numbers are formed according to the vigesimal method. The vigesimal counting method is not strictly followed, so that forms such as 6×20 , 7×20 , and so forth do not exist. Instead, only the multiples of 100, such as 5×20 , 10×20 and 15×20 , conserve the vigesimal method. A new word is introduced for 400, the next base after 20 in the vigesimal system. The Popolucan group, recently renamed Veracruz Mixe and Veracruz Zoque, uses the word *mun* for 100 instead of 400. Mixe, on the other hand, expresses 100 as 5×20 and uses it as a base for the numbers above 100. These terms are borrowed from the Spanish numeral system, but only the principle of formation has been borrowed, with the native number words retained. Moreover, the degree of borrowing varies from language to language.

4.3.5. Other Languages

Data on Cuitlatec are contradictory; Leon [1903] describes its system as decimal while Escalante [1962] claims it is vigesimal. Since it is unclear which source is the more reliable, I shall omit Cuitlatec from this study.

Seri is decimal but the constituents of 7 and 8 contain 2 and 3, respectively, followed by the same morpheme, *wkʷi*, (presumably meaning 5), so that they seem to be analyzable as $2 + 5$ and $3 + 5$, respectively. Nine is evidently formed by back-counting, since the morpheme *kʷánt* designating 10 is attached. The smaller units (addends) follow the larger units and the coefficients (multipliers) also occur after the base. This order is rare for Middle America, but is seen in some southern languages, such as Chibchan and Misumalpan.

In Tarascan we find vestiges of the quinary system in the numbers 7, 8, and 9, but the numerals up to 20 are decimal, with those above 20 again vigesimal. The data available indicate that the smaller addend precedes the larger one beyond 20 in numerals, making this a rare formation. In Classical Tarasco, however, the larger addend precedes the smaller, the standard order for Middle America.

Totonac and Tepehua are decimal up to 20, and from 20 up become vigesimal. The numerals above 100 are formed on a new base, 5×20 , so that the vigesimal system is not retained throughout. Among the Totonacan languages, Xicotepec Totonac uses *cien*, a borrowing from Spanish, for 100 [REID and BISHOP 1974: 415]. The treatment obviously varies from dialect to dialect.

In Huave the forms of the number words from 1 to 3 change according to the classes of the nouns they modify. The nouns are classified into 6 types, rectangular objects, round or square objects, long and slender objects, times, years, and days. But from 4 on, the forms of the numbers do not change. The numbers up to 20 are essentially decimal and from 20 to 99 vigesimal. The numbers from 100 up are formed on a new base, 100, which is expressed as 5×20 .

Oaxaca Chontal is decimal below 20, but the forms of the numbers from 2 to 7 in Lowland Chontal (Huamelultec) and from 2 to 5 in Highland Chontal (Tequistlatec) change slightly according to whether they are used with animate or measure nouns. The numerals from 20 to 99 are formed by the vigesimal method, but the numbers above 100 are formed either on the new base of 100 or from the vigesimal form 5×20 . As a result, it is not clear whether the intervals are counted according to the vigesimal method or whether the next base is 10×20 .

Xinca seems to be decimal up to 20 but its method above 20 is not clear due to lack of data. The structure is base $10 + U$.

Lenca is vigesimal up to 20 and the numerals from 20 to 40 are formed on base 20. Forty becomes the next base for the numbers after 40. A similar formation is found in Paya, but this language seems to be decimal, because 20 and 30 are $2? \times 10$ and $3 \times ?$, respectively (the morphemes for 2 and for 10 are questionable).

In old documents of Tol we observe the quinary method for the numbers from 6 to 9, but no vestiges of it are apparent in von Hagen's modern data [1941]. The numerals above 20 are vigesimal, with a $B \times U$ order. A genetic relationship between Oaxaca Chontal and Tol has been claimed, but is not supported on the basis of their two distinct numeral formations, since Oaxaca Chontal has the order $U \times B$, while Tol has $B \times U$, the more common order in the southern languages.

Miskitu is fundamentally vigesimal, but interesting methods are observed in its formation of the numbers up to 10. Four is formed by double-counting. Seven, 8, and 9 are formed by adding 1, 2, and 3 to 6, respectively. According to Conzemius, *matlalkahbi* for the number 6 is composed of *mata* "hand," *lal* "head" and *kahbaya* "lay upon" [CONZEMIUS 1929: 81]. One hundred is expressed either as 5×20 or as *andat*, a word probably derived from the English word "hundred." Above 100 the base word is borrowed, but the coefficients are indigenous, being postposed to the base in typical Miskitu formation.

Sumu is vigesimal too, but the numbers from 6 up are formed according to the quinary system, by adding 1, 2, 3, and 4 to the base 5. The numerals above 100 are formed from *andat*, probably from the English "hundred" as in Miskitu.

Rama is quinary up to 20, but the formation is somewhat peculiar. The bases 10 and 15 are expressed as $5' \times 2$ and $5' \times 3$, respectively. Data on the numbers

from 20 up are scanty, but it seems likely that the order is $B \times U + U$, as is attested in other neighboring languages.

Guaymí is decimal up to 20 and then becomes vigesimal. Teribe and Bribí are decimal, but Chiripó and Cuna are vigesimal. The order of the formation is base-coefficient ($B \times U$).

4.4. Summary

Numeral systems of native Middle American languages show an enormous variety of ways of forming number words. But the fundamental methods of counting are limited to quinary, decimal and vigesimal. However, it is possible that there is no language in existence which has a purely vigesimal system requiring nineteen different numerals. So-called vigesimal systems generally use the decimal method below 20, and very few languages possess only one system throughout. Therefore, terms such as quinary and decimal should be limited to the numbers below 20 and vigesimal applied only to those above 20. As a result, I separately discussed the numeral systems below 10, from 10 to 20, and above 20. In this chapter I have focused on the analysis of structural features, although the comparison of number word vocabulary would also make an interesting study.

As a rule, numeral words are formed from combinations of U and B, such as $U \times B + U$, $B \times U + U$, $U + U \times B$, and $U + B \times U$ with the symbols U and B denoting the numerals that correspond to the unit- or digit-numbers and the base or rank words, respectively. For example, the number 33 is written as $3 \times 10 + 3$; both tokens of 3 are U and 10 is B.

For the numbers below 10, there are two systems in use, quinary and decimal. Quinary systems are seen in southern Uto-Aztecan, Tarascan, northern Otomanguean, Mixe-Zoquean, Sumu, Rama, and Cabécar (Map 6). Miskitu has a rare system based on 6 for the numbers from 6 to 9, with a numeral formation similar to that of the Mixe-Zoquean languages, whose formation from 7 to 9 is irregular (with the exception of Tlahuitoltepec and Colonial Mixe). Miskitu's seemingly irregular system may be based on the quinary system, since the Mixe-Zoquean group is claimed to have originally had a quinary system and Miskitu's relative, Sumu, also has a quinary system. Additional means for forming numbers below 10 are subtraction, used in the formation of 9, and the multiplicative or duplicative method, used for 4 and 8 in the northern part of Middle America.

For the numerals from 10 to 20, additive constructions with a base of 10 are common, but both orders, $U + B$ and $B + U$, are attested. The former is seen in Mayan, and the latter in other languages. However, Huastec, a Mayan language, has $B + U$ order (Map 10), which must have been borrowed from its neighboring languages, such as Totonacan or Otomian. The difference in formation of the number words 11 and 12 divides the Mayan languages into the Lowland and Highland subgroupings. Numeral systems of the southern Otomanguean languages are purely decimal below 10, but follow the quinary method from 10 to

20 and proceed by twenties from 20 to 100. Some northern Otomanguean languages, however, display traces of the quinary method in their numbers below 10. The Tlapanec number sequence from 11 through 19 follows the southern Otomanguean pattern, although genetically related Subtiaba has the decimal method below 20. Therefore, we might conclude that the mixed quinary-decimal system in Tlapanec might have been the result of borrowing from neighboring languages (Map 7).

Turning to the numbers from 20 up, we find pure decimal systems in Seri, northern Uto-Aztecan languages, and some Chibchan languages. Other languages have vigesimal systems, in which additive constructions with a preceding rank (undercounting) are common, while additive constructions with a succeeding rank (overcounting) are confined to the Mayan group (excluding some Highland Mayan languages which have undercounting methods) and Yatzachi Zapotec (Map 8). The Mayan languages display an interesting variety of formations; undercounting and overcounting are distinguished geographically (Map 11). Mam, Ixil, Classical Quiché and Classical Cakchiquel form their numerals from 20 to 39 by undercounting and thereafter shift to overcounting. However, modern Cakchiquel and Tzutujil have restructured their system so that they have undercounting throughout. Such a mixed system of undercounting and overcounting is also seen in the Chol data given by Merrifield, but the first half of the interval (from 21 to 29) is counted by undercounting and the second half (from 30 to 39) by overcounting, the reverse order of Mam, Ixil, Classical Quiché and Classical Cakchiquel. The other sources on Chol also list overcounting. Overcounting is common to all the Mayan languages, except Tojolabal, Tzutujil, and modern Cakchiquel. Classical Cakchiquel, however, had overcounting. As a result, it seems safe to conclude that overcounting is one of the characteristics of Mayan numeral systems but that some of the Mayan languages have replaced it with undercounting. In this light, Chol may be regarded as being at a transitional stage in the substitution of overcounting with undercounting. The variety of base words in Mayan is also interesting. Base words for twenties, such as **k'al*, **winaq*, **tah-* or **may* are used differently (Maps 12-16). For example, Jacalteco *k'al* and *winax* are used alternately in the sequence from 20 to 99, so that 20 is *k'al* but up to 40 *winax* is used as the base; from 41 to 60 *k'al* appears again, but is replaced by *winax* up to 80, with *k'al* in use again up to 99. It is also interesting to note that Classical Zapotec uses a subtractive method for the 5 numbers below the next rank level. Although the vigesimal system predominates throughout Middle America, its center is Mesoamerica, whose numeral systems show a coefficient-base order, while the system of the languages south of Mesoamerica is different in that their coefficients follow the base ($B \times U$).

As shown above in the case of Huastec, borrowings may provide excellent witness as to past contacts and relationships between or among various languages. At some point after Spanish contact, almost all the indigenous languages began to utilize the Spanish word for 100 as a base, combining the different systems adeptly. Spanish borrowings show regional traits (Map 9): some languages borrow only the

foreign principle of numeral formation; some have borrowed the word for 100 from Spanish, but have managed to conserve their native words for the coefficients, such as Tzutujil *xun-sye:nta* (1·100). In some languages the word for 100 is formed from 5×20 as a new base but the native interval numbers between the hundreds are conserved, so that only the counting method by hundreds is borrowed. Obviously, this phenomenon demonstrates that the borrowing of formation principles does not necessarily entail the borrowing of lexical items.

The modern Cakchiquel numeral sequence follows undercounting for the numbers from 20 up, while Classical Cakchiquel conserves an overcounting system. Some Highland Mayan languages have a special word, *muč'* or *muč'* for 80. It shows up in the numbers from 80 to 99 in modern Cakchiquel, but for the numbers from 61 to 80 in Classical Cakchiquel, as indicated below:

	Modern Cakchiquel	Classical Cakchiquel
60	oš-k'al	oš-k'al
61	oš-k'al	xun ru-xu-muč'
80	xu-muč'	xu-muč'
90	xu-muč'laxux	

This phenomenon provides another excellent example of the borrowing of solely the principle of word formation. In other words, basic structure alone, without its surface manifestation, can be borrowed; structural or formal borrowing does occur.

The accompanying maps clearly show both diverse and shared traits of Middle American numeral systems. On the one hand, the diversity can be attributed to the various methods in use, such as decimal-vigesimal, quinary-vigesimal, decimal-quinary-vigesimal, and pure decimal. On the other hand, shared counting methods that extend beyond genetic boundaries are the result of borrowing, as detailed above.

Chapter 5

Word Order Typology

Since Greenberg's pioneering work was published [GREENBERG 1966], more than 1,000 languages have been examined from a typological standpoint [MATSUMOTO 1987], but thorough typological studies of Native Middle American languages have not yet appeared despite the fact that typological data on many of the languages and some families in Middle America were already in existence. Therefore, this chapter focuses on the typology of Middle American languages, specifically word order. Word orders under discussion here have the following seven parameters; (1) word order of the subject (actor), the object (patient), and the verb in declarative transitive sentences; (2) word order of adpositions relative to the head noun, that is, prepositional (Pr) or postpositional (Po) orders; (3) word order of genitives (G) relative to the head noun (N), that is, G-N/N-G; (4) word order of adjectives (A) relative to the head noun, that is, A-N/N-A; (5) word order of personal pronouns or pronominal affixes/clitics (P) relative to the head noun, that is, P-N/N-P; (6) word order of determiners or demonstratives (D) relative to the head noun, that is, D-N/N-D; (7) word order of numerals or quantitatives (Q) relative to the head noun, that is, Q-N/N-Q.

5.1. Linguistic Materials and Their Analysis

The materials from each language are described according to the order of the classification presented in Chapter 1 (Table 1). Since the available materials are relatively limited compared with the phonological systems, data from all the languages and varieties are not given. In some data sets not every entry is available.

In the selection of examples, every effort was made to use the unmarked text style, that is, simpler examples such as sentences or phrases exemplified in a grammar or dictionary (especially in sections specifically treating typological characteristics, where available); examples from texts were avoided as involving pragmatic functions such as topic, focus, and new information. The word order analyzed here can thus be considered the neutral or basic one for the language in question. However, as Brody demonstrates, basic word order sentences have different functions in different languages and therefore the notion of basic word order is not a crosslinguistically uniform concept [BRODY 1984:711]. Although the definition of basic S/O/V word order is problematic, some criteria for selecting examples have been suggested. Durbin and Ojeda list six such criteria, which limit examples to the following: (1) simple sentences, (2) sentences which are transitive where both subject and object are marked either by the presence of nouns or in-

dependent pronouns, (3) sentences whose verbs and nouns are least morphologically marked for syntactic features such as mood, voice, aspect for verbs, and specificity and plurality for nouns, (4) sentences which provide a statement or an explanation of an event but are not semantically marked for a specific context such as topicalization, focus or emphasis, (5) sentences which are not ambiguous outside their context, or which do not require additional information in order to be disambiguated, (6) sentences containing nouns which can reciprocally affect each other, e.g. *Men kill jaguars; Jaguars kill men*, but not *Men buy beans* [DURBIN and OJEDA 1978: 69]. Brody also provides six selectional criteria; (1) simplicity, (2) least markedness, (3) reciprocally affecting verb, (4) disambiguation, (5) full nouns for nominal constituents, and (6) frequency [BRODY 1984]. In her critical review of the previous studies, England proposes 11 criteria to select example sentences for establishing basic word order in Mayan languages: (1) the sentence must have a transitive verb and a subject and object, both expressed as nouns, (2) the sentence is simple rather than complex, (3) the verb must be indicative, affirmative, and active, (4) the sentence should have an interchangeable subject and object, (5) sentences should not be ambiguous in interpretation of subject and object (this criterion is questionable, because basic word orders seem in fact to produce some ambiguous sentences that a different order might be called on to disambiguate), (6) no constituent is focused, topicalized, or otherwise highlighted, (7) the subject noun is definite, (8) the subject noun is animate, (9) frequency of natural occurrence is not a requirement for basic word order, (10) morphological marking may provide evidence for basic word order, (11) elicitation is necessary in addition to analysis of texts to arrive at conclusions regarding basic word order [ENGLAND 1991]. These criteria overlap with Durbin and Ojeda's criteria, but there are some notable differences. It is important to note that frequency of natural occurrence is not a requirement for basic word order according to England. I utilized typological descriptions of individual languages where available, but in their absence I attempted to select examples based on the above criteria. However, it should be noted that in some cases I had to choose examples which do not meet all the above requirements because of the lack of suitable materials. There was sometimes a dearth of sentences which have an animate subject but an inanimate object; these sentences are probably most neutral semantically. To compensate for the lack of suitable materials on certain languages, I took into consideration the word order of other members of their language group as well as other orders such as Po/Pr and GN/NG in an effort to establish basic word order. In some languages where both SVO and VOS are permissible, for example, it is difficult to decide which is more relevant for basic word order. When it is not clear whether or not both orders are basically equivalent as regards function and form, or in cases where both orders are claimed to be basically equivalent, I adopt both orders for the purpose of analysis. With regard to basic word order, the animacy hierarchy may be an important factor in word order, but its precise role is not clearly defined in the materials, except for such languages as Huastec, Tenejapa Tzeltal and Tlapanec. The hierarchy is

presumably irrelevant to other languages, since only for Yucatec is it explicitly reported that marking for tense, number, person, animate, inanimate, or human does not seem to affect basic word order [DURBIN and OJEDA 1978: 71]. (See Database 3)

5.2. Language Types and Language Classification

I summarize the materials given in the previous section (Database 3) in Table 29, in which certain trends are readily identifiable, for example, that S/O/V order is divergent even in the same family, while other word order patterns are relatively stable. Based on prepositions and postpositions, for example, we may call the Uto-Aztec and Mixe-Zoquean postpositional languages, and the Mayan and Otomanguean prepositional languages. I will discuss here language classification from a typological point of view.

Proto-Uto-Aztec seems to have had the word order patterns SOV, Po, GN, AN, DN, and QN. Languages conserving these orders are Pima Bajo, Tarahumara, Yaqui and Mayo. With the change of S/O/V order, the order GN changed to NG in Nahuatl. In conformity with the change from GN to NG, AN became NA in the Central Mexican Highlands, while the languages in other regions retained the AN order. Some scholars claim that the Uto-Aztec languages in Middle America belong to the southern Uto-Aztec group [cf. MILLER 1984], but Table 29 suggests that they should instead be classified into two groups, Sonoran and Aztec. Among the Sonoran languages, Cora and Huichol are genetically close, but their orders of S/O/V, GN/NG, and AN/NA are different. Cora has VSO, GN/N-ra G, while Huichol has SVO, GN-ya, NA. Yaqui and Mayo share the same type and thus may be grouped into a single subgroup.

Cuitlatec is extinct, with limited descriptive materials. Based on the data available, Cuitlatec has SVO, Pr, NG, AN, NP, and DN. The only head-modifier order is NP.

Tarascan is a postpositional language. It has SVO, NA, DN, and QN, but other categories permit both possibilities, GN & NG, PN & NP. I propose that proto-Tarascan was a modifier-head language having such orders as GN and PN, but it now allows both orders, perhaps under the influence of Otomanguean languages.

Totonac is a prepositional, SVO language, and has AN, PN, DN, and QN; however, the order in genitive constructions is NG, the most common one among Middle American languages.

Oaxaca Chontal (Tequistlatec and Huamelultec, spoken in southeastern Oaxaca), Tol (also called Jicaque, spoken in Honduras), Tlapanec (spoken in Guerrero), Subtiaba (formerly spoken in Nicaragua), and Seri (spoken in Sonora) have been classified together as Hokan, although they are geographically separated. Opinions regarding this controversial classification abound, so at this point I would like briefly to review its history and also to address the grouping in light of the findings of my own typological study [cf. OLTROGGE 1977].

Table 29. Distribution of word order types

	S/O/V	Pr/Po	GN/NG	AN/NA	PN/NP	DN/ND	QN/NQ
[2] Papago	(VSO)	Po/Pr	GN/N-j G	AN	PN	DN	QN
[3] Pima Bajo	SOV	Po	GN	AN	PN	DN	QN
[4] Northern Tepehuan	VSO	Po	GN	AN	PN	DN	QN
[5] Southern Tepehuan	VSO	Po	GN	AN	PN	DN	QN
[6] Tarahumara	SOV	Po	GN-la	AN	PN	DN	QN
[8] Yaqui	SOV	Po	G-ta N	AN	PN	DN	QN
[9] Mayo	SOV	Po	G-ta N	AN	PN	DN	QN
[10] Cora	VSO	Po	GN/N-ra G	PN	DN	QN	
[11] Huichol	SVO	Po	GN-ya	NA	PN	DN	QN
[12] Classical Nahuatl	SVO/VOS	Po/Pr	GN/NG	AN/NA	PN	DN	QN
[12] Tezcoco Nahuatl	SVO	Po/Pr	NG/N de G	NA	PN	DN	QN
[12] Tetelcingo Nahuatl	SVO	Po/Pr	NG	NA	PN	DN	QN
[12] North Puebla Nahuatl	SVO/VOS	Po/Pr	NG	AN	PN	DN	QN
[12] Huasteca Nahuatl	VSO	Po/Pr	NG	AN	PN	DN	QN
[13] Michoacan Nahual	SVO	Po/Pr	GN/N de G	NA	PN	DN	QN
[14] Istmo Nahuat	SVO	Po/Pr	NG	NA	PN	DN	QN
[15] Pipil	VOS	Po/Pr	NG	AN	PN	DN	QN
D7 Cuitlatec	SVO	Pr	NG	AN	NP	DN	
[20] Seri	SOV	Po	GN	NA	PN	ND	NQ
[21] Tarasco	SVO	Po	NG-ri/G-ri N	NA	PN/NP	DN	QN
[22] Totonac	SVO	Pr	NG/N šla G	AN	PN	DN	QN
[24] Chichimec	SOV	Po	GN	NA	DN	QN	
[25] Pame	SVO/SOV		NA	DN	QN		
[26] Matlatzinca	VOS	Pr	NG	AN	PN	DN	
[27] Ocuiltec	SVO			AN	PN	DN	QN/NQ
[28] Otomí	VOS	Pr	NG	AN	PN	DN	QN
[29] Mazahua	VOS/SVO	Pr	NG	AN	PNP	DN	QN
[30] Tlapanec	VOS/VSO	Pr	NG	NA	NP	ND	QN
[31] Ixcatec	VSO	Pr	NG	NA	NP	ND	QN
[32] Popoloc	VSO	Pr	NG	NA	NP	DND	QN
[33] Chocho	SVO	Pr	NG	NA	NP	DND	QN
[34] Mazatec	SVO	Pr	NG	NA	NP	DND	QN
[35] Amuzgo	VSO	Pr	NG	NA	NP	ND	QN
[36] Mixtec	VSO	Pr	NG	NA	NP	ND	QN
[37] Cuicatec	SVO	Pr	NG	NA	NP	ND	QN
[38] Trique	VSO	Pr	NG	NA	NP	ND	QN
[39] Zapotec	VSO	Pr	NG	NA	NP	ND	QN
[40] Chatino	VSO	Pr	NG	NA	NP	ND	QN
[41] Chinantec	VSO	Pr	NG	NA	NP	(D)ND	QN
[42] Huave	SVO	Pr	NG	AN	PN	DND	QN
[43] Huamelultec Chontal	VOS	Pr	NG	AN	PN	DN	QN
[44] Copainalá Zoque	VOS	Po	G-is N	AN	PN	DN	QN
[44] Francisco León Zoque	SVO	Po	G-is N	AN/NA	PN	DN	QN/NQ
[45] Sierra Popoluca	SVO	Po/Pr	GN/NG	AN	PN	DN	QN

Table 29—continued.

	S/O/V	Pr/Po	GN/NG	AN/NA	PN/NP	DN/ND	QN/NQ
[46] Sayula Popoluca	Free	Po/Pr	GN/NG	AN/NA	PN	DN	QN
[46] Oluta Popoluca	SVO	Po/Pr	GN	AN	PN	DN	QN
[47] Colonial Mixe	VO	Po/Pr	GN	AN	PN	DN	QN
[47] Coatlán Mixe	VSO	Po/Pr	GN	AN/NA	PN	DN	QN
[47] SJ Paraíso Mixe		Po/Pr	GN	AN	PN	DN	QN
[47] Tlahuitoltepec Mixe	VSO	Po/Pr	GN	AN	PN	DN	QN
[48] Huastec	VOS/VSO	Pr	NG	AN	PN	DN	QN
[49] Yucatec	VOS/SVO	Pr	NG	AN	PN	DN(D)	QN
[50] Lacandón	VOS/SVO	Pr	NG	AN	PN	DN	QN
[51] Itzá	VOS/SVO	Pr	NG	AN/NA	PN	DN(D)	QN
[52] Mopán	VOS	Pr	NG	AN	PN	DN	QN
[53] Chol	VOS	Pr	NG	AN	PN	DN	QN
[54] Chontal	SVO	Pr	NG	AN	PN	DN(D)	QN
[55] Chortí	SVO	Pr	NG	AN	PN	DN(D)	QN
[56] Tzotzil	VOS	Pr	NG	AN	PN	DN	QN
[57] Tzeltal	VOS/VSO	Pr	NG	AN	PN	DN(D)	QN
[58] Tojolabal	VOS	Pr	NG	AN	PN	DN(D)	QN
[59] Chuj	VOS	Pr	NG	AN	PN	DN(D)	QN
[60] Jacaltepec	VSO	Pr	NG	AN/NA	PN	DN	QN
[62] Acatec	VOS	Pr	NG	AN	PN	ND	QN
[65] Tectitec	VOS	Pr	NG	AN	PN	DN	QN
[66] Mam	VSO	Pr	NG	AN/XNA	PN	DN	QN
[67] Aguacatec	VSO	Pr	NG	AN	PN	DN(D)	QN
[68] Ixil	VSO	Pr	NG	AN	PN	DN	QN
[69] Kekchí	VOS	Pr	NG	AN	PN	DN(D)	QN
[70] Pocomchí	VOS	Pr	NG	AN/NA	PN	DN(D)	QN
[71] Pocomam	VOS	Pr	NG	AN	PN	DN	QN
[72] Uspantec	SVO	Pr	NG	AN	PN	DN	QN
[73] Nahuála Quiché	VOS/SVO	Pr	NG	AN	PN	DN	QN
[73] Totonicapán Quiché	VSO/SVO	Pr	NG	AN	PN	DN	QN
[76] Cakchiquel	SVO	Pr	NG	AN	PN	DN	QN
[77] Tzutujil	VOS	Pr	NG	AN	PN	DN	QN
[78] Xinca	VOS	Pr	NG	AN/NA	NP	DN(D)	QN
[79] Garífuna	VSO	Po/Pr	NG	NA/AN	PN	ND	QN
D14 Lenca	SOV	Po	GN	NA	PN	ND	NQ
[80] Tol	SOV	Po	GN	NA	PN		NQ
[81] Mískitu	SOV	Po	GN	NA	NP/I	ND	NQ
[82] Sumu(Ulwa)	SOV	Po	GN	NA	NP/I	ND/DN	NQ
[84] Rama	SOV	Po	GN	NA	PN	ND	NQ
[85] Guatuso	SOV	Po	GN	NA/AN	PN	DN	NQ
[86] Boruca	SOV	Po	GN	NA	PN	DN	QN
[87] Cabécar	SOV	Po	GN	NA	PN	ND	NQ
[88] Bribí	SOV	Po	GN	NA	PN	ND	NQ
[89] Térraba	SOV	Po	GN/NG	NA	PN	ND	NQ
[90] Guaymí	SOV	Po	GN	NA	PN	ND	NQ
[91] Bocotá	SOV	Po	GN	NA	PN	ND	NQ
[92] Cuna	SOV	Po	GN/G3N	NA	PN	DN	NQ

Daniel G. Brinton proposed a close relationship among Yuman, Seri and Oaxaca Chontal in 1892; then Alfred L. Kroeber [1915] proposed a Hokan hypothesis which held that these languages belong to one and the same stock. For decades the hypothesis was accepted without serious discussion [CAMPBELL 1979: 918]; however, since the 1950s it has been under debate again, with more views being expressed than ever before. For example, Greenberg and Swadesh [1953] claimed that Tol, which had been considered to be related to Paya or Chibchan, belongs to Hokan. This hypothesis was readily accepted, despite the fact that it was based on the comparison of a mere 68 words. Oltrogge [1977] proposed a genetic relationship for Tol and Oaxaca Chontal, which he suggested are related to Subtiaba besides, so that all three of them appear to belong to Otomanguean.

On the other hand, Tlapanec, spoken in Guerrero, Mexico, and Subtiaba, once spoken in Nicaragua until the beginning of the present century, were claimed to be Hokan. This hypothesis has been accepted since the 1920s [LEHMANN 1920; SAPIR 1925]. However, Tlapanec has such Otomanguean characteristics as tones, nasalization, and affix constructions, and therefore the opposing opinion, that Tlapanec is related to Otomanguean, has become the dominant one [RENSCH 1977]. Subtiaba and Tlapanec have an undeniably close genetic relationship, but it is still an open question whether or not these two comprise the Supanec family, can be included in the Otomanguean group, or belong to the problematic Hokan stock.

Seri, located in northern Mexico, is also supposed to belong to the Hokan stock, but the more widely held view is that Seri and Oaxaca Chontal are not genetically related [TURNER 1967]. Without consensus for defining the Hokan stock in the first place, it is difficult to judge whether Seri should be classified as such or not. If Seri is Hokan, then Tequistlatec is not, and vice versa [TURNER 1967: 235].

We might first examine the validity of the Tequistlatecan grouping, which until recently included Oaxaca Chontal and Tol. It is doubtful that Tol belongs to the Hokan stock, but the claim that Tol and Oaxaca Chontal are genetically related is generally accepted; as evidence for it, Campbell and Oltrogge [1980] compare over fifty words. However, their correspondences are loose, and the list of words being compared is rather short to begin with.⁵⁾ Accordingly, there is little conclusive evidence that Tol and Oaxaca Chontal have a genetic relationship.

If we broaden our horizons to include grammatical structures, it becomes more difficult to see any relationship between Oaxaca Chontal and Tol. For example, let us compare independent and possessive pronouns and plural formations. No correspondences are apparent.

Independent pronouns:

	Huamelultec	Tol
1 sg.	iyá'	nap ^h
2 sg.	imá'	hip ^h
3 sg.	ít'úwá	hup ^h
1 pl.	iyank'	kup ^h

2 pl.	imank'	nun
3 pl.	it'túwá'	yup ^h
	[WATERHOUSE 1962, 1967]	[ROYCE de DENNIS 1982]

Possessives:

	Huamelultec	Tol
1 sg.	a(y)-	NA-
2 sg.	o-	-y-/hE-
3 sg.	i-	-w-/hU-
1 pl.	ał-	k ^h is
2 pl.	ot-	±nun ±nu ±-w-/his
3 pl.	it-	his
	[WATERHOUSE 1962, 1967]	[DENNIS and FLEMING 1975]

Plural formations:

	Huamelultec		Tol	
	Singular	Plural	Singular	Plural
"woman"	akán'óʔ	akátn'óʔ	kep	nekep
"man"	akwéʔ	akútwéʔ	yom	neyom
"grandson"	kón'íʔ	kótn'íʔ		
"brother"			t ^h am	na-t ^h ampan ("my brothers")
	[WATERHOUSE 1962, 1967]		[ROYCE de DENNIS 1982]	

Furthermore, Oaxaca Chontal and Tol are almost each other's mirror image typologically, so that they appear nearly as different as they can be.

Tequistlatec	Huamelultec	Tol
SVO	VOS	SOV
Pr	Pr	Po
NG	NG	GN
AN	AN	NA
PN	PN	PN
DN	DN	ND
QN	QN	NQ

Ultimately, more data must be examined if we are to resolve this issue; however, the analysis above makes a proposed genetic relationship between Tol and Oaxaca Chontal hard to accept. It seems less controversial to separate Tol from Oaxaca Chontal for the time being.

Seri is a postpositional, SOV language. GN and PN are head-modifier order, while NA, ND, and NQ are modifier-head. Typologically Seri is identical to Tol. We would profit from the comparison of these two languages, but this has not yet been done. At least we can say that they are very different phonologically.

Typologically Tlapanec shows Otomanguean characteristics and if we take the comparative study of words into consideration [RENSCH 1977], it should be classified as Otomanguean. Thus I place Tlapanec between Otopamean and Popolocan in the classification presented in Table 1 (Chapter 1).

Matlatzinca, Ocuiltec, Otomí and Mazahua are typologically different from the other Otomanguean languages, with NG, AN, PN, DN, QN, and for the most part

VOS orders (except for SVO in Ocuiltec; Ocuiltec also differs in having both orders for Q-N). Brinton [1891] was the first to suggest the Otopamean subgrouping, which is claimed to include Chichimec. However, Chichimec differs from the other Otomanguean languages in that it is verb-final and postpositional; accordingly, it must be separated from the Otopamean subgrouping. Nouns in Central Pame are inflected for number of the noun, number of the possessor, and person of the possessor, like those in Chichimec [GIBSON and BARTHOLOMEW 1979], and therefore it is difficult to determine basic word order. The Pame described by Manrique [1967] is South Pame and P/N order seems to be PN, but it is not clear whether Pame noun inflection is different from that of Chichimec. Both Chichimec and Pame have NA.

The languages from Ixcatec to Chinantec in Table 29 show the same pattern of Pr, NG, NA, NP, ND, and QN, except for some languages which have DND. Therefore, based on the analysis here, I classify Otomanguean into three major groups, Chichimec, Otopamean (northern group) and others (southern group). VSO may be basic, although SVO is reported for Chocho, Mazatec, and Cuicatec.

Some scholars classify Huave as Otomanguean ([SWADESH 1967, RENSCH 1973]; cf. [CAMPBELL 1979: 964]), but Huave should be separated from Otomanguean on the basis of the comparison of word lists and grammatical structures. Its separation is also supported from a typological point of view. Huave has SVO, Pr, NG, AN, PN, DND, and QN, patterns distinctly foreign to Otomanguean.

In Mixe-Zoquean languages which are postpositional the verb-final word order is not the basic one. Both Po and Pr are found except in the Zoquean subgroup. In Zoquean languages genitive-noun constructions are "G-*is* 3 (the third person possessive)-N"; the ergative marker *-is* is suffixed to the genitive noun. GN predominates in Mixe-Zoquean on the whole, but both GN and NG are attested for Sierra Popoluca and Sayula Popoluca. The form 3-NG is a common pattern amongst Native Middle American languages. Francisco León Zoque, Sayula Popoluca and Coatlán Mixe have both AN and NA, although one example of NA for Sayula Popoluca in which a numeral occurs appears to be questionable. When adjectives occur with numerals, the A/N order may change, as it does in Mam and Jacaltepec, whose adjectives follow the noun when numerals precede it, the reverse of the order used in the absence of numerals. At any rate, care must be exercised in the treatment of non-basic sentences.

The Mayan family almost all shares the same orders, except for S/O/V order. These are Pr, NG, AN, PN, DN, and QN. The languages having VSO order are distributed in the western Guatemalan Highlands. All the Mayan languages have AN, but Itzá, Jacaltepec, Mam and Pocomchí also have NA. At least the following languages have double marking in D-N constructions, represented as DN(D) in Table 29: Yucatec, Itzá, Chontal, Chortí, Tzeltal, Tojolabal, Chuj, Aguacatec, Kekchí, Pocomchí. The first D includes definite articles and the second D demonstratives or adverb-like particles, such as "here" or "there."

Xinca is a prepositional language and has a pattern similar to the Mayan one,

although the languages do not seem to be genetically related. Xinca has NP, in contrast to PN in Mayan.

Garífuna (Black Carib), an Arawakan language, is a VSO language. Arawakan languages are postpositional, but Garífuna also has a few prepositions derived from relational nouns. This is a well-known pathway for grammaticalization in Middle American linguistics. Garífuna has the noun orders NG, PN, ND, and QN. As for A/N, both AN and NA occur. We observe both head-modifier and modifier-head orders. Irregularity in the positions of modifiers relative to the noun seems to be a result of Mayan influence.

Lenca has SOV, Po, GN, NA, PN, ND, and NQ orders; just as Misumalpan and Chibchan do. However, Mískitu and Sumu have NP, contrary to PN, and Guatuso, Boruca and Cuna have DN. Boruca also has the reverse order in Q-N. Competing word orders are observed in Guatuso (NA/AN), Sumu (ND/DN) and Térraba (GN/NG).

5.3. Discussion

In this section I discuss each word order parameter and its interaction with the other orders.

5.3.1. S/O/V Order

Subject/verb/object order is less stable than the other word orders. The reason may be that S and O are not obligatory constituents. That is, the V in many Middle American languages is not a simple verb but rather verbal complex, with affixes marking pronominal subject, object, and other forms, and these in turn cross-reference the nominal constituents of S, O, and other forms. In other words, constituents other than the verb phrase appear non-obligatorily, and this may account for the comparatively free word order.

Let us call here the verb with affixes representing subject, object and other categories the sentence nucleus (SN). Although it may be technically classified as a verb, it can function as a sentence in and of itself and is an obligatory, central element in a given sentence, hence, the sentence nucleus.

Generally speaking, there are minimally a speaker and hearer(s) in a given speech act and thus first and second person appear with overwhelming frequency. In Middle American languages, first and second person are typically expressed as affixes or clitics on the verb; accordingly, this sentence nucleus can function as a sentence. Of course the subject and object may be expressed by the independent pronouns, but in this case, they are the redundant elements which serve to add emphatic meaning. Third person, on the other hand, is needed only in cases where the speaker refers to a non-second person. S and O can then be expressed overtly in such a sentence. However, S and O in some languages are obligatorily expressed as affixes or clitics which, moreover, can be abbreviated if the participants have a contextual understanding. The order of S/O/V is germane only in sentences where S and O are expressed independently. Although mine may seem at first blush to be a

somewhat extreme position, I contend that we need to discuss word order from a comprehensive or holistic viewpoint, taking into consideration the first, second and third persons. Yet the analysis of S/O/V order can be revealing, as long as it is limited to sentences where S and O are expressed as full nouns. As is stated in the introduction to this chapter, full nouns for S and O are required to determine basic word order, and even where this is the case, S and O must be cross-referenced by the verbal affixes. In investigating the word order of incorporating languages, we must also consider the sentence nucleus, that is, the order within the verb; the sentence nucleus, after all, is an obligatory element and in fact is in itself an interesting object of comparative study. Moreover, the order of S/O/V is typically different from that of the sentence nucleus.

It has been pointed out that S/O/V order is closely correlated with other orders. In fact, SOV order in Middle American languages implies Po. But the reverse is not the case; if a language is postpositional, its basic order is not necessarily OV. SOV languages may have AN or NA, and VSO languages may have Po or Pr, with various other combinations observed. Thus, I now consider whether affix order within the sentence nucleus bears a closer relation with the other orders. Here we symbolize *s*, *o* and *v* for the pronominal subject, pronominal object and verb within the sentence nucleus, respectively, and use square brackets [] to represent the internal structure of the sentence nucleus. The following should be seen as a preliminary analysis, as I am not attempting a detailed comparison at this time. Still, Classical Nahuatl, whose basic order is claimed to be SVO/VOS, is readily seen to have the order [sov], while its other orders are Po/Pr, NG/GN, NA/AN, PN, DN, and QN. Although the genitive and adjective can occur on either side of the noun, the original order seems to have been modifier-head, if evidence from genetically related languages is taken into consideration. Since the head of [sov] is considered *v*, all the orders can be described as modifier-head. And I suppose that through linguistic innovation, the modifier-head order began to be replaced by head-modifier. The coexistence sets Po/Pr, NG/GN, and NA/AN presumably reflect the transition from one historical stage to another, that is, Po-GN-AN to Pr-NG-NA. On the other hand, in the southern Otomanguean group, the order is [vs] since the verb in declarative transitive sentences is placed first, and the modifiers follow the head. In fact, all the orders are head-modifier. However, the northern Otomanguean group displays the reverse orders, AN and DN. If it is conceded that the difference in orders between the two Otomanguean groups is due to their respective orders of [s/v/o], we may further suppose that the order within the sentence nucleus has closer relations with other orders. Overall, then, the order of the sentence nucleus seems to be more relevant to other orders than does S/O/V. In other words, the order of S/O/V undergoes change more readily than that of [s/o/v].

The analysis of Nahuan and Otomanguean leads to the following supposition.

If a language has modifier-head order, all items such as adjectives, personal pro-

nouns, etc. precede the noun. If a language has head-modifier order, all the items follow the noun. If some order violates this rule, it serves as impetus for other parts to change into the opposite structure. If the orders continue to undergo change, the language develops the opposite structure.

If this supposition is correct, we may say that some Native Middle American languages are at a transitional stage; in other words, they are in the process of change. The Mayan languages provide an illustration of this transitional stage; hence, I now discuss the relationship between a transitive sentence nucleus and S/O/V, using them as my example.

I have already examined Mayan sentence nuclei (SN) [YASUGI 1980]. The orders of s/o/v and S/O/V are displayed in Table 30. In column A the order of the elements s, o, v within the SN are inserted after V. However, in Mayan languages the object affix for the third person singular is zero, that is, the third person singular is not obligatorily expressed as an object affix in the SN. Furthermore, o may be abbreviated when the third person singular is expressed; this option is represented by column B. All the various SNs become a simple type [sv]. From column B, we notice that if the SN is [sv], the order of the elements outside the SN is VS (VOS/VSO) or SV[sv]O, putting V between S and O.

Table 30. Connection between s/v/o and S/V/O

A	B
V[svo]OS : Yucatec, Mopán, Itzá, Lacandón, Chol, Tzotzil, Tojolabal	V[sv]OS
V[osv]OS : Kekchí, Pocomchí, Quiché, Tzutujil	V[sv]OS
V[osvo]OS: Huistan Tzotzil	V[sv]OS
SV[svo]O: Chontal, Chortí	SV[sv]O
V[osv]SO: Jacalteco, Mam, Aguacateco	V[sv]SO
V[svo]SO: Ixil	V[sv]SO
V[osv]OS/V[osv]SO: Huastec	V[sv]OS
V[svo]OS/V[svo]SO: Tenejapa Tzeltal	V[sv]OS

SVO is frequently an optional order in VOS languages, although only VOS is presented in Table 30. This phenomenon may be related to topicalization. It is possible that if topicalization of S occurs frequently and the SVO order begins to dominate, it may proceed to become the basic order. In fact, SVO occurs more frequently than VOS in the Yucatecan subgroup, and may do so in Chontal and Chortí. SVO seems to be regarded as a basic order due to its high frequency, and with that presumption we can narrow down S/O/V order to VSO and VOS. As is seen in Table 30, if the order is [sv], then the order outside the SN is VS. The notion that if V occurs before O/S, v in the SN follows O/S and the order becomes its own mirror image is a superficially appealing one; however, it turns out to be specious, because Otomanguean languages have V[vs]SO and the positions of V and v are thus identical.

If the position of O in relation to V is important [LEHMANN 1978], the languages examined above can be classified as VO. In this case the order within the SN is [sv], which makes the order within the SN irrelevant to the order VSO or VOS.

Now let us turn to the relationship of s/o/v and S/O/V for first and second person. Among these same VOS order languages, o either precedes or follows v so that the order within the SN may be either [osv] or [svo]. o, then, has a position opposite that of v, either preceding or following v. Both SVO and VSO languages also permit [osv] and [svo]. Consequently, the orders within the SN and outside it cannot be said to have any relationship.

A close relationship between V and O has been claimed [TOMLIN 1986:73-101]. However, if we examine the position of s/o/v within the SN, s always precedes v and therefore s would seem to have a rather closer relation with v than o has. Incidentally, the affixes are ergative and are the same as the possessive affixes. This phenomenon may be due to the close connection between ergative and possessive discussed in Chapter 6.

We must conclude that the variation of VSO, SVO, and VOS is not relevant to the distribution of s/o/v order within the SN, because there turns out to be no correlation between the distribution of S/O/V and that of s/o/v. What then is the cause of the variation, which seems to elude specification? Since it is clearly not the result of language structure, we must look instead to factors outside the language; such language-external factors, might include, for example, the tendency to place the topic first, or word order changes induced by language contact, and so forth. The role of psychological factors should not be downplayed; that S precedes V provides an illustration of their role. However, we must now turn to a discussion of the various orders within the languages, aided by Map 17.

As Map 17 reveals, the regions of VSO, SVO, and VOS are clearly divided. This particular geographical distribution is most likely the result of linguistic diffusion originating in one language or area not yet identified.

The order in the Mayan languages is overwhelmingly VOS and therefore that order seems to be the basic one. If this is true, why then did VOS change into VSO in some languages? Judging from the geographical distribution of these two types, it seems possible that the innovating VSO originated in the Mam-Ixil area, since the surrounding languages have VOS, while some dialects between them have both VOS and VSO. It is reported that some dialects of Chuj and Cakchiquel have VSO in addition to VOS [DAYLEY 1980:64] and these languages are interpreted as demonstrating an intermediate stage of the change from VOS to VSO. It might then be asked why this change occurred in Mam or Ixil in the first place. Mam and Ixil have a few peculiarities when compared with other Mayan languages. For example, Mam has auxiliary verbs on which can be marked a contrast of a dependent and independent state or mood; in other words, the verb takes affixes in a different mode from other Mayan languages. Ixil, on the other hand, has a similar system to Mam and Aguacatec phonologically, but the SN is similar to that of Lowland

Mayan. We assume that one of the several innovations peculiar to the Mam group might have induced the VSO order.

Only one example of a transitive sentence in Mam was presented in section 1 (Database 3); in it the verb takes a singular object and the order is V[sv]SO. Here I give another example in which the object is plural.

ma či kub' t-b'iyó'n šwa:n ši:naq [ENGLAND 1983: 141]
 REC OBJ DIR (down) SUBJ-hit Juan man
 "Juan hit the men."

I have already mentioned that the order within the SN does not correlate with that outside the SN. It is possible, however, that the order within the SN triggered the change of S/O/V order. As is indicated in the example above, the order is V[osv]SO, and the order of the SN is the reverse to that outside the SN. It seems clear that when the subject and object are repeated in the SN as affixes, the mirror image relation is more stable than it is when both the SN and the sentence have the same constituent order. If we assume this was true of Mam, its VSO order would be readily explicable. However, there may exist additional possibilities. Mam directionals (auxiliary verbs) are almost obligatory and occur between the object prefix and the verb in the SN. This structure may necessitate the subject nominal's preceding the object nominal; it is also conceivable that the subject nominal's position is due to the simplification of the subject affixes (the first, second, and third persons are *n-/w-*, *t-*, *t-*, as opposed to **in-/inw-*, **a-/aw-*, **s-/r-*). These are only subtle differences from other Mayan languages, and in fact there is no hard evidence to support the suppositions above. At any rate, it is difficult, perhaps impossible, to determine the precise impetus for the change from VOS to VSO in some Mayan languages.

It should be noted that when linguists speak of word order they generally mean the unmarked order of S/O/V in a transitive sentence. However, the presence of two third persons in a Mayan sentence makes that sentence ambiguous, because, since the object affix is zero, it can be difficult to distinguish the subject from the object. In general, there are three methods used to disambiguate this subject-object relation: markers on the nouns representing the subject and object, markers on the verb, and word order. As is shown in Database 3, word order is not fixed as in English. Consequently the other two methods may be used in tandem with modifications in word order.

The first example is from Itzá; a topicalization suffix is attached to the noun to disambiguate the sentences.

k-u-kins-ik balum winik
 HAB-SUBJ-kill-INCOMP jaguar man
 "Man kills jaguars," or "Jaguars kill man." [HOFLING 1984: 42]

k-u-kins-ik a' balum he'lo' a' winik
 HAB-SUBJ-kill-INCOMP ART jaguar DIS ART man
 "The man kills that jaguar," or "That jaguar kills the man."

[HOFLING 1984: 42]

The topicalization marker on the agent noun serves to disambiguate the sentences.

k-u-kins-ik (a') winik a' balum-eh
 HAB-SUBJ-kill-INCOMP ART man ART jaguar-TP

"The jaguar kills (the) man."

[HOFLING 1984: 40]

It is reported that the next sentence is unacceptable, because the first NP is specified and the second is not.

*k-u-kins-ik a' balum-eh (a') winik (-eh)
 HAB-SUBJ-kill-INCOMP ART jaguar-TP ART man

[HOFLING 1984: 42]

The following examples show verb markers used for disambiguation. Quiché changes voice to disambiguate the subject-object relationship.

š-#-u:-kuna-x ri: ačih ri: išoq
 COMP-OBJ-SUBJ-cure-ACT ART man ART woman

"The woman cured the man," or "The man cured the woman."

[MONDLOCH 1978b: 5]

š-#-kuna-š ri: ačih r-umal ri: išoq
 COMP-SUBJ-cure-PASS ART man her-by ART woman

"The man was cured by the woman."

[MONDLOCH 1978b: 11]

5.3.2. The Relative Order of S/O/V and Pr/Po

As a means of examining the relationship between the relative order of S/O/V and other orders, I will give the sorted data, based on the types of S/O/V (Table 31).

Table 31. Distribution of word order types by type

	S/O/V	Pr/Po	GN/NG	AN/NA	PN/NP	DN/ND	QN/NQ
[3] Pima Bajo	SOV	Po	GN	AN	PN	DN	QN
[6] Tarahumara	SOV	Po	GN-la	AN	PN	DN	QN
[8] Yaqui	SOV	Po	G-ta N	AN	PN	DN	QN
[9] Mayo	SOV	Po	G-ta N	AN	PN	DN	QN
[20] Seri	SOV	Po	GN	NA	PN	ND	NQ
[24] Chichimec	SOV	Po	GN	NA	DN	QN	
D14 Lenca	SOV	Po	GN	NA	PN	ND	NQ
[80] Tol	SOV	Po	GN	NA	PN	NQ	
[81] Miskitu	SOV	Po	GN	NA	NP/I	ND	NQ
[82] Sumu(Ulwa)	SOV	Po	GN	NA	NP/I	ND/DN	NQ
[84] Rama	SOV	Po	GN	NA	PN	ND	NQ
[85] Guatuso	SOV	Po	GN	NA/AN	PN	DN	NQ

Table 31—continued.

	S/O/V	Pr/Po	GN/NG	AN/NA	PN/NP	DN/ND	QN/NQ
[86] Boruca	SOV	Po	GN	NA	PN	DN	QN
[87] Cabécar	SOV	Po	GN	NA	PN	ND	NQ
[88] Bribri	SOV	Po	GN	NA	PN	ND	NQ
[89] Térraba	SOV	Po	GN/NG	NA	PN	ND	NQ
[90] Guaymí	SOV	Po	GN	NA	PN	ND	NQ
[91] Bocotá	SOV	Po	GN	NA	PN	ND	NQ
[92] Cuna	SOV	Po	GN/G3N	NA	PN	DN	NQ
[44] Francisco León Zoque	SVO	Po	G-is N	AN/NA	PN	DN	QN/NQ
[11] Huichol	SVO	Po	GN-ya	NA	PN	DN	QN
[21] Tarasco	SVO	Po	NG-ri/G-ri	NA	PN/NP	DN	QN
[46] Oluta Popoluca	SVO	Po/Pr	GN	AN	PN	DN	QN
[13] Michoacan Nahuatl	SVO	Po/Pr	GN/N de G	NA	PN	DN	QN
[45] Sierra Popoluca	SVO	Po/Pr	GN/NG	AN	PN	DN	QN
[12] Tetelcingo Nahuatl	SVO	Po/Pr	NG	NA	PN	DN	QN
[14] Istmo Nahuatl	SVO	Po/Pr	NG	NA	PN	DN	QN
[12] Tezcoco Nahuatl	SVO	Po/Pr	NG/N de G	NA	PN	DN	QN
[27] Ocuiltec	SVO	Pr		AN	PN	DN	QN/NQ
D7 Cuitlatec	SVO	Pr	NG	AN	NP	DN	
[33] Chocho	SVO	Pr	NG	NA	NP	DND	QN
[34] Mazatec	SVO	Pr	NG	NA	NP	DND	QN
[37] Cuicatec	SVO	Pr	NG	NA	NP	ND	QN
[42] Huave	SVO	Pr	NG	AN	PN	DND	QN
[54] Chontal	SVO	Pr	NG	AN	PN	DN(D)	QN
[55] Chortí	SVO	Pr	NG	AN	PN	DN(D)	QN
[72] Uspantec	SVO	Pr	NG	AN	PN	DN	QN
[76] Cakchiquel	SVO	Pr	NG	AN	PN	DN	QN
[22] Totonac	SVO	Pr	NG/N šla G	AN	PN	DN	QN
[25] Pame	SVO/SOV		NA	DN	QN		
[12] Classical Nahuatl	SVO/VOS	Po/Pr	GN/NG	AN/NA	PN	DN	QN
[12] North Puebla Nahuatl	SVO/VOS	Po/Pr	NG	AN	PN	DN	QN
[44] Copainalá Zoque	VOS	Po	G-is N	AN	PN	DN	QN
[15] Pipil	VOS	Po/Pr	NG	AN	PN	DN	QN
[26] Matlatzinca	VOS	Pr	NG	AN	PN	DN	
[28] Otomí	VOS	Pr	NG	AN	PN	DN	QN
[43] Huamelultec Chontal	VOS	Pr	NG	AN	PN	DN	QN
[52] Mopán	VOS	Pr	NG	AN	PN	DN	QN
[53] Chol	VOS	Pr	NG	AN	PN	DN	QN
[56] Tzotzil	VOS	Pr	NG	AN	PN	DN	QN
[58] Tojolabal	VOS	Pr	NG	AN	PN	DN(D)	QN
[59] Chuj	VOS	Pr	NG	AN	PN	DN(D)	QN
[62] Acatec	VOS	Pr	NG	AN	PN	ND	QN
[65] Tectitec	VOS	Pr	NG	AN	PN	DN	QN
[69] Kekchí	VOS	Pr	NG	AN	PN	DN(D)	QN

Table 31—continued.

	S/O/V	Pr/Po	GN/NG	AN/NA	PN/NP	DN/ND	QN/NQ
[70] Pocomchí	VOS	Pr	NG	AN/NA	PN	DN(D)	QN
[71] Pocomam	VOS	Pr	NG	AN	PN	DN	QN
[77] Tzutujil	VOS	Pr	NG	AN	PN	DN	QN
[78] Xinca	VOS	Pr	NG	AN/NA	NP	DN(D)	QN
[29] Mazahua	VOS/SVO	Pr	NG	AN	PNP	DN	QN
[65] Tectitec	VOS	Pr	NG	AN	PN	DN	QN
[69] Kekchí	VOS	Pr	NG	AN	PN	DN(D)	QN
[70] Pocomchí	VOS	Pr	NG	AN/NA	PN	DN(D)	QN
[71] Pocomam	VOS	Pr	NG	AN	PN	DN	QN
[77] Tzutujil	VOS	Pr	NG	AN	PN	DN	QN
[78] Xinca	VOS	Pr	NG	AN/NA	NP	DN(D)	QN
[29] Mazahua	VOS/SVO	Pr	NG	AN	PNP	DN	QN
[30] Tlapanec	VOS/VSO	Pr	NG	NA	NP	ND	QN
[48] Huastec	VOS/VSO	Pr	NG	AN	PN	DN	QN
[49] Yucatec	VOS/SVO	Pr	NG	AN	PN	DN(D)	QN
[50] Lacandón	VOS/SVO	Pr	NG	AN	PN	DN	QN
[51] Itzá	VOS/SVO	Pr	NG	AN/NA	PN	DN(D)	QN
[57] Tzeltal	VOS/VSO	Pr	NG	AN	PN	DN(D)	QN
[73] Nahualá Quiché	VOS/SVO	Pr	NG	AN	PN	DN	QN
[4] Northern Tepehuan	VSO	Po	GN	AN	PN	DN	QN
[5] Southern Tepehuan	VSO	Po	GN	AN	PN	DN	QN
[10] Cora	VSO	Po	GN/N-ra G	PN	DN	QN	
[2] Papago	(VSO)	Po/Pr	GN/N-j G	AN	PN	DN	QN
[12] Huasteca Nahuatl	VSO	Po/Pr	NG	AN	PN	DN	QN
[47] Coatlán Mixe	VSO	Po/Pr	GN	AN/NA	PN	DN	QN
[47] Tlahuitoltepec Mixe	VSO	Po/Pr	GN	AN	PN	DN	QN
[79] Garífuna	VSO	Po/Pr	NG	NA/AN	PN	ND	QN
[31] Ixcatec	VSO	Pr	NG	NA	NP	ND	QN
[32] Popoloc	VSO	Pr	NG	NA	NP	DND	QN
[35] Amuzgo	VSO	Pr	NG	NA	NP	ND	QN
[36] Mixtec	VSO	Pr	NG	NA	NP	ND	QN
[38] Trique	VSO	Pr	NG	NA	NP	ND	QN
[39] Zapotec	VSO	Pr	NG	NA	NP	ND	QN
[40] Chatino	VSO	Pr	NG	NA	NP	ND	QN
[41] Chinantec	VSO	Pr	NG	NA	NP	(D)ND	QN
[60] Jacaltepec	VSO	Pr	NG	AN/NA	PN	DN	QN
[66] Mam	VSO	Pr	NG	AN/XNA	PN	DN	QN
[67] Aguacatec	VSO	Pr	NG	AN	PN	DN(D)	QN
[68] Ixil	VSO	Pr	NG	AN	PN	DN	QN
[73] Totonicapán Quiché	VSO/SVO	Pr	NG	AN	PN	DN	QN
[47] SJ Paraíso Mixe	Po/Pr	GN	AN	PN	DN	QN	
[47] Colonial Mixe	VO	Po/Pr	GN	AN	PN	DN	QN
[46] Sayula Popoluca	Free	Po/Pr	GN/NG	AN/NA	PN	DN	QN

We may sum up the relations between S/O/V and Pr/Po as follows:

	SVO	VSO	VOS	SOV	SVO/VOS	VOS/SVO	VOS/VSO	VSO/SVO	
Pr	11	12	15			5	3	1	47
Po	3	3	1	19					26
Po/Pr	6	5	1		2				14
	20	20	17	19	2	5	3	1	87

Glancing at the world’s languages, we observe that there are languages having SOV and Pr, but that there is no language exhibiting this pattern in Middle America, where all the languages with SOV have Po, while prepositional languages never have SOV.

Greenberg did not find languages having both VSO and Po, and so he declared the following universal: Languages with dominant VSO order are always prepositional [GREENBERG 1966: Universal 3]. But since then such languages have been reported [DERBYSHIRE and PULLUM 1986; TOMLIN 1986; HAWKINS 1983: 22]. Co-occurrence of VSO and Po is seen in Papago, Northern Tepehuan, Southern Tepehuan, Cora, Huasteca Nahuatl, Tlahuitoltepec Mixe and Garífuna. That these must have been postpositional, SOV languages becomes apparent when they are compared to other genetically related languages. Papago, Huasteca Nahuatl, Tlahuitoltepec Mixe and Garífuna have Po as well as Pr. Hence these are regarded as showing a transitional stage from Po to Pr.

5.3.3. Coexistence of Po and Pr

Closer examination may reveal more examples of the coexistence of Po and Pr, and Table 29 may not be said to reflect the situation precisely. But at least the data in Table 29 are attested.

	SVO	VSO	VOS	SVO/VOS	
Po/Pr	6	5	1	2	14



Although languages having both Po and Pr exhibit four types of S/O/V, they are restricted to Uto-Aztecan, Mixe-Zoquean and Garífuna. All languages genetically related to them have Po only.

From Table 31 I extract the data on Pr/Po and GN/NG as follows:

	Pr	Po	Po/Pr	
NG	46		7	53
GN		23	5	28
GN/NG		3	5	8
	46	26	17	89

If a language has Pr, it has NG, and if a language has Po, it has GN, that is, two language types, Pr & NG and Po & GN predominate. However, languages with Po may have GN/NG and the languages with both Po and Pr show three distinct patterns.

In most Middle American languages, so-called relational nouns function as prepositions. Most relational nouns turn out to be body part nouns. When they function as prepositions, the possessor nouns follow them and the possessive prefix, which agrees with the possessor noun, is affixed to the relational noun. Interestingly, the structure of relational noun constructions is the same as that of genitive constructions. In both constructions the possessive prefix, which agrees with the possessor, is affixed to the possessed nouns. Below are examples from Classical Nahuatl.

Postposition / Preposition	Possessive construction
no-yaka-pan / i-pan no-yak	i-peʔ siʔi
my-nose-in its-in my nose	her-mat grandmother
 "in my nose"	 "grandmother's mat"

A look at postpositional and verb-final languages of the world reveals that the GN pattern is dominant in SOV and Po languages. In Middle America, as is stated above, languages with both Po and Pr have the NG, GN and GN & NG patterns and are restricted to Uto-Aztecan, Mixe-Zoquean and Garífuna. It is assumed that the languages with both Po and Pr were formerly typical Po-SOV languages that came to have Pr as a result of the structural similarity of prepositional constructions to genitive constructions. We can also postulate that a change from SOV word order to other verb-medial or verb-first positions could have triggered Pr constructions. Which structural change occurred first is more or less a case of the chicken vs. the egg. The fact that these languages are no longer verb-final must also be considered as well as possible influence from Spanish. In many languages Spanish prepositions have been borrowed, and this gives additional impetus to the use of prepositions as opposed to postpositions.

Uto-Aztecan languages exhibit a number of variant word orders, but we can readily deduce from Table 29 SOV, Po, GN, AN, PN, DN and QN orders for proto-Uto-Aztecan, an assessment which agrees with the reconstruction proposed

(1) Po GN/NG AN \rightarrow Po/Pr GN/NG AN \rightarrow Po/Pr NG AN
 \rightarrow Po/Pr GN/NG AN/NA \rightarrow Po/Pr NG NA
 (2) *Po GN AN/NA \rightarrow Po GN NA \rightarrow Po/Pr GN/NG NA \nearrow

In Mixe-Zoquean, whose proto-language also seems to have been postpositional and verb-final, however, a different process is postulated, that is, the adposition order was the first to change. Since the change in Sierra Popoluca is the same as the first stage of (1), we can say that this process is restricted to the Mixean group.

5.3.4. GN/NG

Garífuna has NG, but genetically related Arawakan languages have GN. We assume that Garífuna may have changed GN to NG under the influence of Mayan languages.

[TAYLOR 1977:57]

The suffix *-is* is attached to the noun in Zoque marks the ergative; it is suffixed to

the possessive noun as well as to the transitive verb (See [44]-(1) in Database 3). In Mayan also the ergative affixes are attached not only to the transitive verb as subject but also to the noun as possessive. It is important to note that ergative affixes mark possession.

With regard to genitive expressions, I have only given GN/NG constructions, but there are various other expressions in use, such as *G-ri* N and *N šla* G. Note that only Tarasco has genitive case per se, but the suffix *-ta* in Yaqui and Mayo may also be included in the list of case suffixes. No other languages have a case system. Therefore genitive G and modified noun N should properly be symbolized as separate terms such as N¹ and N². However, these representations do not permit us to distinguish the modifier noun from the modified noun, and therefore we use G and N here for modifier and modified nouns, respectively. The most common form of modifying relation for nouns is 3-NG, in which 3 represents the third person cross-referencing the modifier noun. There are various constructions in use besides 3-NG. For example, in Kekchí the following forms are reported: NG, 3-N P-G, P-NG, P-3-NG, 3-N-*il* G, 3-N-*il* P-G, 3-N-*al* G, 3-N-*al* P-G [STEWART 1980: 96-108]. In possessive expressions alienable nouns are typically distinguished from inalienable nouns, and temporary possession may be distinguished from permanent possession. A genitive construction may also be used to express material composition. These constructions may be ostensibly the same or similar, but they are nevertheless worth studying in detail.

5.3.5. AN/NA

There is some ambiguity in determining AN vs. NA order, because many languages lack so-called "be" verbs altogether, making it difficult at times to distinguish modifier adjectives from predicate adjectives.

Co-occurrences with AN/NA are given as follows:

	SVO	VSO	VOS	SOV	SVO/VOS	VOS/SVO	VOS/VSO	VSO/SVO	SVO/SOV	
NA	9	8		14			1		1	33
AN	11	7	14	4	1	4	2	1		44
NA/AN		1		1						2
AN/NA	1	3	2		1	1				8
	21	19	16	19	2	5	3	1	1	87

	Pr	Po	Po/Pr	
NA	12	16	4	32
AN	30	7	9	46
NA/AN		1	1	2
AN/NA	5	1	3	9
	47	25	17	89

	NG	GN	GN/NG	
NA	15	14	3	32
AN	32	11	2	45
NA/AN	1	1		2
AN/NA	5	2	2	9
	53	28	7	88

Beyond observing that the languages with VOS have not NA but AN, it is difficult to deduce generalizations from the tables above. Accordingly, I shall utilize Greenberg's implicational universals concerning A/N order, listed below.

Universal 5: If a language has dominant SOV order and the genitive follows the governing noun, then the adjective likewise follows the noun.

Universal 17: With overwhelmingly more than chance frequency, languages with dominant order VSO have the adjective after the noun.

Universal 18: When the descriptive adjective precedes the noun, the demonstrative and the numeral, with overwhelmingly more than chance frequency, do likewise.

These universals are formulated as follows:

(1) $(SOV \ \& \ NG) \supset NA = AN \supset \sim (SOV \ \& \ GN)$

(2) $VSO \supset NA = AN \supset \sim VSO$

(3) $AN \supset DN = ND \supset NA$

(4) $AN \supset QN = NQ \supset NA$

Since there is no language with SOV & NG in Middle America, (1) may be restated as follows:

Hawkins Universal 1: If a language has SOV word order, then if the adjective precedes the noun, the genitive precedes the noun;
i.e., $SOV \supset (AN \supset GN)$. [HAWKINS 1983:64]

Since Seri, Chichimec and Central American languages have SOV & GN & NA, the following reverse order is false.

If a language has SOV, then if the genitive precedes the noun, the adjective precedes the noun.

With regard to (2), the following combinations are attested in Middle America:

VSO languages : NA & NG : 8
AN/NA & NG : 3
AN/NA & GN : 1
AN & NG : 3
AN & GN : 3
NA & GN : 0

Clearly, my findings do not support the universal. (2) is restated by Hawkins:

If a language has VSO word order, then if the adjective follows the noun, the genitive follows the noun;
i.e., $VSO \supset (NA \supset NG)$.

The following tables are based on Table 29. Since no language in Middle America has either AN & ND or AN & NQ, (3) and (4) do not apply here.

	DN	ND	DND	DN/ND	
NA	10	18	3	1	32
AN	45		1		46
AN/NA	10	1			11
	65	19	4	1	89

	QN	NQ	QN/NQ	
NA	21	12		33
AN	43		1	44
AN/NA	10	1		11
	74	13	1	88

Each language family is relatively stable in regard to A/N order, except for Otomanguean and Uto-Aztecan. Otomanguean languages have both AN and NA. The former is found in Matlatzinca, Ocuiltec, Otomí, and Mazahua, the latter in other languages, which are clustered geographically. In Uto-Aztecan, both AN and NA are observed, but NA is restricted to Huichol and some Nahuatl languages. This phenomenon seems to be due to language contact, the result of influence from languages having NA. The only Nahuatl languages conserving AN are North Puebla Nahuatl, Huastec Nahuatl and Pipil, which can be presumed to have been under the influence of Totonac and Huastec, both AN languages.

Seri and Tol probably conserve their original orders, NA, ND, and NQ. NQ order is rather rare, although Misumalpan and Chibchan in Central America also have it.

It seems evident that Mixe-Zoquean originally had Po, GN, and AN, but some languages within the group have alternative orders. For example, Sayula Popoluca has Po & Pr, GN & NG, AN & NA, and Sierra Popoluca has Po & Pr and GN & NG. These are interpreted as various stages along the transition from Po-GN-AN to Po/Pr-NG-NA.

Some languages appeared to lack simple adjective-noun phrases. In their stead I cited noun phrases with numerals or demonstratives. As Mam and Jacalteco demonstrate, it is completely possible that the order of adjective-noun is affected by other elements such as numerals and demonstratives. Accordingly, we must also take note of the order when other elements appear in the noun phrase. In some cases the lack of data prevented investigation of the interactions of noun phrase elements. That their order may change through the addition of other elements indicates that modifier-head relationships are not as tight as is sometimes claimed. Or we may prefer to consider that modifier-modified relationships are somewhat clarified by separating the modifiers and placing them before or after the noun. If a reverse order results from the addition of modifiers and subsequently becomes fixed, then it is possible that the impetus for word order change may arise through the addition of modifiers.

5.3.6. PN/NP

The majority of Otomanguean languages have NP, but there are a few within the group which have PN. Languages other than Otomanguean which have NP are Cuitlatec, Xinca, Mískitu, and Sumu. Tarascan has both PN and NP. Other

languages have PN. In many Otomanguean languages, pronominals are expressed in terms of tones or nasalization, making it difficult to separate out the morphemes for pronominals. Chichimec and Pame pronominals conjugate and so it is especially difficult to extract the root for these languages. In northern Uto-Aztecan, pronominals are prefixes, but the third person singular is suffixed. The descriptions vary from language to language and are confused. As is seen in Huichol, however, third person is typically unmarked, so that a genitive marker appears to function as the third person.

5.3.7. DN/ND

D refers to definite articles or demonstratives which may not be unambiguously distinguished. In the languages which do distinguish definite articles from demonstratives, the latter tend to follow the noun while the former precede it; the noun thus occurs flanked by the demonstrative and the definite article. This situation is represented as DND in Table 29, but it has not yet been examined thoroughly. As a result, the number of languages having DND may increase with further investigation.

DN is dominant except in Otomanguean, Misumalpan and Chibchan languages. However, the northern group of Otomanguean languages has DN, and among Chibchan languages, Guatuso, Boruca and Cuna have this order. In northern Middle America only Seri has ND.

5.3.8. QN/NQ

Q represents numerals or quantitives. We should first consider numerals separately from the quantitives, but these occur before the noun in all languages except Seri and the Central American languages, and as a result their investigation can lead to only trivial findings. Therefore, I have limited my investigation to quantitives in this study. However, such quantitives as "all" and "many" frequently exhibit the same behavior as the numerals, so numerals were used in some cases where good example sentences with quantitives were lacking. However, in some cases it is difficult to decide whether quantitives function as adverbs or as noun modifiers, as shown by the following.

nánk'u nimál mapé kúmba
my-road animal many I-saw

[LASTRA DE SUÁREZ 1984: 40]

"I saw many animals on the road."

ikág nt'á síma'an túkhar
I one dog I have

[LASTRA DE SUÁREZ 1984: 38]

"I have a dog."

In the first example the English translation is "many animals." If we judge the word order based on the English translation, the order is NQ. However, in the second example the numeral precedes the noun, providing evidence that *mapé* in the

first example may actually be an adverb. The relationship between the quantitative and its associated noun is fraught with such interesting problems, and is as a result well worth studying. In such a case the numeral and noun is to be preferred as an example of Q/N order.

All the languages in Middle America having NQ order are verb-final and postpositional: Seri, Lenca, Tol, Misumalpan, and Chibchan. In the Chibchan group only Boruca has QN. However, in some Otomanguean languages such as Zapotec and Mixtec, ordinal numerals occur after the noun. Generally the positions of D and Q relative to the noun are the same, but the Otomanguean languages, with the exception of Otomí, Mazahua and Pame, take the reverse orders, ND and QN. The ND & QN pair is also found in Acatec and Garífuna, and the mirror-image pair, DN & NQ, in Guatuso and Cuna. Ocuiltec and Francisco León Zoque have both QN/NQ.

5.4. Summary

This chapter sets out typological data on 91 Middle American languages (including some dialects). The study focused on: (1) the order of S (subject)/O (object)/V (verb); (2) adposition order, i.e., the existence of Pr (prepositions) vs. Po (postpositions); (3) G (genitive) and N (noun) order; (4) A (adjective) and N order; (5) P (personal pronoun or pronominal affix) and N order; (6) D (definite article or demonstrative) and N order; (7) Q (numeral or quantitative) and N order. The data are summarized in Table 29.

I first discussed language classification from a typological standpoint. The major difference from previous classifications is the position of Tol. It is difficult to discover regular correspondences between Tol and Tequistlatec by comparing basic words (Note 5). The typological data also support separating Tol from the Tequistlatec complex, since it is typologically a mirror image to Tequistlatec. Interestingly, Seri has the same word order type as Tol, and therefore the two are worth comparing. Tlapanec is classified as Otomanguean, but Huave appears to be an isolate. The phonology, morphology, syntax and lexicon of Huave are too different from those of the Otomanguean languages to establish genetic correspondences. Huave is also typologically different from the Otomanguean languages, which are typical VSO languages having head-modifier word orders. However, Chichimec is an SOV language, and Otomí and Mazahua are VOS. If we classify Chichimec as Otomanguean, we must divide the Otomanguean family into three major sub-branches, that is, Chichimec, Northern Otomanguean (Otomí, Mazahua) and Southern Otomanguean (others). The Mayan languages are VOS with Pr, NG, AN, PN, DN, and QN, but the western Highland sub-branches are VSO, which order is supposed to have spread from Mam-Ixil. Although the Uto-Aztecan and Mixe-Zoquean groups consist of postpositional languages, the S/O/V order varies amongst them. It is possible that they all might have been SOV languages at one time but subsequently changed their word order under the influence of other languages in the culturally defined area of Mesoamerica.

Greenberg set up a total of 45 language universals, one of which states that languages with dominant VSO order are always prepositional. He also recognized three basic positions of the verb: VSO, SVO, and SOV. VSO-Po languages have been found since then, but it is worth noting again that VSO-Po languages are not unknown in Middle America, for example, Northern Tepehuan, Southern Tepehuan, Cora, Huasteca Nahuatl, Coatlán Mixe, Tlahuitoltepec Mixe and Garifuna; furthermore, VOS languages abound in Mesoamerica.

After the discussion of language classification, I examined word order diversity, basing my investigation on both genetic classifications and the languages' areal distribution. Almost all indigenous Middle American languages are so-called incorporating languages. The sentence nucleus (SN), which consists of verb stem [v] and obligatory affixes or clitics indicating subject [s], object [o], and other categories, is a kind of micro-sentence, serving as the larger construction in miniature. In order to investigate the factors contributing to the diversity of S/O/V order, I compared s/o/v order within the SN with S/O/V order. s/o/v order within the SN was found to be irrelevant to changes in S/O/V order, and seems to be more closely related to the other word orders than to S/O/V order. Further study in this area should prove rewarding.

Mesoamerican languages share a number of linguistic features that may have resulted from diffusion or mutual interaction. Examination of the areal distribution of word order types reveals that the languages which have variant orders are bordered by languages characterized by word order types different from the type dominant in area of the former, demonstrating the importance of contact borrowing to language change. In Mesoamerica there are no SOV languages, although the area itself is sandwiched between areas rife with SOV languages. The central part of Mesoamerica is occupied by the southern Otomanguean subgroup, consisting of VSO, head-modifier languages surrounded by SVO or VOS, modifier-head languages. Some word order changes presumably resulted from interaction between these two groups. For example, the change of GN-AN to NG-NA is observed in Nahuatl, and Classical Nahuatl has Po & Pr, GN & NG and AN & NA. These coexistence sets are assumed to reflect the transition from one historical stage, i.e., Po-GN-AN, to another, Pr-NG-NA, under the influence of head-modifier languages. The Otomanguean languages have exerted only a weak influence on their P/N and D/N orders, whereas they have had a dramatic effect on their G/N and A/N orders. The word orders S/O/V, Po/Pr, N/A and N/G seem to be more sensitive to diffusion than are P/N, D/N, and Q/N.

The southern Otomanguean subgroup is made up of head-modifier languages, but these have QN order. In the Zapotecan writing system of Monte Alban I to IV, from ca.500 B.C. to A.D.900, glyphs precede the numerals, and this order may reflect the ancient Zapotec NQ order. If so, it is possible that the southern Otomanguean languages followed strict head-modifier order. The coexistence of Po & Pr, GN & NG and AN & NA is supposed to have occurred in Classical Nahuatl between the 14th and early 16th centuries, judging from the ethnohistorical

data, and this coexistence is claimed to have subsequently been restricted to NG-NA order. These conclusions may seem to be mere guesswork, but there is no doubt that typological studies of Middle American languages can contribute important findings not only to general linguistics (including areal linguistics, language change, and so forth), but also to an understanding of Mesoamerican history as a whole.

Chapter 6

Toward a New Typology of Language: Typology of the Syntactic Relations of Cross-Referencing Pronominals

In the previous chapters, I have analyzed Native Middle American languages from an areal-typological point of view. This chapter will be an attempt at providing a new typology based mainly on the syntactic relations of cross-referencing pronominals of Native Middle American languages.

Among the syntactic relations between the noun phrase (NP) and the verb (the case-relations), ergativity has recently received the most attention. In general, the single participant of an intransitive sentence is indicated by the symbol S, and two participants of a transitive sentence are referred to with the symbols A and O.

S = intransitive subject

A = transitive subject

O = transitive object ⁶⁾

Any grouping of S with O in contrast to A is described as an "absolutive-ergative" or simply "ergative" system, and any grouping of S with A in contrast to O is referred to as a "nominative-accusative" or simply "accusative" system. The following chart depicts an ergative and an accusative system, respectively:

NOMINATIVE	{	A	ERGATIVE
		S	
ACCUSATIVE	}	O	ABSOLUTIVE

Although ergativity has been discussed on the levels of morphology, syntax, and discourse, morphological ergativity has been the most extensively studied. Morphological ergativity generally refers to a nominal case-marking system, but cross-referencing pronominals may also show ergativity. In most of the Middle American languages, person markers of intransitive and transitive sentences are obligatorily expressed by pronominal clitics or affixes. In other words, the syntactic relations are indicated by the internal structure of the verbal cross-referencing system instead of by overt case marking on NPs, except in such groups as Tarascan and Chibchan. As a result, analyses of the syntactic relations of A, O, and S in Middle American languages naturally focus on their pronominal systems. However, some sources equate A and G (possessive or genitive); accordingly, I will include G in my discussion of the syntactic relations of A, S, and O.

6.1. Person Marking System

Dixon notes that the syntactic function of an NP in a simple sentence may be shown by any (or a combination) of the following: 1) a case marker on the noun; 2) particles, i.e. prepositions or postpositions; 3) pronominal cross-referencing on the main verb or on an auxiliary verb; 4) word order [DIXON 1987: 3]. Although the presence of one strategy for marking syntactic function normally excludes the others, combinations of them are not unheard of. For example, Zoque, a Mixe-Zoquean language of Mexico, has a double marking system in which the A is expressed by a cross-referencing pronominal and also marked directly on NPs with the suffix *-is*. The absolutive S or O, on the other hand, is left unmarked. In (1) the subject *yomo* is cross-referenced by the third person marker *y* in the verb complex. On the other hand, the object marker O in (1) and the subject marker S in (2) are # (zero morph). That is, A is treated in a manner that makes it contrast with S and O. *y* also indicates the possessor *une-* in (3). Note that the suffix *-is* functions not only as an ergative marker but also as a genitive marker.

- (1) *yomo-is* *t-y-iŋvitu'-yah-pa* *ane*
 woman-ERG 3sg. (y)-turn over (tiŋvitu')-PL-INCOMP tortilla
 "The women turn over the tortillas." [ENGEL & BARTHOLOMEW 1987: 344]
- (2) *tihki-yah* *pin* [ENGEL & BARTHOLOMEW 1987: 341]
 entered-PL man
 "The men entered."
- (3) *une-is* *k-y-i'* [ENGEL & BARTHOLOMEW 1987: 342]
 child-GEN his-hand (<y-ki')
 "a child's hand"

According to the head-marking and dependent-marking grammar proposed by Nichols, case marking systems and particles constitute dependent marking, while cross-referencing systems are considered head marking [NICHOLS 1986]. These two, then, are opposite methods for indicating the syntactic relations of the NPs in a sentence. In addition to these two major patterns, Nichols identifies two further types: 1) the complete absence of formal marking, and 2) the double marking type, where both head and dependents have formal markers. The former corresponds to a word order strategy, and the latter is illustrated by the Zoque examples just above.

Pronominal clitics or affixes on the verb cross-reference three basic nominal phrases, A, O, and S; in other words, pronominal markers are obligatorily expressed as separate affixes or clitics. In case marking systems, on the other hand, the absolutive NP is normally left unmarked while the ergative NP usually carries an overt marker.

Pronominal systems normally consist of person and number; the components of the concept of person in particular do not function equally. For example, the personal pronouns *I* and *you* are fundamentally different from the third person pro-

nouns *he, she, it, they*. The referents *I* and *you* are inherently mutable, depending as they do on who is the speaker and who is the addressee, while the third person pronouns function as more or less discourse-constant substitutes for nouns to refer to non-participants. (Of course, the third person can refer to a participant. For example, one can say, "*He is my brother*," while indicating him.) The third person may additionally be split by gender and animacy, categories which only infrequently apply to first or second person.

It is quite common in Middle American languages for person markers, particularly those of subject and object, to be expressed as clitics or affixes on the verb. Independent personal pronouns for first and second persons are generally omitted, although they can be included for emphasis. The different status of personal pronouns is also reflected in the fact that while all languages have overt morphemes for first and second persons, many have a zero morpheme for the third. A hierarchy of inherent salience in the system of person has been set up as follows [SILVERSTEIN 1976; FOLEY and VAN VALIN 1985: 288]:

Speaker/addressee > 3rd person pronouns > human proper nouns >
human common nouns > other animate nouns > inanimate nouns

It is important to bear these differences in status in mind; we will consider each person and number separately as necessary.

6.2. Pronominal Square

Mayan languages have two distinct sets of person markers. The ergative markers, often called Set A by Mayanists, function to indicate the subjects (A) of transitive verbs, and the possessors (G) of nouns. The absolutive set, referred to as Set B, indicates the subjects (S) of intransitives and stative or equational predicates, and the objects (O) of transitive verbs. To illustrate this relationship, some examples are given from Tzutujil, a Mayan language of Guatemala.

The Ergative Person Markers (Set A)

	Preconsonantal	Prevocalic
1sg.	nu:-/ (n-)/in-/ (#-)	w-/inw- nw-
2sg.	a:-/ (a-)	a:w-/ (aw-)
3sg.	ru:-/ (r-)/u:-/ (#-)	r-
1pl.	qa:-/ (qa-)	q-
2pl.	e:-/ (e-)	e:w-/ (ew-)
3pl.	ke:-/ (ki-)	k-

The Absolutive Person Markers (Set B)

1sg.	in-
2sg.	at-
3sg.	#-
1pl.	oq-
2pl.	iš-
3pl.	e:-/e'-

- (4) š-in-r-a:xo' [DAYLEY 1985: 95]
 COMP-me (1ABS)-he (3ERG)-love
 "He loved me."
- (5) in-r-alk'wa:l [DAYLEY 1985: 151]
 I (1ABS)-his (3ERG)-child
 "I am his child."
- (6) š-in-wari [DAYLEY 1985: 87]
 COMP-I (1ABS)-sleep
 "I slept."
- (7) in-winaq [DAYLEY 1985: 151]
 I (1ABS)-man
 "I am a man."

The structure of the transitive (4) and the equational (5) sentences is almost identical:

- (4) tense/aspect-Set B (absolutive)-Set A (ergative)-transitive stem
 (5) Set B (absolutive)-set A (ergative)-noun stem

The structure of the intransitive (6) and the equational (7) sentences is also almost identical:

- (6) tense/aspect-Set B (absolutive)-intransitive stem
 (7) Set B (absolutive)-noun stem

The one difference is that an aspect marker appears in (4) and (6).

The close relationship between verbal and nominal sentences (the latter is a sentence lacking an overt predicate, one of whose nominal roots functions as a predicate) is more clearly demonstrated in Sierra Popoluca, a Mixe-Zoquean language of Veracruz, Mexico, whose first and second person are expressed by the portmanteau morpheme *man-*, readily analyzed as *mi-* (Set B: second singular absolutive) + *an-* (Set A: first singular ergative).

- (8) man-tóy-pa [ELSON 1960: 48]
 I = you-love-INCOMP
 "I love you."
- (9) man-há:tuj [ELSON 1960: 32]
 you = my-father
 "You are my father."
- (10) mi-míñ-pa [ELSON 1960: 31]
 you-come-INCOMP
 "You come."
- (11) an-tlak [ELSON 1960: 32]
 my-house
 "my house"
- (12) mi-yó:ya [ELSON 1960: 30]
 you-pig
 "You are a pig."

In these languages four categories, A, O, S, and G, are marked in terms of Set A or Set B affixes as core constituents of the syntax. G is integrated into the NP, whereas A, O, and S are integrated into the VP. Therefore, G would appear to have no similarity to A, O, and S. As is shown above, however, G is formally the same as A. Consequently, G must also be taken into consideration along with A, O, and S, although so far only A, O and S have been discussed. Interestingly enough, the syntactic relations of A, O, S, and G can be nicely illustrated by a square divided into four parts, each of which contains either A, O, S, or G. The pairs consisting of A and S and of G and O are arranged horizontally, while the pairs consisting of A and G and of S and O form a vertical pattern. On the other hand, A and O are arranged diagonally, as are S and G. An A-O diagonal line represents a sentence with two arguments, while an S-G line represents a sentence with one argument. The two elements in the horizontal or vertical relation can be linked by taking away the border line, whereas the two elements in the diagonal relation cannot be linked directly, indicating that A should differ from O, and likewise S should differ from G.

A	S
G	O

Fig. 2

However, A and O may be expressed by the same morpheme, and S and G may take the same form as well. If one intends to link A with O or S with G by erasing the lines, one cannot draw them in the square except under the following conditions:

- a) If A and O are the same, then either S or G is identical to A and O, or both S and G are identical to A and O.
- b) If S and G are the same, then either A or O is identical to S and G, or both A and O are identical to S and G.

This may represent a kind of implicational universal. The syntactic relations A, O, S and G can be illustrated in the square, which in turn indicates that the relations can be described as a two-dimensional structure.

6.3. Types of Pronominal Square

In this section I present various patterns of the square, utilizing pronominal affixes or clitics from Middle American languages. Some languages, however, have case marking systems, which are also discussed here. Personal pronouns themselves, including pronominal clitics or affixes, will be treated in detail in a separate paper.

Mayan languages have two sets of person markers, the ergative (Set A) and the

absolutive (Set B) as shown above for Tzutujil. Set B affixes typically take the same form, although they are subdivided into Set B1 (preposed) and Set B2 (postposed) in some Highland Guatemalan languages. A and G are marked by Set A affixes, while S and O are marked by the Set B ones, producing the square below.

A	S
G	O

Fig. 3

This square may be considered a typical ergative pattern for Middle America.

Some Mayan languages, however, have split ergativity. How then is split ergativity to be represented? Split case marking is triggered by the following three factors: 1) the category of person as in Mocho only, where third person is marked on an ergative basis, and non-third person on an accusative basis, 2) tense/aspect as in Yucatecan and Cholan, where in the incomplete aspect all subjects are marked with Set A, and all objects with Set B, or 3) the distinction between main and subordinate clauses as in Jacaltec [LARSEN and NORMAN 1979]. In these splits S is treated in the same way as A and G, while O remains unchanged. This situation can be illustrated as follows:

A	S
G	O

Fig. 4

In contrast to the Mayan languages, Uto-Aztec languages show accusative patterns. For example, Classical Nahuatl has three different sets of person markers as listed below [SULLIVAN 1976]:

Classical Nahuatl

	Subject (A = S)	Object (O)	Possessive (G)
1sg.	ni-	neč-	no-
2sg.	ti-	mic-	mo-
3sg.	#-	k-/ki-	i-
1pl.	ti-	teč-	to-
2pl.	an-	ameč-	amo-
3pl.	#-	kin-	in-

These different sets produce the following figure.

A	S
G	O

Fig. 5

This pattern seems to be a common one for accusative languages; notoriously accusative Indo-European languages such as English also follow it. However, in Northern Tepehuan, for example, G is the same as O except in the third person.

A	S
G	O

Fig.6a: Non-third persons

A	S
G	O

Fig.6b: Third person

Northern Tepehuan

	Subject (S)				Object (O)	Possessive (G)
	I	II	III	IV		
1sg.	n=/an=, iñ=	=ni,	an-	=iñ	(g)iñ-	(g)iñ-
2sg.	p=/pi=	=pi	ap-	=pi	(g)i-	(g)i-
3sg.	v=/# =				#-	-di
1pl.	tit=/ti=	=timi	ti-	=ir	(g)ir-	(g)ir-
2pl.	m=/mi=	=pimi	?	=m	(g)in-	(g)in-
3pl.	v=/# =				#-	-di

Notes: Set I occurs as proclitics to WH-words and conjunctions. The *n=* series occurs before vowels, and *an=* series before consonants (*iñ=* before a palatalized consonant). Set II and Set III occur with verbs. Set IV occurs as enclitics to the AUX (auxiliary) BASE preceding auxiliary verbs, and as proclitics to the auxiliary verb when the AUX BASE is not present [BASCON 1982: 347-350].

If we compare Fig. 6a with Fig. 3, we notice that Fig. 6a is a 90-degree rotated image of Fig. 3. Since this is an interesting pattern, I give below another example from Papago. In Papago, the subject is expressed as AUX (auxiliary) which is obligatorily present and always occurs in second position [ZEPEDA 1983]. Independent pronouns function not only as subjects but also as objects; however, these are optionally present.

Papago

Auxiliary (A = S)				
Imperfective			Perfective	
	Long form	Short form	Long form	Short form
1sg.	'añ	ñ	'ant	nt
2sg.	'ap	p	'apt	pt
3sg.	'o	'o	'at	t

1pl.	'ac	c	'att	tt
2pl.	'am	m	'amt	mt
3pl.	'o	'o	'at	t

	Object (O)	Possessive (G)	Independent Long form	Pronouns Short form
1sg.	ñ-	ñ-	'a: ñi	'a: ñ
2sg.	m-	m-	'a: pi	'a: p
3sg.	#-	-(i)j	hegai	heg
1pl.	t-	t-	'a: cim	'a: c
2pl.	'em-	'em-	'a: pim	'a: p
3pl.	ha-	ha-	hegam	heg
(13)	s-hottam 'ap cipkan			[ZEPEDA: 1983: 19]
	quickly AUX work			
	"You were working quickly."			
(14)	hegai 'uwi 'o cipkan			[ZEPEDA: 1983: 8]
	that woman AUX work			
	"That woman is/was working."			
(15)	ceoj 'o ('a: ñi) ñ-ceggia			[ZEPEDA: 1983: 35]
	boy AUX INDEP PRON 1sg.O-fight			
	"The boy is/was fighting me."			
(16)	ñ-je'e /m-'o:gi /kotoñ-ij			[ZEPEDA: 1983: 76]
	my-mother /your-father /shirt-his			
	"my mother" /"your father" /"his shirt"			

The syntactic relations A, S, O, and G are the same as those of Northern Tepehuan. If Fig. 3 represents a typical ergative pattern, then it may be said that Fig. 6a is a typical accusative pattern. However, the differences between Fig. 5 and Fig. 6a should rather be attributed to the different principles of dependent- vs. head-marked languages. In dependent-marked languages G and O happen to be marked on the same NP, and thus the genitive marker naturally tends to differ from the accusative marker. On the other hand, in head-marked languages G is marked on the NP, whereas O is marked on the verb, obviating the need to distinguish G from O as a matter of economy. These facts help explain how it is that Northern Tepehuan and Papago take a different pattern in the third person. Since the third person object in these languages is a zero form, the situation becomes the same as in dependent-marked languages.

Totonac, a member of the Totonacan family, shows a similar pattern, but a split line divides first from non-first persons. Since the subject markers cannot always be separated from the aspect markers, I present only representative forms from the Papantla dialect which are merged with aspect markers. The third person is morphologically a zero form. This means that the third person subject and object are not marked on the verb, and the distinction between them is made on the basis of word order instead [ASCHMANN and WONDERLY 1952; HERNÁNDEZ GARCÍA

1982].

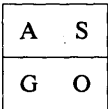


Fig.7a: First person

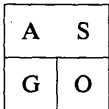


Fig.7b: Non-first persons

Totonac

	Possessive markers	Object markers	
1sg.	ki-/kin-	ki-/kin-	
2sg.	mi-/min-		-ni/-n
3sg.	iš-/iĉ-		-#
1pl.	ki-/kin- ...-k'an	ki-/kin- +PL...	-n/-w
2pl.	mi-/min- ...-k'an	+PL...	-ni/-n
3pl.	iš-/iĉ- ...-k'an	+PL...	-#

Subject Markers for CVC-V/CVCC-V roots

	Incompletive	Completive	Continuative
1sg.	k-... -V	k-... -t	k-... -ma
2sg.	-V-ya	-#	-p'a:t
3sg.	-V	-t	-ma
1pl.	-V-ya	-u	-ma:nmáw
2pl.	-V-yá:tit	-tit	-p'a:nántit
3pl.	ta-... -V	ta-... -t	ta-... -ma:na

The same split line is observed in Cora, a Uto-Aztecan language, except in first plural, but the pattern is different from that of Totonac.

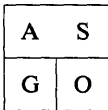


Fig.8a: Personal clitics and non-first person affixes

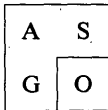


Fig.8b: First person affix

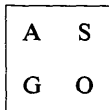


Fig.8c: First plural affix

Cora

	Subject (A=S)	Object (O)	Possessive (G)
1sg.	nya-/nu=	na-	nya-
2sg.	pa-/pa=	mwa-	a-

3sg.	#-/pu=	y-/#-/ra-h-	-ra'an	
1pl.	ta-/tu=	ta-	ta-	
2pl.	sa-, ša-/ šu=	hamw-	há'anmwa-	
3pl.	ma-/mu=	wa'-	wá'a-	[CASAD 1984: 297]

In Yaqui and Mayo the pattern exhibited by the pronominals is different from that of the NPs, so I also list the NP pattern. In the latter, only G and O are marked by *-ta*. But the third person singular and first and second person plural follow the same pattern as that demonstrated by NPs.

A	S
G	O

Fig.9a: Pronominals

A	S
G	O

Fig.9b: NPs

Yaqui

	Subject (A = S)	Object (O)	Possessive (G)
1sg.	inepo, nee	nee	in
2sg.	empo	enči	em
3sg.	aapo	a (a)	a
1pl.	itepo, te	itom	itom
2pl.	eme ('e)	enčim	enčim
3pl.	bempo	am	bem

- (17) inepo em misi-ta biča-k
 I your cat-DEP see-REALIZED
 "I saw your cat."

[LINDENFELD 1973: 53]

- (18) itom pare-ta kari
 our priest-DEP house
 "Our priest's house"

[LINDENFELD 1973: 56]

As shown in these examples, Yaqui and Mayo display dependent marking patterns; they are the only Uto-Aztecan languages among those in the Mexican territory which have this type of marking. Also in contrast to the majority of Uto-Aztecan languages, they have SOV order with postpositions, and exhibit consistent modifier-head order throughout their grammars. Nichols suggests that in the event that we have two clearly related languages with clearly cognate morphology, one of them strongly head-marking and one strongly dependent-marking, we should reconstruct the dependent-marking type [NICHOLS 1986: 89]. If we apply her suggestion to Uto-Aztecan historical linguistics, we can say that Yaqui and Mayo are the most conservative languages, at least as regards syntactic relations at the clause level.

Zoque shows a pattern opposite to that of Yaqui in the case marking of NPs, as

is shown in Fig. 10. A and G are marked by the same suffix, -'is. Person markers on the verb (i.e. A, S, and O) and on the noun (i.e. G) take the same pattern as that of case markers, that is, A and G are the same, as are S and O.

A	S
G	O

Fig.10

Zapotecan and Mixtecan languages in Oaxaca do not formally distinguish among A, S, O and G. The pattern is drawn as follows:

A	S
G	O

Fig.11

Isthmus Zapotec

(19) má be'eda be

has come he

"He has come."

[PICKETT 1960: 55]

(20) má bi'ni ne ni

has done he it

"He has done it."

[PICKETT 1960: 55]

(21) ike be

head he

"his head"

[PICKETT 1960: 37]

However, the treatment of pronominals varies from dialect to dialect. In general, there are two distinct sets of pronouns in use, independent and bound, and the object is typically distinguished from the subject by means of independent pronouns or particles.

Atatlahuca Mixtec

(22) híní de ña

know he she

"He knows her."

[ALEXANDER 1980: 64]

(23) híní de sa ñá

know he I (independent)

"He knows me."

[ALEXANDER 1980: 64]

Jamiltepec Mixtec

- (24) kañi sutu ra či ra
 hit-COM father he OBJ he
 "His father hit him."

[JOHNSON 1988: 21]

Huave uses different sets of person markers depending on whether a clause is indicative or subordinate, to use Stairs and Hollenbach's [1981] terminology. Below is presented a partial description of the pronominal system. (For a full description, see [STAIRS and HOLLENBACH 1981]).

Huave

Dependent personal pronouns

Subject (A = S)

Set 1 Present Future Past

1sg. sa- -na- -as, -iis, -ias, -os

2sg. i- -me- -e-

3sg. a- -ma- -a-

Set 2 Present Future Past Set 3 Present Future Past

1sg. ši- -ni- -as 1sg. ši- -ni- -iis

2sg. er- -me(r)- -e(r)- 2sg. i(r)- -mi(r)- -ir-, -e-

3sg. i- -mi -i 3sg. i- -mi -i

Note: Set 1 occurs with 98 percent of all Huave verb roots [STAIRS and HOLLENBACH 1969: 44].

Possessive (G)

1sg. sa- ši- ši- ša-, še-

2sg. i- er- i- mi-

3sg. a- i- o- mi-

Dependent personal pronouns for subordinate verbs

Subject (A) of transitives

Subject (S) of intransitives:

1sg. na- ni- ni-

ne-

2sg. me- me- me-

mer-

3sg. ma- mi- mi-

me-

Note: Roughly speaking, these forms are used under the following conditions:

(a) when the verb occurs with tenses such as future, present progressive, continuous, and recent past,

(b) when the verb occurs after such adverbs as *aliin* "yet," *gno* "no," *netam* "necessarily,"

- (25) ngo ma-rang nahiit

[STAIRS and HOLLENBACH 1981: 323]

no he-do work

"He does not work."

(c) when the verb occurs after such verbs as *al* "be," *ambič* "finish," *ndom* "can,"

- (26) ambič ma-ngal tišem

[STAIRS and HOLLENBACH 1981: 323]

finish he-buy shrimps

"He finished buying shrimps."

(d) when the verb occurs in subordinate clauses.

The object seems to be expressed by the independent personal pronoun.

Independent personal pronouns

	Subject	Object
1sg.	šike	šik
2sg.	ike	ik
1,2sg.	ikora	ikor
3sg.	neh	neh
1pl.	šikona	šikon
2pl.	ikona	ikon
1,2pl.	ikooca	ikooc
3pl.	nehiw	nehiw

- (27) ngo na-kiib ik.
no I-bring you
“I cannot bring you.” [STAIRS and STAIRS 1981: 94]

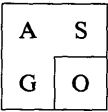


Fig.12a: Present indicative Set 1 and Set 2



Fig.12b: Past and future indicative



Fig.12c: Subordinate

Languages treated so far are almost all located in Mesoamerica, except for a few Uto-Aztecan languages. South of Mesoamerica are languages genetically related to South American groups. These exhibit a dependent-marking pattern, in contrast to the languages already treated, in addition to some other noteworthy patterns.

Bribri and Cabécar, languages of the Chibchan family in Costa Rica, are so-called ergative languages. They have only a single set of person markers, but when these function as agents of transitive verbs, they take the postposed ergative particle *ti* in Cabécar, *dor* in Bribri. The third person object and possessive marker is *i*, which may be a contracted form of *hié/ ihé/ ié*. Although Bribri and Cabécar are often called ergative, they seem to have started out as non-ergative languages, judging from the patterns shown in Fig. 13.

Cabécar

1sg.	jís
2sg.	bá
3sg.	hié/ihé/ié
1pl.excl.	sá

1pl.incl.	sé
2pl.	bás
3pl.	hiéwá

- (28) jís ksá hír [MARGERY 1989: LXXII]
 I sang today
 "I sang today."
- (29) jís tɪ dí jé [MARGERY 1989: LXXI]
 I ERG chicha drink
 "I drink chicha."
- (30) jís tɪ i sɔwə [MARGERY 1989: 79]
 I ERG it saw
 "We saw it."
- (31) hié tɪ jís ppá kal hula wa [MARGERY 1989: LX]
 he ERG I hit tree arm with
 "He hit me with a stick."
- (32) jís mɪnə [MARGERY 1989: XLI]
 I mother
 "my mother"
- (33) i tabéli [MARGERY 1989: XLII]
 he machete
 "his machete"

A	S
G	O

Fig.13a: Non-third persons

A	S
G	O

Fig.13b: Third person

Guaymí, a Chibchan language of Panama and Costa Rica, exhibits a different pattern. The case marking system is so complex that space considerations permit only a rough outline of it. G is marked with *-gwe/-we* on NPs, but pronominals cannot carry the same marking. A, S, and O are not marked at all in non-perfect (present) tense, while A and S are both marked with *-gwe/-we* in the perfect (non-present, non-durative).

Guaymí

1sg.	ti	/tiwe
2sg.	mo	/mowe
3sg.	niara	/niarawe, iwe, kwe
1pl.	num	/numwen
2pl.	mim	/munwen
3pl.	niaratre	/niaratrewe, iwetre, kwetre

[ALPHONSE 1956: 4]

- (34) ti toro-e
I book-POSSD
"my book"

[ALPHONSE 1956: 8]
- (35) ti blite
I speak
"I speak."

[ALPHONSE 1956: 26]
- (36) ti-we blitaba
I-NOM spoke
"I spoke."

[ALPHONSE 1956: 26]
- (37) ti-we niara miti
I-NOM he struck
"I struck him."

[ALPHONSE 1956: 51]
- (38) niara ti toen
he I see
"He sees me."

[ALPHONSE 1956: 57]
- (39) toma-gwe hu
Tom-G house
"Tom's house"

[ALPHONSE 1956: 49]
- (40) Juan toro-e
Juan book-POSS
"Juan's book"

[ALPHONSE 1956: 50]
- (41)  o-we tata  okoni
Cho-NOM father cursed
"Cho cursed father."

[ALPHONSE 1956: 7]



Fig.14a: Pronominals in non-perfect

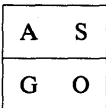


Fig.14b: Pronominals in perfect

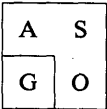


Fig. 14c: NPs in non-perfect

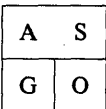


Fig. 14d: NPs in perfect

I have presented above representative samples of Middle American languages which show different patterns. In the next section these patterns will be summarized.

6.4. Discussion

So far I have focussed primarily on the syntactic relations of cross-referencing pronominals, using the pronominal square as an illustrative device, but since case

marking systems are utilized in Yaqui, Mayo and the Chibchan languages, I have applied the square to them as well. The square is readily applicable to other systems such as the non-cross-referencing personal pronouns of English.

Theoretically there are four different patterns: non-partite, di-partite, tri-partite, and quadri-partite.

I) Non-partite

A	S
G	O

II) Di-partite

A	S
G	O

a

A	S
G	O

b

III) Tri-partite

A	S
G	O

a

A	S
G	O

b

A	S
G	O

c

A	S
G	O

d

IV) Quadri-partite

A	S
G	O

Every pattern is attested in the Middle American languages except for III-c and III-d. Outside Middle America, the III-c pattern is observed, for example, in nominal case inflections in almost all Australian languages [DIXON 1980]. It is possible that the III-d pattern, heretofore unattested, may eventually be found in languages from parts of the world other than Middle America.

I) Non-partite: Zapotec, Mixtec, Cuna

II) Di-partite: a) Mayan, Zoque

b) Papago, Northern Tepehuan, Tepecano

III) Tri-partite: a) Yaqui, Mayo, Seri, Tarascan

b) Cabécar third person

c) (Chinook, Australian languages)

d) ?

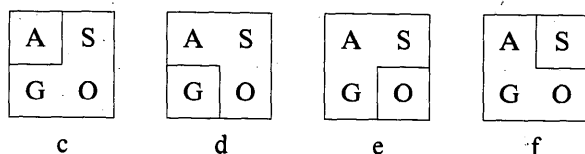
IV) Quadri-partite: Huave dependent clauses

III-a may represent an accusative type, and III-b an ergative type in the depen-

dent-marking languages of Middle America. Since A, O, S, and G are marked on NPs, G is naturally different from A, S or O. III-c and III-d might conceivably occur under special circumstances.

Although II-a and II-b are the norm amongst the di-partite patterns, there exist additional derivative patterns as indicated in the following diagrams.

II) Di-partite



These patterns are found in the formally marked cases of Chibchan languages.

One-marked languages:

c) A-marked: Cabécar, Bribri

d) G-marked: Guaymí non-perfective

Three-marked:

e) ASG-marked: Guaymí perfective

Only II-f is unattested. Some of these patterns are observed even in well-known languages. For example, II-d is found in the second person of the English pronoun system and II-e in the second person of the Spanish pronoun system.

All the types encountered in natural language may be illustrated by the square. However, there do exist two exceptional cases which the square cannot represent. In one case portmanteau morphemes consisting of subject and object are used. Since the morphemes do not easily break down into their constituent elements of A, S, O and G, these cannot be plotted on the square. In the other case, encountered in Mixean languages, only one participant is expressed in a sentence. The principal participant of a clause is determined in part by hierarchical ranking of importance and in part by relative importance. The ranking of importance is first person over second person, and second person over third person. Among third persons, rank is determined by relative importance. For example, if a first person is involved in the action of a clause, then the verb is inflected to indicate only the role of the first person whether it is subject of intransitive action, subject of transitive action, or object of transitive action [HOOGSHAGEN 1984: 7-8]. Since only one participant is expressed in a sentence, the square cannot be drawn to reflect this situation.

Several types of nominal hierarchy have been proposed up to now. One of the best known is Silverstein's lexical hierarchy [SILVERSTEIN 1976]; Keenan and Comrie's noun phrase accessibility hierarchy for relativization is also well known [KEENAN and COMRIE 1977]. In these hierarchies each element is related in a linear fashion. However, the pronominal square proposed here is not linear, i.e., one dimensional, but square, i.e., two dimensional. The figure is square, but A, S, O, G are related to each other cyclically. One may suppose that A, S, O, and G can be

placed linearly, as is shown below:

A	S	O	G
---	---	---	---

This linear pattern can account for the fact that (1) S and G are not treated alike, and that (2) A and O are not treated alike, but cannot account for the fact that A and G are treated alike in such languages as Mayan and Zoque.

There are several other points to consider. It may be asked why only A, S, O, and G are taken into consideration and other categories such as Indirect Object (IO) and Oblique are not. Empirically we know that IO and Oblique are not as essential to the clause as the four categories dealt with here, and this evidence is further supported by the fact that Middle American pronominal systems generally lack any special morpheme for IO or Oblique. If the investigation had been limited to case marking systems, G would not have been shown to play the important role it often does. On the other hand, the analysis of pronominal systems has revealed that A, O, S, and G are the essential categories in syntactic relations.

Using the square we have found that:

- a) S and G are not treated alike; in other words, S and G do not form a natural class.
- b) A and O are not treated alike; in other words, A and O do not form a natural class.

These findings may correspond to empirical claims, but from the square we have further identified the restrictions which are described by the implicational laws:

- c) If A and O are the same, then either S or G is identical to A and O, or both S and G are identical to A and O.
- d) If S and G are the same, then either A or O is identical to S and G, or both A and O are identical to S and G.

It should also be pointed out that the ergative case is overwhelmingly identified with the genitive in Middle American languages, although in many case-marking languages it is identical to some other case, most often the genitive or instrumental, but occasionally the locative or dative [TRASK 1979: 385]. If we take Fig. 3 as an example of a typical ergative pattern, then the ergative system reported for Cabécar and Bribrí turns out not to be ergative, although it does seem ergative in appearance. If the assumption here is correct, the square will prove useful in distinguishing a pseudo-ergative system from a true one.

Finally, a connection between A and G has already been demonstrated [for example, ALLEN 1964], which leads us to conclude that at the very least the connection of G to A, O, and S is worth more serious attention.

6.5. Summary

Of the syntactic relations between the NP and the verb, the relations among A, S and O have been subjected to intensive study. When A is marked in the same way as S, the system is called accusative, and when S is marked in the same way as O, ergative. However, the pronominal systems of Middle American languages have led us to an investigation of not only the syntactic relations of A, S, and O, but also of G, since in Mayan languages, for example, G is treated in the same way as A. As a means to account for all the data I have proposed the pronominal square, in which A and O are diagonally opposed as are S and G. This square can be used to shed some light on the syntactic relations among A, S, O, and G, as presented in the findings below:

- 1a) S and G are not treated alike, in other words, S and G do not form a natural class.
- 1b) A and O are not treated alike, in other words, A and O do not form a natural class.
- 2a) If A and O are the same, then either S or G is identical to A and O, or both S and G are identical to A and O.
- 2b) If S and G are the same, then either A or O is identical to S and G, or both A and O are identical to S and G.

Chapter 7

Conclusions

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 ironic that no language has an inventory identical to that of any other language. There is not a single language with a phonemic inventory agreed upon by all the sources on that language. Even the same author may report different inventories over time; moreover, different investigators may come up with different inventories even when analyzing the same language of the same informant. See Northern Tepehuan, Tlapanec, Amuzgo, and other inventories in Chapter 2.1 (Database 1).

My typological comparison of the phonological systems of Native Middle American languages presented me with many problems such as those described above, to the extent that I began to think that it was impossible to discuss the phonological systems on a typological basis. Objects of comparison must be on the same level of description, yet phonemes are not objective but rather subjective constructs. In other words, phonemes are language-particular and constitute abstract systems. The same phonological data are likely to be interpreted in different ways. Despite the many inherent difficulties already pointed out, I ventured to compare phonological systems typologically, because an understanding of its phonemes is essential to the understanding of a given language; it is perhaps fair to say that the latter can come about only through the former.

Although phonemic inventories allow of various interpretations, the comparison of them can lead to many insights on the phonological traits of Native Middle American languages. The size of the sample in this study is 174 languages (including many dialects and different interpretation 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, and these may be lengthened or nasalized or both. The variation of phonemes is shown in Appendix 1. Native Middle American languages form their phonological systems within these limits. The phonemic inventories may vary from language to language but nevertheless reveal general trends. Native Middle American languages seem to share a common core of structural phonological units; the preferred set of consonants appears to be as follows:

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

Many of the languages have additional phonological units. Some add voiced series, others glottalized series, and so on. The most aberrant system is that of Oaxaca Chontal. Seri is particularly rich in the fricative series.

Some units exhibit a peculiar geographical distribution. For example, retroflexed affricates and sibilants are restricted to two areas: western Highland Guatemala and Oaxaca; as it happens, these two areas yield other peculiar phonemes as well.

It is difficult to conceive a time perspective on the cultural-linguistic history of Middle America without consideration of proto-systems, because the phonemes treated in this monograph are in and of themselves independent, meaningless units separated from "the word." Phonological change can be investigated only through the intermediary of positionally defined allophones within the framework of the word as the basic linguistic unit. On the other hand, the numeral systems and word order typology discussed in the subsequent two chapters do provide relevant information for the investigation of cultural-linguistic history, especially in light of the evidence they offer of sustained and intimate contact. Numeral systems and word order typology, unlike phonological systems, are meaningful sequences displaying various combinations of elements (morphemes and words) and are therefore of greater usefulness for the understanding of cultural-linguistic history.

Numeral systems were chosen for areal-typological study at the morphological level. The typical numeral system consists not of a single principle, but of a combination, so that it in fact comprises a mixed system; for example, a quinary system may be combined with a decimal one for the numbers under 20 while from 20 up a vigesimal system is used alongside a decimal one, and so forth. Numeral words are formed from combinations of U (unit or digit numbers) and B (base words). The principle of formation of the number words in Middle America is overwhelmingly $U \times B + U$. However, the languages to the south, genetically related to South American groups, have the order $B \times U + U$. The formation is different from that of the Middle American languages, although in both formations larger units follow smaller units. Among the northern languages only Seri has the same formation.

We have seen that there are many variations in the formation of the number words. There are quinary methods, decimal-vigesimal methods, multiplicative methods, and subtractive methods, among others. These methods are geographically restricted in their distribution. For example, quinary methods are observed in the formation of the numbers from 10 to 19 in the southern Otomanguean languages. Central American languages to the south have the common feature of $B \times U$ order, regardless of whether they are decimal or vigesimal.

The comparison of the formations of numeral words of Middle American languages reveals that not only the words but also the principles of formation are subject to borrowing. Cakchiquel provides a typical example of this phenomenon. Classical and modern Cakchiquel use almost the same vocabulary in the numbers from 61 to 99, but the formation pattern of these numbers is different. Classical Cakchiquel used the overcounting method for the numbers from 61 to 80, and the base *muč'*, meaning 80, was utilized for the numbers from 61 to 80. On the other hand, modern Cakchiquel uses *muč'* from 80 to 99, obviously with the undercounting method. Here we can see that only the formation principle is borrowed, whereas the vocabulary is identical. Is the borrowing of formation principles peculiar to the numeral systems? Or can such borrowing be observed in other systems? Thus far, lexical borrowing has received a great deal of attention, but borrowing of principles has not been seriously examined up to now. Word order can be considered a formation principle and borrowing can be shown to have occurred even here. In other words, structural or formal borrowing does occur. Therefore, we suppose that there are other examples of such cases where only principles of formation are borrowed. Numeral systems offer only one example of this phenomenon.

As is stated in the introduction to Chapter 4, numbers were first written about 500 B.C. in the Oaxaca Valley. The symbols involved comprise a system of dots and bars. Thirteen, for example, is expressed by two bars and three dots, which may be regarded as vigesimal from the standpoint of formation principle. This system, however, was used exclusively for the 260-day and 365-day almanacs. The highest number expressed is 19 and the numbers do not exceed 20. Around the beginning of the Christian era, the so-called Long Count was created. This system is composed of 5 bases: Baktun, Katun, Tun, Uinal, and Kin in Maya. Each order does not go beyond 20 and is normally lined up vertically from the largest to the smallest. The higher numbers are represented by their relative position. Here the vigesimal system can be unequivocally identified. For the moment, let us consider the relationship between such ancient systems and language data from after the 16th century.

We find good examples in Mayan writing that indicate that the symbols correspond directly to words. The head forms for 11 and 12 do not have a jaw bone representing 10, while the glyphs for the number 13 and above have one. The terms used for the numbers from 10 up in Yucatec Maya are *lahun*, *buluk*, *lahka*, *oš-lahun*, *kan-lahun*, *ho-lahun* and so on. The numbers from 13 above are 3+10, 4+10, 5+10, and the like, while 11 and 12 are different. They do not have the morpheme *lahun* representing 10, and thus correspond more closely to the glyph formations. As is seen in these examples, glyphs generally reflect the system of the language. The bar and dot system no doubt indicates the use of a quinary system, since a bar and a dot represent five and one, respectively. This fact leads to the obvious conclusion that the Maya developed the calendrical systems but did not invent the bar and dot numeral system, since it does not conform to the numeral system of

the Mayan languages. In fact, the bar and dot system was not adopted by the Maya until 700 years after it was invented.

The languages which conserve quinary systems are Mixe-Zoquean and Nahuatl. Nahuatl quinary systems conform to the bar and dot system, but it is interesting to note that only dots were used to express the numbers in the Postclassic period when the Nahuatl group first entered Mesoamerica. The bar and dot system is seen in codices and inscriptions of Mixtec and Mixtec-Puebla style. It seems to have been accepted by the Nahuas, who apparently overlooked the discrepancy between the numerical system and its written form. The dots of the numerical expressions may reflect the system of Mixtecan languages, which have ten different stems up to 10.

In such southern Otomanguean languages as Zapotecan and Mixtecan, the numeral words up to 10 are expressed as different morphemes and the numbers from 10 to 19 are formed according to the quinary method. Otomí and Mazahua show, however, that there are languages which seem to have been quinary up to 10; further, Amuzgo and Mazatec show the quinary method from 20 up. Therefore, it may be reasonable to assume that the people who invented the bar and dot system in the first place were Otomanguean. It is natural for the number words up to 20 to have undergone changes during 2500 years. As an aside, it is interesting to note here that Otomanguean languages have tone systems, and these might have emerged with the increasing loss of phones in words.

In Monte Albán, Oaxaca, where the bar and dot numeral expression was first recorded, the numerals occur under the glyph, expressing, perhaps, the order noun-numeral. In Mesoamerican languages the order followed is numeral-noun, but in languages near Monte Albán such as Zapotec and Mixtec the order for ordinals is noun-numeral. (Ordinals are expressed by the change of word order from numeral-noun to noun-numeral.) Moreover, the typological study of Otomanguean word order reveals that numeral-noun is the irregular order while noun-numeral is the consistent one, since Otomanguean languages such as Zapotec and Mixtec follow head-modifier order in other areas of their grammars.

Otomanguean languages are almost purely head-modifier; only in the sequence noun-numeral (Q/N) is the order reversed, that is, QN. Assuming that the head-modifier order principle were consistently applied, the Otomanguean languages might have had NQ at some time in the past. This assumption is supported by the fact that glyphs precede the numerals, represented as bars and dots, in the inscriptions of Monte Albán, Oaxaca from about 500 B.C. to A.D. 900. Typologically this is NQ. Nevertheless, if we integrate textual and typological data with the head-modifier order principle, we can readily interpret these phenomena. As is stated above, Otomanguean numerals typically precede the noun, but in some southern Otomanguean forms the reverse order obtains when a numeral is used as an ordinal number, as is shown below. Here X symbolizes the definitive morpheme(s).

Language	Ordinal formation
Mazatec	noun-numeral (for 1), noun X-numeral (for 2 on)
Atatlahuca Mixtec	noun-numeral
Silacayoapan Mixtec	noun-numeral
Jicaltepec Mixtec	noun-numeral
Jamiltepec Mixtec	noun X-numeral
San Juan Colorado Mixtec	noun-numeral (for 1), X-numeral-noun (for 2 on)
Cuicatec	noun-numeral (for 1,2), X-numeral-noun (for 3 on)
Juárez Zapotec	noun X-numeral
Yatzachí Zapotec	noun X-numeral
Mitla Zapotec	X-numeral-noun
Classical Zapotec	X-numeral-noun?
Valle Zapotec (18c.)	X-numeral-noun?
Chatino	noun-X-numeral
Chinantec	noun-X-numeral [YASUGI 1990b]

If we postulate that in ancient times the language had noun-numeral order, we arrive at the following schema.

In ancient times	After A.D. 900	In modern times
noun-cardinal	cardinal-noun	a) cardinal-noun, X-ordinal-noun
noun-ordinal	noun-ordinal	b) cardinal-noun, noun-X-ordinal
		c) cardinal-noun, noun-ordinal

The noun-numeral order matches the glyph-numeral order of textual data from Monte Albán I-IV (500 B.C.-A.D. 900). After Monte Albán IV, speakers may well have begun to distinguish cardinals from ordinals by placing the numerals before the noun when they were used with cardinal meaning. However, in some of these languages, even the ordinal came to precede the noun through a process which might have been motivated by the systematization of word order. If this inference is correct, Mixtec languages such as Atatlahuca and Silacayoapan Mixtec might be regarded as the most conservative, while the noun-X-numeral word order in Jamiltepec Mixtec and X-numeral noun in San Juan Colorado Mixtec seem to provide typical examples of linguistic innovation from a noun-ordinal to an ordinal-noun order.

Taking these points into consideration, we must conclude that the notation recorded in Monte Albán probably reflected the Otomanguean number system. However, it is also possible that Mixe-Zoquean was the language in which the bar and dot notation originated. The numeral systems of Mixe-Zoquean languages are

quinary, and in Francisco León Zoque numerals can occur before or after the noun, as is shown below:

tuyi	meckuy /	meckuy	tuyi	[ENGEL and BARTHOLOMEW 1987: 354]
dog	two	two	dog	
"two dogs"				

We cannot say with complete certainty that these expressions have existed since ancient times. However, if the numeral expressions of Francisco León Zoque turn out to be conservative forms, one or more of the Mixe-Zoquean languages are likely candidates for being the language which produced the bar and dot notation. Supposing that the bar and dot notation existed prior to the Monte Albán period, which was contemporaneous with the Olmec period, we can infer that the language of the Olmec almost certainly derived from the Mixe-Zoquean group, because the distribution of Mixe-Zoquean languages overlaps with signs of Olmec and Epi-Olmec life as seen in the latter's monuments, and because the Mixe-Zoquean languages in general have the quinary method. The glyphs in Monte Albán are claimed to be Zapotecan, but it is nevertheless conceivable that the language which produced the glyphs was Mixe-Zoquean. Even if this supposition turns out not to be true, the considerable influence exercised by Lowland languages on Zapotec cannot be denied, evidenced by the fact that jaguars and snakes, which live only in the Lowlands, are expressed as Zapotecan glyphs. Taking all these facts into consideration, it is clear that the Zapotecan glyphs must be investigated from a wider viewpoint that includes the Mixe-Zoquean languages; it is only by taking this wider perspective that the glyphs can be fully understood.

At the syntactic level, I have discussed seven word orders. Since a detailed typological study of Middle American languages has not yet been done and the data are difficult to check, I have given examples for each word order by consulting the original references, and have supplied the literature referred to (Database 3). Although a more thorough study of word order may reveal the existence of other word orders (for example, a language may have both Po and Pr), at least the word orders listed in Table 29 are definitely attested. Basing my analysis on that table, I now discuss historical implications involving the languages in Mesoamerica, an area where high civilizations once developed.

The central part of Middle America is known as Mesoamerica, a cultural area as defined by Kirchhoff [KIRCHHOFF 1943]. Defining the area according to linguistic criteria, the northern border is seen to run from the north of Huastec through the south of Chichimec and then between Cora/Huichol and Mayo/Yaqui. The southern border lies between the Mayan languages and Tol/Lenca. Typologically, Mesoamerica is an area sandwiched by SOV-postpositional languages. However, there may once have been SOV languages within Mesoamerica; good candidates are Mixe-Zoquean and Nahuatl. Yet these are not currently SOV-postpositional languages. Therefore Mesoamerica completely lacks SOV languages at present.

As for the order of GN/NG, NG is overwhelmingly predominant, with the Mixe-Zoquean group conserving GN order. Sierra Popoluca and Sayula Popoluca, however, have both GN and NG orders. With regard to AN/NA, PN/NP, and DN/ND, all languages have AN-PN-DN, except southern Otomanguean ones, which have NA-NP-ND. As for QN/NQ, all Mesoamerican languages have QN.

Table 29 and Map 17 indicate that the majority of Otomanguean languages distributed in the center of Mesoamerica have NA, NP and ND, whereas other languages such as Otomí and Mazahua have the reverse orders, i.e., AN, PN, and DN. It is clear from the table and map that languages of the head-modifier order and modifier-head order came into contact. P/N, D/N and Q/N orders are rather stable; in other words, Otomanguean influence is weak. However, Otomanguean languages have had considerable effect on the A/N order of many Nahuan languages, no doubt as a result of interrelationships between the two groups. The shift from AN to NA does not occur in the geographically marginal languages. North Puebla Nahuatl, Huasteca Nahuatl and Pipil have AN order, and Huastec, Otomí and Mazahua, which neighbor the last two languages, may have influenced them to retain that order, because they themselves have AN order and are geographically close.

It is evident that the shift from AN to NA order is related to the shift from GN to NG, because in Classical Nahuatl the coexistences of GN & NG and AN & NA can be observed, and in Cora, too, GN co-occurs with NG. Huichol, moreover, has GN but NA. Similar phenomena can be seen in the Mixe-Zoquean languages, which must have been formerly postpositional. Many of them have GN and AN, but in Francisco León Zoque, Sayula Popoluca, and Coatlán Mixe both orders, AN and NA, are permitted. These coexistence sets are eloquent of the transition from one stage to another.

Word order change can occur gradually. For example, a language may change from AN to NA order by going through a stage in which both AN and NA orders are grammatically acceptable alternatives. In fact, in some cases, we can observe not only AN and NA orders but also GN and NG orders in a single language.

We can deduce from Table 29 that A/N and G/N orders are less stable than P/N, D/N and Q/N orders. This tendency may be a function of the relative proximity of modifiers to the head, with the latter orders more closely associated with their respective heads than are the former to theirs.

Viewing the prehistory of Mesoamerica in terms of Po/Pr order, both the Nahuan group, which immigrated from the north, as well as the Mixe-Zoquean group, which may have been living in its present location from ancient times, are postpositional, while the rest are prepositional. Prepositional languages predominate and postpositional languages have been becoming prepositional ones for some time. This process is currently well under way and as a result of it many postpositional languages have both Po and Pr. The coexistence of the two orders may be related to the use of relational nouns, which function as prepositions.

I have mentioned the structural parallels between the relational-noun/govern-

ing-noun order and NG constructions. Both of these reflect head-modifier order. Otomanguean languages have this order, that is, Pr and NG, since they have head-modifier order in general. However, Mayan and Totonac, both of whose basic order is modifier-head, also have NG. It is difficult to unravel whether the Mayan languages had NG originally, or whether they changed GN into NG under the influence of NG languages. However, for the third person, the genitive construction is third person pronominal affix-N-G (which is transcribed as 3-NG in 5.1), where G and the third person pronominal are cross-referenced, whereas for the first and second persons, the structure is P-relational noun, which makes the structure modifier-head. In light of these facts, 3-NG seems unnatural and may be an innovative form. However, all the Mayan languages have NG and Pr, and there is no evidence to suggest that they ever had GN and Po, a fact which serves as a warning not to apply the head-modifier principle to all languages indiscriminately. At any rate, taking into consideration the Nahuatl and Mixe-Zoquean groups in which the transition from GN, Po to NG, Pr is observed, it is clear that GN/NG and Pr/Po are more easily affected than other orders such as A/N, P/N, and Q/N.

The cross-linguistic comparison of word orders can lead to the identification of linguistic change at work, and if we consider this change together with archaeological and historical evidence, we arrive at even more interesting insights. For example, Classical Nahuatl has GN & NG and AN & NA, whereas modern Nahuatl languages have NG-NA. We deduce from these phenomena that the Nahuatl languages show various stages in the change from GN-AN to NG-NA. If we couple this deduction with the documented fact that the Aztecs, speaking Classical Nahuatl, migrated to the central Mexican valley in the early 14th century, we may then assume that the coexistences of GN & NG and AN & NA occurred between the 14th and 16th centuries and subsequently became restricted to NG-NA.

Since there are only so many ways in which the elements of word order can be combined, it is difficult to get more interesting insights than the word order universals first proposed by Greenberg [1966]. However this present study reveals that VSO-Po languages do exist, a fact which was not known at the time Greenberg wrote his pioneering work; moreover, there exist many VOS languages, formerly considered rare. Taking into consideration the distribution map of the languages and the language classification derived from comparative linguistics, it is shown that at least to some extent linguistic typology can contribute not only to typological studies and language classification, but to the understanding of linguistic change in general. The comparison of more items and the analysis of the coexistence of different word orders within a single given language can both contribute to solutions to problems of language contact and change and further the understanding of Mesoamerican history.

Chapter 6 differs in terms of focus from the previous chapters; the latter have as their primary aim the discussion of Middle American languages from an areal-typological point of view, while Chapter 6 represents my attempt to propose a new typology based mainly on the syntactic relations of cross-referencing pronominals

of Native Middle American languages. Cross-referencing pronominals in the verbal systems of Middle American languages are restricted to A, O, and S. In such languages as Mayan and Zoquean, however, A and G are treated alike, indicating that G is related to A in some respect. Therefore I took G into consideration as well, along with A, O, and S. These four categories can be plotted in a square as shown below.

A	S
G	O

Erasing lines allows us to type the Native Middle American languages. For example, Mayan languages are figured as follows:

A	S
G	O

Ergative pattern

A	S
G	O

Split ergative pattern

A and O cannot be linked directly by means of erasing lines. This fact adds support to the empirical claim that A generally differs from O. However, A and O may be treated alike. In this case, either S or G is identical to A and O, or both S and G are identical to A and O. Otherwise, A and O cannot be linked in the square. The square, then, constitutes a kind of implicational universal. Similarly, we can deduce from the square that S and G are not treated alike, in other words, S and G do not form a natural class, and if S and G are the same, then either A or O is identical to S and G, or both A and O are identical to S and G.

I have proposed a new typology of the syntactic relations of cross-referencing pronominals, and in the process identified a kind of implicational universal which is based mainly on cross-referencing pronominals; however, the principles of plotting syntactic relations of A, O, S, and G in a square is readily applied to other areas as well, such as case marking systems and personal pronouns which function as A, O, S and G.

PART II

DATABASE 1: PHONOLOGICAL SYSTEMS

Papago [2]

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

Consonants:

p t č k ?
b d ʃ g
s š h
m n ñ
l ɖ
w

Vowels:

i i u ii ɨ uu
o oo
a aa

/l/ is an apico-alveolar lateral flap. /ɖ/ is an apico-alveolar retroflexed lax stop and is restricted in occurrence to medial position. /š/ 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 it as long vowels. Diphthongs registered by Zepeda are *ai, ei, oi, ui*.

Northern Tepehuan [4]

Northern Tepehuan¹ [BASCOM 1982] (19C, 5V+G)

Consonants:

p t tʲ č k ?
b d dʲ g
v s š x
m n ñ
l r

Vowels:

i i u ii ɨ uu
o oo
a aa

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

※Northern Tepehuan² [BASCOM 1959]

Consonants:

p t tʲ č k ?
b d dʲ 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 (j) g
 v s (š) h
 m n (ñ)
 (ʔm) (ʔn) (ʔñ) (ʔŋ)
 ɾ (lʲ)
 y

Vowels:

i ĩ u i: ĩ: u:
 ẽ o ẽ: o:
 a a:

Parentheses enclose allophones. /d t s n ɾ/ are palatalized contiguous to /i/ as [dž tš š ñ gl]. 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. /ẽ/ is replaced by /ʌ/ in Willett [1988], who notes that seven different diphthongs occur; /ui ĩ oi ai io ia ua/. I give below another analysis by the same author for reference.

***Southeastern Tepehuan**² [WILLETT 1978]**Consonants:**

p t č k ʔ
 b d j g
 v s š h
 m n ñ
 r lʲ
 y

Vowels:

i ĩ 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
 l ɾ
 w y

Vowels:

i u
 e o
 a

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. /l/ is a voiced alveolar retroflexed lateral. /ɾ/ is an alveolar retroflexed vibrant and has both trilled and forward-flapped allophones. The syllable types are C, CV, CCV. Stress is phonemic.

Norogachi Tarahumara² [LIONNET 1966] (16C, 5V)

Consonants:

p t č k ?
 b r g
 s x
 m n
 l R
 w y

Vowels:

i u
 e o
 a

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

***Varohio (Sonora)** [7]

[JOHNSON and JOHNSON 1947] (14V, 5V+5G)

Consonants:

p t č k ?
 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 a 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 ?
 b g
 s š x
 m n
 l ɭ
 r
 w y

Vowels:

i u
 e o
 a

Accent /' /

/ɭ/ is a voiced retroflexed lateral. /x/ is interpreted as a velar fricative but is symbolized as /h/ and positioned under/?/ in the phonemic inventory in the original source. /ɾ/ is a vibrant. The syllable types are V, CV, CVC.

Mayo [9]

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

Consonants:

p t č k ?
 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 clear in the source cited but the above system may be a reasonable approximation. /b^w/ may be a phoneme as is in Yaqui, because *bu*+V clusters exist in the dictionary. /w/ is written *gu* before *a* and *o* or *hu* before *i* and *e*.

Cora [10]Jesús María (El Nayar) Cora¹ [CASAD 1984] (18C, 5V+5L)

Consonants:

p t tʰ c čʸ č k ?
 s š h
 m n nʸ
 l r
 w y

Vowels:

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

Tone is phonemic.

Ixcatán Cora² [McMAHON 1967] (18C, 6V+6G)

Consonants:

p p^w t c č k k^w ?
 β
 s h
 m m^w n
 l ɾ
 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. /ɾ/ has a dental allophone before /æ/ and elsewhere is a retroflexed flap. /s/ has three allophones; dental [S] before /æ/, alveolar [s] before /i e/ and alveopalatal retroflexed [ʃ] before /a u ə/.

Huichol [11]**Huichol¹** [GRIMES 1955, 1959, 1964] (13C, 5V+5G)

Consonants:

p t c k k^w ?
 z h
 m n
 r
 w y

Vowels:

i ĩ u ii ĩĩ uu
 e ee
 a aa

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

※**Huichol²** [McINTOSH 1945] (15C, 5V+5G)

Consonants:

p t c č k k^w ?
 z h
 m n
 l ɾ
 w y

Vowels:

i i u ií iĩ uú
 e eé óó
 a aá

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

The system given for Huichol by Palafox Vargas [1978] seems to be as follows:

p	t	c	k	?	i	i	u	i:	i:	u:
β		z		h	e	Λ		e:	Λ:	
m	n				a			a:		
		ɹ	ř							
w	y									

Nahuatl [12]**Classical Nahuatl** [ANDREWS 1975] (15C, 4V+4L)

Consonants:

p t ʔ c č k k^w ?
 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 λ c č k kʷ ?
 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 λ 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/ occur predominantly in Spanish loan words.

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

Consonants:

p t λ c č k kʷ
 g
 s š h
 m n
 l
 w y

Vowels:

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

***San Agustín Guapa (Guerrero)** [DAKIN 1979] (15C, 4V+4L)

Consonants:

p t λ c č k kʷ
 s š h
 m n
 l
 w y

Vowels:

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

***Ixcatepec (Guerrero)** [McQUOWN 1940] (16C, 4V)

Consonants:

p t λ c č k kʷ ?
 s š h
 m n
 l
 w y

Vowels:

i o
 e a

McQuown's analysis of vowel length is dubious, if Ixcatepec is compared with other dialects. He notes that long vowels exist although he does not register them as phonemes.

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

Consonants:

p t ʎ c č k kʷ ?
 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 ʎ c č k kʷ ?
 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/ in this later study either.

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

Consonants:

p t ʎ c č k kʷ
 g
 f s š h
 m n
 l
 (ř)
 w y

Vowels:

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

/f/ occurs only infrequently. Alveolar flap /ř/ has been found in only 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 Luís Potosí) [CROFT 1951] (15C, 4V+4L)

Consonants:

p t ʎ c č k kʷ
 s š h
 m n
 l
 w y

Vowels:

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

Coscatlán (San Luís Potosí) [DAKIN 1979] (17C, 4V+4L)

Consonants:

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

Vowels:

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

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

Consonants:

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

Vowels:

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

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

Consonants:

p t c č k k^w
 g
 s š h
 m n
 l
 w y

Vowels:

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

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

Consonants:

p t c č k k^w ?
 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 ã/ occur in Spanish loans.

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

Consonants:

p t c č k
 b^w 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 k^w
 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 k^w ?
 β ð γ
 š h
 m n
 l ł
 w y

Vowels:

i i u
 e o
 a

Tones: ' (high)

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

✱Cuitlatec² [McQUOWN 1940a] (18C, 8V)

Consonants:

p t č k k^w ?
 b d g g^w
 š h
 m n
 l ł
 w y

Vowels:

i i u
 e o
 ʌ
 æ ɔ

Tones: ' (high)

/s r ř/ are found in Spanish loans. Since McQuown uses /ə/ as high, central, and /a/ as low, front, these are replaced here by /i/ and /æ/ respectively. /ł/ is a voiceless fricative lateral.

Notes:

According to Escalante, /β ð γ/ are voiced fricatives, although he writes them as /b d g/. He does not admit the /g^w 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 ?
b bʸ g
š š x h
m mʸ n nʸ
l l̥ r
w y

Vowels:

i i̥ u i: i̥: u:
e o e: o:
a a:

Paipai² [LANGDON 1971, 1976] (18C, 5V+5L)

Consonants:

p t (c) č k q ?
v s š x
m n nʸ
l l̥ 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 ?
b
s š x h hʷ
m n
l l̥
r r̥
w y

Vowels:

i u
e o
a

Kiliwa [18]

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

Consonants:

p pʰ t tʷ č k kʷ ?
b
s š x h hʷ
m mʸ n nʸ
l r
w y

Vowels:

i i̥ u i: i̥: u:
e o e: o:
a a:

Kiliwa² [Mixco 1985] (18C, 3V+3L)**Consonants:**

p t č k k^w q ?
 (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. 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 my analysis.

Cocopa [19]**※Cocopa¹ [ROBLES and BRUCE 1975] (20C, 6V+6L)****Consonants:**

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

Vowels:

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

Cocopa² [CRAWFORD 1989] (24C, 3V+3L)**Consonants:**

p t t̥ c k k^w q q^w ?
 s š ṣ̌ x x^w
 m n n^y
 l l^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 /t̥/ is an alveolar stop. /t̥/ is rare in native words in normal speech, but common in affective speech and in Spanish loan words. /f v θ ð d g ŋ e o/ occur in Spanish loan words.

Seri [20]**Seri¹ [MARLETT 1984, 1988] (16C, 4V+4L)****Consonants:**

p t k k^w ?
 φ W s l š x X X^w
 m n
 y

Vowels:

i i:
 o o:
 æ a æ: a:

/ř/ occurs in loanwords. /š/ represents a voiceless retroflexed alveopalatal fricative, /W/ a voiceless spirantized [w], and /X/ a voiceless uvular fricative. The rounded 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.

※Seri² [MOSER and MOSER 1965] (18C, 4V + 4L)

Consonants:

p t k k^w ?
 φ W s ł š x X X^w
 m n ŋ
 l y

Vowels:

i
 ε o
 a V, VV, VVV

/ř/ is a flap and occurs only in Spanish loans. Since Moser and Moser note that /e/ is a mid open front vowel which has a phonetic quality varying between [e] and [æ], /e/ is replaced by /ε/ in the above chart. Stress /' / is phonemic. Moser and Moser do not admit long vowels but describe sequences of two and three identical vowels. In the latter case the first vowel of three identical vowels seems to be simply a stressed vowel. Thus I treat the sequence of two identical vowels as a 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 *ji* "yes" and *?i?ijiki* "a nickname.")

Tarasco [21]

Ichupio and Tarerio Tarasco¹ [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 r̥
 w y

Vowels:

i i u
 e o
 a

/b d g f l ñ/ occur in Spanish loans.

San Jerónimo Purenchécuaro Tarasco² [NANSEN DÍAS 1985] (19C, 6V)

Consonants:

p t c č k k^w
 p^h t^h k^h k^{wh}
 s š x
 m n
 r r̥
 w y

Vowels:

i i 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	ɬ			
w			y			

Vowels:

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

CV?

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

Consonants:

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

Vowels:

i	u	i:	u:
	a		a:

CV?

/ɬ/ is added in Aschmann's Dictionary [1983].

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

Consonants:

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

Vowels:

i	u	i:	u:
	a		a:

C?V

/r/ is registered by Levy [1987] but it is a marginal phoneme. Levy reports laryngealized vowels and describes C?V as CV.

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

Consonants:

p	t	c	č	k	k ^w	q	ʔ
f		ɬ	š	x	x ^w		
m	n						
	l	ɬ	ɬ				
	r						
w			y				

Vowels:

i	u	i:	u:
	a		a:

McQuown added /f/ and /x^w/ to his 1983 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 ?
m n
l ɬ χ
w y

Vowels:

i u i: u:
a a:

/s š h/ are not found in Levy's inventory, and this omission must be due to a quotation error.

Tepehua [23]

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

Consonants:

p t c č k q ?
s š h
m n
l (r̃)
w y

Vowels:

i u i: u:
e o e: o:
a a:
C?V

/r̃/ is attested only in Spanish loan words and in a few onomatopoeic 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 ?
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 actualizes 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~C?V~CV?~CṼ (Ṽ represents a laryngealized vowel.)

Even in the same dialect different treatments are observed. See Papantla Totonac, in which Levy registers glottal stop plus vowel as a laryngealized vowel, while Aschmann and Hernández García treat the sequence as C?V.

Chichimec [24]**Chichimec¹** [LASTRA DE SUÁREZ 1984] (20C, 7V+7N)

Consonants:

p t c č k ?
 b d ĵ g
 s h
 z

Vowels:

i ü u j ü u
 e o ɛ ɔ
 æ a æ ʌ

Fortis m n

Lenis m n

l r

w

/d ĵ/ occur only 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.

※**Chichimec²** [ROMERO CASTILLO 1960] (17C, 7V+5N)

Consonants:

p t c č k ?
 b d g
 s h
 z

Vowels:

i ü u j ü u
 e o ɛ
 æ a ʌ

Tones: high, low

m n

l r

w

Pame [25]**Central Pame (Santa María Acapulco)** [GIBSON 1956] (21C, 5V+5N)

Consonants:

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

Vowels:

i j
 e ɛ
 ɛ o ɛ ɔ
 a ʌ

Tones: high, low, falling glide

w y

/f/ occurs in Spanish loanwords.

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

Consonants:

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

Vowels:

i i u j i u
 e o ɛ ɔ
 a ʌ

Tones: high, low, glide

Matlatzinca [26]

[SCHUMANN 1975] (16C, 7V)

Consonants:

p t c č k kʷ ?
 s š h
 β
 l
 m n
 w y

Vowels:

i i 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 the 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 kʷ ?
 (s) š h
 β
 l (r)
 m n
 w y

Vowels:

i i u i: i: u:
 e ʌ ɔ e: ʌ: ɔ:
 a a:

Tones: high, glide

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

Otomí [28]Mezquital¹ [SINCLAIR and PIKE 1948; HESS 1968] (23C, 9V+4N)**Consonants:**

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

Vowels:

i i u i u
 e ʌ o e
 e a ɔ ɤ

Tones: high, low, rising

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

Consonants:

p t c k ?
 φ θ s š x h
 β ð z ɣ
 m n ñ
 r
 w y

Vowels:

i i u
 e ʌ o
 æ a ɔ

Tones: high, low, rising

/č ž ɭ/ are phonemic only in recent Spanish loans. Phonemic 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 [ANDREWS 1949] (23C, 9V+3N)

Consonants:

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

Vowels:

i u i ɥ
 e ə o
 ɛ ʌ ɔ
 a ɶ

Tones: high, low, rising

/s ž ɭ/ are rare phonemes.

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

Consonants:

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

Vowels:

i ī u i ɥ
 e ə o
 æ a ɔ æ ɶ

Tones: high, low, rising

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

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

Consonants:

p t c k ?
 b d j g
 š h
 m n
 r
 w y

Vowels:

i ī u i ɥ
 e ə o
 æ a ɔ æ ɶ

Tones: high, low, falling, rising

Mazahua [29]

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

Consonants:

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

Vowels:

i i u j y
 e ə o ɛ ɤ ɔ
 ε ɔ
 a ɤ

Tones: high, low, falling

Tlapanec [30]Tlapanec¹ [SUÁREZ 1983a] (20C, 5V+5N+10L)

Consonants:

p t c č k ?
 b d j g
 φ s š h
 m n
 l r
 w y

Vowels:

i u i: u: j y j: y:
 e o e: o: ɛ ɔ ɛ: ɔ:
 a a: ɤ ɤ:

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

12, 13, 21, 23, 32, 31, 323

[SUÁREZ 1983b]

*Tlapanec² [TITO MORÁN 1988] (23C, 5V+5N+10L)

Consonants:

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

Vowels:

i u i: u: j y j: y:
 e o e: o: ɛ ɔ ɛ: ɔ:
 a a: ɤ ɤ:

Tones: high, mid, low

The two inventories above are from the same dialect (Malinaltepec), but the differences are observed in /c ñ/ and the aspirated stops. [c], [ñ] and the aspirated stops exist but are interpreted as consonant clusters, that is, *ts* in Tito Morán and *ph, th, kh, ny* in Suárez, due to differences of analysis.

Ixcatec [31]

[FERNÁNDEZ DE MIRANDA 1959, 1961] (23C, 5V+5N)

Consonants:

t	tʸ	c	č	k	ʔ
b	d	dʸ	ǰ	g	
ɸ	s		š	h	
m	n		ñ		
l	ř		ř̃		
w			y		

Vowels:

i	u	ɨ	ʉ
e	o	ɛ	ɔ
a		ǣ	

Tones: high, mid, low

/p/ occurs in loanwords. Since voiced stops occur only after nasals, they may be analyzed as voiced allophones of voiceless stops or prenasalized consonants /ⁿb ⁿd ⁿdʸ nʃ nɡ/.

Popoloc [32]**Western Popoloc¹ (Otlaltepec)** [WILLIAMS and PIKE 1968] (21C, 5V+5N)**Consonants:**

t	c	č	č̃	k	ʔ
	s	š	š̃	h	
(z)	(ž)	(ž̃)	ɣ		
m	n		ñ		
(l)	ř				
w			y		

Vowels:

i	u	ɨ	ʉ
e	o	ɛ	ɔ
a		ǣ	

Tones: high, mid, low

/p/ is found only in loan words. /ř̃/ is found in loan words except in one native word. /l/ is a rare phoneme. Except for /ɣ/, the voiced fricatives are rare. /z/ occurs in only four morphemes. /ž/ occurs in only two. A sequence of two vowels is not analyzed as a long vowel.

※**Western Popoloc² (Otlaltepec)** [PIERSON 1953] (20C, 5V+5N)**Consonants:**

t	c	č	č̃	k	ʔ
d	j	ǰ			
s	š	š̃		h	
v				ɣ	
m	n				
l	ř				
				y	

Vowels:

i	u	ɨ	ʉ
e	o	ɛ	ɔ
a		ǣ	

Tones: high, mid, low

12, 13, 21, 23, 31, 32,

131, 121, 213, 312, 313

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

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

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

Vowels:

i u ɨ ʉ
 e o ɛ ɔ
 a ɤ
 Tones: 1 (high), 2, 3, 4 (low)
 12, 13, 21, 23, 31, 32,
 131, 121, 213, 312, 313

/p/ and /ð/ are found in only two morphemes each.

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

(p) t c č ċ k ʔ
 φ θ s š ṣ̌ h
 β ð z ž ɣ
 m n ñ
 l ɾ ɹ
 y

Vowels:

i ɨ i: ɨ:
 e o ɛ ɔ e: o: ɛ: ɔ:
 a ɤ a: ɤ:
 Tones: 1 (high), 2, 3, 4 (low)

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

Chocho [33]

[Mock 1977] (24C, 5V+5N)

Consonants:

p t c č ċ k ʔ
 φ θ s š ṣ̌ x
 β ð z ž ẓ̌ ɣ
 m n
 l r ɹ

Vowels:

i u ɨ ʉ
 e o ɛ ɔ
 a ɤ
 Tones: 1 (high), 2, 3 (low), 12, 21, 32

Accent generally falls on the penultimate syllable. /ð ɣ/ are pronounced [d g] after nasals.

Mazatec [34]

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

Consonants:

t tʰ c č k ʔ
 s ṣ̌ h
 m n ñ
 ɾ
 β y

Vowels:

i u ɨ ʉ
 e o ɛ ɔ
 æ a ɤ ɤ:
 Tones: 1 (high), 2, 3, 4 (low), 14, 24,
 34, 21, 31, 41, 42, 214, 314,
 414, 424, 11

/p ð ɣ ɹ/ are found in Spanish loans.

Jalapa de Díaz [SCHRAM and PIKE 1978] (21C, 5V+5N)

Consonants:

t c č k k^w ?
 d j ĵ g g^w
 s š h
 m n ñ
 l r
 w y

Vowels:

i u ɨ ʉ
 o ɔ
 æ a ɤ ɶ

Tones: high, mid, low

Huautla de Jiménez [PIKE 1967] (17C, 4V+4N)

Consonants:

p t c č ċ k ?
 s š h
 m n ñ
 l (ř)
 v y

Vowels:

i ɨ
 e o ɛ ɔ
 a ɶ

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

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

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

Consonants:

p t c č ċ k ?
 s š h
 m n ñ
 l ř ř
 w y

Vowels:

i u ɨ ʉ
 e o ɛ ɔ
 a ɶ

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

Amuzgo [35]**San Pedro Amuzgo¹ [SMITH-STARK and TAPIA GARCÍA 1984] (21C, 7V+5N)**

Consonants:

(p) t tʰ c č k ?
 b dʰ g
 s š h
 m n ñ
 (l) r (ř)
 w y

Vowels:

i u
 e o ɛ ɔ
 ɛ a ɔ ɤ ɶ ɔ

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

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

Consonants:

t tʲ c č k kʷ ?
 s š h
 β
 m n
 l
 w y

Vowels:

i u i̯ u̯
 e o e̞ ɔ̞
 ε a ɔ̞ ɶ
 Tones: 1 (high), 2, 3 (low),
 21, 13, 31

Although the informant for both Amuzgo charts is the same person, the inventories are different.

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

Consonants:

(p) t c tʲ č k kʲ kʷ ?
 (m^p) n^t n^{tʲ} ŋ^k
 (β) s š h
 m n nʲ
 l
 r (r̃)
 w y

Vowels:

i u
 e o e̞ ɔ̞
 æ a ɔ̞ æ̞ ɶ̞
 Tones: 1 (high), 2 (mid), 3 (low),
 13, 32, 21

n and *mb* are syllabic consonants. Parenthesized phonemes are extremely rare.

Mixtec [36]

Acatlán [PIKE and WISTRAND 1974] (24C, 5V+5N)

Consonants:

p t č k kʷ ?
 m^b n^d n^j n^{j̃} n^g
 s š (h)
 v ð
 m n ñ
 l ř ř̃
 (w) y

Vowels:

i u i̯ u̯
 e o i̯ ɔ̞
 a ɶ̞
 Tones: high, mid, low

/w h/ are rare. /ř ř̃/ are rare and found mostly in loan words.

Huajuapán [PIKE and COWAN 1967] (17C, 5V+4N)

Consonants:

t č k k^w ?
 ʰd (ʰg)
 s š
 β ð ž
 m n ñ
 l

(w)

Vowels:

i ü i
 e o ɛ ɔ
 a ɶ

Tones: high, mid, low

/ʰg w/ are rare phonemes. /p mβ φ h γ r ř/ occur in Spanish loan words.

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 ?
 (mβ) ʰd (ʰj) (ʰg)
 β s š ž h
 m n ñ
 l

y

Vowels:

i u i u
 e o ɛ
 a ɶ

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

/mβ ʰj ʰg/ are rare. /ř/ occurs in Spanish loans with a few exceptions.

Mixtepec [PIKE and IBACH 1978] (22C, 5V+5N)

Consonants:

(p) t c č k k^w ?
 (mβ) ʰd ʰj ʰj ʰg (ʰg^w)
 s š
 m n ñ
 l ř
 v y

Vowels:

i u i u
 e o ɛ ɔ
 a ɶ

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

13, 23, 31, 32

/p mβ ʰg^w/ are rare. /ɔ/ occurs only in one morpheme, -ɔ "we exclusive."

/v/ varies from labiodental to bilabial.

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

Consonants:

t č k k^w ?
 ˢd (ˢg)
 β s š (h)
 m n ñ
 l ř
 y

Vowels:

i u i̯ u̯
 e o ɛ ɔ
 a ɤ
 Tones: high, mid, low

/p ˢb/ occur only in loan words. /ˢg/ occurs only in one morpheme, /iˢgà/ "other." The phoneme /β/ has an allophone [w] before the vowel /a/ and is realized as [β] elsewhere. /h/ is a rare phoneme. Zylstra [1991]'s inventory is as follows:

/t č k k^w b d ˢb ˢd s š x v m n ñ l r y ? i e a o u i̯ ɤ ɔ ʉ/ (19C, 5V+4N)

/p g f/ occur in Spanish loans.

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

Consonants:

(p) t tʲ č k k^w ?
 (ˢb) ˢd ˢdʲ (ˢg) (ˢg^w)
 s š (h) (h^w)
 m n ñ
 l r
 β y

Vowels:

i u i̯ u̯
 e o (ɛ)
 a ɤ
 Tones: high, mid, low

/p ˢb ˢg ˢg^w h h^w ɛ/ are rare phonemes. /r/ is a vibrant. The semiconsonant /β/ is a bilabial continuant and varies from slight friction to frictionless.

Ayutla² [HILLS 1990] (23C+?, 5V+3N)

Consonants:

(p) t tʲ (kʲ) k k^w
 (ˢb) ˢd ˢdʲ (ˢg) (ˢg^w)
 s (sʲ) š (x)
 (m) n nʲ ñ
 l ř
 v y

Vowels:

i u i̯ u̯ iʔ uʔ jʔ uʔ
 e o eʔ oʔ
 a a aʔ ɤʔ
 Tones: high, mid, low

/p kʲ ˢb ˢg ˢg^w sʲ x m/ are rare.

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

Consonants:

(p) t č k k^w (?)
 s š h
 z ž
 β ð
 m n ñ
 l
 y

Vowels:

i u ɨ ʉ
 e o ɛ ɔ
 a ɤ

Tones: high, mid, low

/p ʔ/ are rare. /^mb nd nʃ ^{ng}/ are treated as clusters /mp nt nč nk/.

Ocotepec² [ALEXANDER 1988] (19C, 5V+5N)

Consonants:

(p) t č k k^w ?
nd (nʃ) (ng)
 s š x
 v (ð)
 (m) n ñ
 (l)
 y

Vowels:

i u ɨ ʉ
 e o ɛ ɔ
 a ɤ

Tones: high, mid, low

/p nʃ ^{ng} ð m l/ are rare. /^mb f g r ř/ have been introduced through Spanish loanwords.

Molinos [MERRIFIELD and STOUTT 1967] (18C, 5V+5N)

Consonants:

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

Vowels:

i u ɨ ʉ
 e o ɛ ɔ
 a ɤ

Tones: high, mid, low

/nd/ is interpreted as /nd/.

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

Consonants:

p t č k k^w ?
^mb nd nʃ ^{ng}
 s š h
 β ð ž
 m n N ñ
 l r
 (y)

Vowels:

i ī u ɨ ỹ ʉ
 e o ɛ ɔ
 a ɤ

Tones: 1, 2, 3, 4

/N/ is a voiceless alveolar nasal. /y/ is rare and occurs as second member of a consonant cluster. Alexander [1980] reports Atatlahuca has a three tone system /1, 2, 3/.

San Miguel El Grande [MAK 1950] (21C, 6V+5N)**Consonants:**

p t č k k^w ?
 m^b n^d n^j n^g
 s š h
 β ð ž
 m n ñ
 l r

Vowels:

i ī u ī ī u
 e o ɔ
 a ɤ

Tones: high, mid, low

/β/ is slightly voiced except after glottal stop or between /i/ vowels, when it becomes [w]. Pike notes that /β/ varies freely from a stop especially in morpheme-initial position, 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+5N)**Consonants:**

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

Vowels:

i ī u ī ī u
 e o
 a ɤ

Tones: high, mid, low

※Diuxi¹ [PIKE and ORAM 1976] (18C, 6V+6N)**Consonants:**

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

Vowels:

i ī u ī ī u
 e o ɛ ɔ
 a ɤ

Tones: high, low

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

Diuxi² [KUIPER and ORAM 1991] (19C, 6V+6N)**Consonants:**

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

Vowels:

i ī u ī ī u
 e o (ɛ) ɔ
 a ɤ

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 kʷ ?
 mb nd nj ng ngʷ
 s š
 φ ð ž
 m n ñ
 l ɾ

Vowels:

i i u j j u
 e o ɛ ɔ
 a ʌ

Tones: high, mid, low

/p f h ɾ/ are found in Spanish loans.

Coatzacoapan [PIKE and SMALL 1974; SMALL 1979, 1990] (23C, 6V+6N)

Consonants:

(p) t c č k kʷ ?
 mb nd nj nj ng ngʷ
 s š
 β ð ðʷ
 m n ñ
 l ɾ

Vowels:

i i u j j u
 e o ɛ
 a ʌ

Tones: high, low, high-low glide

[SMALL 1990]

/p/ is rare. /f x g y w/ have entered the language through Spanish loanwords. According to Pike and Small [1974], tone system is high, low, high-low, low-high.

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

Consonants:

(p) t tʷ č k kʷ ?
 (mb) nd ndʷ ng
 v s š x
 m n ñ
 l r
 y

Vowels:

i i u j j u
 e o ɛ ɔ
 a ʌ

Tones: high, mid, low

/p mb/ are rare.

San Juan Colorado [STARK, JOHNSON and LORENZO 1986] (20C, 6V+6N)

Consonants:

p t tʷ c k kʷ ?
 mb nd ndʷ
 s š x
 m n ñ
 l r
 v y

Vowels:

i i u j j u
 e o ɛ ɔ
 a ʌ

Tones: high, mid, low

Chayuco [PENSINGER and LYMAN 1975] (20C, 6V+6N)

Consonants:

p t tʲ k kʷ ?
 mʙ nd ndʲ ng
 v θ s š
 m n ñ
 l ɾ
 y

Vowels:

i i u i i u
 e o ɛ ɔ
 a ɶ

Tones: high, mid, low

/q/ possibly is /kʷ/, although it is noted that /q/ represents [ky].

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

Consonants:

p t tʲ č k kʷ ?
 mʙ nd ndʲ ng
 s š
 m n ñ
 l ɾ
 w y

Vowels:

i u i u
 e o ɛ ɔ
 a ɶ

Tones: high, mid, low

/ɸ sʲ x/ are found only in Spanish loans. /ɾ/ is a postdental flap.

Cuicatec [37]***Concepción Pápalo**¹ [NEEDHAM and DAVIS 1946] (14C, 6V+6N)

Consonants:

t č k kʷ ?
 β ð
 s x
 m n
 (l)
 (r)
 y

Vowels:

i u i u
 e ɛ
 ɛ ɔ ɛ ɔ
 a ɶ

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 in one phoneme /e/; long vowels are treated as vowel clusters VV [DAVIS and WALKER 1955].

Concepción Pápalo² [BRADLEY 1991] (15C, 5V+5N)

Consonants:

p t č k kʷ ?
 s x
 v ð
 m n
 l r
 y

Vowels:

i u i u
 e o ɛ ɔ
 a ɶ

Tones: high, mid, low

/f/ occurs in Spanish loanwords.

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

Vowels:

i	u	ĩ	ũ
e	o	ẽ	õ
a	ɔ	ã	

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

I cannot confidently extract phonemes from Anderson's Dictionary, but the vowel system indicated above seems fairly accurate; it is different from that of Concepción Pápalo, although their consonant systems seem to be identical.

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	<u>m</u>	<u>n</u>	<u>l</u>	<u>y</u>	<u>w</u>
	c	č	r	ʔ	h					

Vowels:

i	ĩ	u	ũ	ĩ	ũ
e	ɛ	o	õ	ẽ	õ
a				ã	

Tones: 1, 2, 3, 4, 5,

12, 13, 21, 23, 32, 34, 35, 43, 45, 51, 52, 53, 54,
343, 354

/ç/ occurs but /ž/ does not in Good's inventory [1979].

San Juan Copalá [HOLLENBACH 1977] (22C, 5LV+3SV)**Consonants:**

Fortis	p	t	k	s	š	ṣ̌
Lenis	b	d	g	z	ž	r
Affricates	c	č	č̣			
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 can 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 ʔ, which has the phonetic characteristics of a ballistic accent [HOLLENBACH 1985: 456].

Long	i	u	Short		
	e	o		eʔ	oʔ
	a			aʔ	

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, the more commonly reported system for other Middle American languages.

Notes:

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

Zapotec [39]

Although the most famous characteristic of Zapotec is the contrast of fortis and lenis, some sources do not describe this contrast. There are two types of 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 consonantal but in Zapotecan it is considered part of the vocalic nucleus, creating a contrast between plain and checked vowels [JOSSEAND 1983: 177].

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

Consonants:

p	t	c	č	k	k ^w	ʔ
s	š	f	θ	x		
z	ž	v	ð	ɣ		
m	n	l	r	ř	w	

Vowels: i e a o u

j ɐ ɯ

Tones: high, mid, low

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

Juárez Zapotec (Eastern Ixtlán=Atepec) [BARTHOLOMEW 1983] (35C, 5V)

Consonants:

pp	bb	tt	cc	čč	kk	kk ^w	θθ	s	šš	m	n	l	r	y			
p	b	t	d	c	č	k	g	k ^w	g ^w	θ	š	ž	<u>m</u>	<u>n</u>	<u>l</u>	<u>r</u>	<u>y</u>
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 Ixtlán [THIESSEN 1987] (24C, 5V)

Consonants:

Fortis	p	t	t:	c	č	k	k ^w	s	š	n	l	r
Lenis	b	d				g	g ^w	ž	<u>n</u>	<u>l</u>	<u>r</u>	
Non-contrast	θ	x	m	ʔ								

Vowels: i e a o u

simple: V

laryngealized (interrupted): VʔV

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

Consonants:

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 ĭ æ

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

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

Consonants:

Fortis p t č k s š š m n l

Lenis b d ĵ g z ž ž m n lNon-contrast ř w x X ?

Vowels: i e a o

/b f x ñ ř y(l) u/ occur in Spanish loans.

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

Consonants:

Fortis p t č k k^w s š š n lLenis b d ĵ g g^w z ž ž n lNon-contrast m x ř X X^w ?

Vowels: i e a o ə

/f x x^w y ř ñ/ occur in Spanish loans. /x/ is a voiceless alveolo-palatal fricative.×**Villa Alta (Yatzachi)** [LEAL 1950; Pike 1948] (25C, 5V)

Consonants:

Fortis p t č k k^w s š š n lLenis b d ĵ g g^w z ž ž n lNon-contrast m y X X^w ?

Vowels: i e a o ĩ (high back unround)

Tones: 1(high), 2(mid), 3(low), 12, 13, 21, 23, 32

/f x^w x r ř/ occur in borrowed words.**Cajonos** [NELLIS and HOLLENBACH 1980] (26C+?, 4V)

Consonants:

Fortis p t c č k s š m n l r X

Lenis b d ĵ ĵ g z ž m n l r X (uvular fricative)

Non-contrast w y

Vowels: i e a o

simple: V

checked (glottalized): V?

laryngealized: VV

Tones: high, low, downglide

/f x/ are found only Spanish loan words.

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

Consonants:

Fortis p t č k k^w s š n lLenis b d ĵ g g^w z ž ž n lNon-contrast m r X X^w y ?

Vowels: i e a o u

Syllable nuclei: V and V?

Tones: high, mid, low, mid-falling

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

Consonants:

Fortis	p	t	č	k	s	š	n	l
--------	---	---	---	---	---	---	---	---

Lenis	b	d	j	g	z	ž	<u>n</u>	<u>l</u>
-------	---	---	---	---	---	---	----------	----------

Non-contrast	ɣ	w	y
--------------	---	---	---

Vowels:	i	e	a	o
---------	---	---	---	---

	i?	e?	a?	o?
--	----	----	----	----

	i?i	e?e	a?a	o?o
--	-----	-----	-----	-----

/ɣ/ is a voiced uvular fricative.

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

/m m r/ are phonemic only in loanwords.

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

Consonants:

Fortis	p	t	c	č	k	s	š
--------	---	---	---	---	---	---	---

Lenis	b	d	j	j̃	g	z	ž
-------	---	---	---	----	---	---	---

Non-contrast	m	n	l	r	ʔ
--------------	---	---	---	---	---

Vowels:	i	e	ɛ	a	o	u
---------	---	---	---	---	---	---

simple:	V
---------	---

laryngealized:	VʔV
----------------	-----

checked:	Vʔ
----------	----

Tones: high, mid, low

Albarradas [KREIKEBAUM 1987] (22C+?, 7V)

Consonants:

Fortis	p	t	č	k	k ^w	s	š	n	l	r
--------	---	---	---	---	----------------	---	---	---	---	---

Lenis	b	d	j	g	(g ^w)z	ž	<u>n</u>	<u>l</u>	<u>r</u>
-------	---	---	---	---	--------------------	---	----------	----------	----------

Non-contrast	m	w	y	(f)	(x)
--------------	---	---	---	-----	-----

Vowels:	i	e	a	o	u	ɛ	ü (i?)
---------	---	---	---	---	---	---	--------

simple:	V
---------	---

laryngealized:	VʔV
----------------	-----

interrupteded:	Vʔ
----------------	----

aspirated:	Vh
------------	----

Tones: rising, falling, low

Parenthesized phonemes occur in Spanish loans. There are two non-standard orthographic symbols, *ě* and *ü*. The former is interpreted as an unrounded mid-open front vowel and therefore is transcribed as *e*. Since the latter is given no interpretation, it is impossible to specify.

※**Mitla**¹ [BRIGGS 1961] (26C, 6V)

Consonants:

Fortis p t k k^w s š m n l

Lenis b d g g^w z ž m n l

Non-contrast f x ř ř̄ h ? w y

Vowels: i e æ a o u

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

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

Mitla² [STUBBLEFIELD and HOLLENBACH 1991] (29C, 6V)

Consonants:

Fortis p t c č k k^w s š m n l r

Lenis b d j ĵ g g^w z ž m n l r

Non-contrast f h w y ?

Vowels: i e æ a o u

checked (glottalized): V?

laryngealized: VV

aspirated: Vh

Tlacoahuaya [RENDON 1970] (21C, 6V)

Consonants:

Fortis p t č k k^w s š n

Lenis b d ĵ g g^w z ž n

Non-contrast m l r y ?

Vowels: i e a o u i

Tones: high, low, rising

Guelavia¹ [JONES and CHURCH 1985] (22C+?, 6V)

Consonants:

Fortis p t c č k s š m n l

Lenis b d j ĵ g z ž m n l

Non-contrast w y (?)

Vowels: i e a o u i

simple: V

laryngealized: V?V

checked: V?

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

Consonants:

Fortis p t c č ċ k s š š̌ m n l

Lenis b d j ĵ g z ž ž̌ m n l

Non-contrast ř w y (?)

Vowels: i e a o u i

plain: V

laryngealized: V?V

checked: V?

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)

Consonants:

Fortis p t tʸ č k kʷ s š m n ñ l

Lenis b d dʸ ĵ g gʷ z ž m n ñ l

Non-contrast w y ?

Vowels: i e a o u +

simple: V

glottalization: V?

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.

Quioquitani [WARD 1987] (24C+?, 6V)

Consonants:

Fortis p t c č k kʷ s š

Lenis b d j ĵ g gʷ z ž

Non-contrast m n ñ l r h w y

Vowels: i e æ a o u

simple: V

laryngealized: V?V

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

Ayoquesco [MACLAURY 1989] (20C+?, 6V)

Consonants:

Fortis p t č k k^w s šLenis b d ĵ g g^w z ž

Non-contrast m n l r w y

Vowels: i e a o u ĭ (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 ř/ occur in Spanish loanwords.

Lachixio [PERSONS 1979] (25C+?, 4V)

Consonants:

p t c č kʷ k k^w

ᵐb ᵐd ᵐz ᵐg

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)

Consonants:

Fortis p t c č k s š m n l w y

Lenis b d j ĵ g z ž m n l w y

Non-contrast r ʔ

Vowels: i e a o u

simple: V

glottal interruption: Vʔ

aspiration: V^h

Tones: high, low, rising

/f x n r/ occur in Spanish loans.

Isthmus¹ [MARLETT and PICKETT 1987] (23C, 5V)

Consonants:

Fortis p t č k s š n ñ l

Lenis b d ĵ g z ž n ñ l

Non-contrast m r w y ?

Vowels: i e a o u

simple: V

checked: V?

laryngealized: VV

Tones: high, low rising, low

/f ñ h/ occur in loanwords or interjections.

※**Isthmus²** [PICKETT 1967] (23C, 5V)

Consonants:

Fortis p t č k s š

Lenis b d ĵ g z ž

Non-contrast m n ŋ l ř ě w y f h ?

Vowels: i e a o u

simple: V

rearticulated: VV

checked: V?

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 syllable patterns: CV, CVV, CCCV, and CVC.

※**Isthmus³** [PICKETT 1953, 1955] (20C, 5V)

Consonants:

Fortis p t k s š n l w

Lenis b d g z ž n l w

Non-contrast m ř h y

Vowels: i e a o u

Tones: high, low

/f/ occurs in Spanish loans. /ř/ is rare and found in only three native-origin words but is 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 ?
 b d g
 s š h
 m n
 l r
 w y

Vowels:

i u ɨ ʉ
 e o ɛ ɔ
 a

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

/c/ and /č/ are analyzed as /t/ plus the 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 references deny it.

Tataltepec¹ [PRIDE 1984] (25C, 5V+3N)

Consonants:

p t tʲ c č k kʷ ?
 d dʲ g gʷ
 s š h hʲ hʷ
 m n nʲ
 l lʲ r
 w y

Vowels:

i u ɨ ʉ
 e o
 a ʌ

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

***Tataltepec²** [UPSON and LONGACRE 1965] (18C, 5V+4N+9L)

Consonants:

t tʲ c č k kʷ ?
 s š h hʲ hʷ
 m n nʲ
 l lʲ
 w y

Vowels:

i u ɨ ʉ i: u: ɨ: ʉ:
 e o ɛ ɔ e: o: ɛ: ɔ:
 a ʌ 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 to the above inventory.

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

Consonants:

t tʲ c č k kʷ ?
 s š h hʲ hʷ
 m n nʲ
 l lʲ
 w y

Vowels:

i u ɨ ʉ i: u: ɨ: ʉ:
 e o ɛ ɔ e: o: ɛ: ɔ:
 a ʌ a: ʌ:

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

/r/ is a retroflexed palatal that varies between a spirant [ʒ̣] and a trill [r̄]. /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 i 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 details are not clear.

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

Consonants:

t k ʔ
b
f s h
z
n ñ
l

Vowels:

i i u
e o
a

Consonant clusters are /gy gw/ and /hn hl ʔm/. The system presented above is very interesting but it is noted to be provisional due to lack of data. Therefore I do not adopt it for this study.

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

Consonants:

p t tʰ k ʔ
 b d dʰ g
 f s š h
 w ð y ɾ
 m n ñ ŋ
 l
 ɾ

Vowels:

i ü i̯ u i̯ ü i̯ u
 e ë o ɛ ɛ̃ ɔ
 a ɶ

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 j̃ g
 s h
 z
 m n ñ ŋ
 l lʰ
 w (y)

Vowels:

i i̯ u
 e ö o
 a

Consonant clusters are /ky kw gy gw/ and /hm hn hñ hŋ hw hl ʔm ʔn ʔñ ʔw ʔl ʔlʰ 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 ?
b g
h
z
m n ŋ
l
w (y)

Vowels:

i ĩ u
e ə o
a

Tone and nasalization are noted to exist.

Consonant clusters are /ky kw gy gw/, /ty zy ly cy ŋy/ and possibly /ny/; also /hm hn hŋ hŋy hw hl (hly) hy ?m ?n ?ŋ ?w ?l ?ly ?y/ and possibly /hny ?ny/.

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

Consonants:

p t c k ?
b d j g
ɸ s r h
m n ŋ
l
w y

Vowels:

i ĩ u ĩ ĩ u
e ě o ɛ ě ɔ
a ɤ

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

Stress: ballistic, controlled

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

Consonants:

p t c k ?
b d j g
m n ŋ
f s r h
l
w y

Vowels:

i ĩ u ĩ ĩ u
e ě o ɛ ě ɔ
a ɤ

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 ^ŋg/ [WESTLEY 1971].

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

Consonants:

p t c k ?
 β ð ɾ
 φ θ s h
 m n ŋ
 l r

Vowels:

i ĩ u j j̃ ʉ
 e ě o ɛ ẽ ɔ
 a ɶ

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

Stress: ballistic, controlled

/ẽ/ is mid front retracted, occurring only after laryngeals and only in certain ideolects. /ɾ/ is retroflexed and slightly voiced, phonetically [ʒ]. Semivowels are expressed by /u/ and /i/. /r/ occurs in Spanish loans. /ɾ/ occurs post-vocally, following /a/ in the absence of nasalization, and following /ai/ 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 ĩ u
 e ě o
 a

※**Usila** [RENSCH 1968] (19C, 5V+N)

Consonants:

p t tʰ c k ?
 b d dʰ 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 hdʰ ?m ?n ?ñ ?ŋ ?l ?dʰ/. Vowels may be optionally nasalized and checked by /ʔ/.

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

Consonants:

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

Vowels:

i ĩ u j j̃ ʉ
 e ě o ɛ ẽ ɔ
 a ɶ

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

/r/ is a retroflexed alveopalatal grooved affricate in a stressed syllable; in unstressed syllables 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 ai au ou/, occur. /b f/ are only found in Spanish loanwords.

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

Consonants:

p t c č k ?
s h
m n ñ ŋ
l r
w y

Vowels:

i i 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 ?m ?n ?ñ ?ŋ ?l ?w ?y/.

Vowels may be nasalized and/or checked by /ʔ/.

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

Consonants:

p t c k ?
d g
θ s h
m n ŋ
l r
w y

Vowels:

i i u
e ə o
a

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

Notes:

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 syllables in all environments is that the ballistic syllables 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 CV syllable may be slightly longer than a CV syllable, 2) a CV? syllable is always shorter than a CV? syllable, 3) a CV may have an upglide, but usually does not, 4) the final glottal in closed syllables is very clearly marked (fortis) in ballistic syllables, whereas it is 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 ĩ ř
w y

Vowels:

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

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

Oaxaca Chontal [43]

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

Consonants:

Voiceless	Central						Lateral	
Obstruent	p	t	c	tʲ	č	k		
Continuant	f		s		š	x	l	lʲ
Glottalic	fʼ		cʼ		čʼ	kʼ ?	lʼ	
Voiced								
Obstruent	b	d	r			g		
Continuant	m	n	ɾ	ɳ	y	w	l	lʲ
Glottalic	mʼ	nʼ		ɳʼ		wʼ	lʼ	
Vowels								
short	i	e	a	o	u			
long	i:	e:	a:	o:	u:			

/lʲ/ is a lightly glottalized affricate [tlʲ] and is the same as /Lʼ/(ʰ) described by Waterhouse and Morrison [1950], who additionally list /N ɣ w/, which are not considered phonemes later.

Tequistlatec¹ [WATERHOUSE 1980] (27C, 5V)

Consonants:

Voiceless								
Obstruent	p	t	c			k		
Continuant	f	s	N	š	w	h	l	
Glottalic	fʼ		cʼ	čʼ	kʼ	?		
Voiced								
Obstruent	b	d				g		
Continuant	m	r	n	ɳ	y	ŋ w	l	
Vowels:								
	i	e	a	o	u			

Tequistlatec² [TURNER 1967; TURNER and TURNER 1971] (27C, 5V)

Consonants:

Voiceless	Central						Lateral	
Obstruent	p	t	c	č	k			
Continuant	f	s	N	š	w	h	l	
Glottalic	fʼ		cʼ	čʼ	kʼ	?	ʰ	
Voiced								
Obstruent	b	d			g			
Continuant	m	n		y	ŋ w		l	
Vowels:								
	i	e	a	o	u			

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

Comparing both sources' systems, the difference is seen in /*ñ*/, /*λ'*/ and /*r*/. /*λ'*/ is interpreted as /*l'*/ 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 seems safer to say that the /*r*/ occurs only in Spanish loans.

Huamelultec has more phonemic contrasts than Tequistlatec. Huamelultec has three alveopalatals /*tʲ* *ɬʲ* *ɬʲʷ*/, and three glottalized nasals /*m'* *n'* *ɲ'*/, plus a glottalized vocoid /*w'*/, while Tequistlatec has a phoneme /*ŋ*/.

Zoque [44]

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

Consonants:

p	t	tʲ	c	č	k	ʔ
b	d	dʲ		j	g	
	s			š		h
m	n			ɲ	ŋ	
	l					
w				y		

Vowels:

i	i	u
e		o
		a

/*f* *r* *ɾ*/ may appear in Spanish loans. Since /*ʌ*/ in the original is described as a high, central, unrounded vowel, it is replaced by /*i*/.

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

Consonants:

p	t	tʲ	c	č	k	ʔ
b	d	dʲ	j		g	
	s			š		h
m	n			ɲ	ŋ	
	l					
w				y		

Vowels:

i	i	u
e		o
		a

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

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

Consonants:

p t tʲ c č k ?
 b d dʲ ĵ g
 s š h
 m n ñ ŋ
 l
 w y

Vowels:

i u
 e ʌ o
 a

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

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

Consonants:

p t c k ?
 s h
 m n ŋ
 w y

Vowels:

i i u
 e o
 a

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

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

Consonants:

p t c k ?
 s h
 m n ŋ
 l r
 w y

Vowels:

i i u
 e o
 a

Veracruz Zoque/Popoluca Zoque [45]**Sierra Popoluca** [ELSON 1960, 1967] (22C, 6V+6L)

Consonants:

p t tʲ c č k ?
 b d dʲ 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 š h
 m n
 l ř
 w y

Vowels:

i u i: u:
 e ʌ o e: ʌ: o:
 a a:

/φ β ð r/ appear in Spanish loans.

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

Consonants:

p t c č k ?
 s š h
 m n
 l
 w y

Vowels:

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

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

Mixe [47]**Coatlán [HOOGSHAGEN 1984] (15C, 6V+6L+6EL)**

Consonants:

p t c k ?
 b d g
 š h
 m n ŋ
 w y

Vowels: Short

Long

Extra long

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

/f s l ř/ appear in Spanish loans.

San José El Paraíso [VAN HAITSMAN and VAN HAITSMAN 1976]

(12C, 6V+6L+6EL)

Consonants:

p t c k ?
 š h
 m n ŋ
 w y

Vowels: Short

Long

Extra long

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

/b d g j ĵ/ 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 phoneme /s/.

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

Consonants:

p t c k ?
 s š h
 m n
 l r
 w y

Vowels:

i u i: u:
 e ʌ o e: ʌ: o:
 a ɔ a: ɔ:

Totontepec¹ [SCHOENHALS and SCHOENHALS 1982; SCHOENHALS 1979]
(16C, 9V+9L)

Consonants:

p t c č k ?
 d g
 v s š h
 m n ñ
 y

Vowels:

i i u i: i: 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**² [CRAWFORD 1963] (15C, 9V+9L)

Consonants:

p t c k ?
 d g
 v s š h
 ž
 m n
 y

Vowels:

i i u i: i: u:
 e ʌ U e: ʌ: U:
 æ a o æ: a: o:

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

Huastec [48]**Veracruz (Xiloxúchil)** [OCHOA PERALTA 1984] (21C, 5V+5L)

Consonants:

p t c č k kʷ
 t' c' č' k' kʷ' ?
 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 ř/ are introduced through Spanish borrowings, although /r ř/ can be found in some onomatopoeias.

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

Consonants:

p t c č k k^w
 b t' c' č' k' k'^w ?
 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/ is found only in Spanish loans.

Yucatec [49]※Yucatec¹ [BLAIR 1964] (21C, 5V)

Consonants:

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

Vowels:

i u
 e o
 a

/b d g f ř/ occur in Spanish loan words. Vowels may combine with either of the accents /' / (high) and /' / (low), or may occur without accents.

Yucatec² [BARRERA VÁSQUEZ 1946; Po'OT YAH and BRICKER 1981] (20C, 5V+5L)

Consonants:

p t c č k
 p' t' c' č' k' ?
 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].

Lacandón [50]

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

Consonants:

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

Vowels:

i u i: u:
 e ə o e: ə: o:
 a a:

Itzá [51]※Itzá¹ [SCHUMANN 1971] (21C, 6V+5L)

Consonants:

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

Vowels:

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

Itzá² [HOFLING 1990] (20C, 6V+5L)

Consonants:

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

Vowels:

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

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

Mopán [52]

[ULRICH and ULRICH 1982, 1986] (21C, 6V+6L)

Consonants:

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

Vowels:

i i u i: (i:) u:
 e o e: o:
 a a:

/ĩ/ occurs rarely, mostly in onomatopoetic words. /i:/ has been encountered only in Belize in the word *tiki:ntic* "following."

Chol [53]

Tila¹ [WARKENTIN and SCOTT 1980] (23C, 6V)

Consonants:

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

Vowels:

i u
 e ə o
 a

/d g f r ĩ/ appear in Spanish loans. Since /Λ/ in the original is interpreted as a mid, central vowel, it may be better to replace it with /ə/. /t tʲ/ are found only in a few words, while /tʲ tʲ'/ occur with normal frequency.

※**Tila²** [SCHUMANN 1973] (22C, 6V)

Consonants:

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

Vowels:

i i u
 e o
 a

/d g/ appear in Spanish loans. /t tʲ/ are represented as [tʲ tʲ']. They occur in only a few words.

Chontal [54]

[KNOWLES 1984] (21C, 6V)

Consonants:

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

Vowels:

i i u
 e o
 a

/d g ř/ are most commonly found in Spanish loan words, but occur in a few native Chontal words in restricted environments. /f ñ/ are only found in Spanish loan words.

Chortí (Jocotán) [55]

[LUBECK 1989] (20C, 5V)

Consonants:

p t c č k
 b' t' c' č' k' ?
 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' (Zinacantán) [AISSEN 1987; Haviland 1981] (21C, 5V)

Consonants:

p t c č k
 p' t' c' č' k' ?
 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 represented as [b], [ʔb], [ʔm] and [ʔM] in Weathers [1947].

※Tzotzil² (Chalchihuitán) [HOPKINS 1967a] (20C, 5V)

Consonants:

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

Vowels:

i u
e o
a

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

Tojolabal [58]

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

Consonants:

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

Vowels:

i u
e o
a

/b d g/ appear only in Spanish loan words.

Chuj [59]

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

Consonants:

p t c č k
 b' t' c' č' k' ?
 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.

Jacalteco [60]

[DAY 1973] (26C, 5V)

Consonants:

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

Vowels:

i u
 e o
 a

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

Acatec [62]

[DAKIN 1976; PEÑALOSA 1987] (23C, 5V+5L), (25C, 5V+5L)

Consonants:

p t c č ċ k (q)
 b' t' c' č' ċ' k' (q') ?
 s š š̌ 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 differences between San Rafael La Independencia and San Miguel Acatán are as follows:

Acatec¹ (San Rafael) /q/ /q' /

Acatec² (San Miguel) /k/ /ʔ/

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

Tectitec [65]

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

Consonants:

p t c č ċ k' k q
 b' t' c' č' ċ' k' k' q' ?
 s š š̌ 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/ also occur in Spanish loans, and are marginal in relation to the native phonemic system, that is, /d/ appears only in *tidi* "what, thing," and /r/ is found in some onomatopoeic words.

Mam [66]

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

Consonants:

p t c č ċ k' k q
 b' t' c' č' ċ' k' k' q' ?
 s š š̌ 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. [ĩ] occurs mostly in loans and sound imitative words.

Aguacatec [67]

[McARTHUR and McARTHUR 1956] (27C, 5V+5L)

Consonants:

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

Vowels:

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

Ixil [68]Ixil¹ (Nebaj) [AYRES 1980] (25C, 5V+5L)**Consonants:**

p t c č ċ k q
 b' t' c' č' ċ' k' q' ?
 s š š̃ 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 [r̄] and [r̃]. /b'/ is implosive [ɓ].

Ixil² (Chajul) [AYRES 1980] (28C, 5V+5L)**Consonants:**

p t c é ċ ċ̃ k q
 b' t' c' é' ċ' ċ̃' k' q' ?
 s ś š̃ š̃̃ 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 /é é' ś/ are added. /č ċ' š/ are lamino-alveolo-palatals. /b'/ is implosive [ɓ].

Ixil³ (Cotzal) [TOWNSEND 1986] (27C, 5V+5L)**Consonants:**

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

Vowels:

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

/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.

Kekchí [69]

[STEWART 1980; CUC CAAL 1988] (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:

/d g f v/ occur in Spanish loans.

Pocomchí [70]

Pocomchí¹ [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.

Pocomchi² [RAMÍREZ and RAMÍREZ 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' ?
 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] / # _
 → [ʷm] / # _

Uspantec [72]

[KAUFMAN 1976] (22C, 5V+5L)

Consonants:

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

Vowels:

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

Long vowels are not registered in Cartilla Uspanteca [ANONYMOUS 1980].

Quiché [73]

※**Quiché¹ (Totoncapán)** [Fox 1973] (22C, 6V)

Consonants:

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

Vowels:

i u
e ə o
a

Quiché² (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' ?
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.

Quiché³ (Nahualá) [MONDLOCH 1978] (22C, 5V+5L)

Consonants:

p t c č k q
b' t' c' č' k' q' ?
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]

[DUBOIS 1981] (25C, 5V+5L)

Consonants:

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

Vowels:

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

/ŋ/ occurs only in word-final position.

Sipacapeño [75]

[KAUFMAN 1976; HOILAND and SÁNCHEZ 1980] (24C, 5V+5L)

Consonants:

p t c č kʸ k q
 b' t' c' č' kʸ' k' q' ?
 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]Cakchiquel¹ (Patzicia) [BLAIR *et al.* 1981] (22C, 6V)

Consonants:

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

Vowels:

i u
 e ə o
 a

/r l v y/ are devoiced in word-final position.

Cakchiquel² (Comalapa) [CHACACH CUTZAL 1990] (22C, 5TV+4LV)

Consonants:						Vowels: Tense				Lax	
p	t	c	č	k	q	i	u	ɪ	ʊ		
b'	t'	c'	č'	k'	q' ?	e	o	ɛ	ɔ		
		s	š		x		a				
m	n										
	l										
	r										
w										y	

Tzutujil [77]

Tzutujil¹ (Santiago) [DAYLEY 1985] (22C, 5V+5L+2)

Consonants:						Vowels: Short		Long	Broken Long	
p	t	c	č	k	q	i	u	i:	u:	
b'	t'	c'	č'	k'	q' ?	e	o	e:	o:	ie uo
		s	š		x		a		a:	
m	n									
	l									
	r									
w										y

/b d g/ occur in Spanish loans.

Tzutujil² (San Pedro La Laguna) [BUTLER and BUTLER 1977] (22C, 5V+5L)

Consonants:						Vowels:			
p	t	c	č	k	q	i	u	i:	u:
b'	d'	c'	č'	k'	q' ?	e	o	e:	o:
		s	š		x		a		a:
m	n								
	l								
	ř								
w									y

/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]※Xinca¹ [SCHUMANN 1966] (20C, 6V)

Consonants:

p t c č k ?
 b g
 f
 s š š h
 m n
 l ɫ
 r
 w y

Vowels:

i i u
 e o
 a

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

Xinca² [CAMPBELL 1972] (17C, 6V)

Consonants:

p t k
 p' t' c' k' ?
 š h
 m n
 l ɫ
 r
 w y

Vowels:

i i u
 e o
 a

/č/ occurs only in loanwords.

※Xinca³ [MAYERS 1966: 309] (22C, 6V+4L)

Consonants:

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

Vowels:

i i u (i:) u:
 e o e: o:
 a a:

/l/ is manifested as [l] in initial and medial position, [ɭ] or [ɫ] in final position. /r/ is manifested as [r̄] in initial and medial position, [r] in final position. Compared with the other two systems above, this is less systematic as it 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	ɨ	ʉ
e	o	ɛ	ɔ
a			ɔ̃

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' ?
β	s		h
m	n		ŋ
	l		
w	ɨ	y	

Vowels:

i	ɨ	u
e		o
a		

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

Mískitu [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 (※Mískitu¹), but /e/ and /o/ scarcely exist at all and it would seem that originally only the three fundamental vowels, *a*, *i* *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 expressed as /mh nh ŋh lh rh/.

Rama [84]

[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 ċ k
 j
 φ s x
 l ł
 r ř
 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 [u̠] and [i̠].

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		
				ɾ		

Vowels:

i	u	ɨ	ɯ
ɪ	ʊ		
e	o	ɛ	ɔ
a			ɑ

Tones: high, low

/ɾ/ is a retroflexed trill. /tk/ is a dento-velar stop. [m n ñ] are not phonemes, but rather nasalized /b d ǰ/. [w] and [y] are not phonemes, either. There are two tones, high and low. According to Constenla Umaña, /ɾ/ is lateral flap /l/ and there are three tones, rising, falling and low [CONSTENLA UMAÑA 1981].

Bribri [88]Bribri¹ [CONSTENLA UMAÑA 1990] (14C, 7V+5N)

Consonants:

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

Vowels:

i	u	ɨ	ɯ
ɪ	ʊ		
e	o	ɛ	ɔ
a			ɑ

[m n ñ] are nasalized /b d ǰ/. /ɾ/ is lateral flap /l/ and /h/ is /x/; tonemes are high, low, rising and falling in [CONSTENLA UMAÑA 1981].

✱Bribri² [SCHLABACH 1974] (20C, 7V+5N)

Consonants:

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

Vowels:

i	u	ɨ	ɯ
ɪ	ʊ		
e	o	ɛ	ɔ
a			ɑ

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

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

Consonants:

p t č k ʔ
b d ĵ
s š h
r ř ɾ
w y

Vowels:

i u ɨ ʉ
ɪ ʊ
e o ɛ ɔ
a ʌ

Nasalized /b d ĵ/ are manifested as [m n ñ] before a nasalized vowel or in word-final position. There are two tone contrasts plus combinations of them.

Térraba [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 ɾ

Vowels:

i u ɨ ʉ
ɪ ʊ
ɛ ɔ ɛ ɔ
a ʌ

There is an accent phoneme /'/. Semivowels *w* and *y* are interpreted as /u/ and /i/ in the non-syllabic nucleus. /ɾ/ is a lateral flap /ɺ/ in [CONSTENLA UMAÑA 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 ɾ
w y

Vowels:

i u ɨ ʉ
ɪ ʊ ɪ ʊ
e o ɛ ɔ
a ɔ ʌ ɔ

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

Guaymí Movere [90]

[ABARCA GONZÁLEZ 1985] (15C, 8V+7N)

Consonants:

t	č	k
b	ð	ǰ
s		x
m	n	ñ
	l	ɾ

Vowels:

i	ĩ	u	ĩ	ũ
e	ẽ	o	ẹ	ọ
a	ɔ	ɶ	ɷ	

There are two tone contrasts.

Bocotá [91]

[MARGER Y 1988] (11C, 7V+7N)

Consonants:

t	č	k
b	d	ǰ
s		h
l		
r		

Vowels:

i	u	ĩ	ũ
e	o	ẹ	ọ
ɛ	ɔ	ɶ	ɷ
a		ɶ	

[m n ñ ɲ] 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 [91]

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

Consonants:

p	t	č	k	kʷ
s				
m	n			
l	ɾ			
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 kʷ/ are pronounced as the corresponding voiced sounds [SHERZER 1983: 36].

DATABASE 2: NUMERAL SYSTEMS

Papago [2]

	[SAXTON 1982: 198]	[ZEPEDA 1983: 117-119]	
1	himako	himako	
2	gook	gook	
3	waik	waik	
4	gi'ik	gi'ik	
5	hitasp	h itasp	
6	čuudp	čuudp	
7	wiwa'ak /wiwkam	wiwa'ak	
8	gigi'ik	gigi'ik	4"
9	humukt /humjkam	humuk	
10	wistmaam	wistmaam	
11		gamai-himako	10+1
12		gamai-gook	10+2
13		gamai-waik	10+3
14		gamai-gi'ik	10+4
15		gamai-hitasp	10+5
16		gamai-čuudp	10+6
17		gamai-wiwa'ak	10+7
18		gamai-gigi'ik	10+8
19		gamai-humuk	10+9
20		gokko-wistmaan	2 × 10
21		gokko-himako	20+1
22		gokko-gook	
23		gokko-waik	
24		gokko-gi'ik	
29		gokko-humuk	
30		waikko-wistmaan	3 × 10
31		waikko-himako	
40		gi'ikko-wistmaan	4 × 10
99		humukko-humuk	
100		siant	
110		himako-siant wistmaan	1 × 100+10
1000		miil	

Basic vocabulary:

$U = \{1...7, 9, 10\}$

$B^1 = \{10' \text{ (gamai)}/10 \text{ (wistmaan)}\}$, $B^2 = \{100 \text{ (siant)}\}$, $B^3 = \{1000 \text{ (miil)}\}$

Derivative vocabulary:

$\{2'...9'\} = \{\text{gokko, waikko, gi'ikko ... humukko}\}$

① From 1 to 10 the formation of number words is decimal, but 8 (gi-gi'ik) is formed as a multiple of 4 (gi'ik), that is, by reduplication of the first syllable, which means 4. This method is expressed in this study as /4"/.

$N_{1-10} = \{1...7, 4, " 9, 10\}$

② Numeral words from 11 to 19 are formed from *gamai*- and morphemes from 1 to 9. *gamai* is regarded as an allomorph of 10 *wistmaam*.

$N_{11-19} = B^1 \text{ (gamai-)} + \{N_{1-9}\}$

③ Decimal system above 20.

$$N_{20-99} = \{N_{2'.9'}\} \times B^1 \text{ (wistmaan)} / \text{___ round numbers} \\ = \{N_{2'.9'}\} + \{N_{1.9}\} / \text{___ interval numbers}$$

④ 100 and 1000 are Spanish loan words, to which Papago numeral words are attached.

$$N_{100-999} = \{N_{1.9}\} \times 100 \pm \{N_{1.99}\}$$

$$N_{1000-} = \{N_{1.9}\} \times 1000 \pm \{N_{1.999}\}$$

Pima Bajo [3]

[PENNINGTON 1979]

(The original was written in the 18th century. The transcription follows the original.)

1	maco/ maddo	
2	goc	
3	vaico	
4	guico/ macoba	
5	utaspo	
6	tutpo	
7	bubacama	
8	guiguico	4"
9	tumbustamama	
11	bustamama gamai maco	10+1
12	macobai/ bustamama gamai goco	10+2
13	bust'mama vaico	10+3
15	vaico utaspo	3×5
20	maco opa	1×20
30	maco opa. ovai gamai bust'ma	1×20+10
40	goc obpai	2×20
60	vaico opa /obbac	3×20
70	gamui vustama	
80	guico opa	4×20

Basic vocabulary:

$$U = \{1...7, 9, 10\}$$

$$B^1 = \{10 \text{ (bustamama)}\}, B^2 = \{20 \text{ (opa)}\}.$$

Derivative vocabulary:

$$2' = \text{goco}, 20' = \text{obpai}.$$

① Decimal, but 8 (gui-guico) is formed by the reduplication of the first syllable of 4 (guico). Since the morpheme for 10 is found in the number 9, the formation of 9 seems to be /-1+10/.

$$N_{1-10} = \{1...7, 4, " -1+10\}$$

② Beyond eleven, 1, 2... are added to *bustamama* connected by the word *gamai*. However, in 13 *gamai* is omitted. The composition of 15 is 3×5.

③ Vigesimal above 20.

$$N_{20-80} = \{N_{1.4}\} \times B^2 \text{ (opa)} + \{N_{1.9}\}$$

Northern Tepehuan [4]

[BASCON 1982: 334]

1	imóko
2	goóka

3	vaíka	
4	maakóva	
5	taáma	
6	naadámi	
7	kuvárahámi	
8	maamáková	4"
9	tuvušt'áma	-1+10
10	baivušt'áma	
11	baivušt'áma dan imóko	10+1
19	baivušt'áma dan tuvušt'áma	10+9
20	imó kóbai	1×20
39	imó kóbai dan baivušt'áma dan tuvušt'áma	20+10+9
40	góo kóbai	2×20
60	váik kóbai	3×20
80	maakó kóbai	4×20
100	imó siénto	1×100

Basic vocabulary:

$$U = \{1...7\}$$

$$B^1 = \{10 \text{ (baivušt'áma)}\}, B^2 = \{20 \text{ (kóbai)}\}, B^3 = \{100 \text{ (siénto)}\}$$

A connective: {dan}

① Eight (maamáková) is formed by the reduplication of the first syllable of 4 (maakóva). Nine is *tu-vušt'áma* and 10 is *bai-vušt'áma*. Since both consist of the same morpheme *-vušt'áma*, the meaning of 9 is to be taken as "one toward 10" or "one subtracted from 10" or "near 10." Here this is expressed as /-1+10/.

$$N_{1-9} = \{1...7, 4, -1+10\}$$

② From 11 to 19, the numeral words are *baivušt'áma* (10) plus 1, 2, ...9 with the connective word *dan*.

$$N_{10-19} = B^1 \text{ (baivušt'áma)} \pm \text{dan} \pm \{N_{1-9}\}$$

③ Vigesimal above 20. Interval words are formed from rank words, a conjunction *dan* and the numbers from 1 to 19.

$$N_{20-99} = \{1...4\} \times B^2 \text{ (kóbai)} \pm \text{dan} \pm B^1 \pm \text{dan} \pm \{N_{1-9}\}$$

④ 100 is borrowed from Spanish.

Tepecano [D1]

[MASON 1916: 377]

(c in the original is changed to š and · is to : . Eight in the original is *civ·a'ík* which may be *šiva: 'ík*.)

1	hö'maD/ hö'ma:i	
2	go:k	
3	va: 'ík	
4	ma'kov	
5	(i) štumá:M	
6	šivhö'maD	5+1
7	šivgo: 'k	5+2
8	šiva: 'ík	5+3
9	šivma'kov	5+4
10	ma'mvöc	

Basic vocabulary:

$$U = \{1 \dots 5\}$$

$$B^1 = \{5' (\text{šiv})\}, B^2 = \{10 (\text{ma'mvöc})\}$$

① Quinary. From 6 up, 5' (šiv) + {1...4}.

Tarahumara [6]

[MERRIFIELD 1968a: 96-98]

1	biré	
2	okuá	
3	bikiyá	
4	nawó	
5	marí	
6	usáni	
7	kičáo	
8	o-sá nawó	2×4
9	ki-makói	$-1 + 10?$
10	makói	
11	makói waminá biré	10 farther 1
19	makói waminá kimakói	10 farther 9
20	o-sá makói	2×10
22	o-sá makói waminá okuá	2×10 farther 2
33	bai-sá makói waminá bikiyá	3×10 farther 3
45	nawó-sa makói waminá marí	4×10 farther 5
56	marí-sa makói waminá usáni	5×10 farther 6
60	usán-sa makói	6×10
70	kičáo-sa makói	7×10
100	biré sientó	1×100
227	okuá sientó waminá o-sá makói waminá kičáo	$2 \times 100 + 2 \times 10 + 7$
880	o-sá nawó sientó waminá o-sá nawó-sa makói	$2 \times 4 \times 100 + 2 \times 4 \times 20$
9999	kimakói mli waminá kimakói sientó waminá kimakói-sa makói waminá kimakói	9×1000 farther 9×100 farther 9×10 farther 9

Western Tarahumara [BURGESS 1984: 86-87]

1	bilé	
2	oká	
3	baikiá / bakiá	
4	naó	
5	marígi	
6	usáni	
7	gičáo	
8	o-sá nó	2×4
9	gi-makoé	$-1 + 10$
10	makoé	
11	makó bilé	$10 + 1$
20	bilé eliá / o-sá makoé	2×10
30	bai-sá makoé	3×10
40	oká eliá / naó-sa makoé	4×10
50	marígi-sa makoé	5×10

60	usáni-sa makoé	6×10
70	gičáo-sa makoé	7×10
80	o-sá nó-sa makoé	$2 \times 4 \times 10$
90	gi-makó-sa makoé	9×10
100	bilé siénto/makó-sa makoé	$1 \times 100/10 \times 10$
150	bilé siénto aminá nasípa	1×100 and half
969	gi-makoé siénto miná usáni-sa makoé miná gi-makoé	$9 \times 100 + 6 \times 10 + 9$

Basic vocabulary:

$$U = \{1 \dots 7\}$$

$$B^1 = \{10 \text{ (makói)}\}, B^2 = \{100 \text{ (siento)}\}, B^3 = \{1000 \text{ (mili)}\}$$

Connectives: {-sa, waminá}

① Eight is a combination of 2 and 4, which is expressed in this study as $/2 \times 4/$. Nine is $/-1 + 10/$. To describe the form exactly, we would have to set up a morphophonological rule such as *okua* \rightarrow *o/-sa*, but such a minute rule is omitted, because we are primarily interested in the formation, that is, $/2 \times 4/$.

$$N_{1-9} = \{1 \dots 7, 2 \times 4, -1 + 10\}$$

②③ From 11 to 19, the numbers 1 to 9 are added to 10 connected by *waminá*. The numbers from 20 up are decimal.

$$N_{10-99} = \{\#, 2 \dots 9\}\text{-sa} \times U^1 \text{ (makói)} \pm \text{waminá} \pm \{N_{1-9}\}$$

④ The next rank is 100 and the third rank is 1000. These words are borrowed from Spanish.

$$N_{100-} = \{1 \dots 9\} \times B^2 \pm \{N_{1-99}\}$$

Eudeve (Heve, Eudeva, Dohema) [D4]

[PENNINGTON 1981] (original transcription)

1	sei	
2	godúm	
3	veidúm	
4	návoi	
5	márqui	
6	visani	
7	seniövusáni	$1 + 6$
8	gos návoi	(2×4)
9	vesmácoi	("casi diez")
10	mácoi	
11	mácoi se beguam	$10 + 1$ above
12	mácoita goc beguam	
14	mácoita náguoc beguam	
20	sei dóhme	"one person"
30	sei dóhme mácoita beguám	
40	goc dóhme	2×20
80	návoi dóhme	4×20
100	márqui dóhme	5×20

Basic vocabulary:

$$U = \{1 \dots 6\}, B^1 = \{10 \text{ (mácoi)}\}, B^2 = \{20 \text{ (dóhme)}\}$$

Derivative Vocabulary:

2' = goc, 4' = naguoc

Connectives: {-ta}, {beguam}

① Seven appears to be 1+6. Eight is 2×4 . Nine is analyzed as $-1+10$, but the meaning seems to be "almost 10."

$N_{1-9} = \{1...6, 1+6, 2 \times 4, -1+10\}$

② From 11 up the numerals are formed by adding 1...9 to 10 and *beguam* occurs after that. The meaning is "one above 10, two above 10, etc." -ta is not suffixed to *mácoi*. Instead of *godúm* and *návoi*, *goc* and *naguoc* are used for the 2 and 4 of 12 and 14.

$N_{10-19} = B^1 (\text{mácoi}) \pm ta \pm \{N_{1-9}\} \pm \text{beguam}$

③ From 20 up the system is vigesimal and the coefficients occur before the base 20. The coefficient 2 is 2' (goc).

$N_{20-} = \{N_{1-9}\} \times B^2 (\text{dóhme}) \pm \{N_{1-19}\}$

Yaqui [8]

[JOHNSON 1962: 30-31]

1	séenu / séenu	
2	wói	
3	báhi	
4	náiki	
5	mámni	
6	búsani	
7	wóbusani	$2 \cdot 6$
8	wóhnaiki	2×4
9	bátani	
10	wohmámni	2×5
11	wohmámni 'áma wépu'ulai	$10+1$
20	sénu taká	
21	sénu taká 'áma wépu'ulai	$20+1$
100	mámni taká	5×20

Mayo [9]

[COLLARD & COLLARD 1962: 216-7] [Lionnet 1977: 27]

1	seenu	seénu	
2	guooyi	woóyi	
3	bahi	báhi	
4	naíki	naíki	
5	mamni	mámni	
6	búsani	búsani	
7	guoibúsani	woibúsani	$2 \cdot 6$
8	guohnaíki	wohnaíki	2×4
9	bátani	bátani	
10	guohmamni	wohmámni	2×5
11	guohmámnama huépu'ulai		$10+1$
12	guohmámnama guooyi		$10+2$
13	guohmámnama bahi		$10+3$
14	guohmámnama naíki		$10+4$
15	guohmámnama mamni		$10+5$

16	guohmámnama búسانی	10+6
17	guohmámnama guoibúسانی	10+7
18	guohmámnama guohnaíki	10+8
19	guohmámnama bátani	10+9
20	senú taká	senú taká
21	senú taká ama huépu'ulai	20+1
30	senú taká ama guohmamni	20+10
40	guoi taká	wói taká
60	baih taká	3×20
80	naíki taká	4×20
100	mamni taká	5×20

Basic vocabulary:

 $U = \{1...6, 9\}$
 $B^1 = \{10 \text{ (wohman)}\}, B^2 = \{20 \text{ (taká)}\}$

Derivative vocabulary:

 $1' = wépulai$

A connective: {ama}

① The formation of 7 is uncommon. Seven is *wo-busani* = $2 \cdot 6$. Eight is 2×4 and 10 is 2×5 , both of which are formed by double counting.

 $N_{1-10} = \{1...6, 2-6, 2 \times 4, 9, 2 \times 5\}$

② Eleven is formed from 10 and *ama wépulai*, and is different from 1 (*séenu*). From 12 up the same morphemes as the numbers from 2 to 9 are added to 10 through a connective *-ama*.

 $N_{11-19} = B^1 \text{ (wohman)-ama} + \{1', 2...9\}$

③ Vigesimal beyond 20.

 $N_{20-} = \{N_{1-}\} \times B^2 \text{ (taká)} \pm \text{ama} \pm \{N_{1-19}\}$

Cora [10]

[CASAD 1984: 267-269]

1	saíti	
2	wá'ap"á	
3	wáika	
4	m"ák"á	
5	anšívi	
6	aráhsevi (ha-ra "in the face of/ there outside-facing frontwards" + 1)	
7	aráawa'ap"á	ha-ra + 2
8	aráawaiika	ha-ra + 3
9	arám"ák"á	ha-ra + 4
10	tam"áam"ata'á	
15	tam"áam"ata'á hap"án anšívi	10 above 5
16	tam"áam"ata'á hap"án aráhsevi	10 above 5 + 1
20	seit'é	
25	wá'ap"á hece	2 hece
35	seit'é hap"án tam"áam"ata'á hap"án anšívi	20 + 10 + 5
40	wá'ap"at'é	2×20
50	m"ák"á hece	4 hece
60	wáikat'é	3×20
80	m"ák"at'é	4×20
100	anšít'é	5×20

1000	sei-ví'ira'a	1×1000
2000	wá'ap ^w a-ví'ira'a	2×1000

Basic vocabulary:

$$U = \{1 \dots 5\}$$

$$B^1 = \{5' \text{ (ara)}\}, B^2 = \{10 \text{ (tam}^w\text{ám}^w\text{ata'a)}\}, B^3 = \{20 \text{ (t'é)}\}, \{\text{hece}\},$$

$$B^4 = \{1000 \text{ (ví'ira'a)}\}$$

Derivative vocabulary:

$$1' = \text{sevi}$$

A connective: {hap^wán}

- ① The numbers from 6 to 9 are quinary, being formed from 5' (ara) and {1'...4}.

$$N_{1-5} = \{1 \dots 5\}$$

$$N_{6-9} = B^1 \text{ (ara)} + \{1' \dots 4\}$$

- ② The numerals from 10 to 19 are formed from 10 plus the numbers from 1 to 9 by means of a connective, *hapwán*.

$$N_{10-19} = B^2 \text{ (tam}^w\text{ám}^w\text{ata'a)} \pm \text{hap}^w\text{án} \pm \{N_{1-9}\}$$

- ③ Vigesimal above 20, but 25 and 50 follow a different formation.

$$N_{20} = \{1 \dots 4\} \times B^2 \text{ (t'é)} \pm \text{hap}^w\text{án} \pm \{N_{1-19}\}$$

$$N_{25} = 2 \times \text{hece}, N_{50} = 4 \times \text{hece}$$

- ④ From 1000 up, the base is ví'ira'a.

$$N_{1000} = \{1 \dots\} \times B^4 \text{ (ví'ira'a)} \pm \text{hap}^w\text{án} \pm \{N_{1-999}\}$$

Huichol [11]

	[GRIMES 1964: 39, 41]	[PALAFOX VARGAS 1978: 41-42]	
1	zewí/ zei	zebí	
2	huuta	huta	
3	haika	haika	
4	nauka	nauka	
5	aúzawi	auzubi	
6	ataa + zewí	ata zebí	5 + 1
7	ataa + húuta	ata huta	5 + 2
8	ataa + háika	ata haika	5 + 3
9	ataa + náuka	ata nauka	5 + 4
10	tamámata	taamámata	
11		taamámata zebí	10 + 1
12	tamámata heimana húuta	taamámata huta	10 + 2
13		taamámata haika	10 + 3
14		taamámata nauka	10 + 4
15		taamámata auzubi	10 + 5
16		taamámata ata zebí	10 + 5 + 1
17		taamámata ata huta	10 + 5 + 2
18		taamámata ata haika	10 + 5 + 3
19		taamámata ata nauka	10 + 5 + 4
20	téwí + yari (person-one)	rei tebiyari	
71	haika téwiyari heimana tamámata heimana zewí		$3 \times 20 + 10 + 1$
399	haika sientú yaari heimana nauka téwí yari heimana tamámata		$3 \times 100 + 4 \times 20 + 10 + 5 + 4$

Basic vocabulary:

$$U = \{1...5\}$$

$$B^1 = \{5^1 \text{ (ata)}\}, B^2 = \{10 \text{ (tamámata)}\}, B^3 = \{20 \text{ (téwiyari)}\}$$

A connective: {heimana}

① The numerals from 6 to 9 are quinary.

$$N_{1-5} = \{1...5\},$$

$$N_{6-9} = B^1 \text{ (ata)} + \{1...4\}$$

② The numbers from 11 to 19 are formed from 10 plus the numbers from 1 to 9 by means of a connective, *heimana*, but in some cases the connective is not necessary.

$$N_{10-19} = B^2 \text{ (tamámata)} \pm \text{heimana} \pm \{N_{1-9}\}$$

③ Vigesimal above 20.

$$N_{20+} = \{1? / 2...\} \times B^3 \text{ (téwiyari)} \pm \text{heimana} \pm \{N_{1-19}\}$$

Nahuatl [12]

Classical Nahuatl [SULLIVAN 1983: 189-195] (original transcription)

1	ce	
2	ome	
3	ei/ yei	
4	nahui	
5	macuilli	
6	chicuace	5+1
7	chicome	5+2
8	chicuei	5+3
9	chiconahui	5+4
10	matlactli	
11	matlactli once	10+1
12	matlactli omome	10+2
13	matlactli omei	10+3
14	matlactli onnahui	10+4
15	caxtolli	
16	caxtolli once	15+1
17	caxtolli omome	15+2
18	caxtolli omei	15+3
19	caxtolli onnahui	15+4
20	cempoalli	1×20
21	cempoalli once	1×20+1
22	cempoalli omome	1×20+2
23	cempoalli omei	1×20+3
24	cempoalli onnahui	1×20+4
25	cempoalli ommacuilli	1×20+5
26	cempoalli onchicuace	1×20+5+1
27	cempoalli onchicome	1×20+5+2
28	cempoalli onchicuei	1+20+5+3
29	cempoalli onchiconahui	1×20+5+4
30	cempoalli ommatlactli	1+20+10
31	cempoalli ommatlactli once	1×20+10+1
32	cempoalli ommatlactli omome	1×20+10+2
33	cempoalli ommatlactli omei	1×20+10+3
34	cempoalli ommatlactli onnahui	1×20+10+4

35	cempoalli oncaxtolli	$1 \times 20 + 15$
36	cempoalli oncaxtolli once	$1 \times 20 + 15 + 1$
37	cempoalli oncaxtolli omome	$1 \times 20 + 15 + 2$
38	cempoalli oncaxtolli omei	$1 \times 20 + 15 + 3$
39	cempoalli oncaxtolli onnahui	$1 \times 20 + 15 + 4$
40	ompoalli	2×20
60	eipoalli	3×20
80	nauhpoalli	4×20
100	macuilpoalli	5×20
120	chicuacempoalli	6×20
140	chicompoalli	7×20
160	chicuepoalli	8×20
180	chiconahupoalli	9×20
200	matlacpoalli	10×20
220	matlactli oncempoalli	11×20
240	matlactli omompoalli	12×20
260	matlactli omeipoalli	13×20
280	matlactli onnauhpoalli	14×20
300	caxtolpoalli	15×20
320	caxtolli oncempoalli	16×20
340	caxtolli omompoalli	17×20
360	caxtolli omeipoalli	18×20
380	caxtolli onnauhpoalli	19×20
400	centzontli	1×400
500	centzontli ipan macuilpoalli	$400 + 5 \times 20$
600	centzontli ipan matlacpoalli	$400 + 10 \times 20$
700	centzontli ipan caxtolpoalli	$400 + 15 \times 20$
800	ontzontli	2×400
1200	etzontli	3×400
1600	nauhtzontli	4×400
2000	macuiltzontli	5×400
4000	matlactzontli	10×400
4400	matlactli oncentzontli	11×400
7600	caxtolli onnauhtzontli	19×400
8000	cenxiquipilli	1×8000
16000	onxiquipilli	2×8000
40000	macuilxiquipilli	5×8000
80000	matlaxiquipilli	10×8000
136000	caxtolli omome xiquipilli	17×8000
160000	cempoalxiquipilli	20×8000
3200000	centazonxiquipilli	400×8000
64000000	cempoaltzonxiquipilli	$20 \times 400 \times 8000$

Basic vocabulary:

$$U = \{1 \dots 5\}$$

$$B^1 = \{5' \text{ (chicu-)}\}, B^2 = \{10 \text{ (matlactli)}\}, B^3 = \{15 \text{ (caxtolli)}\},$$

$$B^4 = \{20 \text{ (poalli)}\}, B^5 = \{400 \text{ (tzontli)}\}, B^6 = \{8000 \text{ (xiquipilli)}\}$$

Connectives: {on/ om}

① Quinary from 6 to 9.

$$N_{1,5} = \{1 \dots 5\},$$

- $N_{6-9} = B^1 \text{ (chicu-)} + \{N_{1-4}\}$
- ② Quinary from 11 to 19.
 $N_{10-14} = B^2 \text{ (matlactli)} \pm \text{on/om} \pm \{N_{1-4}\}$
 $N_{15-19} = B^3 \text{ (caxtolli)} \pm \text{on/om} \pm \{N_{1-4}\}$
- ③ Vigesimal from 20 up.
 $N_{20-399} = \{N_{1-19}\} \times B^4 \text{ (poalli)} + \{N_{1-19}\}$
- ④ New words for 400, 8000 are introduced.

Modern Nahuatl [12-14]

Tetelcingo Nahuatl [TUGGY 1979: 72]

1	sie/ sente	
2	ume/ unte	
3	yeyi/yete	
4	nōwi	
5	nōk'ili	
6	čikwasie	5+1
7	čikume	5+2
8	čik'ieyi	5+3
9	čiknōwi	5+4
10	mah'ak'li	
11	mah'ak'li wansie	10+1
12	mah'ak'li wanume	10+2
13	mah'ak'li wa yeyi	10+3
14	mah'ak'li wa nōwi	10+4
15	kaštuli	15
16	kaštuli wansie	15+1
17	kaštuli wanume	15+2
18	kaštuli wa yeyi	15+3
19	kaštuli wa nōwi	15+4
20	sempoali	1×20
40	uhpoali	2×20

Usually Spanish loans are used above 10.

North Puebla Nahuatl [BROCKWAY 1979: 165]

1	seya	
2	ome	
3	yiya	
4	nawe	
5	mak'ili	
6	čik'asin	5+1
7	čikome	5+2
8	čik'eyi	5+3
9	čiknawe	5+4
10	ma'lak'li	
11	ma'lak'li wan seya	10+1
12	ma'lak'li wan ome	10+2
13	ma'lak'li wan yiya	10+3
14	ma'lak'li wan nawe	10+4

15	kaštoli	15
16	kaštoli wan seya	15+1
17	kaštoli wan ome	15+2
18	kaštoli wan yiyi	15+3
19	kaštoli wan nawe	15+4
20	sempowali	1×20
21	sempowali wan seya	1×20+1
25	sempowali wan mak ^w ili	1×20+5
30	sempowali wan ma'łakłi	1×20+10
33	sempowali wan ma'łakłi wan yiyi	1×20+10+3
37	sempowali wan kaštoli wan ome	1×20+15+2
40	ompowali	2×20
60	yepowali	3×20
80	nawpowali	4×20

Huasteca Nahuatl [BELLER and BELLER 1979: 252]

1	se	
2	ome	
3	eyi	
4	nawi	
5	mak ^w ili	
6	čikwaseh	5+1
7	čikome	5+2
8	čikweyi	5+3
9	čiknawi	5+4
10	mahłakłi	
11	mahłakłi wan seh	10+1
15	kaštoli	15
16	kaštoli wan seh	15+1
20	sempwali	1×20

Michoacan (Pómaro) Nahual [SISCHO 1979: 346]

1	se	
2	ome	
3	ye	
4	nawi	
5	mak ^w ili	
6	čik ^w ase	5+1
7	čikome	5+2
8	čik ^w e	5+3
9	čiknawi	5+4
10	mahlakli	

Sierra Nahuatl [ROBINSON 1966: 159]

1	se:
2	ome
3	e:yi
4	nawi
5	ma:k ^w il

6	čik*ase:	5+1
7	čikome	5+2
8	čik*e:yi	5+3
9	čiknawi	5+4
10	mahtakti	
11	mahtaktionse:	10+1
12	mahtaktiomome	10+2
13	mahtaktiome:yi	10+3
14	mahtaktionnawi	10+4
15	kaštol	15
16	kaštolonse:	15+1
17	kaštolomome	15+2
18	kaštolome:yi	15+3
19	kaštolonnawi	15+4
20	sempowal	1×20
21	sempowal wan se:	1×20+1
25	sempowal wan ma:k*il	1×20+5
30	sempowal wan mahtakti	1×20+10
35	sempowal wan kaštol	1×20+15
40	omepowal	2×20
60	e:yipowal	3×20
80	nawipowal	4×20
100	se: siento	1×100
153	se: siento wan ome powal wan mahtaktiome:yi	100+2×20+10+3

Mecayapan Nahuatl [WOLGEMUTH 1981: 60]

1	se:
2	o:me
3	e:yi
4	na:wi

Spanish numerals are used above 5.

Modern Nahuan [12-14]

The formation is fundamentally the same as that of Classical Nahuatl, but there are some variations. For example, from 5 or 10 up Nahuan words are replaced by Spanish words, and from 100 up, the Spanish word *ciento* for 100 becomes a rank word.

Cuitlatec [D7]

	[ESCALANTE 1962]	[LEON 1903] (original transcription)
1	ti'i /ti'wili	tahuaɟ
2	káti/ káta	caxla
3	kalíti/ ka'líta	calí
4	páta	paxla
5	puwáti/ puwáta	puaxla
6	dašíta	daschí
7	wišíti/ wišíta	huischí
8	puhtálíta (<puwa ti+ihta ti=5+mitad)	pujta lijpuɟla
9	niŋi/ niŋi	noxla
10	šiti/ ciŋi	tchonsla
11	pili	aguiltahúa
		10+1

12	
20	méti
30	kitméti (<šiti + meti = 10 + 20)
40	
50	
60	
70	
80	
90	
100	puhmé (<puwa ti + meti = 5 × 20)
1000	

aguilcaxta	10 + 2
tahuelmé	
calichonli	3 × 10
paxlachonli	4 × 10
puaxlachonli	5 × 10
daschichonli	6 × 10
huistlaichonli	7 × 10
pujlaliypuxlachonli	8 × 10
noxtachonli	9 × 10
puajchonli	
chonslapuajchonli	

[McQuown 1940]

1	tawal
100	tawal puhmé

Basic vocabulary:

U = {1...10}

B¹ = {10' (aguil)}, {10'' (chonli)}

① From 1 to 10 the formation of number words is decimal. *-ta* and *-ti* are both suffixes but the difference in their meanings is not clear. The word for 10 given by Escalante is different from Leon's 10.

N₁₋₁₀ = {1...10}

② From the data given by Leon the words from 11 to 19 are formed from *aguil-* and morphemes from 1 to 9. The word for 11 is different.

N₁₁₋₁₉ = 10' (aguil) + {1...9}

③ The formation above 20 seems to be vigesimal from the data given by Escalante, while Leon's data is clearly decimal from 30 up.

N₃₀₋ = {3...9} × 10'' (chonli)

④ 100 and 1000 may be decimal.

Notes: The contrasts *t*: *l* and *tch*:*ch* in *pujta lijpuvla* (8) and *pujlaliypuxla-chonli* (80), *noxla* (9) and *noxta-chonli* (90), *tchonsla* (10) and *chonsla-puaj-chonli* (100) seem to be typographical errors.

Seri [20]

[TURNER 1967: 238]

1	tašo/ tóohon	
2	kóokh /káhkon	
3	kápax /pxáa'on	
4	kšóoškw/ šóxkon	
5	kóiton /x'áiton	
6	isnáapkásh/ nápsh	
7	tonkohk'fi'/ káowk'i	
8	kšóxoofka/ pxáowk'i	
9	ksoik'ánt/ ksóox'ánt	-1 + 10
10	k'ánt/ xó'nal	
11	t'ánt tášo kk'fi'	10 + 1
20	i'ánt kóokh	10 × 2
21	i'ánt tokh tášo kk'fi'	10 × 2 + 1

50	i'ánt kóiton	10×5
100	i'ánt k'ánt	10×10
1000	i'ánt i'ánt k'ánt	$10 \times 10 \times 10$

Basic vocabulary:

$$U = \{1 \dots 10\}$$

$$B^1 = \{10' (t'ánt)\}, B^2 = \{100\}$$

A connective: {tášo}

① Decimal. However, since the morphemes representing 2 and 3 are found in the second alternatives for 7 and 8, and the same morpheme wk^wi follows them, the formation seems to be $2+5$, $3+5$, respectively. The word for 9 has $k'ánt$, which represents 10, so 9 seems to be formed by back-counting.

$$N_{1-9} = \{1 \dots 6, 2' + 5', 3' + 5', -1' + 10, 10\}$$

② The numbers from 11 to 19 are formed from $t'ánt$ (10) and $1 \dots 9$ through the connective *tášo*.

$$N_{11-19} = B^1 (t'ánt) + \text{tášo} + \{N_{1-9}\}$$

③ The numbers from 20 up are also decimal. The coefficients follow the base.

$$N_{20-99} = 10'' (i'ánt) \times \{N_{1-9}\} + \text{tášo} + \{N_{1-9}\}$$

Tarasco [21]

	[FOSTER 1969: 157]	[NANSEN DÍAZ 1985]	
1	má		
2	ci-ma = ni	cimá	
3	tani = mu	tanímu	
4	t ^h a = mu	t ^h ámu	
5	yu = mu	yúmu	
6	k ^{hw} i = mu		
7	yu = mu ci-ma = ni	yúm cimánina	$5 + 2$
8	yu = mu tani = mu	yúm tanímu	$5 + 3$
9	yu = mu t ^h a = mu	yúm t ^h amu	$5 + 4$
10	te = mpe-ni	témpini	
11	témpeni ká má		
19	témpeni ká yúmu t ^h amu		$10 + 5 + 4$
20	e-k ^w a = ce		
21	má e-k ^w a = ce		$1 + 20$
22	ci-ma = ni e-k ^w a = ce		$2 + 20$
23	tani = mu e-k ^w a = ce		$3 + 20$
30	te = mpe-ni e-k ^w a = ce		$10 + 20$
100		yúm ek ^w áci	5×20

mu is "mouth, edge," and *ce* is "down, ground."

Classical Tarasco

[BASALENQUE 1886 (1714): XXXI-XXXII] [GILBERTI 1898 (1558): 283-285]

1	ma	ma	ma-ro
2	tziman	tzim-an	tzim-oro
3	tanimu	tani-mu	tani-poro
4	tamu	tha-mu	tha-poro
5	yumu	yu-mu	yu-poro

6	cuimu	cui-mu	cui-poro	
7	yun-tziman	yun-tzim-an	yun-tzim-oro	5+2
8	yun-tanimu	yun-tani-mu	yun-tani-poro	5+3
9	yun-thamu	yun-tha-mu	yun-tha-poro	5+4
10	temben	temben	temb-oro	
11	temben-ma	tembe-ma	temb-oro-ma-ro	10+1
12		temben-tzim-an	temb-oro-tzim-oro	10+2
13	temben-ca-tinimu	temben-tani-mu	temb-oro-tani-poro	10+3
14		temben-tha-mu	temb-oro-tha-poro	10+4
15		tembe-yu-mu	temb-oro-yu-poro	10+5
16		temben cui-mu	temb-oro-cui-poro	10+6
17		tembe-yun-tzim-an	temb-oro-yun-tzim-oro	10+5+2
18		tembe-yun-tani-mu	temb-oro-yun-tani-poro	10+5+3
19		tembe-yun-tha-mu	temb-oro-yun-tha-poro	10+5+4
20	ma-ekuatze	ma-equatze/ ma-catari	ma-catari	
30	ma-equatze-ca-temben			20+10
40	tziman-equatze			2×20
80	tham-equatze			4×20
100	yum-ekuatze			5×20
400	ma-urepeta	ma-yrepe/ ma-yrepeta		1×400
8000	maxkuatze irepeta			20×400

Basic vocabulary:

$$U = \{1...6\}$$

$$B^1 = \{5' \text{ (yun)}\}, B^2 = \{10 \text{ (tembe/temben)}\}, B^3 = \{20 \text{ (ekwace)}\}$$

① Quinary except 6.

$$N_{1-6} = \{1...6\}$$

$$N_{7-9} = B^1 + \{2, 3, 4\}$$

② Decimal.

$$N_{10-19} = B^2 \text{ (tembe/temben)} (\pm ka) \pm \{1...9\}$$

③ The numbers above 20 seem to be vigesimal, but smaller units precede the base. If this is true, the formation is very rare for Middle America.

$$N_{20+} = \pm \{1...\} + \{\#, 2...\} \times B^3 \text{ (ekwace)}$$

However, in Classical Tarasco, the base precedes smaller units. This formation is common in Middle America.

$$N_{20+} = \{1...\} \times 20 \text{ (ekwace)} \pm ca \pm \{N_{1-19}\}$$

Notes: Numeral classifiers are used in Classical Tarasco as cited by Gilberti.

Totonac [22]

[HERNÁNDEZ GARCÍA 1982: 112-3]

1	túm
2	t'uy
3	t'utu'
4	t'at'i
5	kícis
6	čaśán
7	tuhún
8	cayán
9	náhaca

10	kaw	
11	kawitu'	10+1
12	kut'uy	10+2
13	kut'ut'u	10+3
14	kut'at'i	10+4
15	kukícis	10+5
16	kučašán	10+6
17	kutuhún	10+7
18	kucayán	10+8
19	kunahaca	10+9
20	p'ušám	
21	p'ušamatúm	20+1
30	p'ušamakaw	20+10
40	tip'ušám	2×20
60	tutump'ušám	3×20
80	t'at'ip'ušám	4×20
100	kicisp'ušám	5×20
1000	kawkicisp'ušám	10×5×20

Tepehua [23]

[BOWER 1948]

1	tam	
2	t'uy	
3	t'utu	
4	t'a:t'i:	
5	ki:s	
6	ča:šan	
7	tuhun	
8	cahin	
9	naha:c	
10	ka:w	
11	ka:wtam	10+1
12	ka:wt'uy	10+2
13	ka:wt'ut'u	10+3
14	ka:wt'a:t'i:	10+4
15	ka:wki:s	10+5
16	ka:wča:šan	10+6
17	ka:wtuhun	10+7
18	ka:wcahin	10+8
19	ka:wnaha:c	10+9
20	p'ušám	
21	p'ušamtam	20+1
22	p'ušamt'uy	20+2
23	p'ušamt'utu	20+3
24	p'ušamt'a:t'i:	20+4
25	p'ušamki:s	20+5
26	p'ušamča:šan	20+6
27	p'ušamtuhun	20+7
28	p'ušamcahin	20+8
29	p'ušamnaha:c	20+9

30	p'ušamka:w	20+10
31	p'ušamka:wtam	20+10+1
32	p'ušamka:wt'uy	20+10+2
33	p'ušamka:wt'ut'u	20+10+3
34	p'ušamka:wt'a:t'i:	20+10+4
35	p'ušamka:wki:s	20+10+5
36	p'ušamka:wča:šan	20+10+6
37	p'ušamka:wtuhun	20+10+7
38	p'ušamka:wcahin	20+10+8
39	p'ušamka:wnaħa:c	20+10+9
40	t'up'ušam	2×20
50	t'up'ušamka:w	2×20+10
60	t'utump'ušam	3×20
80	t'a:t'i:p'ušam	4×20
100	ki:sp'ušam	5×20
400	t'a:t'i:ki:sp'ušam	4×5×20
500	ki:ski:sp'ušam	5×5×20
1000	ka:w si:yentus	10×100

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 (ka:w)\}, B^2 = \{20 (p'ušam)\}, B^3 = \{100 = 5 \times 20\}$$

In Totonac some morphophonemic changes such as *ka:w*→*ku*, *kaw-i-tu'* and *p'ušam-a-túm*, are observed.

①②③ Decimal up to 20 and vigesimal above 20.

$$N_{1..99} = \pm \{ \#, 2, 3, 4 \} \times B^2 \pm B^1 \pm U$$

④ Decimal above 100.

$$N_{100..} = \{ \#, 2 \dots 9 \} \times B^3 \pm \{ N_{1..99} \}$$

Chichimec [24]

[ANGULO 1932: 183-184] (Original transcription) [ROMERO C. 1966: 530-531]

1	nánt'á	nánt'a	
2	tàn'én	tanehén'es	
3	tínhùn	tín'uhun	
4	tipán	tipán	
5	sàngwáro	sangwáro	
6	tákùn	táku'un	
7	tsákús	sak'usp	
8	tsándzèv	sánzep	
9	nánt'á páməf "one more"	nánt'a páməp	
10	rátsorò	rác'oro	
11	rátsorò nánt'á énùnts	rác'oro nánt'a enúc'	10+1
12	rátsorò tàn'én énùntsès	rác'oro tanehén'es enúc'es	10+2
13	rátsorò tínhùn égàts	rác'oro tín'uhun égac'	10+3
14	rátsorò tipán égàts	rác'oro tipán égac'	10+4
15	rátsorò sàngwáro égàts		10+5
16		rác'oro táku'un égac'	10+6
17		rác'oro sak'usp égac'	10+7
18		rác'oro sánzep égac'	10+8

19		çác'oro nánt'a pámeç éğac'	10+9
20	nánt'à ùpín	nánt'a up'ín	1×20
21	nánt'à ùpín nánt'à énúnts	nánt'a up'ín nánt'a enúc'	1×20+1
22	nánt'à ùpín tàn'én énúntsès	nánt'a up'ín tanehén'es enúc'es	1×20+2
23		nánt'a up'ín tín'uhun éğac'	1×20+3
30	nánt'à ùpín rátsorò éğàts	nánt'a up'ín rác'oro éğac'	1×20+10
31	nánt'à ùpín rátsorò nánt'à énúnts	nánt'a up'ín rác'oro nánt'a enúc'	1×20+10+1
40	tàn'én ùpínès	tanehén'es up'ín'es	2×20
50	níxhyùúr'i	níhu úr'ihì	half 100
60	tínhùn ùpín	tín'uhun up'ín	3×20
70	tínhùn ùpín rátsorò éğàts	tín'uhun up'ín rác'oro éğac'	3×20+10
80	tipán ùpín	tipán up'ín	4×20
90		tipán up'ín rác'oro éğac'	4×20+10
100	nánt'à úr'i	nánt'a úr'ihì	1×100
110		nánt'a úr'ihì rác'oro éğac'	1×100+10
200	tàn'én úr'i		2×100
300	tínhùn úr'i		3×100
1000	nánt' à úvó		"one world"

Basic vocabulary:

$U = \{1...9\}$

$B^1 = \{10 \text{ (rác'aro)}\}$, $B^2 = \{20 \text{ (up'ín)}\}$, $B^3 = \{100 \text{ (úr'i/ úr'ihì)}\}$, $B^4 = \{1000 \text{ (úvó)}\}$

Connectives: $\{\text{enúc' / enúc'es/ éğac'}\}$

① Decimal up to 20. However, since the word for 9 contains *nánt'a* (1), the formation may be $-1+10/$. Angulo gives the meaning as "one more."

$N_{1-9} = \{1...9\}$

② To the words from 11 to 19 are added *enúc'*, *enúc'es*, and *éğac'*. These are singular, dual and plural forms of *enúc'*, respectively. (*nunc* means "to add.")

$N_{10-19} = B^1 \pm \{N_{1-9}\} \pm \text{enúc' / enúc'es/ éğac'}$

③ Vigesimal from 20 to 99. However, 50 is expressed by half-counting, that is, half-100.

$N_{20-99} = \{1...4\} \times B^2 + \{N_{1-19}\}$

④ From 100 up, 100 and 1000 become the bases.

$N_{100-999} = \{1...9\} \times B^3 + \{N_{1-99}\}$

Pame [25]

	Jiliapan	Jiliapan (South)	Tilaco (South)	S. M. Acapulco (Central)	Alaquines (North)
	[Manrique C. 1967: 342]		[Soustelle 1937: 367]		
1	'na/ nada	nna	nna	nda	šõnta/ nda
2	tii	ti	tiyõi	núwi	nuyi/ -e
3	hnjũ'	/niyũ	tinyũn	renhũ	nũ
4	pye	tipiyã	tyipyã	kinyui	ginyui
5	šuthunt	špõtũnt	šputun	kit'yê	gyiç'ay/ gik'yay
6	tikyent	tikiyẽn	takẽn	telyã	terya
7	tiktĩ	tekiti	tikiyõi	telinyúhin	tinyuyn
8	tignyíu	tẽiniyun	kyõdinũn	dẽnsaw	tin'hũn
9	naũhwe	nahwẽn	nahẽ	tẽnsõntã	
10	sthũ	stut'u	štusu	şẽskay	
11	sthutná				

12	sthuti				10+2
15	sthutešthunt				10+5
20	'nade	nade	nade	delye'	1×20
40	tide				2×20
100	'nante'e				

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{5' \text{ (tik)}\}, B^2 = \{10 \text{ (sth)}\}, B^3 = \{20 \text{ (de)}\}, B^4 = \{100 \text{ (nte'e)}\}$$

Derivative vocabulary:

$$1' = \text{yent}, 3' = \text{nyfu}$$

A connective: {-t-}

① The structure is rather hard to analyze, but in Jiliapan the words from 6 to 8 are formed from *tik-* plus the numbers from 1 to 3, giving the appearance of a quinary method. Since the first morpheme of the word for 9 is *na-* (1), the formation may possibly be $-1+10/$, which is similar to that of Chichimec. On the other hand, it is difficult to discover signs of the quinary system in the other dialects, because of severe phonological changes they have undergone. Nevertheless, vestiges of the quinary system are apparent when all dialects are compared. As is seen above, it is possible that there are languages which look decimal because of phonological change, but which were actually once quinary. For example, in the southern Otomanguean languages, a quinary method appears above 10 but there is no evidence of the quinary system up to 10. This may have resulted from phonological change.

$$U = \{1 \dots 5\},$$

$$N_{6-8} = B^1 + \{1', 2, 3'\}, N_9 = \{9\}$$

② The words from 11 to 19 are formed from 10 and the numbers from 1 to 9 with a connective *t* (V)-.

$$N_{10-19} = B^2 \pm t \pm \{N_{1-9}\}$$

③ Vigesimal from 20 to 99.

$$N_{20-99} = \{1 \dots 4\} \times B^3 \pm \{N_{1-19}\}$$

④ 100 is a new base.

$$N_{100} = \{1 \dots\} \times B^4 \pm$$

Matlatzinca [26]

(original transcription)

	[Basalenque 1642]	[Soustelle 1937: 325]	Mexicalzingo [Soustelle: 325]	San Francisco [Soustelle: 325]	Oztotilpan [Schumann 1975: 535]
1	huera-hui	yndahhuy	indawi	indaḥwi	ndawi
2	no-huí	ynahuy	hinowi	teṇowö	tenowi
3	inyuu/ ní	ynyuhu	hišu	rošu	rošu
4	cunno-hui	yncunohuy	ink ^h unuwi	rokuntrowö	rokulhowi
5	incutha	yncuthaa	ink ^h huda	rokut'a	rokut'a
6	daha-tho-hui	yndahtohuy	indat ^h owi	ndatowö	ndatowi
7	ne-tho-hui	ynethohuy	neṭowi	neṭowö	netowi
8	nen-cuno-huí	ynencunoui	inenk ^h unowi	neṅu/ nowö	nenkunhowi
9	muratan-dahatha	ymurahtadahata	inmaratandaha	ratandat'a	murata-ndat'a
10	dahata	yndahatta	indaṛa	dat'a	ndat'a
11	dahatha-mus-dahuí		10+1		
12	dahatha-mus-rohui		10+2		

13	dahatha-mu-cuthatha	
14	dahatha-muz-cunohui	10+4
15	indata-muz-cutha	10+5
30	dohon-tha-mutz-dahatha	20+10
40	nehenta	2×20
60	nintha	3×20
100	incuthatha	5×20
1000	nenutha mutz dahathatha	2×400+10×20

Basic vocabulary:

$$U = \{1...5\}$$

$$B^1 = \{5' \text{ (tho)}\}, B^2 = \{10\}, B^3 = \{20 \text{ (tha)}\}, B^4 = \{400\}$$

Derivative vocabulary:

$$1' = \text{daha} \sim \text{dohon}, 2' = \text{ne} \sim \text{nen} \sim \text{nehen}, 3' = \text{thatha} \sim \text{nin}$$

A connective: {mus~mutz}

① Six and 7 are analyzed as /1+5/, /2+5/. Eight is /2×4/ and 9 is /-1+10/. *tho* is regarded as /5'/, which seems to have the same origin as *to* in Otomi. Therefore the formation is quinary, but 8 and 9 are formed by the multiplicative and back-counting methods, respectively.

$$N_{1-9} = \{1...5, 1'+5', 2'+5', 2' \times 4, -1'+10\}$$

② From 10 up the forms seem to be described as 10+mus+{U}, but this is not clear, due to lack of data from 15 up. Since closely related Ocuiltec forms the numerals likewise, Matlatzinca may turn out to have the same formation.

$$N_{10-19} = B^2 \pm \text{mus} \pm \{N_{1-9}\}$$

Ocuilteco [27] (original transcription)

	[Schumann 1975: 535]	[Soustelle 1937: 327]
1	mbla	bla
2	mno	^m no
3	phyu	phyu
4	gunhno	gun/ ho
5	kwit'a	kwit'a
6	mblandoho	blandoho 1+5?
7	mnyehndoho	nyendoho 2+5?
8	mnyehnguhno	mnyegunho 2×4?
9	mbla-tylaht'a	^m blatilat'a -1+10?
10	mblaht'a	^m blat'a
11	mblaht'a mucu-la	10+1
12	mblaht'a mucu-no	10+2
13	mblaht'a mucu-hyu	10+3
14	mblaht'a mucu-gunhno	10+4
15	mblaht'a mucu-kwit'a	10+5
16	mblaht'a mucu-mblandoho	10+1+5
17	mblaht'a mucu-mnyehndoho	10+2+5
18	mblaht'a mucu-mnyennguhno	10+2×4
19	mblaht'a mucu-mblatyulaht'a	10-1+10
20	mblohnda	

Basic vocabulary:

$U = \{1...5\}$, $B^1 = \{5' \text{ (n-doho)}\}$, $B^2 = \{10\}$, $B^3 = \{20\}$

A connective: {muci}

- ① Six and 7 are $/1+5/$ and $/2+5/$. Eight is $/2 \times 4/$ and 9 is $/-1+10/$.

$N_{1-9} = \{1...5, 1+5', 2'+5', 2' \times 4, -1+10'\}$

- ② The formation above 10 is $10 + \text{muci} + \{1...9\}$.

$N_{10-19} = B^2 \pm \text{muci} \pm \{N_{1-9}\}$

- ③ The method of counting above 20 may be vigesimal, but no data is available.

Notes: The words for 10 and 20 contain *mbla* or *mbl-* (1). If *mbla* and *mbl-* are subtracted, (a)ht'a and *ohnda* are obtained as the roots, but *t'a* and *da* seem to be more proper forms, if Ocuilteco is compared with the neighboring languages, Otomí and Mazahua.

Otomí [28]

	Sierra Otomí [ECHEGOYEN GLEASON 1979: 72-76]	Mezquital Otomí [HESS 1968: 63, 74-76]	
1	n'da	'nā	
2	yoho	yóho	
3	hyu	hñū	
4	goho	gohó	
5	kit'a	kát'a	
6	'dato	'ráto	
7	yoto	yotó	
8	hyato	hñáto	
9	gito	gə̀tò	
10	'dæt'a	'rét'a	
11	'dæ'mada		10+1
12	'dæ'mayoho	'rét'a ma yóho	10+2
13	'dæ'mahyu	'rét'a ma hñū	10+3
14	'dæ'magoho		10+4
15	'dæ'makit'a		10+5
16	'dæ'ma'dato		10+6
17	'dæ'mayoto		10+7
18	'dæ'mahyato		10+8
19	'dæ'magito		10+9
20	'dote	'náte	
21	'dote ma 'da		20+1
22	'dote ma yoho		20+2
23	'dote ma hyu		20+3
24	'dote ma goho		20+4
25	'dote ma kit'a		20+5
30	'dote ma 'dæt'a		20+10
40	yote	yo'ráte	2×te
50	yote ma 'dæt'a	yo'ráte ma 'rét'a/ندنθebé	2×20+10/ half 100
60	hyate	hñū'ráte	3×te
70	hyate ma 'd æt'a		3×20+10
74		hñū'ráte ma 'rét'a ma gohó	3×20+10+4
80	goho'dote	gohó'ráte	4×20
90	goho'dote ma 'dæt'a		4×20+10
99	goho'dote ma 'dæmagito		4×20+10+9

100	n'da siänto	'na nðebé	1×100
102	n'da siänto næ yoho		$1 \times 100 + 2$
111	n'da siänto næ 'dæ'mada		$1 \times 100 + 11$
128	n'da siänto næ 'dote ma hyäto		$1 \times 100 + 20 + 8$
140	n'da siänto næ yote		$1 \times 100 + 2 \times 20$
155	n'da siänto næ yote ma 'dæ'makit'a		$1 \times 100 + 2 \times 20 + 10 + 5$
200	yo siänto		2×100
300	hyu siänto		3×100
400	goho siänto		4×100
411		gohó nðebé ne 'rét'a ma 'ra	$4 \times 100 + 10 + 1$
500	kit'a siänto		5×100
1000	n'da mahuähi	'na 'mō	1×1000
1001		'na 'mō nē 'nä	$1 \times 1000 + 1$
4490		gohó 'mō nē gohó nðebé nē gohó	$4 \times 1000 + 4 \times 100 + 4 \times 20 + 10$
"5000"		kát'à 'mō	
"10000"	'dæt'a mahuähi		

Basic vocabulary:

$U = \{1 \dots 5\}$
 $B^1 = \{5' \text{ (to)}\}$, $B^2 = \{10 \text{ ('dæ')}\}$, $B^3 = \{20 \text{ (te)}\}$, $B^4 = \{100 \text{ (siänto)}\}$, $B^5 = \{1000 \text{ (mahuähi)}\}$

Derivative vocabulary:

$\{1', 2', 3', 4'\} = \{'da/'do, yo, hyä, gi\}$

Connectives: {ma, næ}

① Quinary.

$N_{1-5} = \{1 \dots 5\}$
 $N_{6-9} = \{1' \dots 4'\} + B^1$

② Since 15 is 10 + 5, it cannot be called quinary. It is better to think that the words from 10 to 19 are formed from 10 plus the numbers from 1 to 9.

$N_{11-19} = B^2 + ma + \{N_{1-9}\}$

③ Vigesimal from 20 to 99.

$N_{21-99} = \{1' \dots 4'\} \times B^3 + ma + \{N_{1-19}\}$

④ The numbers above 100 are formed from a new base 100, but the interval numbers follow the vigesimal method.

$N_{100-} = \{U'\} \times B^4 \pm$
 $N_{1000-} = \{U'\} \times B^5 \pm$

Mazahua [29]

[NÁGERA YAGUAS 1637: 6-8, 33] (Original transcription)

1	daha	
2	yehe	
3	eñhij	
4	zioho	
5	zicha	
6	nantto	1+5
7	yencho	2+5
8	ñincho	3+5
9	zincho	4+5
10	decha	

11	dechēdaha	10+1
12	dechēyehe	10+2
13	dechenñhij	10+3
14	dechēquioho	10+4
15	dechenquicha	10+5
16	dechēnantto	10+6
17	dechēyencho	10+7
18	dechēñincho	10+8
19	dechēquincho	10+9
20	yhotte	
30	yhottendecha	20+10
40	yheche	2×che
50	yhechendecha	2×20+10
60	ñhiche	3×che
70	ñhichendecha	3×20+10
80	zhiche	4×20
90	zhichendecha	4×20+10
100	zhichiche	5×20
110	zhichichendecha	5×20+10
120	ñanttiche	6×20
140	yhENCHICHE	7×20
160	ñhinchiche	8×20
180	zhinchiche	9×20
200	dechiche	10×20
210	dechichen decha	10×20+10
220	dechen daha enche	11×20
230	dechen daha enche quiziyeche	11×20+10
240	dechen yehe enche	12×20
250	dechen yehe enche quiziyeche	12×20+10
260	dechen ñhijenche	13×20
270	dechen ñhijenche quiziyeche	13×20+10
280	dechen quioho enche	14×20
290	dechen quioho enche quiziyeche	14×20+10
300	dechen quicha enche	15×20
320	dechen nantto enche	16×20
340	dechen yhencho enche	17×20
360	dechen ñhincho enche	18×20
380	dechen quincho enche	19×20
400	damo	
410	damo decha	400+10
420	damo dotte	400+20
430	damo dotten decha	400+20+10
440	damo yheche	400+2×20
450	damo yhechen decha	400+2×20+10
460	damo ñhiche	400+3×20
470	damo ñhichen decha	400+3×20+10
480	damo quiche	400+4×20
490	damo quichen decha	400+4×20+10
500	damo quicheche	400+5×20
600	damo dechiche	400+10×20

700	damo dechen quicha enche	$400 + 15 \times 20$
800	yemo	2×400
900	yemo quichiche	$2 \times 400 + 5 \times 20$
1000	yemo dechiche	$2 \times 400 + 10 \times 20$

Basic vocabulary:

$$U = \{1 \dots 5\}$$

$$B^1 = \{5' \text{ (to/ cho)}\}, B^2 = \{10 \text{ (decha)}\}, B^3 = \{20 \text{ (te/ che)}\}, B^4 = \{400 \text{ (mo)}\}$$

Derivative vocabulary:

$$\{1', 2', 3', 4', 5'\} = \{\text{nant, yen, ñin, zin, cho}\}, \{20'\} = \{\text{che}\}$$

$$\{1'', 2'', 3'', 4'', 5'' \dots\} = \{\text{yho, yhe, ñhi, zhi, zhichi} \dots\}$$

Connectives: {en, i}

① Quinary. The numbers from 6 to 9 are $\{1' \dots 4'\} + 5'$. The base for 5' is *to/cho*. As for the alternation of *to/cho*, when the preceding vowel is high and anterior, *to* changes to palatalized *cho*.

$$N_{1-5} = \{1 \dots 5\}$$

$$N_{6-9} = \{1' \dots 4'\} + 5'$$

② The words from 11 to 19 are formed from 10 plus with the numbers $\{1 \dots 9\}$ by means of a connective, *en*.

$$N_{11-19} = B^2 + \text{en} + \{N_{1-9}\}$$

③ Vigesimal above 20.

$$N_{21-399} = \{N_{1' \dots 19''}\} \times B^3 \text{ (-te/-i-che/-en-che)} \pm \{N_{1-19}\}$$

④ Since 400 is *da-mo* and 800 is *ye-mo*, they are analyzed as $\{D'\} \times mo$.

Tlapanec [30]

[SUÁREZ 1983a]

1	mba ¹	
2	a ³ hma ³	
3	a ² cu ¹	
4	a ² kho ³	
5	wi ² cu ²	
7	hu ² wą ²	
9	mi ² hna ¹ gu ³ wa ³	(mi ² hngi ² = "cerca")
10	gu ³ wa ³	
15	gu ³ wa ³ ni ¹ cu ²	10 + 5
17	gu ³ wa ³ ni ¹ cu ² e ³ hma ³	10 + 5 + 2
20	mba ² ski ¹ yu ¹	
35	mba ² ski ¹ yu ¹ gu ³ wa ³ ni ¹ cu ²	1 × 20 + 10 + 5
40	a ³ hma ³ ski ¹ yu ¹	2 × 20
59	a ³ hma ³ ski ¹ yu ¹ gu ³ wa ³ ni ¹ cu ² e ³ kho ³	2 × 20 + 10 + 5 + 4

(According to Suárez, the numeral just above is 55, but judging from its composition, it must be 59.)

$$\text{"100"} \quad mba^2 \text{ sye}^1 \text{to}^3 \quad 1 \times 100$$

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10\}, B^2 = \{15\}, B^3 = \{20\}, B^4 = \{100\}$$

Derivative vocabulary:

$2' = e^3hma^3$, $4' = e^3kho^3$ (perhaps $a \rightarrow e$ / # a -)

$5' = n + wi^2cu^2 > ni^2cu^2$

A connective: {-n-} The numbers 11 through 19 in Subtiaba and 15 in Tlapanec provide evidence that a connective -n- likely follows the morpheme for 10 in Tlapanec also.

① The numbers below 10 are decimal, but 9 appears to be $-1+10/$. According to Suárez, mi^2hna^1 is derived from $mi^2hngi'^2$, "near."

$N_{1-9} = \{1...9\}$

② The data for 11 through 19 are scanty, but the numbers above 15 are undoubtedly quinary.

$N_{15-19} = B^2 \pm \{1'...4'\}$

③ Vigesimal from 20 to 99.

$N_{20-99} = \{1...4\} \times B^3 \pm N_{1-19}$

④ The word for 100 is borrowed from Spanish.

$N_{100} = U \times B^4 \pm$

Subtiaba [D8]

[LEHMANN 1920: 926, 931, 960-961]

(original transcription with some abbreviation)

1	imba	imba	imba	
2	apu	apu	apu	
3	asu	assu	asu	
4	acu	asku	axku	
5	haisu/ hiusu	uissu	uisu	
6	mahu		maxu	
7	niquinu		kinu	
8	nuha		nua	
9	melnu		mænu	
10	guha/ gua		gua/ guha/ guxa	
11	gua-n-imba		gua-n-imba	10+1
12	gua-n-apu		gua-n-apu	10+2
13	gua-n-asu		gua-n-asu	10+3
14	gua-n-acu		gua-n-axku	10+4
15	gua-n-isu		gua-n-isu	10+5
16	gua-n-mahu		gua-n-maxu	10+6
17	gua-n-quinu		gua-n-kinu	10+7
18	gua-(n)-nuha		gua-n-nua	10+8
19	gua-n-melnu		gua-n-mænu	10+9
20	dino (diño)/imba diño/'ba diño		imba-diño/dado xda	
21	'ba-diño-imba-nu		imba-diño-imba-nu	1×20+1
22	'ba-diño-apu-nu		imba-diño-apu-nu	1×20+2
23	'ba-diño-asu-nu			1×20+3
30	'ba-diño-guha-nu		imba-diño-guha-nu	1×20+10
31	'ba-diño-gua-n-imba-nu			1×20+11
32	'ba-diño-gua-n-apu-nu			1×20+12
33	'ba-diño-gua-n-asu-nu			1×20+13
40	apu-diño		apu-diño	2×20
50	apu-diño-guha-nu		apu-diño-guha-nu	2×20+10

60	asu-diño	asu-diño	3×20
70	asu-diño-guha-nu		$3 \times 20 + 10$
80	acu-diño		4×20
90	acu-diño-guha-nu		$4 \times 20 + 10$
100	huisu-diño/guha-mba	guha-mbo	5×20 /great ten
200	guaha-diño	guaha-diño	10×20
400	diño-amba	diño-axmba	great twenty
1000	guha-isu-diño	guha-isu-diño	$10 \times 5 \times 20$
2000	huisu-diño-amba	isu-diño-axmba	5×400
4000	guha-diño-amba	gua-diño-axmba	10×400

Basic Vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10\}, B^2 = \{20\}, B^3 = \{400\}$$

Derivative vocabulary:

$$1' = 'ba, 5' = isu$$

Connectives: {-n-} {-nu}

①② The words from 1 to 19 follow the decimal method. A connective *-n-* is inserted between 10 and $\{1 \dots 9\}$.

$$N_{1-19} = \pm B^1 \pm n \pm U$$

③ The numbers above 20 are vigesimal, but 1000 is $10 \times 5 \times 20$. The formation is decimal.

$$N_{20-399} = N_{1-19} \times B^2 \pm (N_{1-19} + nu)$$

Ixcatēc [31]

[FERNÁNDEZ de MIRANDA 1961]

1	hngu ²	
2	yu ¹ hu ²	
3	nj ¹ hē ²	
4	ñu ¹ hū ¹ / ñu ¹	
5	š'q ¹	
6	šhø ³	
7	ya ² tu ²	
8	hni ¹	
9	nj ² hē ²	
10	u ² te ³	
11	u ² te ³ hngu ²	10 + 1
13	u ² te ³ nj ¹ hē ²	10 + 3
15	čj ¹ 'u ³	15
17	čj ¹ 'u ² yu ¹ hu ²	15 + 2
19	čj ¹ 'u ² ñu ¹ hū ¹	15 + 4
20	škā ¹	20
29	škā ¹ nj ² hē ²	20 + 9
30	škā ¹ u ² te ³	20 + 10
39	škā ¹ u ² te ³ nj ² hē ²	20 + 10 + 9
50	ya ¹ a'skā ² u ² te ³	$2 \times 20 + 10$
60	ye ¹ e'skā ²	3×20
100	syē ¹ ntu ¹	
400	ñu ¹ hū ¹ syē ¹ ntu ¹	4×100

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 (u^2te^3)\}, B^2 = \{15 (\check{c}i^1'u^3)\}, B^3 = \{20 (\check{s}ka^1)\}, B^4 = \{100\}$$

Derivative vocabulary:

$$\{2'\} = ya^1a^1, \{3'\} = ye^1e^1$$

① Decimal below 10.

$$N_{1-9} = \{1 \dots 9\}$$

② Quinary from 10 to 19.

$$N_{10-14} = B^1 \pm \{1 \dots 4\}$$

$$N_{15-19} = B^2 \pm \{1 \dots 4\}$$

③ Vigesimal from 20 to 99.

$$N_{20-99} = \{\#, 2', 3', 4'\} \times B^3 \pm \{N_{1-19}\}$$

④ The word for 100 is a Spanish loan.

$$N_{100} = U \times B^4 +$$

Chocho [33]

[Mock 1977]

1	ngu ²	
2	žu ¹²	
3	nie ¹²	
4	niu ²¹	
5	žu ² u ¹	
6	šu ²	
7	ža ³ du ³	
8	ši ¹	
9	na ³	
10	te ³	
11	tɔ ¹	
12	rxα ³	
13	še ² e ¹	
14	rxɔ ³	
15	rxɔ ¹ ʔ	15
16	rxɔ ¹ ʔ ku ²	15+1
17	rxɔ ¹ ʔ žu ¹²	15+2
18	rxɔ ¹ ʔ nie ¹²	15+3
19	rxɔ ¹ ʔ niu ²¹	15+4
20	kα ¹	
21	kα ¹ ku ²	20+1
22	kα ¹ žu ¹²	20+2
23	kα ¹ nie ¹²	20+3
24	kα ¹ niu ²¹	20+4
25	kα ¹ žu ² u ¹	20+5
26	kα ¹ šu ²	20+6
27	kα ¹ ža ³ du ³	20+7
28	kα ¹ ši ¹	20+8
29	kα ¹ na ³	20+9
30	kα ¹ te ¹	20+10
31	kα ¹ tɔ ¹	20+11

32	kā ¹ rxa ³	20+12
33	kā ¹ še ² e ¹	20+13
34	kā ¹ rxq ³	20+14
35	kā ¹ rxq ¹ ?	20+15
36	kā ¹ rxq ¹ ? ku ²	20+15+1
37	kā ¹ rxq ¹ ? žu ¹²	20+15+2
38	kā ¹ rxq ¹ ? nie ¹²	20+15+3
39	kā ¹ rxq ¹ ? niu ²¹	20+15+4
40	ža ²¹ kā ²	2×20
41	ža ²¹ k a ² ku ²	2×20+1
42	ža ²¹ k a ² žu ¹²	2×20+2
50	ža ²¹ k a ² te ³	2×20+10
55	ža ²¹ k a ² rxq ¹ ?	2×20+15
56	ža ²¹ k a ² rxq ¹ ?ku ²	2×20+15+1
60	nie ¹² kā ²	3×20
61	nie ¹² kā ² ku ²	3×20+1
70	nie ¹² kā ² te ¹	3×20+10
75	nie ¹² kā ² rxq ¹ ?	3×20+15
76	nie ¹² kā ² rxq ¹ ?ku ²	3×20+15+1
80	niu ²¹ kā ²	4×20
81	niu ²¹ kā ² ku ²	4×20+1
90	niu ²¹ kā ² te ³	4×20+10
95	niu ²¹ kā ² rxq ¹ ?	4×20+15
100	ngu ² sie ²¹ ntu ² ?	1×100

Basic vocabulary:

$$U = \{1 \dots 15\}$$

$$B^1 = \{15 \text{ (rxq}^1\text{?)}, B^2 = \{20 \text{ (k}^2\text{a}^2\text{)}, B^3 = \{100 \text{ (sie}^{21}\text{ntu}^2\text{?)}\}$$

①② The numbers 1 through 15 are fused and it is difficult to decompose the words. The words from 16 to 19 are formed by adding the numbers 1 through 4 to a new base 15.

$$N_{1-14} = \{1 \dots 14\}$$

$$N_{15-19} = B^1 + \{1 \dots 4\}$$

③ Vigesimal from 20 to 99.

$$N_{20-99} = \{\#, 2', 3', 4'\} \times B^2 \pm \{N_{1-19}\}$$

④ The word for 100 is a Spanish loan.

$$N_{100} = U \times B^3 +$$

Mazatec [34]

Chiquihuitlán Mazatec (û = ʷ, â = ʌ)

[JAMIESON 1988: 67-68] [THOMAS 1897-8: 888-890]

1	ngu	gu
2	ho	ho
3	hyā	ha
4	ñuḥu	ñi-hu
5	'ñu	ʷ
6	hyu	hu
7	yatu	yi-tu
8	hyi	hi-i
9	ñāḥa	ñi-ha

10	tə	te	
11	te-ngu	te-n-gu	10+1
12	te-ho	te-n-ho	10+2
13	te-hya	te-n-ha	10+3
14	te-ñuhū	te-ni-hu	10+4
15	tyhū'u	te-ū	15 (10+5)
16	tyhū'u-ngu	te-ū-n-gu	15+1 (10+5+1)
17	tyhū'u-ho	te-ū-n-ho	15+2 (10+5+2)
18	tyhū'u-hya	te-ū-n-ha	15+3 (10+5+3)
19	tyhū'u-ñuhū	te-ū-ñi-hu	15+4 (10+5+4)
20	kə	kə	20
21	kə-ngu	kə-n-gu	20+1
22	kə-ho	kə-n-ho	20+2
23	kə-hya	kə-n-ha	20+3
24	kə-ñuhū	kə-ñi-hu	20+4
25	kə-ñū	kə-ū	20+5
26		kə-hu (kə-ū-n-gu)	20+5+1
27		kə-yitu (kə-ū-n-ho)	20+5+2
28		kə-hii (kə-ū-n-ha)	20+5+3
29		kə-ñiha (kə-ū-ñi-hu)	20+5+4
30	kə-tə	kə-te	20+10
31		kə-te-n-gu	20+10+1
32		kə-te-n-ho	20+10+2
33		kə-te-n-ha	20+10+3
34		kə-te-ñi-hu	20+10+4
35	kə-tyhū'u	kə-te-ū	20+10+5
36	kə-tyhū'u-ngu	kə-te-hū (kə-te-ū-n-gu)	20+10+5+1
37		kə-te-yitu (kə-te-ū-n-ho)	20+10+5+2
38		kə-te-hii (kə-te-ū-n-ha)	20+10+5+3
39		kə-te-ñiha (kə-te-ū-ñi-hu)	20+10+5+4
40	ya-čə	yi-cha	2×20
41		yicha-ngu	2×20+1
46		yicha-hū (yicha-ū-ngu)	2×20+5+1
50	ya-čə-tə	yichite (or ichite)	2×20+10
51		ichite-ngu	2×20+10+1
55	ya-čə-tyhū'u		2×20+15
56		ichite-hū (ichite-ū-ngu)	2×20+10+5+1
60	hya-čə	ichite-ko-te	3×20 (2×20+10+10)
61		ichite-ko-te-ngu	2×20+10+10+1
66		ichite-ko-te-hū (ichite-kote-ngu)	2×20+10+10+5+1
70	hya-čə-tə	ichite-koho-kə	3×20+10 (50+20)
71		ichite-koho-kə-ngu	50+20+1
76		ichite-koho-kə-hū	50+20+5+1
80	ñuhū-čə	ichite-koho-kə-te	4×20 (50+20+10)
90		ichite-koho-yicha	50+40
95		ichite-koho-yicha-ū	50+40+5
96	ñuhū-čə-tyhū'u-ngu		4×20+15+1
100	ngu sientu	ū-cha	1×100 (5×20)
110		ū-cha-te	5×20+10
200	ho sientu	ho-ū-cha	2×100 (2×5×20)

245	ho sientu koho ya-čā'ñu	$2 \times 100 + 2 \times 20 + 5$
300	ha-ŭ-cha	$3 \times 5 \times 20$
1000	te-ŭ-cha	$10 \times 5 \times 20$
2000	ho-mi (ho-te-ŭ-cha)	$2 \times 1000 (10 \times 100)$
10000	te-mi	10×1000
20000	kā-mi	20×1000
30000	kāte-mi	$(20 + 10) \times 1000$
100000	ŭ-cha-te-ŭ-cha	$100 \times 10 \times 100$
110000	ŭ-cha-te-te-ŭ-cha	$(100 + 10) \times 10 \times 100$
130000	ŭ-cha-kāte-te-ŭ-cha	$(100 + 30) \times 10 \times 100$

Proto Mazatec [KIRK 1985]

1	*hku ³¹
2	*hau ²
3	*šhā ²
4	*ñu ³ hu ²
5	*'ñāu ²
6	*šhāu ⁴³
7	*ñā ³ tu ⁴³
8	*šh ²¹
9	*ñā ³ hā ⁴³
10	*te ³
15	*t'huau ³ u ²
20	*kā ⁴³
50	*ñā ⁴ čā ² te ³
100	*'ñāu ³ čā ³
400	*yuwa

Basic vocabulary:

$$U = \{1 \dots 10\}$$

$$B^1 = \{10' (te)\}, B^2 = \{15 (tyh\dot{u}'u)\}, B^3 = \{20 (kā)\}, B^4 = \{100 (sientu/ \dot{u}cha)\}$$

- ① The numbers 1 through 10 are decimal.

$$N_{1-9} = \{1 \dots 9\}$$

- ② The numbers 10 through 19 are quinary.

$$N_{10-14} = B^1 (*te^3) \pm \{1 \dots 4\}$$

$$N_{15-19} = B^2 (*t'huau^3u^2 < 10 + 5) \pm \{1 \dots 4\}$$

Thomas's data cited from Francisco Belmar [1905: 91-92] show more clearly than Jamieson's that 15 is 10+5.

- ③ Vigesimal from 20 to 99.

$$N_{20-99} = \{\#, 2', 3', 4'\} \times B^3 \pm \{N_{1-19}\}$$

In Jalapa de Díaz two current alternative systems exist for counting 26 through 29. One of these is formed by using $20 + 5 + \{1 \dots 4\}$. The numbers from 50 to 99 are $50 \pm \{1 \dots 49\}$.

- ④ There are two methods for forming the numbers from 100 up. A new base 100 (B^4) is expressed either by 5×20 or by the Spanish loan word for 100.

$$N_{100-} = \{\#, 2 \dots 9\} \times B^4 (*'ñāu^3čā^3/ \dot{u}cha) \pm \{N_{1-99}\}$$

Amuzgo [35]

[ANONYMOUS 1954]

1	kwi	
2	we	
3	nde	
4	nekie	
5	'aum	
6	nñam	
7	ntkie'	
8	nnę	
9	nhę	
10	ki	
11	ka-nčo-'kwi'	10+1
12	ka-nčo-we	10+2
13	ka-nčo-'nde	10+3
14	ka-nčo-nekie	10+4
15	ki-n-'aum	10+5
16	ki-n-'aum nčo-'kwi	10+5+1
17	ki-n-'aum nčo-we	10+5+2
18	ki-n-'aum nčo-nde	10+5+3
19	ki-n-'aum nčo-nekie	10+5+4
20	ntkyu	
21	ntkyu nčo-'kwi	20+1
22	ntkyu nčo-we	20+2
23	ntkyu nčo-nde	20+3
24	ntkyu nčo-nekie	20+4
25	ntkyu nčo-'aum	20+5
26	ntkyu nčo-'aum nčo-'kwi	20+5+1
27	ntkyu nčo-'aum nčo-we	20+5+2
28	ntkyu nčo-'aum nčo-nde	20+5+3
29	ntkyu nčo-'aum nčo-nekie	20+5+4
30	ntkyu nčo-ki	20+10
40	we-n'ą	2×20
50	we-n'ą nčo-ki	2×20+10
60	nde-n'ą	3×20
70	nde-n'ą nčo-ki	4×20+10
80	nekie-n'ą	4×20
90	nekie-n'ą nčo-ki	4×20+10
100	kwi sientó	1×100

Basic vocabulary:

$$U = \{1 \dots 10\}$$

$$B^1 = \{5 ('aum)\}, B^2 = \{10 (ki)/10' (ka)\}, B^3 = \{20 (n'ą)/20' (ntkyu)\}, B^4 = \{100 (siento)\}$$

Connectives: {-nčo-, -n-}

① Decimal under 10.

$$N_{1-9} = \{1 \dots 9\}$$

② Quinary from 10 to 19.

$$N_{11-14} = B^2 (ka) \pm nčo + \{N_{1-4}\}$$

$$N_{15-19} = B^2 (ki) \pm n \pm B^1 \pm n\check{o} \pm \{N_{1-4}\}$$

③ Vigesimal from 20 to 99.

$$N_{20-24} = B^3 (ntkyu) \pm n\check{o} \pm \{N_{1-4}\}$$

$$N_{25-29} = B^3 (ntkyu) \pm n\check{o} \pm B^1 \pm n\check{o} \pm \{N_{1-4}\}$$

$$N_{40-99} = \{2, 3, 4\} \times B^3 (n'a) \pm$$

④ The word for 100 is borrowed from Spanish.

$$N_{100} = \{U\} \times B^4 \pm$$

Mixtec [36]

Atlatluuca Mixtec [ALEXANDER 1980: 73-75] (Mixteca Alta)

1	i^2i^2	
2	u^2u^3	
3	u^2nj^3	
4	ku^2u^3	
5	$u^{2'}u^3$	
6	$i^2\bar{n}u^3$	
7	$u^2\check{s}a^3$	
8	u^3na^3	
9	i^2i^3	
10	$u^2\check{s}i^3$	
11	$u^2\check{s}i^3 i^2i^2$	10+1
12	$u^2\check{s}i^3 u^2u^3$	10+2
13	$u^2\check{s}i^3 u^2nj^3$	10+3
14	$u^2\check{s}i^3 ku^2u^3$	10+4
15	$\check{s}a^{2'}u^3$	
16	$\check{s}a^{2'}u^3 i^2i^2$	15+1
17	$\check{s}a^{2'}u^3 u^2u^3$	15+2
18	$\check{s}a^{2'}u^3 u^2nj^3$	15+3
19	$\check{s}a^{2'}u^3 ku^2u^3$	15+4
20	o^2ko^3	
21	$o^2ko^3 i^2i^2$	20+1
30	$o^2ko^3 u^2\check{s}i^3$	20+10
35	$o^2ko^3 \check{s}a^{2'}u^3$	20+15
38	$o^2ko^3 \check{s}a^{2'}u^3 u^2nj^3$	20+15+3
40	$u^2u^3 \check{s}i^2ko^3$	2×20
50	$u^2u^3 \check{s}i^2ko^3 u^2\check{s}i^3$	2×20+10
60	$u^2nj^3 \check{s}i^2ko^3$	3×20
70	$u^2nj^3 \check{s}i^2ko^3 u^2\check{s}i^3$	3×20+10
80	$ku^2u^3 \check{s}i^2ko^3$	4×20
90	$ku^2u^3 \check{s}i^2ko^3 u^2\check{s}i^3$	4×20+10
99	$ku^2u^3 \check{s}i^2ko^3 \check{s}a^{2'}u^3 ku^2u^3$	4×20+15+4
100	sien (to)	
400	ku^2u^3 siento	4×100
5000	$u^{2'}u^3$ mil	5×1000

Silacayoapan Mixtec [NORTH and SHIELDS 1978: 19-22] (Mixteca Baja)

1	i^2
2	i^3vi^3
3	u^3nj^3

4	kɔ³mj³	
5	u³³u³	
6	j³ñu³	
7	u³sa³	
8	u³na³	
9	j³	
10	u³šu³	
11	u³šu³ j²	10+1
12	u³šu³ i³vi³	10+2
13	u³šu³ u³nj³	10+3
14	u³šu³ kɔ³mj³	10+4
15	sɔ³³u³	
16	sɔ³³u³ j²	15+1
17	sɔ³³u³ i³vi³	15+2
18	sɔ³³u³ u³nj³	15+3
19	sɔ³³u³ kɔ³mj³	15+4
20	o³ko³	
21	o³ko³ j²	20+1
22	o³ko³ i³vi³	20+2
23	o³ko³ u³nj³	20+3
24	o³ko³ kɔ³mj³	20+4
25	o³ko³ u³³u³	20+5
26	o³ko³ j³ñu³	20+6
27	o³ko³ u³sa³	20+7
28	o³ko³ u³na³	20+8
29	o³ko³ j³	20+9
30	o³ko³ u³šu³	20+10
31	o³ko³ u³šu³ j²	20+10+1
32	o³ko³ u³šu³ i³vi³	20+10+2
35	o³ko³ sɔ³³u³	20+15
36	o³ko³ sɔ³³u³ j²	20+15+2
40	i³vi³ hi²ko²	2×20
41	i³vi³ hi²ko² j²	2×20+1
45	i³vi³ hi²ko² u³³u³	2×20+5
50	i³vi³ hi²ko² u³šu³	2×20+10
51	i³vi³ hi²ko² u³šu³ j²	2×20+10+1
55	i³vi³ hi²ko² sɔ³³u³	2×20+15
60	u³nj³ hi²ko²	3×20
65	u³nj³ hi²ko² u³³u³	3×20+5
70	u³nj³ hi²ko² u³šu³	3×20+10
75	u³nj³ hi²ko² sɔ³³u³	3×20+15
80	kɔ³mj³ hi²ko²	4×20
85	kɔ³mj³ hi²ko² u³³u³	4×20+5
90	kɔ³mj³ hi²ko² u³šu³	4×20+10
95	kɔ³mj³ hi²ko² sɔ³³u³	4×20+15
100	j² sientō	
1000	j² mil	

San Juan Colorado Mixtec [STARK et al. 1986: 200-201] (Mixteca Costa)

1 j² / jtu³u

2	uvi	
3	uñj	
4	kum j	
5	u'u	
6	jñu	
7	uca	
8	una	
9	j	
10	uci	
11	uci j	10+1
12	uci uvi	10+2
13	uci uñj	10+3
14	uci kumj	10+4
15	ca'u	
16	ca'u j	15+1
17	ca'u uvi	15+2
18	ca'u uñj	15+3
19	ca'u kumj	15+4
20	oko	
21	oko j	20+1
22	oko uvi	20+2
23	oko uñj	20+3
24	oko kumj	20+4
25	oko u'u	20+5
26	oko jñu	20+6
27	oko uca	20+7
28	oko una	20+8
29	oko j	20+9
30	oko uci	20+10
35	oko ca'u	20+15
40	uvi šiko	2×20
45	uvi šiko u'u	2×20+5
50	uvi šiko uci	2×20+10
55	uvi šiko ca'u	2×20+15
60	uñj šiko	3×20
65	uñj šiko u'u	3×20+5
70	uñj šiko uci	3×20+10
75	uñj šiko ca'u	3×20+15
80	kumj šiko	4×20
85	kumj šiko u'u	4×20+5
90	kumj šiko uci	4×20+10
95	kumj šiko ca'u	4×20+15
100	sientu	

Jicaltepec Mixtec [BRADLEY 1970: 51]

1	j ³ j ³
2	u'wi'
3	u'ni'
4	ku'mi'
5	u' ¹ u'

6	i'ñu¹
7	u¹ča¹
8	u¹na¹
9	ĩ¹ĩ¹
10	u¹či¹
15	ča¹'ũ¹
20	o¹ko¹

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10\}, B^2 = \{15\}, B^3 = \{20 \text{ (oko} \sim \text{šiko)}\}, B^4 = \{100\}$$

Derivative vocabulary:

$$20' = \text{šiko}$$

① Decimal below 10.

$$N_{1-9} = \{1 \dots 9\}$$

② Quinary from 10 to 19.

$$N_{10-14} = B^1 \pm \{1 \dots 4\}$$

$$N_{15-19} = B^2 \pm \{1 \dots 4\}$$

③ Vigesimal from 20 to 99.

$$N_{20-39} = B^3 \pm \{N_{1-19}\}$$

$$N_{40-99} = \{2, 3, 4\} \times 20' (\text{šiko}) \pm \{N_{1-19}\}$$

④ 100 is borrowed from Spanish.

$$N_{100} = \{U\} \times B^4 \pm \{N_{1-99}\}$$

Cuicatec [37]

[ANDERSON & CONCEPCIÓN ROQUE 1983]

1	a²ma²	
2	u⁴vi⁴	
3	i⁴nu⁴	
4	kũ⁴	
5	gu³'ũ³	
6	ga⁴	
7	nda⁴ča⁴	
8	ni³ni²	
9	nu³²	
10	ndi³či²	
11	ndi³ča²ma²	10+1
12	ndi³ču²vi²	10+2
14	ndi³či² kũ²⁴	10+4
15	ndi³t'i³yũ³	
16	ndi³t'i³yũ³ a²ma²	15+1
17	ndi³t'i³yũ³ u³vi³	15+2
18	ndi³t'i³yũ³ i³nu²	15+3
19	ndi³t'i³yũ³ kũ³⁴	15+4
20	ndi³ku²	
40	u⁴vi⁴ ga³ku³	2×20
50	u⁴vi⁴ ga³ku³ ndi³či²	2×20+10
70	i⁴nu⁴ ga³ku³ ndi³či²	3×20+10
80	kũ⁴ ga⁴ku¹	4×20

90	$ku^4 ga^4 ku^1 ndi^3 \check{ci}^2$	$4 \times 20 + 10$
100	siento	

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10\}, B^2 = \{15\}, B^3 = \{20 (ndi^3 ku^3 \sim ga^3 ku^3)\}, B^4 = \{100 (siento)\}$$

Derivative vocabulary:

$$20' = ga^3 ku^3$$

① Decimal below 10.

$$N_{1-9} = \{1 \dots 9\}$$

② Quinary from 10 to 19.

$$N_{10-14} = B^1 \pm \{1 \dots 4\}$$

$$N_{15-19} = B^2 \pm \{1 \dots 4\}$$

③ Vigesimal from 20 to 99.

$$N_{20-39} = B^3 \pm \{N_{1-19}\}$$

$$N_{40-99} = \{2, 3, 4\} \times 20' (ga^3 ku^3) \pm \{N_{1-19}\}$$

④ The word for 100 is borrowed from Spanish.

$$N_{100} = \{U\} \times B^4 \pm \{N_{1-99}\}$$

Trique [38]

[Good 1979]

1	'ngo ⁵³ /'ngoh ⁴³	
2	wui ⁵³	
3	wa ^{'5} ni ³	
4	ga ^{'5} a ³	
5	u ^{'5} u ³	
6	wata ^{'3}	
7	čih ⁴	
8	tj ^h ⁴	
9	'i ⁴	
10	či ^{'4}	
11	ža ⁵	10+1
12	žu ^{wih} ⁴	10+2
13	ža ^{'5} ni ³	10+3
14	žiga ^{'5} a ³	10+4
15	žinu ^{'3}	
16	žinu ^{'3} ya ⁴	15+1
17	žinu ^{'3} wui ⁵³	15+2
18	žinu ^{'3} wa ^{'5} ni ³	15+3
19	žinu ^{'3} ga ^{'5} a ³	15+4
20	ko ⁴	
21	ko ⁴ ya ⁴	20+1
30	ko ⁴ či ^{'4}	20+10
40	wui ⁵ žia ³	2×20
60	wa ^{'5} ni ⁵ žia ³	3×20
80	ga ^{'5} a ³ žia ³	4×20
100	sientu ³	

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 (\text{ži})\}, B^2 = \{15 (\text{žinų}'), B^3 = \{20 (\text{ko} \sim \text{žia})\}, B^4 = \{100 (\text{sientu}^3)\}$$

- ① Decimal below 10.

$$N_{1-9} = \{1 \dots 9\}$$

- ② Quinary from 10 to 19. It is not difficult to detect the morphemes for 1, 2, 3, and 4 in the numbers, 11 to 14.

$$11 = \text{ži} + \text{yā} > \text{žā}; 12 = \text{ži} + \text{wui} > \text{žuwih}; 13 = \text{ži} + \text{wa'ni} > \text{žanih}; 14 = \text{ži} + \text{gāā} > \text{žigāāh}$$

$$N_{10-14} = B^1 \pm \{1 \dots 4\}$$

$$N_{15-19} = B^2 \pm \{1 \dots 4\}$$

- ③ Vigesimal from 20 to 99.

$$N_{20-39} = B^3 \pm \{N_{1-19}\}$$

$$N_{40-99} = \{2, 3, 4\} \times 20' (\text{žia}) \pm \{N_{1-19}\}$$

- ④ The word for 100 is borrowed from Spanish.

$$N_{100} = \{U\} \times B^4 \pm \{N_{1-99}\}$$

Zapotec [39]

I have given data from two classical Zapotec and three modern Zapotec languages. It is clear that the numerals below 10 have a common origin, although some phonological changes have taken place. However, the numerals above 10 vary, while numerals above 20 vary even more than those below 20.

Classical Zapotec [CÓRDOVA 1578] (Original transcription)

1	tobi/ chaga	
2	topa/ cato	
3	chona/ cayo	
4	tapa/ taa	
5	caayo	
6	xopa	
7	caache	
8	xoono	
9	caa / gaa	
10	chij	
11	chij-bi-tobi	10+1
12	chij-bi-topa/ chij-bi-cato	10+2
13	chijño/ chij-bi-chona	10+3
14	chij-taa	10+4
15	chino/ ce-caayo-quizaha-calle	15/-5+20
16	chino-bi-tobi	15+1
17	chino-bi-topa/ chino-bi-cato/ ce-chona-quizaha-calle	15+2/-3+20
18	chino-bi-chona/ ce-topa-calle/ ce-topa-quizaha-calle	15+3/-2+20
19	chino-bi-tapa/ ce-tobi-calle/ ce-tobi-quizaha-calle	15+4/-1+20
20	calle	
21	calle-bi-tobi	20+1
22	calle-bi-topa/ calle-bi-cato	20+2
23	calle-bi-chona/ calle-bi-cayo	20+3
24	calle-bi-tapa/ calle-bi-taa	20+4
25	calle-bi-caayo	20+5
26	calle-bi-xopa	20+6

27	calle-bi-caache	$20+7$
28	calle-bi-xono	$20+8$
29	calle-bi-gaa	$20+9$
30	calle-bi-chij	$20+10$
31	calle-bi-chij-bi-tobi	$20+10+1$
32	calle-bi-chij-bi-topa	$20+10+2$
33	calle-bi-chijño/ calle-bic-hij-bi-chona	$20+10+3$
34	calle-bi-chij-taa/ calle-bi-chij-bi-tapa	$20+10+4$
35	calle-bi-chino/ ce-caa-toua/ ce-caayo-toua/ cegaago-quizaha-chaatoua	$20+15/-5+40$
36	calle-bi-chij-bi-xopa /ce-caayo-toua-bi-tobi/ ce-tapa-caca-quizaha-chaatoua	$20+10+6/-5+40+1/-4+40$
37	calle-bi-chij-bi-cache/ ce-caayo-toua-bi-topa/ ce-chona-caca-quizaha-chaatoua	$20+10+7/-5+40+2/-3+40$
38	calle-bi-chij-bi-xono/ ce-caayo-toua-bi-chona/ ce-topa-caca-quizaha-chaatoua	$20+10+8/-5+40+3/-2+40$
39	calle-bi-chij-bi-caa / ce-caa (caayo)-toua-bi-tapa/ ce-tobi-caca-quizaha-chaatoua	$20+10+9/-5+40+4/-1+40$
40	toua	2×20
41	toua-bi-tobi	$2 \times 20+1$
42	toua-bi-topa	$2 \times 20+2$
43	toua-bi-chona/ toua-bi-cayo	$2 \times 20+3$
44	toua-bi-tapa	$2 \times 20+4$
45	toua-bi-caayo	$2 \times 20+5$
46	toua-bi-xopa	$2 \times 20+6$
47	toua-bi-caache	$2 \times 20+7$
48	toua-bi-xono	$2 \times 20+8$
49	toua-bi-gaa	$2 \times 20+9$
50	toua-bi-chij	$2 \times 20+10$
51	toua-bi-chij-bi-tobi	$2 \times 20+10+1$
52	toua-bi-chij-bi-topa	$2 \times 20+10+2$
53	toua-bi-chij-bi-chona	$2 \times 20+10+3$
54	toua-bi-chij-bi-tapa/ toua-bi-chij-bi-taa	$2 \times 20+10+4$
55	ce-caa (caayo)-quiona (cayona)/ ce-caayo-zaa-quizaha-chaacacacayona	$-5+3 \times 20$
56	ce-caayo-quiona-bi-tobi/ ce-tapa-caca-quizaha-chaacayona	$-5+3 \times 20+1/-4+3 \times 20$
57	ce-caa (gaayo)-quiona-bi-topa/ ce-chona-caca-quizaha-chaacayona	$-5+3 \times 20+2/-3+3 \times 20$
58	ce-caa (gaayo)-quiona-bi-chona/ ce-topa-caca-quizaha-chaacayona	$-5+3 \times 20+3/-2+3 \times 20$
59	ce-gaayo (caa)-quiona-bi-topa/ ce-tobi-caca-quizaha-chaacayona	$-5+60+4/-1+3 \times 20$
60	cayona	
61	cayona-bi-tobi	$3 \times 20+1$
62	cayona-bi-topa	$3 \times 20+2$
70	cayona-bi-chij	$3 \times 20+10$
71	cayona-bi-chij-bi-tobi	$3 \times 20+10+1$
72	cayona-bi-chij-bi-topa	$3 \times 20+10+2$
73	cayona-bi-chij-bi-chijño/ cayona-bi-chij-bi-chona	$3 \times 20+10+3$
74	cayona-bi-chij-bi-tapa/ cayona-bi-chij-taa	$3 \times 20+10+4$
75	ce-caa (caayo)-taa/ ce-caayo-caca-quezaha (quizaha)-chaataa	$5 > 4 \times 20$
76	ce-gaa (caayo)-taa-bi-tobi/ ce-tapa-quizaha-chaacacataa	

77	ce-caa (gaayo)-taa-bi-topa/ ce-chona-caca-quezaha-cha-a-taa	
78	ce-caa (caayo)-taa-bi-chona/ ce-topa-caca-cha-a-quezaha (quizaha)-taa	
79	ce-gaa (caayo)-taa-bi-tapa/ ce-tobi-caca-quezaha (quizaha)-cha-a-taa	
80	taa	
81	taa-bi-tobi	$4 \times 20 + 1$
82	taa-bi-topa	$4 \times 20 + 2$
90	taa-bi-chij	$4 \times 20 + 10$
91	taa-bi-chij-bi-tobi	$4 \times 20 + 10 + 1$
95	ce-caa (caayo)-quioa/ ce-caayo-caca-quezaha (quizaha)-cha-a-cayoa	$-5 + 5 \times 20$
96	ce-gaa (caayo)-quioa-bi-tobi/ ce-tapa-caca-quizaha-cha-a-cayoa	$-5 + 5 \times 20 + 1/ -4 + 5 \times 20$
97	ce-caa (gaayo)-quioa-bi-topa/ ce-chona-caca-cha-a-quezaha-cayoa	$-5 + 5 \times 20 + 2/ -3 + 5 \times 20$
98	ce-caa (gaayo)-quiyoa-bi-chona/ ce-topa-caca-quizaha-cha-a-cayoa	$-5 + 5 \times 20 + 3/ -2 + 5 \times 20$
99	ce-caa (gaayo)-quioa-bi-tapa/ ce-tobi-caca-cha-a-quezaha (quizaha)-cayoa	$-5 + 5 \times 20 + 4/ -1 + 5 \times 20$
100	cayoa	5×20
101	cayoa-bi-tobi	$5 \times 20 + 1$
110	cayoa-bi-chij	$5 \times 20 + 10$
115	ce-caa (gaa)-yoxopalle/ ce-caayo-caca-quizaha-cha-a-xopalalle	$-5 + 6 \times 20$
120	xopa-lalle	6×20
140	caache-lalle	7×20
160	xono-lalle	8×20
180	caa-lalle	9×20
200	chija	10×20
220	chija-calle	$10 \times 20 + 20$
240	chija-toua	$10 \times 20 + 2 \times 20$
260	chija-cayona	$10 \times 20 + 3 \times 20$
280	chija-taa	$10 \times 20 + 4 \times 20$
300	chinoua	15×20
320	chinoua-calle	$15 \times 20 + 20$
340	chinoua-toua	$15 \times 20 + 2 \times 20$
360	chinoua-cayona	$15 \times 20 + 3 \times 20$
380	chinoua-taa	$15 \times 20 + 4 \times 20$
400	tobi-ela/ chaga-ella	1×400
500	tobi-ela cayoa	$400 + 5 \times 20$
600	tobi-ela chija	$400 + 10 \times 20$
700	chaga-ela chinoua	$400 + 15 \times 20$
800	topa-el/ cato-ela	2×400
1000	cato-ella chija	$2 \times 400 + 10 \times 20$
1200	chona-ela/ cayo-ela	3×400
1600	tapa-ela	4×400
2000	caayo-ela/ gaayo-ela	5×400
3000	caache-ela chibachija	$7 \times 400 + 10 \times 20$
4000	chij-ela	10×400
6000	chino-ela	15×400
8000	chaga-zoti/ tobi-zoti/ calle-ela	$1 \times 8000/20 \times 400$
16000	topa (cato)-zoti	2×8000
24000	chona (cayo)zoti	3×8000

Basic vocabulary:

$U = \{1 \dots 9\}$

$B^1 = \{10 \text{ (chij)}\}$, $B^2 = \{15 \text{ (chino)}\}$, $B^3 = \{20 \text{ (calle)}\}$, $B^4 = \{400 \text{ (ela)}\}$, $B^5 = \{8000 \text{ (zoti)}\}$

Derivative vocabulary:

$20' = \text{ua, na, a, lalle}$; $400' = \text{el, ella}$

Connectives: $\{\text{bi, ce, quizaha}\}$

① Decimal below 10.

$N_{1-9} = \{1...9\}$

② Quinary from 10 to 19.

$N_{10-14} = B^1 \pm \{1...4\}$

$N_{15-19} = B^2 \pm \{1...4\}$ or $N_{15-19} = c \pm \{5...1\} + \text{quizaha} + B^3$

③ The formation above 20 is fundamentally vigesimal.

$N_{20-34} = B^3 \pm \{N_{1-14}\}$

$N_{35} = B^3 + B^2$ or $ce + 5 + B^3$

$N_{36-40} = B^3 + bi + B^1 + bi + \{1...4\}$, or $ce + 5 + 2 \times B^3 + \{1...4\}$, or
 $ce + \{4...1\} + caca \text{ quizaha } chaa + 2 \times B^3$

$N_{40-99} = \{2, 3, 4\} \times 20' \pm \{N_{1-19}\}$

Three or four numbers before the ranks (20, 2×20 , $3 \times 20...$) are expressed by three alternative methods. Thirty-five, for example: the numbers above 35 do not follow the same method as the numbers from 16 to 19. One method is decimal, like $20 + 10 + 5$, $20 + 10 + 6$, etc. Or 35 can be expressed by the subtraction of 5 from 40 and then 1, 2, 3, and 4 are added to form the numbers 36 to 39. The third method is a kind of subtraction, or more precisely backward counting, for example, 4 from 40, 3 from 40, etc. This is the only example of counting back as far as 4. The 5 numbers before the ranks above 40 are not formed on the decimal method but on the other two methods described above.

③④ The words above 100 seem to have been vigesimal.

$N_{20-399} = \{N_{1-19}\} \times 20 \pm \{N_{1-19}\}$

$N_{400-7999} = \{N_{1-19}\} \times 400 \pm \{N_{1-19}\}$

However, Córdova's examples actually show us a mixed system, where 200 and 300 become new bases and the intervals follow the vigesimal system. The numerals above 400 are also mixed.

Valle Zapotec 1823 [Peñafiel 1981: 60-61] (Original transcription)

1	toobi	
2	tioopa/ choopa	
3	choona	
4	taapa	
5	gaayo	
6	xoopa	
7	caache	
8	xoono	
9	gaa	
10	chy	
11	chy-bi-toobi	10+1
12	chy-tioopa	10+2
13	chi-ñoo	
14	chy-taa	10+4
15	chy-no	
16	chynoo-bi-tobi	15+1

17	chynoo-bi-tioopa	15+2
18	chinoo-bi-choona	15+3
19	chynoo-bi-taapa	15+4
20	calle	
21	calle-bi-toobi	20+1
22	calle-bi-tioopa	20+2
23	calle-bi-choona	20+3
24	calle-bi-taapa	20+4
25	calle-bi-gaallo	20+5
26	calle-bi-xoopa	20+6
27	calle-bi-gaache	20+7
28	calle-bi-xoono	20+8
29	calle-bi-gaa	20+9
30	calle-bi-chy	20+10
31	calle-bi-chy-toobi	20+10+1
32	calle-bi-chy-tioopa	20+10+2
33	calle-bi-chy-choona	20+10+3
34	calle-bi-chy-taapa	20+10+4
35	calle-bi-chy-gaayo	20+10+5
36	calle-bi-chy-xoopa	20+10+6
37	calle-bi-chy-gaache	20+10+7
38	calle-bi-chy-xoono	20+10+8
39	calle-bi-chy-gaa	20+10+9
40	tu-á/ tihua/ chua	3×20
41	tu-a-bi-toobi	3×20+1
50	tu-a-bi-chy	3×20+10
51	tu-a-bi-chy-toobi	3×20+10+1
60	cayoo-na	3×20
70	cayoo-na-bi-chy	3×20+10
80	ta-a	4×20
90	taa-bi-chy	4×20+10
100	cayoo-a	5×20
200	chy-á	10×20
300	chynó-a	15×20
400	toobi-eela	1×400
500	toobi-eela cayoo-a	1×400+5×20
600	toobi-eela chy-a	1×400+10×20
700	caaga-eela chyno	1×400+15×20
800	tioopa-eela	2×400
900	tioopa-eela cayoo-a	2×400+5×20
1000	caato-eela chy-a	1×400+10×20
2000	caayo-eela	5×400
3000	caache-eela chya	7×400+10×20
4000	chy-eela	10×400
5000	chy-bi-tioopa-eela	10+2•400
6000	chynoo-eela	15×400
7000	caache-eela	7•400
8000	calle-eela	20×400

Mitla Zapotec [BRIGGS 1961: 86-89]

1	tehb	
2	tyo'p	
3	čôn	
4	tahp	
5	gaí	
6	šo'p	
7	gáhdz	
8	šúhn	
9	gâ	
10	cû	
11	cubitêb	10+1
12	cubityó'p	10+2
13	cú'n	
14	cúdah	10+4
15	cûn	
16	cûnbitêb	15+1
17	cûnbitýó'p	15+2
18	cûnbičôn	15+3
19	cûnbitâp	15+4
20	gahl	
21	galbitêb	20+1
22	galbityó'p	20+2
23	galbičôn	20+3
24	galbitâp	20+4
25	galbigái	20+5
26	galbišo'p	20+6
27	galbigădz	20+7
28	galbišûn	20+8
29	galbigâa	20+9
30	galbicûu	20+10
31	galbicúbitêp	20+10+1
32	galbicúbitýó'p	20+10+2
40	tyûu	
41	tyubitêb	40+1
50	tyubicû	40+10
60	gayohn	
70	gayonbicû	60+10
80	tah	
90	tabicû	80+10
100	tegayû	1×5×20
200	tyop-gáyû	2×5×20
300	con-gáyû	3×5×20
350	con-gáyû garöl	3×5×20+half
1000	temil	

Juárez Zapotec [NELLIS and NELLIS 1983: 469-471]

A		B	
1	ttu ² bi ¹	ttu ² bi ¹	
2	ču ² ppa ¹	ču ² ppa ¹	
3	cu ² nna ¹	cu ² nna ¹	
4	ta ² ppa ²	ta ² ppa ²	
5	ga ³ yu ³	ga ³ yu ³	
6	šu ³ ppa ³	šu ³ ppa ³	
7	ga ² ci ¹	ga ² ci ¹	
8	šu ² nu ¹	šu ² nu ¹	
9	ga ³	ga ³	
10	ci ³ i ²	ci ³ i ²	
11	ci ² nia ²	ci ² nia ²	10+1
12	ci ² nu ²	ci ² nu ²	10+2
13	ci ² nu ² ce ³	ci ² nu ² ce ³	10+3
14	ci ² tá ²	ci ² tá ²	10+4
15	ci ³ nu ³	ci ³ nu ³	10+5
16	ci ³ i ² žu ³ ppa ³	ci ³ i ² žu ³ ppa ³	10+6
17	ci ² ni ²	ci ² ni ²	10+
18	ci ³ i ² žu ¹ u ² nu ²	ci ³ i ² žu ¹ u ² nu ²	10+8
19	če ³ nni ³ a ³	če ³ nni ³ a ³	
20	ga ² lli'a ¹	ga ² lli'a ¹	
21	ttu ² e ² ru'a ¹	ttu ² e ² ru'a ¹	1>40 (2×20)
22	ču ² ppa ¹ e ² ru'a ¹	ču ² ppa ¹ e ² ru'a ¹	2>40
30	ci ³ i ² e ² ru'a ¹	ci ³ i ² e ² ru'a ¹	10>40
31	ci ² nia ² e ² ru'a ¹	ci ³ i ² e ² ru'a ¹ yu ² u ¹ ttu ²	11>40/ 30+1
35	ci ³ nu ³ e ² ru'a ¹	ci ³ i ² e ² ru'a ¹ yu ¹ u ga ³ yu ³	15>40/ 30+5
40	ču ³ a ³	ču ³ a ³	2×20
41	ttu ² e ² yo ³ o ² na ²	ttu ² e ² yo ³ o ² na ²	1>60 (3×20)
59	če ³ nni ³ a ³ e ² yo ³ o ² na ²	ci ³ e ² yo ³ o ² na ² yu ¹ u ga ³	19>60
60	ga ² yu ² na ¹	ga ² yu ² na ¹	3×20
61	ga ² yu ² na ¹ ttu ² bi ¹	ga ² yu ² na ¹ yu ² u ¹ ttu ²	3×20+1
62	ga ² yu ² na ¹ ču ² ppa ¹	ga ² yu ² na ¹ yu ² u ¹ ču ² ppa ¹	3×20+2
70	ga ² yu ² na ¹ ci ³ i ²	ga ² yu ² na ¹ yu ² u ¹ ci ³ i ²	3×20+10
80	tá ²	tá ²	4×20
81	ta ² ttu ² bi ¹	ta ² ttu ² bi ¹	4×20+1
99	ta ² če ³ nni ³ a ³	ta ² ci ³ i ¹ yu ² u ¹ ga ³	4×20+19/ 4×20+10+9
100	(ttu) ga ² yu ³ a ³	(ttu ²) ga ² yu ³ a ³	5×20
101	ga ² yu ³ a ³ ttu ² bi ¹	ttu ² ga ² yu ³ a ³ yu ² u ¹ ttu ²	5×20+1
200	ču ² ppa ¹ ga ² yu ³ a ³	ču ² ppa ¹ ga ² yu ³ a ³	2×5×20
300	cu ² nna ¹ ga ² yu ³ a ³	cu ² nna ¹ ga ² yu ³ a ³	3×5×20
400	ta ² ppa ² ga ² yu ³ a ³	ta ² ppa ² ga ² yu ³ a ³	4×5×20

Yatzachí Zapotec [BUTLER 1980: 211-213]

1	to
2	čopə
3	šonə
4	tap

5	g ^w eyə'	
6	šop	
7	gažə	
8	šon' / šo'on	
9	ga	
10	ši	
11	šneX	
12	šiz̄in / šežin	
13	ši'in	
14	žda'	
15	šino' / šino'o	
16	ši'into	15 + 1
17	ši'inčopə	15 + 2
18	ši'inšonə	15 + 3
19	tg ^w alX	-1 + 20
20	galXə	
21	tojoa	1 > 40
22	čopəjoa	2 > 40
23	šonəjoa	3 > 40
24	tapejoa	4 > 40
25	g ^w eyə'əjoa	5 > 40
26	šopejoa	6 > 40
27	gažəjoa	7 > 40
28	šone'əjoa	8 > 40
29	gajoa	9 > 40
30	šijoa	10 > 40
31	šneXejoa	11 > 40
32	šiz̄inejoa / šežinejoa	12 > 40
33	ši'inejoa	13 > 40
34	žda'əjoa	14 > 40
35	šino'ojoa'	15 > 40
36	ši'intojoa	16 > 40
37	ši'inčopəjoa'	17 > 40
38	ši'inšonəjoa	18 > 40
39	tg ^w alXejoa	19 > 40
40	čoa	2 × 20
41	toyon	1 > 60
42	čopəyon	2 > 60
43	šonəyon	3 > 60
44	tapeyon	4 > 60
45	g ^w eyə'əyon	5 > 60
46	šopeyon	6 > 60
47	gažəyon	7 > 60
48	šone'eyon / šo'onyon	8 > 60
49	gayon	9 > 60
50	šiyon / gašXə g ^w eyoa	10 > 60 / "half 100"
51	šneXeyon / šneXyon	11 > 60
52	šiz̄ineyon / šiz̄inyon	12 > 60
53	ši'ineyon / ši'inyon	13 > 60
54	žda'ayon	14 > 60

55	šino'oyon	15 > 60
56	ši'intoyon	16 > 60
57	ši'inčopəyon/ ši'inčopyo	17 > 60
58	ši'inšonəyon	18 > 60
59	tgu ^w lXeyon/ tg ^w alXyon	19 > 60
60	gyon	
61	gyonto	60 + 1
62	gyončopə	60 + 2
63	gyonšonə	60 + 3
64	gyontap	60 + 4
65	gyong ^w ey ə'	60 + 5
66	gyonšop	60 + 6
67	gyongažə	60 + 7
68	gyonšon	60 + 8
69	gyonga	60 + 9
70	gyonši	60 + 10
71	gyonšneX	60 + 11
72	gyonšiz̄in/ gyonšez̄in	60 + 12
73	gyonši'in	60 + 13
74	gyonžda'	60 + 14
75	gyonšino' / gyonšino'o	60 + 15
76	gyonši'into	60 + 15 + 1
77	gyonši'inčopə	60 + 15 + 2
78	gyonši'inšonə	60 + 15 + 3
79	gyontg ^w alX	60 + 19
80	taplalX	
81	taplalXto	80 + 1
99	taplalXtg ^w alX	80 + 19
100	to g ^w eyoa/ g ^w eyə'alalX	1 × 5 × 20
101	to g ^w eyoa to	1 × 5 × 20 + 1
120	to g ^w eyoa galXə/ šoplalX	1 × 5 × 20 + 20/ 6 × 20
130	to g ^w eyoa šijoa	1 × 5 × 20 + 10 > 40
200	čopə g ^w eyoa	2 × 5 × 20
1000	tmil	
2000	čopə mil	

Isthmus Zapotec [PICKETT 1979: 160-161]

1	tobi
2	čupá
3	čoná
4	tapa
5	gaayu'
6	šoopa'
7	gažé
8	šonó
9	ga'
10	čii
20	gandé
100	ti gayuaa

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10\}, B^2 = \{15\}, B^3 = \{20\}, B^4 = \{100\}$$

Derivative vocabulary:

$$20' = a, na; 60' = yon, yoon'a'; 80' = ta', taplaX, \text{etc.}$$

① Decimal below 10.

$$N_{1-9} = \{1 \dots 9\}$$

② Quinary from 10 to 19.

$$N_{10-14} = B^1 \pm \{1 \dots 4\}$$

$$N_{15-19} = B^2 \pm \{1 \dots 4\}$$

However, it is difficult in Juárez Zapotec to extract the morphemes for 1, 2, and 3 except in 14. Sixteen is $10+6$, and 18 is $10+8$. The formation used seems to be decimal, but 17 and 19 do not seem to be analyzed as $10+7$ and $10+9$. The numbers under 20 show such different forms that we may say they are decimal. In Yatzachí Zapotec the words for 11, 12, and 13 are unanalyzable. Only 14 can be analyzed as $\check{z}da' < \check{s}i + ta'$, $10+4$. Nineteen seems to be back-count, $-1+20/$. In Mitla Zapotec, where a quinary method is clearly in use, 13 is very different from the general rule, being expressed by a peculiar form in all data. Where the numerals as far as 13 are different serves to remind us that there are only 13 numerals in the 260-day calendar. Nineteen in Yatzachí Zapotec is *tgwalX* ($< to-galX\partial$), which may be a conserved form of the subtractive method. The word for 50 may be expressed by the half-count, half of 100.

③ The formation above 20 is fundamentally vigesimal, but it varies from dialect to dialect.

$$N_{20-29} = B^3 \pm \{N_{1-9}\}$$

$$N_{30-39} = B^3 + B^1 \pm \{N_{1-9}\}$$

$$N_{40-99} = \{2, 3, 4\} \times 20' \pm B^1 \pm \{N_{1-9}\}$$

In the source on Valle Zapotec, published in 1823, the numbers above 20 follow the vigesimal-decimal mixed method. Yatzachí and Juárez Zapotec use overcounting as far as 60, placing $\{1 \dots 19\}$ on the next rank. For example, 21 is expressed as 1 and 40. The formation of the numbers from 60 up is done by undercounting.

$$N_{21-59} = \{N_{1-19}\} + \{2, 3\} \times 20'$$

$$N_{60-99} = \{3, 4\} \times 20' + \{N_{1-19}\}$$

③④ 100 is expressed as 5×20 , which becomes a new base.

$$N_{100} = \{U\} \times B^4 \pm \{N_{1-99}\}$$

Yatzachí has two alternates for 120. One is $1 \times 5 \times 20 + 20$, and the other is 6×20 .

Chatino [40]

[PRIDE and PRIDE 1970]

1	caka
2	tuk ^w a
3	sna
4	hak ^w a
5	ka'yu
6	sk ^w a
7	kati
8	snu'
9	kaa
10	tii

11	tičaka	10+1
12	tiťuk ^w a	10+2
13	tišna	10+3
14	tihlyak ^w a	10+4
15	tiñu	
16	tiñu čaka	15+1
17	tiñu t ^y uk ^w a	15+2
18	tiñu šna	15+3
19	tiñu hlyak ^w a	15+4
20	kala	
21	kala nduk ^w a caka	20+1
25	kala nga'yu	20+5
30	kala t ^y ii	20+10
31	kala tyii nduk ^w a caka	20+10+1
35	kala t ^y ii nga'yu/ kala ndi'ñu	20+10+5 /20+15
40	tu'ba	
45	tu'ba nga'yu	40+5
50	tu'ba t ^y ii	40+10
55	tu'ba t ^y ii nga'yu	40+10+5
60	snā yala	3×20
65	snā yala nga'yu	3×20+5
70	snā yala t ^y ii	3×20+10
75	snā yala t ^y ii nga'yu	3×20+10+5
80	hak ^w a yala	4×20
85	hak ^w a yala nga'yu	4×20+5
90	hak ^w a yala t ^y ii	4×20+10
95	hak ^w a yala t ^y ii nga'yu	4×20+10+5
100	ska sientō	1×100
101	ska sientō nduk ^w a caka	1×100+1
150	ska sientō kla'be	1×100+half
500	ka'yu sientō	5×100
1000	tii sientō	10×100
2000	kala sientō	20×100

Basic vocabulary:

$$U = \{1...9\}$$

$$B^1 = \{10 (ti)\}, B^2 = \{15 (tiñu)\}, B^3 = \{20\}, B^4 = \{100\}$$

Derivative vocabulary:

$$20' = yala, 40 = tu'ba (tu'ba > tuk^w a + yala)$$

Connectives: {y} {nduk^wa} {n}

① Decimal below 10.

$$N_{1-9} = \{1...9\}$$

② Quinary from 10 to 19. If a connective -y- is postulated to be in use, the various palatalizations that occur in the words are readily explicable.

$$N_{10-14} = B^1 \pm y \pm \{1...4\}$$

$$N_{15-19} = B^2 \pm y \pm \{1...4\}$$

③ Vigesimal from 20 to 99.

$$N_{20-39} = kala \pm \{N_{1-19}\}$$

$$N_{40-59} = tu'ba \pm \{N_{1-19}\}$$

$N_{60-99} = \{3, 4\} \times 20' (yala) \pm \{N_{1-19}\}$
④ The word for 100 is borrowed from Spanish. It forms a new base for the words above 100.
 $N_{100-} = \{1 \dots\} \times B^4 \pm \{N_{1-99}\}$

Chinantec [41]

San Juan Lealao Chinantec [RUPP 1980: 125]

	inanimate	animate	
1	kə: ³	həy ³	
2	tɨ ⁴	á:y ⁴	
3	ni ³	a: y ³	
4	kʷu ³	kʷuy ³	
5	ñə ³	ñéy ³	
6	hñú: ³	hñú: u ³	
7	gʷá: ⁴	gʷé: y ⁴	
8	hñá ⁴	hñéy ⁴	
9	ñú ⁴	ñúy ⁴	
10	gʷá ⁴	gʷéy ⁴	
11	gʷá ⁴ kʷə: ³	gʷá ⁴ k ʷə:y ³	10+1
12	gʷá ⁴ tʷu ³	gʷá ⁴ tʷuy ³	10+2
20	gʷá: ³	gʷá: y ³	
21	gʷá: ³ zi ³² kə: ³	gʷé: y ³ zi ³² həy ³	20+1
30	gʷá ⁴ gʷá ³	gʷá ⁴ gʷéy ³	20+10
40	tú ⁴ lá: ³	tɨ ⁴ la: y ³	
50	tɨ ⁴ nə ⁴ gʷá ³	tɨ ⁴ nə ⁴ gʷéy ³	
100	kə: ³ ñálá: ³	kə: ³ ñál á:y ³	
1000	kə: ³ mil	kə: ³ mil	

Quioitepec Chinantec [ROBBINS 1968: 51, 76-77]

	inanimate	animate	
1	kəh ²³	həjh ²³	
2	tɨ ²	gai ³²	
3	ni ³	gaih ²³	
4	tʷi ²	tʷijh ²	
5	ñá ²	ñəjh ²	
6	hñi ^{h2}	hñijh ²	
7	dʷiá ³²	dʷai ³²	
8	hñá ²	hñəj ³²	
9	ñi ²	ñij ³²	
10	dʷá ²	dʷei ³²	
12	dʷa ³ tɨ ³	dʷa ³ tijh ³	10+2
14	dʷa ³ tʷi ³	dʷa ³ tʷijh ³	10+4
15	dʷa ³ ñá ²		10+5
18	dʷa ³ hñá ³	d ʷa ³ hñəjh ³	10+8
19	dʷa ³ ñi ³	dʷa ³ ñijh ³	10+9
20	dʷiáh ²	dʷai ^{h2}	
22	dʷiáh ² tɨ ³	dʷiáh ² tijh ³	20+2
24	dʷiáh ² tʷi ³	dʷiáh ² tʷijh ³	20+4
28	dʷiáh ² hñá ³	dʷiáh ² hñəjh ³	20+8

29	d'iah ² ñü ³	d'iah ² ñü ³ h ³	20+9
30	d'á ² d'a ³	d'á ² d'aih ³	
32	d'á ² d'a ³ tû ²		30+2
34	d'á ² d'a ³ t'û ²		30+4
38	d'á ² d'a ³ hñá ²		30+8
39	d'á ² d'a ³ ñü ²		30+9
40	tü ³ ló ³²	tü ³ lai ³²	
42	tü ³ ló ³² tû ²		40+2
44	tü ³ ló ³² t'û ²		40+4
47	tü ³ ló ³² d'ia ³²		40+7
48	tü ³ ló ³² hñá ²		40+8
49	tü ³ ló ³² ñü ²		40+9

Palantla Chinantec [MERRIFIELD 1968: 67-68]

	inanimate	(abstract)	animate	
1	këw ²	ku ²	hã ²	
2	tõ ³	tã ²	ow ³	
3	'niw ³²	'náy ³	úw ²	
4	k'û ²		k'õ ²	
5	'nyí ²		'nyá ²	
6	hgyéw ²		hgyó ²	
7	g'o ³		g'ow ³	
8	hgyi ³		hgya ³	
9	nyu ³		nyo ³	
10	g'i ³		g'a ³	
11	g'i ³ këw ³			10+1
15	g'i ³ 'nyí ²			10+5
20	g'éw ²		g'úw ²	
22	g'éw ² tõ ³			20+2
30	g'ew ² g'i ³		g'ew ² g'á ²	20+10
31	g'ew ² g'i ² rí ² zî ² këw ²			30+1
35	g'ew ² g'i ³ rí ² zî ² 'nyí ²			30+5
40	tõ ³ lãw ³		tõ ³ lúw ³	2×20
50	tõ ³ luw ² g'i ²		tõ ³ luw ² g'á ²	2×20+10
65	tõ ³ luw ² g'i ² rí ² zî ² g'i ³ 'nyí ²			50+10+5
100	nyí ² lëw ²		nyí ² lúw ²	5×20
225	tõ ³ nyí ² lëw ² rí ² zî ² g'éw ² nyí ²			2×100+20+5
1000	mey ³¹		mey ³¹	
2056	tõ ³ mey ³¹ rí ² zî ² tõ ³ luw ² g'i ² rí ² zî ² hgyéw ²			2×1000+50+6

The word forms differ depending on whether they are combined with animate or inanimate nouns. Although some morphemic changes are observed in the above dialects, the basic structure is described as follows:

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10\}, B^2 = \{20\}$$

①② Decimal below 20.

$$N_{1-19} = \pm B^1 + \{1 \dots 9\}$$

③ Vigesimal from 20 to 99.

$$N_{20-39} = B^2 \pm \{N_{1-19}\}$$

$$N_{40-99} = \{2, 3, 4\} \times 20' \pm \{N_{1-19}\}$$

In Palantla and Lealao Chinantec the following connectives are used except in 10.

Connectives: $\{r_i^2 z_i^2\} \{z_i^3\}$

The structure of 30 is well demonstrated in Palantla. In Quiotepec, on the other hand, it is difficult to analyze it due to assimilation.

Chiapanec [D9]

[LEHMANN 1920: 848, 876, 894, 896, 898] (Original transcription)

1	tike	tique, ticao	tiché	tique, tiqueh, tiqui, ndique, ticao	tiche
2	ju-mijí	hao, homo, hohmi, hohmime	hú-mihí	hao, hu-mihi	tū-mīsí
3	ja-miji	hauí, hehmi, hehmime	he-mihí	hauí, hie-mihi	tīhē-mīsí
4	jūa-mipi	haha	ahuá-mihi	aha-mihi, hua-mihi	tūā-mīsí
5	jaō-miji	hao, haomo, himo	hau-mihí	ao-mihi	tāhū-mīsí
6		hambana	hambá-mihi	amba-mihi	tāmbā-mīsí
7		hendi	hendi-mihi	hendi-mihi	tīndī-mīsí
8		haho	hahu-mihi	mahu-mihi	āsū-mīsí
9		heli-me	heli-mihi	heli-mihi	tīhīli-mīsí
10		henda, menda	henda	henda	tēndā
11	10+1		henda-mu-ndiché	henda-mu-ndique	tēndā-mū-ndichē
12	10+2			henda-cu-c-aó	tēndā-cū-c-āhú
13	10+3			henda-mu-y	
14	10+4			henda-m-ahua	
15	15			hendamu	
16	15+1			hendamu-mu-ndique	
17	15+2			hendamu-cu-caó	
18	15+3			hendamu-m-ahua	
19	15+4			hendamu-hua-mihi	
20		hue	ahué	ahua, hahua, haué, hahuy	āhsūc [ahsūé]
21	20+1			(h)ahua-mu-ndique	
22	20+2			ahua-mu-nhumé	
23	20+3			ahua-m-ahue	
24	20+4			ahua-mihi	
25	20+5			ahua-m-aó	
26	20+6			ahua-m-amba	
27	20+7			ahua-m-indi	
28	20+8			ahua-(m)-mahu	
29	20+9			ahua-[m]-heli-mihi	
30	20+10		ahe-mu-nda	ahua-mu-nda	āhsūē-mū-ndā
31	20+10+1			ahua-mu-nda-cu-tique	
40	2×20			humu-hu	tēhū-mū-sūc [sūé]
50	2×20+10			huhume-mu-nda	tū-mū-sē-mū-ndā
60	3×20			himu-hé	tīhī-mu-sūc[sūé]
61	3×20+1			himuhe-cu-tique	
70	3×20+10			hamuhe??	tīhī-mū-sē-mū-ndā
80	4×20				tā-mū-sē
90	4×20+10				tā-mū-sē-mū-ndā

100 5 × 20 haomohue haumu-he hau-mu-hé tãhũ-mũ-sẽ

Basic Vocabulary:

$U = \{1 \dots 9\}$

$B^1 = \{10\}$, $B^2 = \{15\}$, $B^3 = \{20\}$

Derivative vocabulary:

$\{1', 2', 3', 4'\} = \{\text{ndique, cu-caó, y/ahua, ahua}\}$, $20' = \text{hu/he}$

- ① Decimal below 10. The numerals from 2 up are suffixed by *-mihi*.

$N_{1-9} = \{1 \dots 9\}$

- ② Quinary from 10 to 19.

$N_{10-14} = B^1 \pm \{1' \dots 4'\}$

$N_{15-19} = B^2 \pm \{1' \dots 4'\}$

- ③ Vigesimal from 20 up.

$N_{20-39} = B^3 \pm \{N_{1-19}\}$

$N_{40} = \{2' \dots\} \times 20 \text{ (hu/ he)} \pm \{N_{1-19}\}$

Mangue [D10]

[LEHMANN 1920: 845, 848] (Original transcription)

1	teka	?	tike
2	nah	hausmi	jami
3	ho	jami	hajmi
4	hahome	nojo'h	haeme
5		haunsmij	jagusmi

The source lists the numbers only up to 5. The numerals correspond to those of Chiapanec.

Huave [42]

[STAIRS and STAIRS 1981: 395-399]

In Huave the numerals take 6 different forms depending on the modified noun, but this variability is restricted to the numbers from 1 to 3.

	rectangular / round, square	/long, thin	/time, turn	/ year	/ day
1	nop / noik	/ noc	/ nomb	/ nomb	/ noik
2	ihpiw / ihkiaw	/ ihciw/	/ ihmbiw	/ iim	/ ik
3	arohpiw / areh	/ arohciw	/ arohmbiw	/ aroomb	/ er
4	pikiw				
5	akokiaw				
6	anaíw				
7	ayaíw				
8	ohpeakiw				
9	ohkiyeh				
10	gahpowiw/ gahpawiw				
11	gahpanoik/ gahpanop/ gahpanoc		10+1		
12	gahpik/ pahpiip/ gahpiic		10+2		
13	gahpar		10+3		
14	gahpopeik		10+4		
15	gahpokoik		10+5		
16	gahponiy		10+6		
17	gahpoyay		10+7		

18	gahpopeak	$10+8$
19	gahpoki	$10+9$
20	nimiow	
21	nimiow noik	$20+1$
30	nimiow gahpowiw	$20+10$
31	nimiow gahpanoik	$20+10+1$
40	ik miow	2×20
41	ik miow noik	$2 \times 20+1$
50	ik miow gahpowiw	$2 \times 20+10$
60	er miow	3×20
70	er miow gahpowiw	$3 \times 20+10$
80	peik miow	4×20
90	peik miow gahpowiw	$4 \times 20+10$
100	koik miow	5×20
101	koik miow noik	$5 \times 20+1$
110	koik miow gahpowiw	$5 \times 20+10$
120	koik miow nimiow	$5 \times 20+20$
130	koik miow nimiow gahpowiw	$5 \times 20+20+10$
140	koik miow ik miow	$5 \times 20+2 \times 20$
150	koik miow ik miow gahpowiw	$5 \times 20+2 \times 20+10$
160	koik miow er miow	$5 \times 20+3 \times 20$
170	koik miow er miow gahpowiw	$5 \times 20+3 \times 20+10$
180	koik miow peik miow	$5 \times 20+4 \times 20$
190	koik miow peik miow gahpowiw	$5 \times 20+4 \times 20+10$
200	ihkiaw akoik miow/ gahpow miow	$2 \times 5 \times 20 / 10 \times 20$
300	areh akoik miow	$3 \times 5 \times 20$
400	pikiw akoik miow	$4 \times 5 \times 20$
500	akokiaw akoik miow	$5 \times 5 \times 20$

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10' \text{ (gahpa-} \sim \text{gahpo-)}\}, B^2 = \{20 \text{ (miow)}\}, B^3 = \{5 \times 20\}$$

Derivative vocabulary:

$$U' = \{1' \dots 9'\}, 1'' = (\text{ni}), 3'' = (\text{er})$$

①② Decimal below 20. The first digits below 20 correspond to $U\{1 \dots 9\}$, as is shown below, although some differences are observed. The first 3 numbers take different forms which seem to result from a combination of the number and classifier.

	Digits	The first digits in the 10'.
"1"	noik/ nop/ noc	-noik/ -nop/ -noc
"2"	ihkiaw/ ihpiw/ ihciw	-ik/ -iip/ -iic
"3"	ar-	-ar
"4"	pikiw	-peik
"5"	a-kokiaw	-koik
"6"	a-naíw	-niy
"7"	a-yaíw	-yay
"8"	oh-peak-iw	-peak
"9"	oh-kiy-eh	-kiy

$$N_{1-9} = U$$

$$N_{10-19} = B^1 \pm U'$$

③④ Vigesimal from 20 to 99. The numerals above 100 are formed from a new base, 5×20 .

$$N_{20-99} = \{1'', 2', 3'', 4'\} \times B^2 \pm \{N_{1-19}\}$$

$$N_{100+} = \{\#, 2\ldots\} \times B^3 + \{N_{1-99}\}$$

Oaxaca Chontal [43]

Highland Chontal (Tequistlatec)

The numbers from 2 to 5 in Turner's data are distinguished according to their classification as animate or inanimate. The animate forms are apparently formed by adding the morpheme *-ši* or *-ci*.

[WATERHOUSE 1980: 148-149] [TURNER & TURNER 1971: 360-361]

1	anuli	anuli	
2	oke'	oge' / ogeši	
3	afane'	afane' / afanci	
4	amalpu'	amalbu' / amalhši	
5	amake'	amage' / amahši	
6	akamc'us	agamc'ús	
7	akayci	agaycí	
8	apayko	abaygo	
9	apella	abella	
10	imbama'	imbama'	
11	imbamah nuli	imbamah nuli	10+1
12	imbamah koke'	imbamah goge'	10+2
13	imbamah fane'	imbamah fane'	10+3
14	imbamah malpu'	imbamah malbu	10+4
15	imbamah make'	imbamah mage'	10+5
16	imbamah kamc'us	imbamah gamc'ús	10+6
17	imbamah kayci	imbamah gaycí	10+7
18	imbamah payko	imbamah baygo	10+8
19	imbamah pella	imbamah bella	10+9
20	anušans	anušans	20
21		anušans nuli	20+1
22		anušans goge'	20+2
23		anušans fane'	20+3
24		anušans malbu	20+4
25	anušans make'	anušans mage'	20+5
30	anušans kimbama'	anušans gimbama'	20+10
35	anušans kimbama' make'		20+10+5
40	okeh nušans	oge'nušans	2×20
45	okeh nušans make'		2×20+5
50	okeh nušans kimbama'	oge'nušans gimbama'	2×20+10
55	okeh nušans kimbamah make'		2×20+10+5
60	afaneh nušans	afane'nušans	3×20
65	afaneh nušans make'		3×20+5
70	afaneh nušans kimbama'	afane'nušans gimbama'	3×20+10
75	afaneh nušans kimbamah make'		3×20+10+5
80	amalpuh nušans	amalbu' nušans	4×20
85	amalpuh nušans make'		4×20+5
90	amalpuh nušans kimbama'	amalbu' nušans gimbama'	4×20+10

95	amalpuh nušans kimbamah make'	$4 \times 20 + 10 + 5$
100	amašnu'	anulih mašnu/ amage'nušans $1 \times 100/5 \times 20$
200		oge'mašnu/ imbamah nušans $2 \times 100/10 \times 20$
300		afaneh mašnu/ imbamah mage'nušans $3 \times 100/(10+5) \times 20$
400		amalbuh mašnu/ anušans anušans $4 \times 100/20 \times 20$
500		amageh mašnu/ anušans mage'nušans $5 \times 100/(20+5) \times 20$
600		agamc'ús mašnu/ anušans gimbama'anušans $6 \times 100/(20+10) \times 20$
700		agaycí mašnu/ anušans gimbamah mage'anušans $7 \times 100/(20+10+5) \times 20$
800		abaygoh mašnu/ oge'nušans anušans $8 \times 100/2 \times 20 \times 20$
900		abellah mašnu/ oge' nušans mage'anušans $9 \times 100/(2 \times 20 + 5) \times 20$
1000		imbamah mašnu 10×100
2000		anušans mašnu 20×100
3000		anušans gimbamah mašnu $(20+10) \times 100$
4000		oge'nušans mašnu $2 \times 20 \times 100$
5000		oge'nušans gimbamah mašnu $(2 \times 20 + 10) \times 100$
6000		afane' nušans mašnu $3 \times 20 \times 100$
7000		afane' nušans gimbamah mašnu $(3 \times 20 + 10) \times 100$
8000		amalbuh nušans mašnu $4 \times 20 \times 100$
9000		amalbuh nušans gimbamah mašnu $(4 \times 20 + 10) \times 100$
10000		amage' nušans mašnu $5 \times 20 \times 100$

Lowland Chontal (Huamelultec)[WATERHOUSE 1985: 237-240]

The numbers from 2 to 7 take 2 forms, animate and inanimate.

1	ñul'í	
2	ukwe' / kwesi' (animate)	
3	fane' / fañči' (animate)	
4	malpu' / moŋsi' (animate)	
5	mage' (<ma(ne) ge "hand this") / mahsi' (animate)	
6	kañč'uš / kam'masi' (animate)	
7	kote' / kai'isi' (animate)	
8	malfa < 5+3?	
9	penla	
10	mbama'	
11	mbamah ñul'í	10+1
12	mbamah ukwe'	10+2
13	mbamah fane'	10+3
14	mbamah malpu'	10+4
15	mbamah mage'	10+5
16	mbamah kañč'uš	10+6
17	mbamah kote'	10+7
18	mbamah malfa	10+8
19	mbamah penla	10+9

20	ñušans	< *nu(li) *šans "one person"
21	ñušans ñul'i	20+1
30	ñušans kimbama'	20+10
40	ukweh ñušans	2×20
60	faneh ñušans	3×20
80	malpuh ñušans	4×20
100	masñu	100
500	mageh masñu	5×100
1000	mbamah masñu	10×100

Basic vocabulary:

$$U = \{1...9\}$$

$$B^1 = \{10\}, B^2 = \{20\}, B^3 = \{100\}$$

①② Decimal below 20. The numbers from 2 to 5 in Tequistlatec and from 2 to 7 in Huamelultec have both animate and inanimate forms. The animate forms may be derived from the inanimate ones by suffixation.

$$N_{1-19} = B^1 + U$$

③ Vigesimal from 20 through 99.

$$N_{20-99} = \{ \#, 2, 3, 4 \} \times B^2 \pm \{ N_{1-19} \}$$

④ The numerals from 100 up are formed on a new base, 100.

$$N_{100} = \{ \# / 1, \dots \} + B^3 \pm$$

However, they may also be formed on the base 20.

$$N_{100} = \{ 5 \dots \} \times B^2 \pm$$

Zoque [44]

Copainalá Zoque [HARRISON and GARCÍA H. 1981: 473-474]

1	tumi	
2	meca	
3	tuka'y	
4	makšku'y	
5	mohsa'y	
6	tuhta'y	
7	ku'ya'y	
8	tukutuhta'y	3+6
9	makstuhta'y	4+6
10	mahka'y	
11	maktuma'y	10+1
12	makwistihka'y	10+2
13	maktuka'y	10+3
14	makmaktasku'y	10+4
15	yihta'y	
16	yit-ko-tumi	15+1
17	yit-ko-meca	15+2
18	yit-ko-tuka'y	15+3
19	yit-ko-makšku'y	15+4
20	ips	
21	ips-ko-tumi	20+1
22	ips-ko-meca	20+2
23	ips-ko-tuka'y	20+3

24	ips-ko-makšku'y	20+4	
25	ips-ko-mos	20+5	
26	ips-ko-tuhta'y	20+6	
27	ips-ko-ku'ya'y	20+7	
28	ips-ko-tukutuhta'y	20+8	
29	ips-ko-makstuhta'y	20+9	
30	ips-ko-mak	20+10	
31	ips-ko-maktuma'y	20+10+1	
32	ips-ko-makwistihka'y	20+10+2	
33	ips-ko-maktuka'y	20+10+3	
34	ips-ko-makmaktasku'y	20+10+4	
35	ips-ko-yih	20+15	
36	ips-ko-yit-ko-tumi	20+15+1	
37	ips-ko-yit-ko-meca	20+15+2	
38	ips-ko-yit-ko-tuka'y	20+15+3	
39	ips-ko-yit-ko-makšku'y	20+15+4	
40	wistihki's	2×20	
41	wistihki's-ko-tumi	2×20+1	
50	wistihki's-ko-mak	2×20+10	
60	tuki's	3×20	
70	tuki's-ko-mak	3×20+10	
80	maktahsi's	4×20	
90	maktahsi's-ko-mak	4×20+10	
100	mohsi's	5×20	
101	mohsi's-ko-tumi	5×20+1	
120	mohsi's-ko-ips	5×20+20	
140	mohsi's-ko-wistihki's	5×20+2×20	
150	mohsi's-ko-wistihki's-ko-mak	5×20+2×20+10	
200	mahki's	10×20	
250	mahki's-ko-wistihki's-ko-mak	10×20+2×20+10	
300	yihti's	15×20	
320	yihti's-ko-ips	15×20+20	
400	tumi mone'	1×400	
500	tumi mone'-ko-mohsi's	1×400+5×20	
550	tumi mone'-ko-mohsi's-ko-wistihki's-ko-mak	1×400+5×20+2×20+10	
555	tumi mone'-ko-mohsi's-ko-wistihki's-ko-yit	1×400+5×20+2×20+15	
556	tumi mone'-ko-mohsi's-ko-wistihki's-ko-yit-ko-tumi	1×400+5×20+2×20+15+1	
600	tumi mone'-ko-mahki's	1×400+10×20	
700	tumi mone'-ko-yihti's	1×400+15×20	
800	meca mone'	2×400	
900	meca mone'-ko-mohsi's	2×400+5×20	
1000	meca mone'-ko-mahki's	2×400+10×20	
1100	meca mone'-ko-yihti's	2×400+15×20	
1200	tuka' mone'	3×400	
1600	makšku' mone'	4×400	
2000	mohsa' mone'	5×400	
8000	ips mone'	20×400	

Rayón Zoque [HARRISON and HARRISON 1984]

1 tumi

2	meca	
3	tuka'	
4	makšku'	
5	mosa'	
6	tuhta'	
7	ku'ya'	
8	tukuduhta'	3+6
9	makštuhta'	4+6
10	mahka'	
11	maktumi	10+1
12	makwistihka'	10+2'
13	maktuka'	10+3
14	mahkmaktasku'	10+4
15	yihta'	
16	yit-ko-tumi	15+1
17	yit-ko-meca	15+2
18	yit-ko-tuka'	15+3
19	yit-ko-makšku'	15+4
20	ips	
24	ips-ko-makšku'	20+4
30	ips-ko-mahka'	20+10
40	wistihkips	2×20
50	wistihkips-ko-mahk	2×20+10
60	tukips	3×20
70	tukips-ko-mahk	3×20+10
100	mohsips	5×20
400	mone'/tumi mone'	

Francisco León Zoque [ENGEL and ENGEL 1987: 355]

1	tumi	
2	meckuy	
3	tu'kay	
4	maksykuy	
5	mosay	
6	tuhtay	
7	ku'yay	
8	tukutuhtay	3+6
9	makstuhtay	4+6
10	mahkay	

The numerals from 11 up are Spanish.

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (mak)}\}, B^2 = \{15 \text{ (yit)}\}, B^3 = \{20 \text{ (ips)}\}, B^4 = \{400 \text{ (mone')}\}$$

Derivative vocabulary:

$$2' = \text{wis}, 2'' = \text{wistihk}, 3' = \text{tuku}, 4' = \text{makstuht}, 4'' = \text{maktask}, 4''' = \text{maktahs}$$

A connective: {ko}

① The numbers from 1 to 9 seem to have been quinary, but the forms for 8 and 9 are analyzed as 3+6 and 4+6, respectively. $-a'y \sim -u'y$ must be a suffix.

$$N_{1-10} = \{1 \dots 7, 3+6, 4+6, 10\}$$

- ② It becomes clearer that the numerals from 11 up are quinary.

$$N_{10-14} = B^1 \pm \{1', 2, ' 3, 4''\} \pm -a'y/-u'y$$

$$N_{15-19} = B^2 \pm ko \pm \{1, 2, 3, 4\} \pm -a'y/-u'y$$

- ③ The numerals from 20 to 99 are formed on a vigesimal basis.

$$N_{20-99} = \{\#, 2, ' 3, 4''\} \times B^3 \pm ko \pm \{N_{1-19}\}$$

- ④ From 100 through 399, 100 serves as the base on which the interval numerals are formed on a vigesimal basis. 100, 200 and 300 are expressed as 5×20 , 10×20 , and 15×20 , respectively.

$$N_{100-399} = \{5, 10, 15\} \times B^3 \pm ko \pm \{N_{1-19}\}$$

From 400 up, a new base 400 is introduced, but 100 continues to serve as a base, as in $500 = 400 + 5 \times 20$, $600 = 400 + 10 \times 20$.

$$N_{400-7999} = \{1 \dots 20\} \times B^4 \pm ko \pm \{N_{1-399}\}$$

Veracruz Zoque [45]

Texistepec Popoluca

[LEHMANN 1920: 779]

(Original transcription)

Sierra Popoluca

[ELSON 1960: 98, 1967: 282]

1	tum	tu:m-
2	huisna	wis-
3	tuguná	tuku-
4	bacsna	maktas
5	bosná	siŋkoh
6	tujna	
7	hues-tujná	
8	tug-tujná	
9	bacs-tujuná	
10	bacná	
11	bac-tumná	
12	bac'-huisná	
20	ipx-ña	
30	ipx-comoc	
40	vuusk-ipx	
100	box	

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (bak)}\}, B^3 = \{20 \text{ (ipš)}\}, B^4 = \{100 \text{ (boš)}\}$$

- ① The numerals from 1 to 9 seem to have been quinary, but the word forms can be analyzed as $7 = 2+6$, $8 = 3+6$, $9 = 4+6$.

$$N_{1-10} = \{1 \dots 6, 2+6, 3+6, 4+6, 10\}$$

- ② Due to lack of data, forms from 11 up are not clear, but it is possible that the numerals are formed from those below 10 added to the word for 10 (*bac*). Judging from other dialects, the numerals from 15 up are likely formed on a quinary basis.

- ③ The numerals from 20 through 99 seem to be vigesimal. A new word is introduced for 100. In Sierra Popoluca the numerals from 5 up are replaced by Spanish numerals. The word for 2 is *wis*. In Mixe and Zoque this morpheme appears only in derivative words such as 12 in Zoque and 7 in Mixe.

Veracruz Mixe [46]

(Lehmann's transcription is reserved.)

Sayula Popoluca			Oluta Popoluca	
[CLARK & CLARK 1974][LEHMANN 1920: 779]			[LEHMANN 1920: 779]	[CLARK 1981]
1	tu'k	tuc	tuc	tu'k
2	mečk	mechki	meshi/ meski	mesko
3	tú:gup	(tuguec?)	tugup/ tugeuk (tuhuek)	tuvi'k
4	máktašp	mactax	mactax	maktasko
5	mógošp	mogoxp	moxox-ko	mokoško
6	túhtup	tujtup	tujtup-ko	tuhtuhko
7		gux-tujtup	gux-tuku-tujtup	huštukuhtuhko
8		tugu-tujtup	tucujtujko	tukutuhko
9		tax-tujtup	tax-tujtujko	ta:stutuhko
10		macp	maco	maku
11		macpimuj-tup		
12		macpimuj-mechki	maco-muetmetz'ko	
20		ipx		i:pši
30		ipx-imucmap		
40		mech-ipx		
100	tu'k mun	tuc-mun		aukupuki
500				iškiipu:t kama

Basic vocabulary:

 $U = \{1...9\}$ $B^1 = \{10 \text{ (mak)}\}$, $B^3 = \{20 \text{ (ips)}\}$, $B^4 = \{100 \text{ (mun)}\}$

① The numerals from 1 to 9 seem to have been quinary, but the actual forms for 7, 8, and 9 in Sayula are 2+6, 3+6, and 4+6, respectively. In Oluta, the numerals from 6 through 9 are analyzed as 1+5, 2+3+6/2+3+5, 3+5, and 4+1+5.

 $N_{1-10} = \{1...6, 2+6, 3+6, 4+6, 10\}$

② Due to lack of data the formation from 11 up is not clear. Since 11 is 10 (*mac*)-*imuj*-1, and 12 is 10 (*mac*)-*imuj*-2, the formation is base-unit.

③ The numerals from 20 up seem to be vigesimal and a new word is introduced for the word for 100.

Mixe [47]

Totontepec [SCHOENHALS & SCHOENHALS 1982]			Tlahuitoltepec [LYON 1980: 132]	
1	to'k		tu'uk	
2	mehck		mahck	
3	to:hk		takA:k	
4	makta:šk		maktōšk	
5	mugō:šk		makošk	
6	tohtik		tutuhk	
7	vuštohtik		waštuhk	
8	todohtik		tuktuhk	
9	taštohtik		tōštuhk	
10	mahk		mōhk	
11	makto'k	10+1		
12	maktmehck	10+2		

13	makto:hk	10+3
14	makmahkc	10+4
15	makmōkš	10+5
16	maktoht	
17	makuštoht	
18	maktodoht	
19	maktaštoht	
20	i:'pš	
21	i:'pš to'k	20+1
30	i:'pš mahk	20+10
35	i:'pš makmōkš	20+15
40	vihštakupš	2×20
50	vihštakupšikmahk	2×20+10
60	to:gupš	3×20
70	to:gupšikmahk	3×20+10
80	mahktupš	4×20
90	mahktupšikmahk	4×20+10
400	makta:skmōkupš	4×5×20
500	mugōškmōkupš	5×5×20
700	vuštohtikmōkupš	7×5×20

Basic vocabulary:

$$U = \{1...4\}$$

$$B^1 = \{5' \text{ (tohtik/ tuhk)}, B^2 = \{10' \text{ (mak)}\}, B^3 = \{20' \text{ (upš)}\}, B^4 = \{100 \text{ (mōkupš} = 5 \times 20)\}$$

Derivative vocabulary:

$$1' = \text{toh/ tu}, 2' = \text{vuš/ wāš}, 3' = \text{to/ tuk}, 4' = \text{taš/ tōš},$$

$$2'' = \text{vihšt}, 3'' = \text{to:g}, 4'' = \text{mak}, 5'' = \text{mōk}$$

① The numerals from 1 to 9 seem to have been quinary. The quinary system is retained in Tlahuitoltepec, but in Totontepec the words from 7 up are analyzed as follows: $7 = 2 + 6$, $8 = 3 + 6$, and $9 = 4 + 6$.

$$N_{1-5} = \{1...5\}$$

$$N_{6-9} = \{1', 2', 3, 4'\} + B^1 \text{ (Tlahuitoltepec)}$$

$$N_{6-9} = \{\#, 2', 3, 4'\} + B^1 \text{ (Totontepec)}$$

② It is better to regard the numerals from 10 to 19 as being based on the decimal system.

$$N_{10-19} = B^2 + \{N_{1-9}\}$$

③ The numerals from 20 up are vigesimal.

$$N_{20-99} = \{\#, 2, ''\} \times B^3 \pm \{N_{1-19}\}$$

④ 100 is a new base.

$$N_{100} = \{\#, 2, ''\} \times B^4 \pm$$

Colonial Mixe (Traditional transcription is adopted.)

[QUINTANA 1890 (1730): 139-142, YASUGI 1991 :451-452]

[DE LA GRASSERIE 1898: 377]

1	tuuc	tzoc
2	metzc	metzk
3	tucòc	tukok
4	mactoxc	mactacxk
5	mocoxc	mokoxk
6	tuđuuc	

1+5

7	huextuuc	2+5	
8	tuctuuc	3+5	
9	taxtuuc	4+5	
10	mahc		mahk
11	mahc-tuuc	10+1	mohktuuk
12	mahc-metzc	10+2	mahkmetz
13	mahc-tucòc	10+3	mahtukòk
14	mahc-mactz	10+4	mahkmatkz
15	mahc-mocx	10+5	
16	mahc-tuduuc/ mahc-mocx-tuuc	10+1+5/ 15+1	
17	mahc-huextuuc/ mahc-mocx-metzc	10+2+5/15+2	
18	mahc-tuctuuc/ mahc-mocx-tucoc	10+3+5/15+3	
19	mahc-taxtuuc/ atuuc ca ypx	10+4+5/-1+20	
20	ypx		ipx
21	ypx-tuuc	20+1	ipx-tùùk
22	ypx-metzc	20+2	ipx-metz
23	ypx-tucòc	20+3	ipx-tukok
24	ypx-mactaxc	20+4	
25	ypx-mocoxc	20+5	
26	ypx-tuduuc	20+1+5	
27	ypx-huextuuc	20+2+5	
28	ypx-tuctuuc	20+3+5	
29	ypx-taxtuuc/ atuuc ca ypx-mahc	20+4+5/-1+20+10	
30	ypx-mahc	20+10	ipx-mahk
31	ypx-mahctuuc	20+10+1	ipx-mahkmetz
32	ypx-mahc-metzc	20+10+2	
33	ypx-mahc-tucòc	20+10+3	
34	ypx-mahc-mactz	20+10+4	
35	ypx-mahc-mocx	20+10+5	
36	ypx-mahc-tuduuc/ ypx-mahc-mocx-tuuc		20+10+6/20+10+5+1
37	ypx-mahc-huextuuc/ ypx-mahc-mocx-metzc		20+10+7/20+10+5+2
38	ypx-mahc-tuctuuc/ ypx-mahc-mocx-tucòc		20+10+8/20+10+5+3
39	ypx-mahc-taxtuuc/ atuuc ca huixticx		20+10+9/-1+40
40	huixticx	2×20	
50	huixticx-mahc	2×20+10	
60	tucopx	3×20	
80	mohctapx	4×20	
100	mocopx	5×20	
120	tuduupx	6×20	
140	huextuut	7×20	
160	tuctuut	8×20	
180	taxtuut	9×20	
200	maiquipx	10×20	
300	yucmocx	15×20	
400	tuucmoïñ	1×400	
500	tuucmoïñ co mocopx	1×400+5×20	
600	tuucmoïñ co maiquipx	1×400+10×20	
700	tuucmoïñ co yucmocx	1×400+10×20	
800	metzc moïñ	2×400+10×20	
900	metzc moïñ co mocopx	2×400+10×20	

1000 metzc moiñ co maiquipx

 $2 \times 400 + 10 \times 20$

Basic vocabulary:

 $U = \{1...5\}$ $B^1 = \{5'(\text{tuuc}), B^2 = \{10(\text{mahc})\}, B^3 = \{15(\text{mahc-mocx})\}, B^4 = \{20(\text{ypx})\}, B^5 = \{400(\text{moiñ})\}$

Derivative vocabulary:

 $1' = \text{tu}, 2' = \text{huex}, 3' = \text{tuc}, 4' = \text{tax}, 5' = \text{mocx}, 4'' = \text{mactz}$ $2'' = \text{huix}, 4'' = \text{mahc}, 5'' = \text{moc}, 20' = \text{ticx}, \text{òpx}, \text{tapx}, \text{upx}, \text{tuut}...$

① Quinary below 10.

 $N_{1-5} = \{1...5\}$ $N_{6-9} = \{1', 2', 3, 4'\} + B^1$

② There are two ways to form the numerals from 10 to 19. One is decimal and the other is quinary. The decimal system is based on the quinary method from 1 to 9. Therefore, the numbers from 1 through 9 may be regarded as based on the quinary system. The other quinary method is purer, but the base 15 is not an independent word but a compound of 10 and 5'. Nineteen is expressed by back-counting.

 $N_{10-14} = B^2 + \{\#, 1, 2, 3, 4''\}$ $N_{15-19} = B^2 + \{5', N_{6-9}\}$ $N_{15-18} = B^3 + \{1, 2, 3\}, N_{19} = a + 1 + ca + B^4$

③ The numerals from 20 up are vigesimal.

 $N_{20-399} = \{\#, 2'...\} \times B^4 \pm \{N_{1-19}\}$

The coefficients attached to B^4 are slightly different from $\{2...\}$. The base *ypx* also changes morphologically.

④ 400 is a new base.

 $N_{400} = \{1...\} \times B^5 \pm \{N_{1-399}\}$

Huastec [48]

[OCHOA PERALTA 1984: 92-93]

1	hu:n	
2	ča:b	
3	o:š	
4	če:'	
5	bo:'	
6	akak	
7	bu:k	
8	wašik	
9	bele:hu	
10	la:hu	
11	la:hu-hu:n	10+1
12	la:hu-ča:b	10+2
13	la:hu-o:š	10+3
14	la:hu-če:'	10+4
15	la:hu-bo:'	10+5
16	la:hu-akak	10+6
17	la:hu-bu:k	10+7
18	la:hu-wašik	10+8
19	la:hu-bele:hu	10+9
20	hu:n inik / la:hu la:hu	1 × 20/10+10

21	hu:n inik hu:n	$1 \times 20 + 1$
30	hu:n inik la:hu	$1 \times 20 + 10$
40	ča:b inik	2×20
100	hu:n bo:ʼ inik	$1 \times 5 \times 20$
200	la:hu inik	10×20
300	o:š bo:ʼ inik	$3 \times 5 \times 20$
400	če:ʼbo:ʼ inik	$4 \times 5 \times 20$
1000	hu:n šiʼ	1×1000

Classical Huastec (Original transcription)

[TAPIR ZENTENO 1767: 18]		[SAPPER 1910: 315-316]	
1	hun	jun	
2	tzab	tzab	
3	ox	ox	
4	tze	tze	
5	bo	bo	
6	acac	akak	
7	buc	buk	
8	huaxic	vuaxik	
9	belleuh	belleuj	
10	laju	lajú	
11		lajujún	$10 + 1$
12		lajutzáb	$10 + 2$
13		lajuóx	$10 + 3$
14		lajutzé	$10 + 4$
15		lajubó	$10 + 5$
16		lajuakak	$10 + 6$
17	laju-buc/laju-cal-buc/laju-tin-cal-buc	lajubuc	$10 + 7$
18		lajujuaxik	$10 + 8$
19		laju belleuj	$10 + 9$
20	jun-inic	juminik	1×20
30	hum-inic-laju		$1 \times 20 + 10$
40	tzab-inic	tzabinik	2×20
50	tzab-inic-laju		$2 \times 20 + 10$
60	ox-inic	ox inik	3×20
70	ox-inic-al-laju		$3 \times 20 + 10$
80	tze-inic	tze inik	4×20
90	tze-inic-laju		$4 \times 20 + 10$
100	bo-inic	bo inik	5×20
200	tzab-bo-inic		$2 \times 5 \times 20$
300	ox-bo-inic		$3 \times 5 \times 20$
400		tze bo inik	$4 \times 5 \times 20$
1000	hun-xi	xi junxi	
2000	tzab-xi		
3000	ox-xi		

Basic vocabulary:

$U = \{1 \dots 9\}$

$B^1 = \{10 \text{ (lahu)}\}$, $B^2 = \{20 \text{ (inik)}\}$, $B^3 = \{100 \text{ (bo-inik)}\}$, $B^4 = \{1000 \text{ (šiʼ)}\}$

①② Decimal below 20.

$$N_{1-19} = \pm B^1 \pm U$$

③ Vigesimal from 20 to 99.

$$N_{20-99} = \{1...4\} \times B^2 \pm \{N_{1-19}\}$$

④ The base from 100 up is 5×20 . The interval is formed according to the vigesimal method. Ochoa Peralta, however, gives *la:hu inik*, 10×20 , for 200.

$$N_{100-999} = \{1...9\} \times B^3 \pm \{N_{1-99}\}$$

$$N_{1000} = \{1...\} \times B^4 \pm$$

Notes: There are two dialects in Huastec, San Luis Potosí and Veracruz. The phonological correspondence between these two dialects and Chicomuceltec is as follows;

San Luis Potosí	:	Veracruz	:	Chicomuceltec
c	:	č	:	č
č	:	c	:	t

According to this correspondence, we understand that Ochoa Peralta's data is from Veracruz and the data of Sapper and Tapia Zenteno is from San Luis Potosí.

Chicomuceltec [D12]

[SAPPER 1910: 315-316] (Original transcription)

1	jun	
2	cha te eú	
3	ox te eú	
4	che te eu	
5	vo te eú	
6	kak te eu	
7	kk te eu	
8	vuaxak te eu	
9	vuele te eu	
10	lau te eu	
11	jun i laju	1+10
12	cha i lahu	2+10
13	ox i lahu	3+10
14	che i lau	4+10
15	o la te eu	5+10
16	o la teeu nam jun	5+10+1
17	o la teeu nan chateeu	5+10+2
20	jun inik	
21	jun inik nam jún	1×20+1
40	chaú inik	2×20
60	ox inik	3×20
80	che nek	4×20
100	hoo inik	5×20
120	hoo inik nam jun inik	5×20+20
200	cha te ta hoo inik	2×5×20
300	ox te ta hoo inik	3×5×20
400	che te ta hoo inik	4×5×20

Basic vocabulary:

$$U = \{1...9\}$$

$$B^1 = \{10 \text{ (lau)}\}, B^2 = \{15 \text{ (ola)}\}, B^3 = \{20 \text{ (inik)}\},$$

Derivative vocabulary:

$5' = \{\text{hoo}\}$, $20' = \{\text{nek}\}$

Connectives: $\{i\}$ $\{\text{nam}\}$

① Decimal below 10. A suffix *te eu* may be a numeral classifier. *kk* for 7 may be a misprint. The word for 7 should be *buk* or *uk*.

$N_{1-9} = D \pm \text{te eu}$

② Quinary from 10 to 19.

$N_{10} = B^1 + \text{te eu}$

$N_{11-14} = \{1...4\} + i + B^1$

$N_{15-19} = B^2 + \text{te eu} \pm \text{nam} \pm \{1...4\}$

③ The numerals from 20 to 99 are vigesimal. Number words in the interval are formed from the numbers 1 to 19 with *nam* added to the base.

$N_{20-99} = \{1...4\} \times B^3 \pm \text{nam} \pm \{N_{1-19}\}$

④ 100 is expressed as 5×20 . The system follows the decimal and vigesimal methods.

$N_{100} = \{\#, 2...\} - \text{te ta} \times B^4 \pm \text{nam} \pm \{N_{1-99}\}$

Yucatec [49]

Transcription is based on Yucatec traditional orthography.

	[BELTRAN 1746]		[TOZZER 1921: 99-103]
1	hun		hun
2	ca		ca
3	ox		ox
4	can		can
5	ho		ho
6	uac		uac
7	uuc		uuc
8	uaxac		uaxac
9	bolon		bolon
10	lahun		la hun
11	buluc		buluc
12	lahca		la ca
13	ox-lahun		la ox
14	can-lahun		la can
15	ho-lhun		la ho
16	uac-lahun		la uac
17	uuc-lahun		la uuc
18	uaxac-lahun		la uaxac
19	bolon-lahun		la bolon
20	hun-kal		hun kal
21	hun t-u-kal	$1 > 2 \times 20$	hun kal yete hun
22	ca t-u-kal	$2 > 2 \times 20$	hun kal yete ca
23	ox t-u-kal	$3 > 2 \times 20$	
24	can t-u-kal	$4 > 2 \times 20$	
25	ho t-u-kal	$5 > 2 \times 20$	
26	uac t-u-kal	$6 > 2 \times 20$	
27	uuc t-u-kal	$7 > 2 \times 20$	
28	uaxac t-u-kal	$8 > 2 \times 20$	
29	bolon t-u-kal	$9 > 2 \times 20$	

30	lahu ca-kal	$10 > 2 \times 20$	hun kal yete la hun
31	buluc t-u-kal	$11 > 2 \times 20$	hun kal yete buluc
32	lahca t-u-kal	$12 > 2 \times 20$	hun kal yete la ca
33	ox-lahu t-u-kal	$13 > 2 \times 20$	
34	can-lahu t-u-kal	$14 > 2 \times 20$	
35	ho-lhu ca-kal	$15 > 220$	
36	uac-lahun t-u-kal	$16 > 2 \times 20$	
37	uuc-lahu t-u-kal	$17 > 2 \times 20$	
38	uaxac-lahu t-u-kal	$18 > 2 \times 20$	
39	bolon-lahu t-u-kal	$19 > 2 \times 20$	
40	ca-kal	3×20	ca kal
41	hun t-u-y-ox-kal	$1 > 3 \times 20$	ca kal yete hun
42	ka t-u-y-ox-kal	$2 > 3 \times 20$	
43	ox t-u-y-ox-kal	$3 > 3 \times 20$	
44	can t-u-y-ox-kal	$4 > 3 \times 20$	
45	ho t-u-y-ox-kal	$5 > 3 \times 20$	
46	uac t-u-y-ox-kal	$6 > 3 \times 20$	
47	uuc t-u-y-ox-kal	$7 > 3 \times 20$	
48	uaxac t-u-y-oxkal	$8 > 3 \times 20$	
49	bolon t-u-y-ox-kal	$9 > 3 \times 20$	
50	lahu y-ox-kal	$10 > 3 \times 20$	ca kal yete la hun
51	buluc t-u-y-ox-kal	$11 > 3 \times 20$	
52	lahca t-u-y-ox-kal	$12 > 3 \times 20$	
53	ox-lahu t-u-y-ox-kal	$13 > 3 \times 20$	
54	can-lahu t-u-y-ox-kal	$14 > 3 \times 20$	
55	ho-lhu y-ox-kal	$15 > 3 \times 20$	
56	uac-lahu t-u-y-ox-kal	$16 > 3 \times 20$	
57	uuc-lahu t-u-y-ox-kal	$17 > 3 \times 20$	
58	uaxac-lahu t-u-y-ox-kal	$18 > 3 \times 20$	
59	bolon-lahu t-u-y-ox-kal	$19 > 3 \times 20$	
60	ox-kal	3×20	ox kal
65	ho t-u-can-kal		
70	lahu can-kal		ox kal yete la hun
75	ho-lhu can-kal		
80	can-kal		can kal
90	lahu y-o-kal		can kal yete la hun
95	ho-lhu y-o-kal		
100	ho-kal		ho kal
180	bolon-kal		bolon kal
181	hun t-u-lahun-kal		
190	lahu t-u-lahun-kal		
195	ho-lhu t-u-lahun-kal		
200	lahun-kal		la hun kal
210	lahu t-u-buluc-kal		
215	ho-lhu t-u-buluc-kal		
220	buluc-kal		buluc kal
230	lahu t-u-lahca-kal		
240	lahca-kal		la ca kal
250	lahu t-u-y-ox-lahun-kal		
255	ho-lhu t-uy-ox-lahun-kal		

260	ox-lahu-kal	la ox kal
270	lahu t-u-can-lahu-kal	
275	ho-lhu t-u-can-lahu-kal	
370	lahu bolon-lahu-kal	
380	bolon-lahu-kal	la bolon kal
381	hun t-u-hun-bak	
385	ho t-u-hun-bak	
390	lahu hun-bak	
395	ho-lhu t-u-hun-bak	
400	hun-bak	hun bak
500	ho t-u-bak	
600	lahu t-u-bak	
700	ho-lhu t-u-bak	
800	ca-bak	
900	ho t-u-y-ox-bak	
1000	lahu-y-ox-bak/ hun-pic	
2000	ca-pic	

Basic vocabulary:

$$U = \{1...9, 11, 12\}$$

$$B^1 = \{10 \text{ (lahun)}\}, B^2 = \{20 \text{ (kal)}\}, B^3 = \{400 \text{ (bak)}\}$$

①② The numerals below 20 are fundamentally decimal, but 11 and 12 are special morphemes. It is probable that the words from 12 through 19 given by Tozzer are systematized on the analogy of the formation *la ca*.

$$N_{1-19} = \{1...9\} \pm B^1, \text{ except for } \{11, 12\} = \{\text{buluc, laha}\}$$

The numeral system given by Tozzer is as follows:

$$N_{1-19} = \pm U^1 + \{1...9\}, \text{ except for } 11 = \{\text{buluc}\}$$

③ The basic formation above 20 is vigesimal. The units are added to the next 20-step. For example, 41 is expressed as 1 toward 60. This method is called overcounting by Menninger [1966]. *t* (< *ti*) is a preposition and can be translated as "to" in English. *u* is the third person possessive and changes into *u-y-* before a vowel. Therefore 41 may be translated as the first number on the third 20-step. Conforming to the rule, the base from 20 to 39 should be *ca-kal*, but it is understandable even when *ca* is omitted, and thus *ca-kal* may be replaced by *kal*.

$$N_{20-399} = \pm \{N_{1-19}\} \pm ti \pm u(y) + \{N_{2-19}\} \times B^2$$

Tozzer's numeration is different from the above. The method is turned undercounting by Menninger. *yete* (< *yetel*) is a conjunction, corresponding to "and."

$$N_{20-399} = \{N_{1-19}\} \times B^2 + yete \pm \{N_{1-19}\}$$

Some irregularity is observed in the numerals given by Beltran. Five and 10 before the next level do not have *tu*. 30 is not *lahu tu ca-kal* but *lah ca-kal*, while 35 is not *holhu tu ca-kal* but *holhu ca-kal*. The irregularity continues as far as 175, and then from 190 on *tu* appears. In 370 *tu* disappears and in 375 it appears again. *tu* is not used in 390 but does appear in 395. It is difficult to explain this irregularity. It may be due to carelessness, or it may reflect a quinary method in use, although the numbers in the interval are formed on a decimal method.

④ From 400 up the formation is based on 400, but this terminates at 1000, and thereafter 1000 becomes the new base. *pic* originally meant 8000 but shifted to mean 1000 under Spanish influence.

The rank numbers above 400 are shown below.

bak	20×20
pic	$20 \times 20 \times 20$
calab	$20 \times 20 \times 20 \times 20$
kinchil	$20 \times 20 \times 20 \times 20 \times 20$
alau	$20 \times 20 \times 20 \times 20 \times 20 \times 20$

The numerals above 400 are a mixed system of overcounting and undercounting. The following 2 numbers are given by Barrera Vásquez [BARRERA VÁSQUEZ 1946: 247]. (The transcription is changed into Classical Yucatec orthography and *uuckal* is changed to *uuculahunkal*.)

- a) 18733 = ca-pic catac uac-bak catac oxlahun tu uuc-lahun-kal
 16000 = ca-pic
 2400 = uac-bak
 333 = 13 > 340 = oxlahun tu uuc-lahun-kal
- b) 18733 = uac (-bak) tu y-ox-pic catac oxlahun tu uuculahunkal
 $= \underbrace{6 \times 400}_{18400} > \underbrace{3 \times 8000}_{333} + 13 > 17 \times 20$

Lacandón [50]

[BRUCE 1968: 70]

- 1 hun-
- 2 ka'-
- 3 oš-

The numerals higher than 4 are not used. The Lacandons point to fingers and toes when they want to signify higher numbers [TOZZER 1921: 98].

Bruce describes the following terms for the numbers above 4.

4	läh-t-a-nup'	"all your fingers"
5	hun-bu-k'ə'	"one hand"
6	taham-u-na'-k'ə'	"the next thumb"
10	ka'-bu-k'ə'	"two hands"
15	hum-buh-ok	"one foot"
20	hun-tul-winik	"one man"
100	hum-bu-k'ə' winik	"five men"

Chol [53]

[WARKENTIN and SCOTT 1980:107-108]

[MERRIELD 1968: 98-99]

1	hum-p'eh	húm-p'ehl
2	ča'-p'eh	čá'-p'ehl
3	uš-p'eh	úš-p'ehl
4	čim-p'eh	čím-p'ehl
5	ho'-p'eh	hó'-p'ehl
6	wik-p'eh	wík-p'ehl
7	wuk-p'eh	wúk-p'ehl
8	wášik-p'eh	wášik-p'ehl
9	bolom-p'eh	bolóm-p'ehl
10	luhum-p'eh	luhúm-p'ehl

11	hun-luhum-p'eh	1+10	hún luhúm-p'ehl	1+10
12	lah-čim-p'eh		láh čim-p'ehl	
13	uš-luhum-p'eh	3+10	úš luhúm-p'ehl	3+10
14	čin-luhum-p'eh	4+10	čín luhúm-p'ehl	4+10
15	ho'-luhum-p'eh	5+10	hó' luhúm-p'ehl	5+10
16	wik-luhum-p'eh	6+10	wík luhúm-p'ehl	6+10
17	wuk-luhum-p'eh	7+10	wúk luhúm-p'ehl	7+10
18	wašik-luhum-p'eh	8+10	wášik luhúm-p'ehl	8+10
19	bolon-luhum-p'eh	9+10	bolón luhúm-p'ehl	9+10
20	hun-k'al		hún k'al	
21	hum-p'eh i ča'k'al	1>2×20	hún k'al yik'ót húm-p'ehl	20+1
22	ča'-p'eh i ča'k'al	2>2×20	hún k'al yik'ót čá'-p'ehl	20+2
23	uš-p'eh i ča'k'al	3>2×20	hún k'al yik'ót úš-p'ehl	20+3
24	čim-p'eh i ča'k'al	4>2×20	hún k'al yik'ót čim-p'ehl	20+4
25	ho'-p'eh i ča'k'al	5>2×20	hó'-p'ehl i čá' k'al	5>2×20
26	wik-p'eh i ča'k'al	6>2×20	hún k'al yik'ót wik-p'ehl	20+6
27	wuk-p'eh i ča'k'al	7>2×20	hún k'al yik'ót wúk-p'ehl	20+7
28	wašik-p'eh i ča'k'al	8>2×20	hún k'al yik'ót wášik-p'ehl	20+8
29	bolom-p'eh i ča'k'al	9>2×20	hún k'al yik'ót bolóm-p'ehl	20+9
30	luhum-p'eh i ča'k'al	10>2×20	luhum-p'ehl i čá' k'al	10>2×20
31	hun-luhum-p'eh i ča'k'al	11>2×20	hún luhúm-p'ehl i čá' k'al	11>2×20
32	lah-čim-p'eh i ča'k'al	12>2×20	láh čim-p'ehl i čá' k'al	12>2×20
33	uš-luhum-p'eh i ča'k'al	13>2×20	úš luhúm-p'ehl i čá' k'al	13>2×20
34	čin-luhum-p'eh i ča'k'al	14>2×20	čín luhúm-p'ehl i čá' k'al	14>2×20
35	ho'-luhum-p'eh i ča'k'al	15>2×20	hó' luhúm-p'ehl i čá' k'al	15>2×20
36	wik-luhum-p'eh i ča'k'al	16>2×20	wík luhúm-p'ehl i čá' k'al	16>2×20
37	wuk-luhum-p'eh i ča'k'al	17>2×20	wúk luhúm-p'ehl i čá' k'al	17>2×20
38	wašik-luhum-p'ehl i ča'k'al	18>2×20	wášik luhúm-p'ehl i čá' k'al	18>2×20
39	bolon-luhum-p'ehl i ča'k'al	19>2×20	bolón luhúm-p'ehl i čá' k'al	19>2×20
40	ča' k'al	2×20	čá' k'al	2×20
41	hum-p'eh i yuš-k'al	1>3×20	čá' k'al yik'ót húm-p'ehl	2×20+1
42			čá' k'al yik'ót čá'-p'ehl	2×20+2
43			čá' k'al yik'ót úš-p'ehl	2×20+3
44			čá' k'al yik'ót čim-p'ehl	2×20+4
45			hó'-p'ehl iyūs k'al	5>3×20
46			čá' k'al yik'ót wik-p'ehl	2×20+6
47			čá' k'al yik'ót wúk-p'ehl	2×20+7
48			čá' k'al yik'ót wášik-p'ehl	2×20+8
49			čá' k'al yik'ót bolóm-p'ehl	2×20+9
50	luhum-p'eh i yuš k'al	10>3×20	luhum-p'ehl iyūs k'al	10>3×20
51			hún luhúm-p'ehl iyūs k'al	11>3×20
52			láh čim-p'ehl iyūs k'al	12>3×20
53			úš luhúm-p'ehl iyūs k'al	13>3×20
54			čín luhúm-p'ehl iyūs k'al	14>3×20
55			hó' luhúm-p'ehl iyūs k'al	15>3×20
56			wík luhúm-p'ehl iyūs k'al	16>3×20
57			wúk luhúm-p'ehl iyūs k'al	17>3×20
58			wášik luhúm-p'ehl iyūs k'al	18>3×20
59			bolón luhúm-p'ehl iyūs k'al	19>3×20
60	uš k'al	3×20	úš k'al	3×20

61	hum-p'eh i čin-k'al	$1 > 4 \times 20$		
70	luhum-p'eh i čin-k'al	$10 > 4 \times 20$		
80	čin-k'al	4×20		
81	hum-p'eh i ho'-k'al	$1 > 5 \times 20$		
90	luhum-p'eh i ho'-k'al	$10 > 5 \times 20$		
100	ho'-k'al	5×20		
110	luhum-p'eh i wik-k'al	$10 > 6 \times 20$		
120	wik-k'al	6×20		
130	luhum-p'eh i wuk-k'al	$10 > 7 \times 20$		
140	wuk-k'al	7×20		
150	luhum-p'eh i wašik-k'al	$10 > 8 \times 20$		
160	wašik-k'al	8×20		
170	luhum-p'eh i bolon-k'al	$10 > 9 \times 20$		
180	bolon-k'al	9×20		
190	luhum-p'eh i luhun-k'al	$10 > 10 \times 20$		
200	luhun-k'al	10×20		
220	hunluhun-k'al	11×20	hún luhún k'ál	11×20
225			hó'-p'ehl iláh čin k'ál	$5 > 12 \times 20$
240	lahčin-k'al	12×20		
246			láh čin k'ál yik'ót wik-p'ehl	$12 \times 20 + 6$
260	ušluhun-k'al	13×20		
280	čin-k'al	14×20		
300	ho'-luhun-k'al	15×20		
320	wik-luhun-k'al	16×20		
340	wuk-luhun-k'al	17×20		
360	wašik-luhun-k'al	18×20		
379			bolón luhúm-p'ehl ibolón luhún k'ál	$19 > 19 \times 20$
380	bolon-luhun-k'al	19×20		
383			bolón luhún k'ál yik'ót úš-p'ehl	$19 \times 20 + 3$
385			bolón luhún k'ál yik'ót hó'-p'ehl	$19 \times 20 + 5$
389			bolón luhún k'ál yik'ót bolóm-p'ehl	$19 \times 20 + 9$
395			bolón luhún k'ál yik'ót hó' luhúm-p'ehl	$19 \times 20 + 5 + 10$
399			bolón luhún k'ál yik'ót bolón luhúm-p'ehl	$19 \times 20 + 9 + 10$
400	hum-bahk'	1×400	húm báhk'	1×400
401			húm báhk' yik'ót húm-p'ehl	$1 \times 400 + 1$
405			húm báhk' yik'ót hó'-p'ehl	$1 \times 400 + 5$
420			húm báhk' yik'ót hún k'ál	$1 \times 400 + 1 \times 20$
425			húm báhk' yik'ót hó'-p'ehl i čá' k'ál	$1 \times 400 + 5 > 2 \times 20$
500	hum-bahk' yik'ót ho-k'al	$1 \times 400 + 5 \times 20$	hó' k'ál i čá' báhk'	$5 \times 20 > 2 \times 400$
600	luhun-k'al i ča-bahk'	$10 \times 20 > 2 \times 400$		
700	ho'luhun-k'al i ča-bahk'	$15 \times 20 > 2 \times 400$		
800	ča-bahk'	2×40		
900	ho'-k'al i yuš-bahk'	$5 \times 20 > 3 \times 400$		
1000	luhun-k'al i yuš-bahk'	$10 \times 20 > 3 \times 400$		
2000	ho'-bahk'	5×400		

Basic vocabulary:

$$U = \{1 \dots 9, 12\}$$

$$B^1 = \{10 \text{ (luhun)}\}, B^2 = \{20 \text{ (k'al)}\}, B^3 = \{400 \text{ (bahk')}\}$$

A connective: {yik'ot}

①② Decimal below 20, except for 12. The word for 12 may have been *lahčə-p'ehl*, but *čə-* is replaced by *čim*, which signifies 4. *p'ehl* is one of the numeral classifiers.

$$N_{1-19} = U \pm B^1 + p'ehl$$

③ The numerals from 20 to 399 are vigesimal and the method is overcounting. *i* (y) is the third person possessive.

$$N_{21-399} = \pm \{N_{1-19}\} \pm i(y) + \{N_{2-19}\} \times B^2$$

④ 400 functions as a base from 400 up.

$$N_{401} = \pm \{N_{1-19}\} \times B^2 \pm i(y) + \{N_{2-19}\} \times B^3$$

However, 500 is *humbak' yik'ot ho'k'al*, whose formula is expressed as

$$N_1 \times B^3 + yik'ot + N_5 \times B^2$$

From 20 up the numeral system given by Merrifield is different from the formulae above. As is shown in the 20s, the first half of the interval is counted by undercounting, whereas the second half is done by overcounting. Moreover, 5 in the first half of the interval is formed by overcounting. What method is in use is not clear for the numbers from 60 to 220, but 246 is formed by undercounting and 379 by overcounting, and undercounting occurs thereafter. Five and 10 in each interval seem to retain the original system.

Chontal [54]

Chontal [KELLER 1955]

Classical Chontal (1610-1612) [SMALLUS 1975: 214]

1	un-/ um-/ u-	hun
2	čə'-/ čə-	cha
3	uš-/ yuš-	ux
4	čən-/ čəm-/ čə-	chan
5	ho'-/ ho-	ho
6	wək-/ wəh-	vac
7		vuc
10		lahun
15		holahun
50		lahun yuxkal

$$10 > 3 \times 20$$

Modern Chontal uses its numerals up to 6, and thereafter Spanish numerals. In Classical Chontal the numerals above 20 are counted by overcounting.

Tzotzil [56]

San Andres Tzotzil

[HURLEY and RUÍZ SÁNCHEZ 1978: 458-459]

Zinacantan Tzotzil

[HAVILAND 1981: 165-175]

1	hun	hun
2	čib	čib
3	ošib	ošib
4	čanib	čanib
5	ho'ob	vo'ob
6	vakib	vakib
7	hukub	vukub
8	vašakib	vašakib
9	baluneb	baluneb
10	lahuneb	lahuneb
11	bulučib	bulučib
12	lahčəeb	lačəeb/ lahčeb
13	ošlahuneb	ošlahuneb

$$3 + 10$$

14	čanlahuneb	čanlahuneb	4 + 10
15	ho'lahuneb	vo'lahuneb	5 + 10
16	vaklahuneb	vaklahuneb	6 + 10
17	huklahuneb	vuklahuneb	7 + 10
18	vašaklahuneb	vašaklahuneb	8 + 10
19	balunlahuneb	balunlahuneb	9 + 10
20	htob	htob	
21	hun šča'vinik	hun šča'vinik	1 > 2 × 20
22	čib šča'vinik	čib šča'vinik	2 > 2 × 20
30	lahuneb šča'vinik	lahuneb šča'vinik	10 > 2 × 20
40	ča'vinik	ča'vinik	2 × 20
42		čib yoš vinik	2 > 3 × 20
50		lahuneb yoš vinik	10 > 3 × 20
60	oš vinik	oš vinik	3 × 20
80	čan vinik	čan vinik	4 × 20
100	ho' vinik		5 × 20
120	vak vinik		6 × 20
140	huk vinik		7 × 20
160	vašak vinik		8 × 20
180	balun vinik		9 × 20
200	lahun vinik/ čib sienta	lahun vinik	10 × 20
220	buluč vinik		11 × 20
240	lahča' vinik		12 × 20
260	ošlahun vinik		13 × 20
280	čanlahun vinik		14 × 20
300	ho'lahun vinik/ ošib sienta	vo'lahun vinik	15 × 20
320	vaklahun vinik		16 × 20
340	huklahun vinik		17 × 20
360	vašaklahun vinik		18 × 20
380	balunlahun vinik		19 × 20
400	h bok' / čanib sienta	h bok'	1 × 400/ 4 × 100
500	ho'ob sienta		5 × 100
600	vakib sienta		6 × 100
700	hukub sienta		7 × 100
800	ča' bok' / vašakib sienta		2 × 400/ 8 × 100

Basic vocabulary:

$$U = \{1 \dots 9, 11, 12\}$$

$$B^1 = \{10 \text{ (lahun)}\}, B^2 = \{20 \text{ (vinik)}\}, B^3 = \{400 \text{ (bok')}\}$$

Derivative vocabulary:

$$1' = \{h\}, 20' = \{tob\}, 2 = \text{čib} > \text{ča-ib}$$

A suffix: {-eb~-ib~-ob~-ub}

①② Decimal below 20, except for 11 and 12.

$$N_{1-19} = U + B^1$$

③ Vigesimal above 20.

$$N_{21-399} = + \{N_{1-19}\} + y / \check{s} + \{N_{2-19}\} \times B^2$$

④ The numbers from 400 up are formed on a new base, 400, but it is not clear how the interval numbers are expressed.

Tzeltal [57]

[KAUFMAN 1971: 91-101]

1	hun/ hun	
2	ča'b/ če'b	
3	oš/ oš-eb	
4	čan/ čan-eb	
5	ho'/ ho'-eb	
6	wak/ wak-eb	
7	huk/ huk-eb	
8	wašuk/ wašuk-eb	
9	balun/ balun-eb	
10	lahun/ lahun-eb	
11	buluč/ buluč-eb	
12	lahč/ lah č-eb	
13	oš-lahun/ oš-lahun-eb	3 + 10
14	čan-lahun/ čan-lahun-eb	4 + 10
15	ho'-lahun/ ho'-lahun-eb	5 + 10
16	wak-lahun/ wak-lahun-eb	6 + 10
17	huk-lahun/ huk-lahun-eb	7 + 10
18	wašuk-lahun/ wašuk-lahun-eb	8 + 10
19	balun-lahun/ balun-lahun-eb	9 + 10
20	h tab	
21	hun y ča' winik	1 > 2 × 20
22	čeb y ča' winik	2 > 2 × 20
30	lahuneb y ča' winik	10 > 2 × 20
40	ča winik	2 × 20
60	oš winik	3 × 20
80	čan winik	4 × 20
100	ho' winik	5 × 20
120	wak winik	6 × 20
140	huk winik	7 × 20
160	wašuk winik	8 × 20
180	balun winik	9 × 20
200	lahun winik	10 × 20
220	buluč winik	11 × 20
240	lahč winik	12 × 20
260	ošlahun winik	13 × 20
280	čanlahun winik	14 × 20
300	ho'lahun winik	15 × 20
320	waklahun winik	16 × 20
340	huklahun winik	17 × 20
360	wašuklahun winik	18 × 20
380	balunlahun winik	19 × 20
400	h bahk'	
800	ča' bahk'	2 × 400

Basic vocabulary:

U = {1...9, 11', 12}

B¹ = {10 (lahun)}, B² = {20 (winik)}, B³ = {400 (bahk')}

Derivative vocabulary:

$$1' = \{h\}, 20' = \{\text{tab}\}$$

A suffix: $\{-eb\}$

①② Decimal below 20, except for 11 and 12.

$$N_{1-19} = U \pm B^1$$

③ Vigesimal above 20.

$$N_{21-399} = \pm \{N_{1-19}\} \pm y + \{N_{2-19}\} \times B^2$$

④ 400 is a new base, but it is not clear how the interval numbers are formed.

Tojolabal [58]

[FURBEE-LOSEE 1976: 117-123] $b' = b$

1	hun	
2	čahb/ čah	
3	oš	
4	čan	
5	ho'	
6	wak	
7	huk	
8	wašak	
9	balun	
10	lahun	
11	huluč	
12	lahčaw	
13	oš-lahun-e'	3 + 10
14	čan-lahun-e'	4 + 10
15	ho'-lahun-e'	5 + 10
16	wak-lahun-e'	6 + 10
17	huk-lahun-e'	7 + 10
18	wašak-lahun-e'	8 + 10
19	balun-lahun-e'	9 + 10
20	tahab /winik/ tak'in	
21	hun-tahab-sok-hun-e'	20 + 1
22	hun-tahab-sok-čahb-e'	20 + 2
30	hun-tahab-sok-lahun-e'	20 + 10
35	hun-tahab-sok-ho-lahun-e'	20 + 5 + 10
39	hun-tahab-sok-balun-lahun-e'	20 + 9 + 10
40	čahb-tahab-e'	2 × 20
50	čahb-tahab-sok-lahun-e'	2 × 20 + 10
60	oš-tahab-e'	3 × 20
80	čan-tahab-e'	4 × 20
100	ho'-tahab-e'	5 × 20
120	wak-tahab-e'	6 × 20
140	huk-tahab-e'	7 × 20
160	wašak-tahab-e'	8 × 20
180	balun-tahab-e'	9 × 20
200	lahun-tahab-e'	10 × 20
220	huluč-tahab-e'	11 × 20
240	lahčaw-tahab-e'	12 × 20
260	oš-lahun-tahab-e'	13 × 20

280	čan-lahun-tahab-e'	14×20
300	ho'-lahun-tahab-e'	15×20
320	wak-lahun-tahab-e'	16×20
340	huk-lahun-tahab-e'	17×20
360	wašak-lahun-tahab-e'	18×20
380	balun-lahun-tahab-e'	19×20
400	hun-ša'n-e'	
800	čahb-ša'n-e'	2×400

Basic vocabulary:

$$U = \{1 \dots 9, 11, 12\}$$

$$B^1 = \{10 \text{ (lahun)}\}, B^2 = \{20 \text{ (tahab)}\}, B^3 = \{400 \text{ (ša'n)}\}$$

A connective: {sok}

A suffix: {-e'}

①② Decimal below 20, except for 11 and 12.

$$N_{1-19} = U \pm B^1$$

③ Vigesimal above 20.

$$N_{21-399} = \{N_{1-19}\} \times B^2 \pm \text{sok} \pm \{N_{1-19}\}$$

④ From 400 up 400 is used as the base, but it is not clear how the intermediate numbers are formed.

Chuj [59]

[HOPKINS 1967: 62-63, 107-110]

1	xun	
2	ča'p' / ča'	
3	oš	
4	čoŋ / čaŋ	
5	hoy / ho' / hop'	
6	wak' / wak	
7	hukup' / huk	
8	waxšak' / waxšak	
9	p'alux	
10	laxux	
11	hušluč' / hušluč	
12	laxčaw	
13	oš-laxux	$3 + 10$
14	čoŋ-laxux	$4 + 10$
15	ho'-laxux	$5 + 10$
16	wak-laxux	$6 + 10$
17	huk-laxux	$7 + 10$
18	waxšak-laxux	$8 + 10$
19	p'alux-laxux	$9 + 10$
20	xunak / xunk', winak / wiŋk'	
21	xun s-ča-wiŋk' / winak	$1 > 2 \times 20$
23	oš s-ča-winak	$3 > 2 \times 20$
35	ho'laxux s-ča-winak	$10 > 2 \times 20$
36	waklaxux s-ča-winak	$11 > 2 \times 20$
40	ča'-winak	2×20
41	xun yoš winak	$1 > 3 \times 20$

42	ča'p' yoš winak	$2 > 3 \times 20$
60	oš-winak	3×20
80	čaŋ-winak	4×20
379	p'aluj-laxuŋe'-s-p'aluj-laxuŋ-winak	$9 + 10 > (9 + 10) \times 20$
380	p'aluj laxuŋ-winak	$(9 + 10) \times 20$
381	xun-s-xunk'al	$1 > 400$
400	xunk'al (winak)	

Basic vocabulary:

$$U = \{1 \dots 9, 11, 12\}$$

$$B^1 = \{10 \text{ (laxuŋ)}\}, B^2 = \{20 \text{ (winak)}\}, B^3 = \{400 \text{ (k'al)}\}$$

①② Decimal below 20, except 11 and 12.

$$N_{1-19} = D \pm B^1$$

③ Vigesimal above 20.

$$N_{21-399} = \pm \{N_{1-19}\} \pm s-/y- + \{N_{2-19}\} \times U^2$$

④ From 400 up, 400 is used as a new base, but it is not clear how the interval numbers are to be formed. 400 is expressed either as *xun k'al* or as *xun k'al winak*. Since *k'al* means 20 and *winak* also means 20 (originally "man"), 400 is analyzed as 1×20 or $1 \times 20 \times 20$. However, *k'al* is not used as 20, as it is in Jacaltec and Yucatec. It appears, therefore, that *k'al* came to have the specific meaning of 400 in Chuj.

Jacaltec [60]

[DAY 1973: 57-59] b' = b

1	hun	
2	ka	
3	oš	
4	kaŋ	
5	ho	
6	wax	
7	hux	
8	wašax	
9	baluŋ	
10	lahuŋ	
11	hun-laŋeb	$1 + 10$
12	kab-laŋeb	$2 + 10$
13	oš-laŋeb	$3 + 10$
14	kaŋ-laŋeb	$4 + 10$
15	ho-laŋeb	$5 + 10$
16	wax-laŋeb	$6 + 10$
17	hux-laŋeb	$7 + 10$
18	wašax-laŋeb	$8 + 10$
19	baluŋ-laŋeb	$9 + 10$
20	hunk'al	
21	hune' s-ka-winax	$1 > 2 \times 20$
22	kab s-ka-winax	$2 > 2 \times 20$
23	ošeb s-ka-winax	$3 > 2 \times 20$
30	lahuŋeb s-ka-winax	$10 > 2 \times 20$
31	hunlaŋeb s-ka-winax	$11 > 2 \times 20$
32	kablaŋeb s-ka-winax	$12 > 2 \times 20$

40	ka-winax	2×20
41	hune' y-oš-k'al	$1 > 3 \times 20$
49	baluṇeb y-oš-k'al	$9 > 3 \times 20$
50	lahuṇeb s-oš-k'al	$10 > 3 \times 20$
51	hunlaṇeb s-oš-k'al	$11 > 3 \times 20$
59	baluṇ-laṇeb y-oš-k'al	$19 > 3 \times 20$
60	oš-k'al	3×20
80	kaṇ-winax	4×20
89	baluṇeb s-o-k'al	$9 > 5 \times 20$
99	baluṇ-laṇeb s-o-k'al	$19 > 5 \times 20$
100	siento	
200	kab siento	

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 (\text{lahuṇ})\}, B^2 = \{20 (\text{winax} \sim k'al)\}, B^3 = \{100 (\text{siento})\}$$

①② Decimal below 20.

$$N_{1-19} = D \pm B^1$$

③ Vigesimal from 20 to 99.

$$N_{21-99} = \pm \{N_{1-19}\} \pm s-/y- + \{N_{2-5}\} \times B^2$$

The word for 20 is *hun-k'al*, but *winax* is used as a base between 21 and 40, after which *k'al* serves as a base.

④ The word for 100 is Spanish but its coefficients are Jacaltec. It is not clear how the interval numbers are to be formed.

$$N_{100-} = \{\#, 2 \dots\} \times B^3$$

Motocintlec [63]

[SAPPER 1910: 315-316] (Original transcription is retained.)

1	uné	
2	cabé	
3	oxé	
4	cané	
5	hooe	
6	ruajake	
7	vuuke	
8	vuajxaké	
9	baluné	
10	lajuné	
11	hunlajuné	$1 + 10$
12	cablajuné	$2 + 10$
13	oxlajuné	$3 + 10$
14	canlajuné	$4 + 10$
15	hoolajuné	$5 + 10$
16	vuaklajuné	$6 + 10$
17	juklajuné	$7 + 10$
18	vuajxaklajuné	$8 + 10$
19	balajuné	$9 + 10$
20	jun k'uté	16×20
21	junk'uté (sic)	

40	cavuinaké	2×20
60	oxvuinaké	3×20
80	canvuinaké	4×20
100	june ciento	1×100
200	cabe ciento	2×100

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (lajun)}\}, B^2 = \{20 \text{ (uinak)}\}, B^3 = \{100 \text{ (ciento)}\}$$

Derivative vocabulary:

$$20' = \{k'ut\}$$

A suffix: $\{-e\}$

①② Decimal below 20.

$$N_{1-19} = D \pm B^1 + e$$

③ Vigesimal from 20 to 99.

In the 20s the base is *k'ut* and thereafter *uinak* is used as a base.

④ The word for 100 is Spanish but its coefficients are Motocintlec. It is not clear how the interval numbers are formed.

Tectitec [65]

[STEVENSON 1987: 13]

1	xun	
2	ka:b'e'	
3	oš	
4	kax	
5	xweb'	
6	(wa) qaq	
7	wuq	
8	waxšaq	
9	b'elxux	
10	laxux	
11	xun-laxux	$1 + 10$
12	ká:b'e-laxux	$2 + 10$
13	oš-e-laxux	$3 + 10$
14	kaxe-laxux	$4 + 10$
15	xweb'-laxux	$5 + 10$
16	qaq-laxux	$6 + 10$
17	wuq-laxux	$7 + 10$
18	waxšaq-laxux	$8 + 10$
19	b'elxux-laxux	$9 + 10$
20	winqi'n	

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (laxux)}\}, B^2 = \{20 \text{ (winqi'n)}\}$$

Derivative vocabulary:

$$3' = \{oše\}, 4' = \{kaxe\},$$

①② Decimal below 20.

$$N_{1-19} = U \pm B^1$$

- ③ Today there are no speakers who know the numerals above 20.

Mam [66]

Ixtahuacan Mam

[MALDNADO ANDRES, et al. 1986] b = b'

[THOMAS 1897-8: 862, 903] (Original transcription)

1	hu:n	jun	
2	kab	cáve	
3	o:š	óxe	
4	kya:x	quiáje	
5	xwe'	jóvue	
6	qaq	vuák	
7	wu:q	uk	
8	waxšaq	vuacxák	
9	belax	belejúj	
10	la:x	lajúj	
11	xun-la:x	hum-lahuh	1 + 10
12	kab-la:x	kab-lahuh	2 + 10
13	oš-la:x	ox-lahuh	3 + 10
14	kyax-la:x	kiah-lahuh	4 + 10
15	o-la:x	oo-lahuh	5 + 10
16	qaq-la:x	vuak-lahuh	6 + 10
17	wu:q-la:x	vuk-lahuh	7 + 10
18	waxšaq-la:x	vuahxak-lahuh	8 + 10
19	belax-la:x	belhuh-lahuh	9 + 10
20	wi:nqan	vuinkim/ huing	
21	wi:nqan xu:n		20 + 1
22	wi:nqan kab		20 + 2
30	winaq la:x	vuinak-lahuh	20 + 10
40	kya'-wnaq	ka-vuinak	2 × 20
41		hum-t-oxkal-im	1 > 3 × 20
42		kabe-t-oxkal-im	2 > 3 × 20
43		oxe-t-oxkal-im	3 > 3 × 20
44		kiah-t-oxkal-im	4 > 3 × 20
45		hoe-t-oxkal-im	5 > 3 × 20
46		vuakak-t-oxkal-im	6 > 3 × 20
47		vuk-t-oxkal-im	7 > 3 × 20
48		vuahxak-t-oxkal-im	8 > 3 × 20
49		velhuh-t-oxkal-im	9 > 3 × 20
50		lahuh-t-oxkal-im	10 > 3 × 20
60	oš-k'a:l		3 × 20
70		lahuh-tu-hu-much-im	10 > 80
80	xun-muč'	hum-mucx	
90		lahuh-t-okal-im	10 > 5 × 20
100		o-kal	5 × 20
200		o-chuk	5 × 40
300		oloh-kal	15 × 20
400		o-mucx	5 × 80
500		o-mucx-o-kal	5 × 80 + 5 × 20
600		o-mucx-o-chuh	5 × 80 + 5 × 40
700		o-mucx-oloh-kal	5 × 80 + 15 × 20

900

lahuh-tuki-okal

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (la:x)}\}, B^2 = \{20 \text{ (winaq} \sim k'a:l)\}$$

Derivative vocabulary:

$$1' = \{xun, xu:n\}, 20' = \{wi:nqan \sim wnaq\}$$

①② Decimal below 20.

$$N_{1-19} = D \pm B^1$$

③ The numerals above 20 are formed according to the vigesimal method, but they are no longer used, having been replaced by Spanish numerals.

$$N_{21-379} = B^2 \pm \{N_{1-19}\}$$

The old materials given by Thomas show that the numerals from 40 up follow the method of overcounting. *chuk* for 40 and *mucx* for 80 serve as bases for their multiples.

Ixil [68]

[AYRES 1980: 137-9]

	Chajul	Nebaj	
1	in-wa'l	u-ma'l	
2	ka:-wa'l	ka'-wa'l	
3	oş-wa'l	oş-wa'l	
4	kah-wa'l	kax-wa'l	
5	o:-wa'l	o'-wa'l	
6	wahqil	wa:xil	
7	huq-wa'l	wux-wa'l	
8	wahşaqil	wa:şi:l/ wa:şaxil	
9	bel-wal	belu-wal	
10	lawal	la-wal	
11	xun-lawal	xun-lawal	1 + 10
12	kab-lawal	kab-lawal	2 + 10
13	oş-lawal	oş-lawal	3 + 10
14	ka:-lawal	ka:-lawal	4 + 10
15	o'-lawal	o'-lawal	5 + 10
16	waq-lawal	wax-lawal	6 + 10
17	huq-lawal	wux-lawal	7 + 10
18	wahşaq-lawal	wa:şax-lawal/ wa:şa-lawal	8 + 10
19	bele-lawal	bele-lawal	9 + 10
20	wi:nqil	wi:nqil	
21	winaq xunul	winax xunul/ winax w-ma'l	20 + 1
22	winaq ka:bil	winax kabil/ winax ka'-wa'l	20 + 2
23	winaq oşol	winax oşol/ winax oş-wa'l	20 + 3
24	winaq kaal	winax kaal/ winax kax-wa'l	20 + 4
25	winaq o'l	winax o'l/ winax o'-wa'l	20 + 5
26	winaq wahqil	winax wa:xil	20 + 6
27	winaq xuqul	winax wuxul/ winax wux-wa'l	20 + 7
28	winaq wahşaqil	winax wa:şi:l	20 + 8
40	ka'-wi:nqil	ka'-wi:nqil	2 × 20
41	in-wa'l t-oş-k'al	u-ma'l t-oş-k'al	1 > 3 × 20
60	oş-k'alal	oş-k'alal	3 × 20

61	in-wa'l i-muĉ'	u-ma'l i-mu ĉ'	1 > 4 × 20
80	muĉ'ul	muĉ'ul	
81	in-wa'l t-o'-k'al	u-ma'l t-o'-k'al	1 > 5 × 20
100	o'-k'al	o'-k'al	5 × 20
101	in-wa'l i-waq-k'al	u-ma'l i-wax-k'al	1 > 6 × 20
120	waq-k'alal	wax-k'alal	6 × 20
140	xuq-k'al	wux-k'alal	7 × 20
160	wahšaq-k'alal	wa: šax-k'alal	8 × 20
180	bele-k'alal	bele-k'alal	9 × 20
200	lah-k'alal	la:-k'alal	10 × 20
220	xunlah-k'alal	xunla:-k'alal	11 × 20
400	wi:nqil-k'alal		20 × 20

[THOMAS 1897-8: 862, 904-905]

1	úng-vual	
2	cá-vual	
3	óx-vual	
4	cáj-vual	
5	ó-vual	
6	vuajil	
7	vúj-vual	
8	vuaxajil	
9	belú-vual	
10	lá-vual	
11	hun-lavual	1 + 10
12	cab-lavual	2 + 10
13	ox-lavual	3 + 10
14	ca-lavual	4 + 10
15	o-lavual	5 + 10
16	vuah-lavual	6 + 10
17	vuh-lavual	7 + 10
18	vuaxah-lavual	8 + 10
19	bele-lavual	9 + 10
20	vuinkil/ vuinquil	
21	vuinah-unul	20 + 1
22	vuinah-cabil	20 + 2
23	vuinah-oxol	20 + 3
24	vuinah-caal	20 + 4
25	vuinah-ool	20 + 5
26	vuinah-vuahil	20 + 6
27	vuinah-vuhul	20 + 7
28	vuinah-vuaxahil	20 + 8
29	vuinah-behu-vual	20 + 9
30	vuinal-lavual	20 + 10
40	ca-vuinkil	2 × 20
60	ox-c'al-al	3 × 20
70	lavual-i-much-ul	10 > 80
80	ung-much-ul	1 × 80
90	lavual-t-o-c'al	10 > 5 × 20
100	o-c'al-al	5 × 20

101	o-c'alal-tuc-ungvual	$5 \times 20 + 1$
110	lavual-i-vuah-c'al	$10 > 6 \times 20$
120	vuah-c'alal	6×20
130	lavual-i-vuh-c'al	$10 > 7 \times 20$
140	vuh-c'alal	7×20
150	lavual-i-vuaxah-c'al	$10 > 7 \times 20$
160	vuaxah-c'alal	8×20
170	lavual-i-bele-c'al	$10 > 9 \times 20$
180	bele-c'alal	9×20
380	belela-n-c'alal	19×20
400	vuinkil-an-c'alal	20×20
420	vuinah-unul-an-c'alal	$(20 + 1) \times 20$
440	vuinah-ca-vual-an-c'alal	$(20 + 2) \times 20$
780	vuinal-bele-lavual-an-c'alal	$(20 + 9 + 10) \times 20$
800	ca-vuinkil-an-c'alal	$2 \times 20 \times 20$

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (la)}\}, B^2 = \{20 \text{ (winaq} \sim k'al)\},$$

Derivative vocabulary:

$$1' = \{\text{xun}\}, 4' = \{\text{ka:}\}, 6' = \{\text{waq}\}, 20' = \{\text{wi:nq}\}$$

Suffixes: {-wa'l, -wal, -Vl}

①② Decimal below 20.

$$N_{1-19} = U \pm B^1 + \text{-wa'l/-wal/-il}$$

③ The numerals above 20 are vigesimal. The method of counting from 20 to 39 is undercounting, while the numerals above 40 are formed by overcounting.

$$N_{20,40} = \{\#, 2\} \times 20' \text{ (wi:nq)} + \text{il}$$

$$N_{21-39} = B^2 \text{ (winaq)} + \{N_{1-19}\} + \text{Vl}$$

$$N_{41-399} = \pm \{N_{1-19}\} \pm i/-t-\{3 \dots\} \times B^2 \text{ (k'al)} \text{ (except for } N_{61-80})$$

$$N_{61-79} = \{N_{1-19}\} + i + \text{muç'}$$

$$N_{80} = \{\text{muç'ul}\}$$

The word for 101 given by Thomas is *o-c'alal-tuc-ungvual*, $5 \times 20 + 1$, which is different from the formulae above. Other words from Thomas conform to the formulae, except for some minor morphological changes.

④ 400 is *wi:nqil k'alal*, whose formation is 20×20 . *wi:nqil* is derived from *winaq* "man" and a suffix *-il*.

Kekchí [69]

[EACHUS and CARLSON 1980: 348-349]

1	hun
2	kwib/ ka'ib
3	ošib
4	ka:ib
5	o:b
6	kwaqib
7	kuuqub
8	kwaqšaib
9	bele:b

10	laxe:b	
11	xunlaxu	1+10
12	kablaxu	2+10
13	ošlaxu	3+10
14	ka:-laxu	4+10
15	o'-laxu	5+10
16	kwaq-laxu	6+10
17	kuuq-laxu	7+10
18	kwaqšaqlaxu	8+10
19	bele-laxu	9+10
20	xun-may	
21	xun š-ka'-k'a:l	1>2×20
22	kwib š-ka'-k'a:l	2>2×20
23	ošib š-ka'-k'a:l	3>2×20
24	ka:ib š-ka'-k'a:l	4>2×20
25	o:b š-ka'-k'a:l	5>2×20
26	kwaqib š-ka'-k'a:l	6>2×20
27	kuuqub š-ka'-k'a:l	7>2×20
28	kwaqšaqlab š-ka'-k'a:l	8>2×20
29	bele:b š-ka'-k'a:l	9>2×20
30	laxe:b š-ka'-k'a:l	10>2×20
31	xun-laxu š-ka'-k'a:l	11>2×20
32	kab-laxu š-ka'-k'a:l	12>2×20
33	oš-laxu š-ka'-k'a:l	13>2×20
34	ka:-laxu š-ka'-k'a:l	14>2×20
35	o'-laxu š-ka'-k'a:l	15>2×20
36	kwaq-laxu š-ka'-k'a:l	16>2×20
37	kuuq-laxu š-ka'-k'a:l	17>2×20
38	kwaqšaqlaxu- š-ka'-k'a:l	18>2×20
39	bele-laxu š-ka'-k'a:l	19>2×20
40	ka'-k'a:l	2×20
41	xun r-oš-k'a:l	1>3×20
50	laxe:b r-oš-k'a:l	10>3×20
60	oš-k'a:l	3×20
62	ka'ib š-ka:-k'a:l	2>3×20
80	ka:-k'a:l	4×20
85	o:b r-o'-k'a:l	5>4×20
100	o'-k'a:l	5×20
120	kwaq-k'a:l	6×20
140	kuuq-k'a:l	7×20
160	kwaqšaql-k'a:l	8×20
180	bele-k'a:l	9×20
200	laxe-k'a:l	10×20
400	oq'ob	
500	o-k'a:l š-kab oq'ob	5×20>2×400
600	o-tuk š-kab oq'ob	5×40>2×400
1000	o-tuk r-oš oq'ob	5×40>3×400

Basic vocabulary:

$$U = \{1...9\}$$

$$B^1 = \{10 \text{ (laxu)}\}, B^2 = \{20 \text{ (k'a:l)}\}, B^3 = \{400 \text{ (oq'ob)}\}$$

Derivative vocabulary:

$$10' = \text{laxe:b} > \text{laxu-e:b}$$

A suffix: $\{-VI\}$

①② Decimal below 20.

$$N_{1-19} = U \pm B^1 \pm -VI$$

③ Vigesimal from 20 to 399.

$$N_{21-399} = \pm \{N_{1-19}\} \pm \dot{s}/r + \{2...19\} \times U^2$$

Although 200 in the list above is *laxe-k'a:l* (10×20), Thomas gives *ho-tuc* (5×40) [Thomas 1897-8: 902].

④ The numerals from 400 above are formed from 400, but as is seen in 600 ($= 200 > 2 \times 400$) and 1000 ($= 200 > 3 \times 400$), 200 is expressed as 5×40 . The numerals beyond 100 in the Kekchí system are being lost. The Kekchí formation is being replaced by the Spanish word for 100. A mixed system has resulted. For example, 123 is expressed as follows:

123 siento rik'in ošib š-ka'-k'a:l 100 and $3 > 2 \times 20$

Pocomchí [70]

[BROWN 1979: 62-68]

	Bound form	Free form	[THOMAS 1897-8: 862, 901]
1	xun-	xunax/nax	jenáj
2	kab'-/ka'	k-i:b'	quiiib
3	oš-	š-i:b'	ixib
4	kax-	kix-eb'/ kex-eb'	quijib
5	ho'-	ho'-o:b'	joób
6	waq-	waq-i:b'	vuakib
7	wuq-	wuq-u:b'	vukúb
8	wahšaq-	wahšaq-i:b'	vuaxakib
9	b'elex-	b'elex-e:b'	belejé
10	lax-	lax-e:b'	lajéb
11	xun-lax		hun-lah 1+10
12	kab'-lax		cab-lah 2+10
13	oš-lax		ox-lah 3+10
14	kax-lax		cah-lah 4+10
15	ho'-lax		ho-lah 5+10
16	waq-lax		vuak-lah 6+10
17	wuq-lax		vuk-lah 7+10
18	wahšaq-lax		vuaxak-lah 8+10
19	b'elex-lax		beleh-lah 9+10
20	xun-inaq		hun-inak 1×20
21	nax ri-ka'-winaq		henah ru-ca-vuinak 1>2×20
22	ki:b' ri-ka'-winaq		quib ru-ca-vuinak 2>2×20
23	šib' ri-ka'-winaq		3>2×20
30			laheb-ru-ca-vuinak 10>2×20
38	wahšaq-lax ri-ka'-winaq		18>2×20
39	b'elex-lax ri-ka'-winaq		19>2×20
40	ka'-winaq		ca-vuinak 2×20
41	nax r-oš-k'ahl		1>3×20

50		laheb-r-ox-k'al	$10 > 3 \times 20$
60	oš-k'ahl	ox-c'al	3×20
61	nax ri-kax-winaq		$1 > 3 \times 20$
70		laheb-ru-cah-vuinak	$10 > 4 \times 20$
80	kax-winaq	cah-vuinak	4×20
81	nax ri-ho'-k'ahl		$1 > 5 \times 20$
100	ho'-k'ahl	ho-c'al	5×20
101	ho'-k'ahl r-u:k' nax		$5 \times 20 + 1$
102	ho'-k'ahl r-u:k' ki:b'		$5 \times 20 + 2$
200		ho-tuc	5×40

In the above examples from modern Pokomch'í two series, bound and free, are presented. The bound form is followed by numeral classifiers. The free form results from the suffixing of *-V:b*, which corresponds with *-Vl* or *-Vb* in other Mayan languages.

Basic vocabulary:

$$U = \{1 \dots 9\},$$

$$B^1 = \{10 \text{ (lax)}\}, B^2 = \{20 \text{ (winaq} \sim k'ahl)\}, B^3 = \{100 \text{ (ho}'k'ahl = 5 \times 20)\}$$

A suffix: *-V:b*

①② Decimal below 20.

$$N_{1-19} = U \pm B^1$$

③ Vigesimal from 20 up.

$$N_{21-99} = \pm \{N_{1-19}\} \pm ri-/r- + \{2 \dots 5\} \times B^2$$

④ The numerals above 100 are formed by undercounting, using 5×20 as the base. *r-uk'* is a preposition and means "with."

$$N_{100-} = B^3 + ruk' + \{N_{1-19}\}$$

Thomas gives *ho-tuc* or 5×40 for 200.

Quiché [73]

	[Fox 1973: 30,57]	[BRASSEUR DE BOURBOURG 1961 (1862): 167-172]	
1	xun	hun	
2	kieb'	cab/ caib	
3	ošib'	ox-ib	
4	kiexeb'	cah/ cah-ib	
5	xob'	oo/ oob	
6	waqib'	vakakib (vakib?)	
7	wuqub'	vuk-ub	
8	waxšaqib'	vahxak-ib	
9	b'elexeb'	beleh/ beleheb	
10	laxux	lahuh	
11	xu-laxux	hu-lahuh	1 + 10
12	kab'-laxux	cab-lahuh	2 + 10
13	oš-laxux	ox-lahuh	3 + 10
14	kax-laxux	cah-lahuh	4 + 10
15	o-laxux	o-lahuh	5 + 10
16	waq-laxux	vak-lahuh	6 + 10
17	wuq-laxux	vuk-lahuh	7 + 10
18	waxšaq-laxux	vahxak-lahuh	8 + 10
19	b'elex-laxux	beleh-lahuh	9 + 10
20	xu-winaq	hu-vinak	1 × 20

21		hu-vinak-hun	$1 \times 20 + 1$
22		hu-vinak-cab	$1 \times 20 + 2$
30	xu-winaq laxux		$1 \times 20 + 10$
40	ka-winaq	ca-vinak	2×20
41		hun-r-ox-qal	$1 > 3 \times 20$
42		cab-r-ox-qal	$2 > 3 \times 20$
43		oxib-r-ox-qal	$3 > 3 \times 20$
50	nik'iax siento		half 100
60	oš-k'al	ox-qal	3×20
61		hun-ri-humuch	$1 > 1 \times 80$
62		cab-ri-humuch	$2 > 1 \times 80$
63		ox-ri-humuch	$2 > 1 \times 80$
70	oš-k'al laxux		$3 \times 20 + 10$
80	xu-muč'	hu-much	1×80
81		hun-r-o-qal	$1 > 5 \times 20$
82		cab-r-o-qal	$2 > 5 \times 20$
83		oxib-r-o-qal	$3 > 5 \times 20$
90	xu-muč' laxux		$1 \times 80 + 10$
100	xun siento	o-qal	1×100
101		hun-ri-vak-qal	$1 > 6 \times 20$
102		cab-ri-vak-qal	$2 > 6 \times 20$
103		oxib-ri-vak-qal	$3 > 6 \times 20$
120		vak-qal	6×20
121		hun-ri-vuk-qal	$1 > 7 \times 20$
122		cab-ri-vuk-qal	$2 > 7 \times 20$
123		oxib-ri-vuk-qal	$3 > 7 \times 20$
140		vuk-qal	7×20
141		hun-ri-vahxak-qal	$1 > 8 \times 20$
142		cab-ri-vahxak-qal	$2 > 8 \times 20$
143		oxib-ri-vahxak-qal	$3 > 8 \times 20$
160		vahxak-qal	8×20
161		hun-ri-beleh-qal	$1 > 9 \times 20$
180		beleh-qal	9×20
181		hun-ri-o-tuk	$1 > 1 \times 5 \times 40$
200		o-tuk	$1 \times 5 \times 40$
201		hun-ri-hulah	$1 > 11 \times 20$
220		hulahu-qal	11×20
221		hun-ri-cablah	$1 > 12 \times 20$
240		cablahuh-qal	12×20
241		hun-r-oxlah	$1 > 13 \times 20$
260		r-oxlah-qal	13×20
261		hun-ri-cahlahuhu-qal	$1 > 14 \times 20$
280		cahlahuh-qal	14×20
281		hun-r-olahuh-qal	$1 > 15 \times 20$
300		r-olahuh-qal	15×20
301		hun-ri-vaklahuh-qal	$1 > 16 \times 20$
320		vaklahuh-qal	16×20
321		hun-r-vuklahuh-qal	$1 > 17 \times 20$
340		vuklahuh-qal	17×20
341		hun-r-vahxaklahuh-qal	$1 > 18 \times 20$

360	vahxaklahuh-qal	18×20
361	hun-ri-beleh-lahuh-qal	$1 > 19 \times 20$
380	belehlahuh-qal	19×20
381	hun-ri-o-much	$1 > 5 \times 80$
400	o-much	5×80
401	o-much-hun	$5 \times 80 + 1$
500	o-much-o-qal	$5 \times 80 + 5 \times 20$
600	o-much-o-tuk	$5 \times 80 + 5 \times 40$
700	o-much-o-lah/ o-much-o-lahuh-qal	$5 \times 80 + 15 \times 20$
720	o-much-vaklahuh-qal	$5 \times 80 + 16 \times 20$
780	o-much-belehlahuh-qal	$5 \times 80 + 19 \times 20$
781	hun-ri-ca-go	$1 > 2 \times 400$
782	cab-ri-ca-go	$2 > 2 \times 400$
800	ca-go	2×400
801	hun-r-oxo-go	$1 > 3 \times 400$
840	cavinak-r-oxo-go	$2 \times 20 > 3 \times 400$
860	ox-qal-r-oxo-go	$3 \times 20 > 3 \times 400$
880	humuch-r-oxo-go	$80 > 3 \times 400$
900	o-qal-r-oxo-go	$5 \times 20 > 3 \times 400$
920	vak-qal-r-oxo-go	$6 \times 20 > 3 \times 400$
940	vuk-qal-r-oxo-go	$7 \times 20 > 3 \times 400$
960	vahxak-qal-r-oxo-go	$8 \times 20 > 3 \times 400$
980	beleh-qal-r-oxo-go	$9 \times 20 > 3 \times 400$
1000	o-tuk-r-oxo-go	$5 \times 40 > 3 \times 400$
1200	r-oxo-go	3×400
1600	cah-go	4×400
2000	r-oo-go/ r-o-go	5×400
2400	vaka-go	6×400
2800	vuku-go	7×400
3000	o-tuk-vahxak-go	$5 \times 40 > 8 \times 400$
3200	vahxa-go	8×400
3600	beleh-go	9×400
4000	lahuh-go	10×400
4400	hulahuh-go	11×400
4800	cablahuh-go	12×400
5000	o-tuk-oxlahuh-go	$5 \times 40 > 13 \times 400$
5200	oxlahuh-go	13×400
5600	cahlahuh-go	14×400
6000	r-oolahuh-go	15×400
6400	vaklahuh-go	16×400
6800	vuklahuh-go	17×400
7000	o-tuk-vahxaklahuh-go	$5 \times 40 > 18 \times 400$
7200	vahxaklahuh-go	18×400
7600	belehlahuh-go	19×400
7601	hun-ri-hu-chuvy	$1 > 8000$
7602	cab-ri-hu-chuvy	$2 > 8000$
8000	hu-chuvy	1×8000
16000	ca-chuvy	2×8000
24000	ox-chuvy	3×8000
80000	lahuh-chuvy	10×8000

88000

hulahuh-chuvy

 11×8000

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (laxux)}\}, B^2 = \{20 \text{ (winaq } \sim k'al)\}, B^3 = \{100 \text{ (siento)}\}$$

A suffix: $\{-V: b\}$

①② Decimal below 20.

$$N_{1-19} = U \pm B^1$$

③ The numerals from 20 to 99 are basically vigesimal, but 50 is expressed as half of 100, and 80 is *muč'*.

$$N_{20-49} = \{1, 2\} \times B^2 \text{ (winaq)} + \{N_{1-19}\}$$

$$N_{50} = \text{nik'ax siento}$$

$$N_{60-79} = 3 \times B^2 \text{ (k'al)} \pm \{N_{1-19}\}$$

$$N_{80-99} = \text{xumuč'} \pm \{N_{1-19}\}$$

N_{50-59} may be formed by *nik'ax siento* + N_{1-9} or *ka-winaq* + N_{10-19} , as is shown in Cakchiquel and Tzutujil.

④ The numerals above 100 may be formed on a new base, 100.

In modern Quiché the numerals from 20 to 99 are formed by undercounting, whereas in Classical Quiché undercounting is applied only to the numerals from 20 to 39, and thereafter overcounting is employed. The system is as follows:

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (lahuh)}\}, B^2 = \{20 \text{ (vinak } \sim qal)\}, B^{2'} = \{80 \text{ (hu-much)}\}, B^{2''} = \{200 \text{ (o-tuk)}\},$$

$$B^3 = \{400 \text{ (o-much} = 5 \times 80)\}, B^4 = \{800 \text{ (ca-go} = 2 \times 400)\}, B^5 = \{8000 \text{ (chuvy)}\}$$

Derivative vocabulary:

$$1' = \{\text{hu}\}, 2' = \{\text{cab}\}, 3' = \{\text{ox}\} \dots$$

$$2'' = \{\text{ca}\}, 3'' = \{\text{oxo}\} \dots$$

A suffix: $\{-Vb\}$

①② Decimal below 20.

$$N_{1-19} = U \pm B^1$$

③ The numerals from 20 up are basically vigesimal, but the numerals from 20 to 39 are formed by undercounting. From 40 up the formation follows overcounting, utilizing *qal* as a base, except for 61 to 80, whose base is *hu-much*, and 181-200, whose base is *o-tuk*.

$$N_{20-39} = \{1\} \times B^2 \text{ (vinak)} \pm \{N_{1-19}\}$$

$$N_{40-379} = + \{N_{1-19}\} + r \text{ (i)} + \{3' \dots 19\} \times B^2 \text{ (qal)}$$

$$N_{61-80} = + \{N_{1-19}\} + ri + \text{humuch (80)}$$

$$N_{181-200} = + \{N_{1-19}\} + r + \text{otuk (80)}$$

④ From 381 to 780, a new base, *omuch*, is introduced, and thereafter *go* becomes a new base for the numerals from 781-7600. From 7601 up *chuvy* functions as a new base.

$$N_{381-399} = \pm \{N_{1-19}\} + r + B^3 \text{ (omuch)}$$

$$N_{400-780} = B^3 \pm \{N_{1-380}\}$$

$$N_{781-800} = \pm \{N_{1-19}\} + ri + \{2'' \text{ (ca)}\} \times B^4 \text{ (go)}$$

$$N_{801-7600} = \pm \{N_{1-399}\} + r \text{ (i)} + \{3'' \dots\} \times B^4 \text{ (go)}$$

$$N_{7601-8000} = \pm \{N_{1-399}\} + ri + 1' \text{ (hu)} \times B^5 \text{ (chuvy)}$$

Cakchiquel [76]

	Classical [BRINTON: 408]	Modern [HERBRUGER et al. 324-326][BLAIR et al. 478-479]	
1	xun	xun	xun
2	kay	kaí'	ka'i'
3	oši	oší'	oší
4	kaxi	kaxí'	kaxi'
5	voo	woó'	vo'o'
6	vaqaqi	waqí'	vaqi'
7	vuqu	wuqú'	vuqu'
8	vaqšaqi	waqšaqi'	vaqšaqi'
9	belexe	belexé'	belexe'
10	laxux	laxúx	laxux
11	xu-laxux	xu(wi)-laxux	xu-laxux 1+10
12	kab-laxux	kabi-laxux	kab-laxux 2+10
13	oš-laxux	oš-laxúx	oš-laxux 3+10
14	kax-laxux	kax-laxux	kax-laxux 4+10
15	voo-laxux	woó-laxux	vo-laxux 5+10
16	vaq-laxux	waq-laxux	vaq-laxux 6+10
17	vuq-laxux	wuq-laxux	vuq-laxux 7+10
18	vaqša-q-laxux	waqša-q-laxux	vaqša-q-laxux 8+10
19	belex-laxux	belex-laxux	belex-laxux 9+10
20	xu-vinaq	xu-wináq	xu-vinaq 1×20
21	xu-vinaq xun	xu-wináq xun	xu-vinaq xun 1×20+1
30		xu-wináq laxux	xu-vinaq laxux 1×20+10
40	ka-vinaq	ka-wináq	ka-vinaq 2×20
41	xun-r-oš-k'al	ka-wináq xun	1>3×20
42	kay-r-oš-k'al	ka-wináq kaí	2>3×20
50		ka-wináq laxux	ka-vinaq laxux 2×20+10
51		nikax sientó	half 100
		nikax sientó rik'í xun	half 100+1
		ka-wináq xuwi-laxux	2×20+10+1
60	oš-k'al	oš-k'ál	oš-k'al 3×20
61	xun ru-xu-muč'	oš-k'ál xun	1>80/ 3×20+1
80	xu-muč'	xu-múč'	1×80
90		xu-múč' laxux	xu-muč' laxux 1×80+10
100	o-k'al	woó-k'al	5×20
		xun sientó	100
101	xun ru-vaq-k'al	xun sientó rik'í xun	100+1
120	vaq-k'al	xun sientó rik'í xu-wináq	6×20/ 100+20
121	xun ru-vuq-k'al	xun sientó rik'í xu-wináq xun	1>7×20/100+20+1
140	vuq-k'al	xun sientó rik'í ka-wináq	7×20/100+2×20
151		xun sientó rik'í ka-winaq xuwi-laxux	100+2×20+1+10
160	vaqša-q-k'al	xun sientó rik'í o š-k'al	8×20/ 100+3×20
180	belex-k'al	xun sientó rik'í xu-múč'	9×20/ 100+80
200	o-tuk	kaí sientó	5×40/ 2×100
300	vo-laxux-k'al	oší sientó	15×20/ 3×100
400	o-muč'	kaxí sientó	5×80/ 4×100
500	o-muč' o-k'al	woó sientó	5×80+5×20/ 5×100

600	o-muč' o-tuk	waqí siento	$5 \times 80 + 5 \times 40 / 6 \times 100$
700	o-muč' vo-laxux-k'al	wuqú siento	$5 \times 80 + 15 \times 20 / 7 \times 100$
800	ka-q'o	waqšaqaí siento	$2 \times 400 / 8 \times 100$
900	*oš-k'al r-oš-oq'o	belexé siento	$*3 \times 20 > 3 \times 400 / 9 \times 100$
1000	o-tuk r-oš-oq'o	xun-mil	$5 \times 40 > 3 \times 400 / 1000$
8000	xu-chuvi		

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (laxux)}\}, B^2 = \{20 \text{ (winaq} \sim k'al)\}, B^3 = \{100 \text{ (siento)}\}$$

A connective: {rik'i}

A suffix: {-V:'}

①② Decimal below 20.

$$N_{1-19} = U \pm B^1$$

③ The numerals from 20 to 99 are fundamentally vigesimal, but 50 may be expressed as half of 100, and 80 is *muč'*.

$$N_{20-59} = \{1, 2\} \times B^2 \text{ (winaq)} \pm \{N_{1-19}\}$$

$$N_{50-59} = \text{nik'ax siento} \pm \text{rik'i} \pm \{N_{1-9}\}$$

$$N_{60-79} = 3 \times B^2 \text{ (k'al)} \pm \{N_{1-19}\}$$

$$N_{80-99} = \text{xumuč'} \pm \{N_{1-19}\}$$

The numbers from 50 to 59 are expressed by *nik'ax siento* + N_{1-9} or by *ka-winaq* + N_{10-19} . In Classical Cakchiquel the numerals up to 40 are formed on the undercounting method, but from 41 up overcounting is employed.

$$N_{41} = \{N_{1-19}\} + \text{ru-/r-} \{3 \dots\} \times B^2 \text{ (k'al)}$$

④ The word for 100 is borrowed from Spanish, but the coefficients are Cakchiquel.

$$N_{100} = \{1 \dots 9\} \times B^3 \pm \text{rik'i} \pm N_{1-99}$$

Classical Cakchiquel follows the vigesimal system, but 200 is $5 \times \text{tuk}$, and 400 is $5 \times \text{muč'}$. It appears that *tuk* means 40 and *muč'* means 80. The numerals from 400 up are formed by adding *omuč'* to 100, 200, and 300. 800 is $2 \times (o) q'o$ and thereafter the formation seems to be overcounting. Although 800 is *ka-q'o*, the numerals from 900 up are formed from *r-oš-oq'o*, and moreover, the word for 400 in Kekchí is *oq'ob*. Thus 400 should be *oq'o*, and 800 is analyzed as *ka-oq'o* > *kaq'o*. 900 should not be *oš-k'al*- but *o-k'al*-; this may be an error.

Tzutujil [77]

[DAYLEY 1985: 161-164]

	Bound form	Free form	
1	xu (')-	xu:n	
2	kab'-/ka'-	ka'i'	
3	oš-	oš-i'	
4	kax-	kixi'/ kaxi'/ kexi'	
5	ho'-/ hox-/ o:'-	xo'-o:'	
6	wa:q-	wa:q-i:'	
7	wuq-	wuq-u:'	
8	waxša-q-	waxša-q-i:'	
9	b'e(:)le(:)x-	b'elex-e:'	
10	lax-	laxu:x	
11	xu(')-laxu:x		1+10
12	kab'-laxu:x		2+10

13	oš-laxu:x	3+10
14	kax-laxu:x	4+10
15	xo'-laxu:x	5+10
16	waq-laxu:x	6+10
17	wuq-laxu:x	7+10
18	waxšaq-laxu:x	8+10
19	b'e(:)lex-laxu:x	9+10
20	xu-winaq/ xun-winaq	1×20
21	xu-winaq xu:n	20+1
22	xu-winaq ka'i'	20+2
23	xu-winaq oš-i'	20+3
24	xu-winaq kaxi'	20+4
25	xu-winaq xo'-o:'	20+5
26	xu-winaq wa:q-i:'	20+6
27	xu-winaq wuq-u:'	20+7
28	xu-winaq waxšaq-i:'	20+8
29	xu-winaq b'elex-e:'	20+9
30	xu-winaq laxu:x	20+10
31	xu-winaq xu'-laxu:x	20+11
32	xu-winaq kab'-laxu:x	20+12
33	xu-winaq oš-laxu:x	20+13
34	xu-winaq kax-laxu:x	20+14
35	xu-winaq xo'-laxu:x	20+15
36	xu-winaq waq-laxu:x	20+16
37	xu-winaq wuq-laxu:x	20+17
38	xu-winaq waxšaq-laxu:x	20+18
39	xu-winaq b'e:lex-laxu:x	20+19
40	ka'-winaq	2×20
41	ka'-winaq xu:n	2×20+1
42	ka'-winaq ka'i'	2×20+2
43	ka'-winaq oši'	2×20+3
50	ka'-winaq laxu:x/ nik'ax sye:nta	2×20+10/ half hundred
51	ka'-winaq xu'-laxu:x/ nik'ax sye:nta xu:n	2×20+11/ half hundred+1
52	ka'-winaq kab'-laxu:x/ nik'ax sye:nta ka'i'	2×20+12/ half hundred+2
53	ka'-winaq oš-laxu:x/ nik'ax sye:nta oši'	2×20+13/ half hundred+3
60	oš-k'axl	3×20
61	oš-k'axl xu:n	3×20+1
80	xumuč'	
81	xumuč' xu:n	80+1
100	xun sye:nta	1×100
200	ka'i' sye:nta	2×100
300	oš-i' sye:nta	3×100
400	kaxi' sye:nta	4×100
500	xo'-o: sye:nta	5×100
600	wa:q-i: sye:nta	6×100
700	wuq-u: sye:nta	7×100
800	waxšaq-i: sye:nta	8×100
900	b'elex-e: sye:nta	9×100
1000	xun mi:l	1×1000
2000	ka'i' mi:l	2×1000

3000	oš-i' mi:l	3×1000
4000	kaxi' mi:l	4×1000
5000	xo'-o:' mi:l	5×1000
6000	wa:q-i:' mi:l	6×1000
7000	wuq-u:' mi:l	7×1000
8000	waxšaq-i:' mi:l	8×1000
9000	b'ele-x-e:' mi:l	9×1000

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (laxu:x)}\}, B^2 = \{20 \text{ (winaq} \sim k'axl)\}, B^3 = \{100 \text{ (sienta)}\}$$

A suffix: $\{-V:'\}$

①② Decimal below 20.

$$N_{1-19} = U \pm B^1$$

①② The numerals from 20 to 99 are fundamentally vigesimal, but 50 may be formed by half-counting, and 80 is *muč'*.

$$N_{20-59} = \{1, 2\} \times B^2 \text{ (winaq)} \pm \{N_{1-19}\}$$

$$N_{50-59} = \text{nik'ax sienta} \pm \{N_{1-9}\}$$

$$N_{60-79} = 3 \times B^2 \text{ (k'axl)} \pm \{N_{1-19}\}$$

$$N_{80-99} = \text{xumuč'} \pm \{N_{1-19}\}$$

The numbers from 50 to 59 may be expressed by *nik'ax sienta* $\pm N_{1-9}$ or by *ka-winaq* $\pm N_{10-19}$.

④ The word for 100 is borrowed from Spanish, but the multipliers (or coefficients) are Tzutujil. It is not clear how the interval numbers are formed.

$$N_{100} = \{1 \dots 9\} \times B^3 \pm$$

Xinca [78]

[LEHMANN 1920: 67, 734, 747] (The original transcription is retained.)

	Chiquimulilla	Sinacatan	Yupiltepec	Jutiapa
1	ical/ ícal	ica	ical/ ical	ical
2	pi-ar/ pi	ti	piar/ bial	piár
3	hual-ar/ cvuá	uala	(h)ualar/ vüaalal	guarar
4	iri-ar/ íria	jiria	iriar/ iriahim	iriar
5	püj/ puj ö	puj	püj/ pijar/ piji	pujar
6	tacá/ taca	tacal	tacá/ tácal	tacalar
7	puljna	pujuá	puljar/ pulja	pulluar
8	jüörte	tapoc/tapuc	apuj	apocar
9		uxtú		gerjsar
10		pakil	pakil	paquilar
11	pakin-cal			
12	pakin-pi			
13	pakin-huial			
14	pakin-iriar			
15	pakin-püj			
16	pakin-tacá			
17	pakin-puljna			
18	pakin-jüörte			

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (pakin)}\}$$

①② The system seems to be decimal.

$$N_{1-19} = \pm U^1 + \{N_{1-9}\}$$

Lenca [D14]

[LEHMANN 1920: 670] (Original transcription)

	[[GUAJQUERO 1853]]	[[SIMILATON]]	
1	ita	eta	
2	naa; (pa)	pé	
3	lagua	lágua	
4	aria	eslea	
5	saiha	say	
6	huie	guilli	
7	huisca	guisca	
8	teefca	tefca	
9	kalapa	calapa	
10	isis	isis	
11	isis-l-ita	isis-la-ita	10+1
12	isis-la-pa	isis-la-pe	10+2
13	isis-lagua	isis-lagua	10+3
20	guamasta	guamasta	
21	guamasta-l-ita	guamasta-la-ita	20+1
30	guamasta-l-isis	guamasta-la-isis	20+10
40	cu-eta	cu-eta	
50		cu-eta-la-isis	40+10
60		cu-eta-guamasta	40+20
70		cu-eta-guamasta-isis	40+20+10

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (isis)}\}, B^2 = \{20 \text{ (guamasta)}\}, B^3 = \{40 \text{ (cueta)}\}$$

Connectives: {la~l}

① Decimal below 20.

$$N_{1-19} = \pm B^1 + U$$

② The numerals from 20 to 39 are formed on the base 20, and those from 40 up are formed on 40.

$$N_{20-39} = U^2 \pm \{N_{1-19}\}$$

$$N_{40-79} = U^3 \pm \{N_{1-39}\}$$

Tol [80]

(The original transcription is retained.)

	[CONZEMIUS 1921-3]	[VON HAGEN 1943: 94]	[LEHMANN 1920: 67]	
1	pani	pani	pani	pfani
2	mata	mata	matiaa	pmatà
3	kont	kont	contias	abrucua
4	yurupana	urupan	chiquitia	urubaná
5	komasopani	komasopani	cumasópni	peve-bané
6		kuspi	comasampe-pani	peve-dro

7		kus panikuö	comasampe-matiao	asha-fa-ffani
8		kamayarö	comasampe-contiac	asha-fa-matá
9			comasampe-contiao	asha-fa-abrucà
10	komaspö	komaspö	comassopnas	commeavü
11				
20	tsenam pani	tsenam pani		
21				
40	tsenam mata	tsenam mata	20×2	
60		tsenam contis	20×3	
80		tsenam yurupa	20×4	
100		tsenam komas	20×5	

The first column of Lehmann's list shows the material dated 1788, and the formation is quinary. The second column is from the Palmar dialect given by Membreño. The words for 7, 8 and 9 in Palmar seem to contain the morpheme for 1, 2 and 3, respectively. It is impossible to regard the list given by von Hagen as a quinary system. The numerals from 20 up are vigesimal, with coefficients following the base.

Mískitu [81]

[CONZEMIUS 1929: 81-82]

1	kumi/ kum	
2	wal	
3	yumpa	
4	walwal	2+2
5	matsip/ matasip	
6	matlalkahbi: /matlalka:bi:	
7	matlalkahbi: pu:ra kumi	6+1
8	matlalkahbi: pu:ra wal	6+2
9	matlalkahbi: pu:ra yumpa	6+3
10	matawalsip/matwalsip	
11	matawalsip pu:ra kumi	10+1
12	matawalsip pu:ra wal	10+2
17	matawalsip pu:ra matlalkahbi: pu:ra kumi	10+6+1
20	ya:wanayska/ ya:wanayska kumi	
21	ya:wanayska pu:ra kumi	20+1
30	ya:wanayska pu:ra matawalsip	20+10
40	ya:wanayska wal	20×2
50	ya:wanayska wal pu:ra matawalsip	$20 \times 2 + 10$
80	ya:wanayska walwal	20×4
99	ya:wanayska walwal pu:ra matawalsip pu:ra matlalkahbi: pu:ra yumpa	$20 \times 4 + 10 + 6 + 3$
100	ya:wanayska matsip/ andat/ andat kumi	$20 \times 5 / 100$
200	andat wal	
1000	tawsin/ tawsin kumi	

Basic vocabulary:

$U = \{1, 2, 3, 5\}$

$B^1 = \{6 \text{ (matlalkahbi:)}\}$, $B^2 = \{10 \text{ (matawalsip)}\}$, $B^3 = \{20 \text{ (ya:wanayska)}\}$,

$B^4 = \{100 \text{ (andat)}\}$

A connective: {pu:ra}

①② The numerals up to 20 are basically vigesimal, but the words for 4, and 6 to 10 are compounds. They are analyzed into roots.

6 = mat-lal-kahbi = hand + head + lay upon, 10 = mata-wal-sip = 5×2 + sip

$N_{1-5} = \{1, 2, 3, 2, 5\}$

$N_{6-9} = B^1 \pm \text{pu:ra} \pm \{1, 2, 3\}$

$N_{10-19} = B^2 \pm \text{pu:ra} \pm \{N_{1-9}\}$

③ The numerals from 20 to 99 are vigesimal.

$N_{20-99} = B^3 \times \{\#, 2, 3, 4, 5\} \pm \{N_{1-19}\}$

④ The numerals from 100 up seem to be formed on a new base, *andat*, which seems to be borrowed from English "hundred."

$N_{100} = B^4 \times \{1 \dots\} \pm$

Sumu [82]

[CONZEMIUS 1929: 81-82]

	Ulwa	Panamaka, Twahaka	
1	asla/ as	asla/as	
2	bo	bo/ bu	
3	bas	bas	
4	aronka/ arunka	aronka/ arunka	
5	sinka	sinka	
6	tiŋ as kaw as	tiŋ as kaw as/ tyas kaw as	5+1
7	tiŋ as kaw bo	tiŋ as kaw bo/ tyas kaw bu	5+2
8	tiŋ as kaw bas	tiŋ as kaw bas/ tyas kaw bas	5+3
9	tiŋ as kaw 'ronka	tiŋ as kaw 'ronka/ tyas kaw runka	5+4
10	salap	salap	
11	salap takat as	salap minitkaw as	10+1
12	salap takat bo	salap minitkaw bo	10+2
17	salap taklat tiŋ as kaw bo	salap minitkaw tiŋ as kaw bo	10+5+2
20	moyh as loyh	moyh as loyh as/ moy as loy (as)	
21	moyh as loyh takat as	moyh as loyh as minitkaw as	20+1
30	moyh as loyh takat salap	moyh as loyh minitkaw salap	20+10
40	moyh as loyh bo/	moyh as loyh bo	20×2
	moyh bo loyh		
50	moyh bo loyh takat salap	moyh as loyh bo minitkaw salap	20×2+10
80	moyh as loyh aronka/	moyh as loyh aronka	20×4
	moyh aronka loyh		
99	moyh as loyh aronka takat salap	moyh as loyh aronka minitkaw salap	20×4+10+5+4
	takat tiŋ as kaw 'ronka	minitkaw tiŋ as kaw 'ronka	
100	moyh as loyh sinka/	moyh as loyh sinka	20×5
	andat as/ andat asla		100×1
200	andat bo	andat bo/ andat bu	100×2
1000	tawsin as/ tawsin asla	tawsin as/ tawsin asla	1000×1

Basic vocabulary:

$U = \{1, 2, 3, 4, 5\}$

$B^1 = \{5' (\text{tiŋ})\}$, $B^2 = \{10 (\text{salap})\}$, $B^3 = \{20 (\text{moyh-as-loyh})\}$,

$B^4 = \{100 (\text{andat})\}$, $B^5 = \{1000 (\text{tawsin})\}$

Connectives: {kaw} {takat, minitkaw} {loyh}

①② The numerals below 20 are basically quinary, but it is better to regard N_{10-19} as follow-

ing the decimal system, because N_{1-9} are added to the B^2 .

$$N_{1-5} = \{U\}$$

$$N_{6-9} = B^1 + as + kaw + \{1, 2, 3, 4\}$$

$$N_{10-19} = B^2 \pm takat \pm \{N_{1-9}\}$$

sin̄ka for 5 appears to be a Spanish loanword.

③ The numerals from 20 to 99 are vigesimal.

$$N_{20-99} = B^3 \times \{\#, 2, 3, 4, 5\} \pm takat \pm \{N_{1-19}\}$$

Since *as* and *bo* represent 1 and 2, respectively, *moyh-bo*, 20×2 , should follow *moyh-as*, 20×1 , but *moyh-as-loyh-bo* is also used for 40. Obviously *moyh-as-loyh* may be employed as a base.

④ 100 is expressed either by 20×5 or by an English loan, *andat*.

$$N_{100} = B^4 \times \{1 \dots\}$$

Cacaopera [D17]

	[CAMPBELL 1975: 151]	[BRINTON 1895: 408] (Original transcription)	
1	timísa	tibas	bas
2	búřu	burro	buyo
3	wasbá	guadbá	guatba
4	botářo	botarro	bota'jio
5		panacás	

Paya [83]

[LEHMANN 1920: 653, 651] (Original transcription)

1	as	
2	poc	
3	mai/ maig	
4	caa/ ca	
5	aúnqui/ aunquí	
6	séra/ será	
7	tavúa/ taoag	
8	óva/ oguag	
9	tax/ tais	
10	úca/ ucá	
11	uca-r-as	10+1
12	uca-ra-poc	10+2
20	vua-uca/ wa-ucá	2? × 20
21	vua-uca-r-as	
22	vua-uca-ra-poc	
30	mai-tup	3 ×
40	isca	? × 4
41	isca-r-as	40+1
50	isca-r-uca	40+10
60	isca-r-vuauca	40+20
70	isca-r-maitup	40+30
80	íscar-tapac-poc	40 × 2
90	isca-poc-ar-uca	40 × 2 + 10
100	ispoc	
1000	arcapiss-as	

Basic vocabulary:

$$U = \{1 \dots 9\}$$

$$B^1 = \{10 \text{ (uca)}\}, B^2 = \{40 \text{ (isca)}\}$$

Derivative vocabulary:

$$2' = \text{vua}, 10' = \text{tup}$$

A connective: $\{\text{ra} \sim \text{r}\}$

- ① The numerals up to 40 seem to be decimal.

$$N_{1-39} = \pm \{\#, 2', 3\} \times B^1 \text{ (uca} \sim \text{tup)} \pm \text{r(a)} + \{U\}$$

- ② The numerals above 40 are formed on a base, 40. A new base seems to be introduced at 100, but this is not clear due to lack of data.

$$N_{40-} = B^2 \times \{\#, 2\} \pm \{N_{1-39}\}$$

Rama [84]

[RIGBY and SCHNEIDER 1989: 179] (Original transcription)

1	sáiming	
2	púksak/ púkshak	
3	pángsak	
4	kúnkunbi	
5	kwíkwistar	
6	kwíkwistar su sáiming	5+1
7	kwíkwistar su púksak	5+2
8	kwíkwistar su pángsak	5+3
9	kwíkwistar su kúnkunbi	5+4
10	kwik púksak atkulin	5×2 (two hands at an end)
11	kwik púksak atkulin su sáiming	5×2+1
12	kwik púksak atkulin su púksak	5×2+2
13	kwik púksak atkulin su pángsak	5×2+3
14	kwik púksak atkulin su kúnkunbi	5×2+4
15	kwik pángsak atkulin	5×3 (three hand at an end)
16	kwik pángsak atkulin su sáiming	5×3+1
17	kwik pángsak atkulin su púksak	5×3+2
18	kwik pángsak atkulin su pángsak	5×3+3
19	kwik pángsak atkulin su kúnkunbi	5×3+4
20	mutkúli sáiming	20×1 (one person)
21	mutkúli sáiming su sáiming	20×1+1

Basic vocabulary:

$$U = \{1, 2, 3, 4, 5\}$$

$$B^1 = \{5 \text{ (kwíkwistar)}\}, B^2 = \{5' \text{ (kwik)}\}, B^3 = \{20 \text{ (mutkúli)}\}$$

Connectives: $\{\text{su}\} \{\text{atkulin}\}$

- ①② The numerals up to 20 are quinary. The words for 10 and 15 are multiples of the base 5, $5' \times 2 + \text{atkulin}$ for 10 and $5' \times 3 + \text{atkulin}$ for 15.

$$N_{1-5} = U$$

$$N_{6-9} = B^1 + \text{su} + \{N_{1-4}\}$$

$$N_{10-19} = B^2 \times \{2, 3\} + \text{atkulin} \pm \text{su} \pm \{N_{1-4}\}$$

- ③ The numerals from 20 up are vigesimal.

$$N_{20-} = B^3 \times \{1 \dots\} \pm \text{su} \pm \{N_{1-19}\}$$

Cabécar [87]

[LEHMANN 1920: 245, 260-263, 327-328] (Original transcription)

	Cabécar	Cabécar	Estrella	Chiripó
1	estaba	ecra	ecra	ætka
2	boctebá	bur	bor	bótkē
3	mañalegui	mañór	mñor	māñát
4	quetovo	quéire	quir	'kít
5	exquetegu	s'quinre	s'quéngr	skær
6	sehen	qui-écra	terlu	skær-ki-ætka
7	curo	qui-bur	cur	skær-ki-bótkē
8		qui-mañor	pagrűj	skær-ki-māñát
9		qui-quéire	tenécrűh	skær-ki-'kít
10	dope	dobob	d'bom	sárlű-bóbölē
11				sárlű-bóbölē-æki-ætka
20	ynste			sákēlē-bóbēlē/ sabá ægēla
30				saűák-bör-ækală-móska
40				saűák-bör
50				saűák-mañár-ækală-móska
60				saűák-mañár
70				saűák-kíri-ækală-móska
80				saűák-kíri
90				saűák-skæł-ækală-móska
100				saűák-skæłē

The numerals from 6 to 9 are formed by adding 1, 2, and 3 to 5, except for Estrella, where the pattern is not clear. The numerals up to 5 in Chiripó are very similar to those of Bribrí, but the formation of the numerals above 5 is different. They are formed on the base 5, as 5+1, 5+2, etc. From 20 up a vigesimal method is employed. The interval numbers such as 30 and 50 seem to be formed by overcounting. *moska* means "half."

Bribrí [88]

[LEHMANN 1920: 174, 260-262, 327-328] (Original transcription)

1	ætka/æ'k		et	
2	bótk /bók		bur/ bul	
3	māñát/ māñát		m'not/mañor	
4	kæt/ kæt		queil/ quéire/ quénca	
5	skæt/ skæt		s'cäng	
6	tædűl/ tædűl		terl/ terí	
7	kűl/ kűl		cugl/ cugu	
8	pákűl/ pákűl		pagle/ pai/ pa	
9	sűnító/ sűnító		sunito	
10	dábűp/ dádűp		d'bob	
11	/ dábűp-ki-ætka			
20	dábűp-bódiűk	/ dábűp-bó-diűk	d'bob-bú-chuc	10×2
30		/ dábűp-māñát-diűk		10×3
40	dábűp-kæ diűk	/ dábűp-kæ-diűk		10×4
50		/ dábűp-skæ-diűk		10×5
60		/ dábűp-dær-diűk		10×6
70		/ dábűp-kűr-diűk		10×7

80	dābōp-pār diūk	/ dābōp-pār-diūk	10 × 8
90		/ dābōp-sūnīr-diūk	10 × 9
100	dābōp-diūk	/ dābōp-diūk	10 × 10

The formation is decimal, coefficients following the base, 10.

Teribe [89]

[LEHMANN 1920: 174,269] (Original transcription)

	Teribi	Térraba	
1	kra-rá	krá-ra	/kra-rá
2	púg-da	krá-bu	/kru-bú
3	myá-re	kra-miá	/kro-miá
4	pkégn-de	kra-būking	/kro-bkin
5	shkégn-de	kra-shking	/kro-škin
6	tér-de	kra-ter	/kro-terre
7	kógū-de	kra-kók	/kro-kok
8	kwógū-de	kra-kwóng	/kro-kuong
9	shkówū-de	kra-shkáp	/kro-škop
10	dwówū-de	kra-rawáb	/kro-rubób/ kra-rawáb
11	kingshu-krá	kingsho-krára	
20	dwowū-púgda	sag-púk	/sak-puk
40			/sap-kín
80			/sak-kuong
100			/sak-debop
			10 × 2
			10 × 4
			10 × 8
			10 × 10

The formation appears to be decimal. Coefficients follow the base. The difference between Teribe and Térraba numerals is apparently great, but it is due to the use of numeral classifiers. The roots are in fact common to both languages.

Guaymí [90]

[ALPHONSE 1956: 13]

1	ti	
2	bu	
3	mo	
4	buko	
5	rigié	
6	ti	
7	kugu	
8	kuo	
9	honkon	
10	hoto	
11	hoto biti ba-ti	10+1
12	hoto biti bo-bu	10+2
13	hoto biti bo-mo	10+3
20	gre	
30	gre biti kro-hoto	20+10
40	gre kete-bu	20×2
50	gre kete-bu biti kuo-hoto	20×2+10
60	gre keta-mo	20×3
80	gre keta-buko	20×4
100	gre keta-rigié	20×5

Numeral classifiers occur before the numerals. Since there is some morphological change between the forms, all of them are given below.

1	2	3	4	5	
ba-ti	bo-bu	bo-mon	bó-boko	bo-rigié	"times"
da-ti	do-bu	do-mon	dó-boko	do-rigié	"plants or bunches like bananas"
i-ti	ni-bu	ni-mon	ní-buko	ni-rigié	"persons"
ka-ti	ko-bu	ko-mon	kó-boko	ko-rigié	"leaves"
kra-ti	kro-bu	kro-mon	kro-bogo	kro-rigié	"things that are long"
kuo-ti	ku-bu	ko-mom	kó-bogwo	kuo-rigié	"things that are round"
kun-ti	kun-mun	kun-mon	kum-bukó	kun-rigié	"moneys"
menani	mena-mu	mena-mo	menam-buko	mena-rigié	"small coins"
otoi-ti	oto-bu	ota-mon	otá-buko	ota-rigié	"cloth"
ketei-ti	kete-bu	keta-mon	keta-buko	keta-rigié	"heaps"
koboi-ti	kobo-bu	kobo-mon	kobo-boko	kobo-rigié	"days"
kudéi-ti	kudé-bu	kudé-mon	kudé-buko	kude-rigié	"hands"
tai-ti	ta-bu	ta-mon	tá-buku	ta-rigié	"spans"
ungrai-ti	ungra-bu	ungra-mon	ungrá-buko	ungra-rigié	"fathoms"

Basic vocabulary:

$U = \{1...9\}$

$B^1 = \{10 \text{ (hoto)}\}$, $B^2 = \{20 \text{ (gre)}\}$

Connectives: {biti} {kete~keta}

① The numerals below 20 are decimal. NUCL represents "numeral classifier."

$N_{1-19} = \pm B^1 \pm \text{biti} \pm \text{NUCL} \pm U$

② The numerals above 20 are vigesimal.

$N_{20-100} = B^2 \times (\text{kete}) \{ \# , 2...5 \} \pm \text{biti} \pm \text{NUCL} \pm \{ N_{1-19} \}$

Cuna [92]

[LEHMANN 1920: 175] (Original transcription)

1	cu-énchique
2	pócua
3	págua
4	paguégua
5	atále
6	nércua/ nerícua
7	cublégue
8	pabáca
9	paquébage
10	ambégui
20	tulábuena
40	tulá-pocua
80	tulá-paquégua
100	tulá-atále

[Holmer 1946: 189]

1	K*ena	
2	po(o)	
3	pa(a)	
4	pakke	
5	attale	
6	nerk*d	
7	kukle	
8	paapakka	3+5'
9	pakkepakka	4+5'
10	ampeki	
		20×2
		20×4
		20×5

The numerals above 20 are vigesimal.

DATABASE 3: Word Order Typology

Papago [2]

(1) VSO

Although it is generally agreed that VSO order is the most neutral [LANGACKER 1977: 24], the order is free. However, the Aux(iliary) obligatorily occurs in second position in a sentence.

huan 'o wakon g maagina	/	huan 'o g maagina wakon	/	[ZEPEDA 1983: 130]
wakon 'o g maagina g huan	/	wakon 'o g huan g maagina	/	
maagina 'o wakon g huan	/	maagina 'o g huan wakon		
		car	AUX ART Juan wash	

"John is/was washing the car."

(2) Po/Pr

ñ = wiihiḡid	/	'ali wiihiḡid		[ZEPEDA 1983: 37, 38]
my = for	/	child for		
"for me"		"for the child"		
am iḡa g	kii /am	kii-č	iḡa	
LOC in ART house	/LOC	house-ABS	in	[SAXTON 1982: 186]
"in the house"				

(3-i) GN-(ga)

čioḡ kotoñ	/ husi jiwiḡ-ga	/ husi wiinag		[ZEPEDA 1983: 75, 78]
boy shirt	/ Jose land-POSS	/ Jose brother/sister		
"the boy's shirt"	"Joe's land"	"Joe's brother/sister"		

The possessed noun may take the suffix *-ga*. However, inherently possessed nouns, such as body parts and kinship terms, as well as nouns which are said to be inalienably possessed, such as clothing and utensils, do not take the suffix *-ga*.

(3-ii) N-(i)ḡ G

NG may occur when a possessed noun is marked by the genitive *-(i)ḡ*.

g	kii-j	g	huan		[SAXTON 1982: 185]
ART	house-GEN	ART	Juan		
"the house of Juan"					
g	kii-j	g	ooga-j	g	huan
ART	house-GEN	ART	father-GEN	ART	Juan
"the house of the father of Juan"					

(4) AN

gi'i	hodai		[SAXTON 1982: 201]
big	stone		
"big stone"			

(5) PN

ñ = ji'i	/ kotoñ-ij		[ZEPEDA 1983: 76]
my = mother	/ shirt-his (GEN)		
"my mother"	"his (her) shirt"		

(6) DN

g	maagina		[ZEPEDA 1983: 130]
ART	car		
"the car"			

(7) QN

ha'i	g	gi'igiḡ	čičoḡ		[SAXTON 1982: 199]
some	ART	big	men		
"some big men"					

Nevome (Pima Bajo) [3]**(1) SOV**

uburhi vusi hunu kupurhu'-t'-igi suri [SHAUL 1982: 31]
 wind all corn flat-PERF-IRREALIS do
 "The wind flattened all the corn."

(2) Po

ikama saidukama bumatu [SHAUL 1982: 31]
 these Spaniards with
 "with these Spaniards"

(3) GN (-di)

Pedro honiga-di / Francisco gaga [SHAUL 1982: 47]
 Pedro wife-POSS / Francisco field
 "Pedro's wife" "Francisco's field"

(4) AN

pa-parh wipuidag-kama [SHAUL 1982: 17]
 bad (PL-DUPLICATION) heart-one
 "bad hearts"

(5) PN

ni-kuna [SHAUL 1982: 45]
 my-husband
 "my husband"

(6) DN

ika nuoki [SHAUL 1982: 24]
 this speech/word
 "this speech/word"

(7) QN

ikama goko gagto [SHAUL 1982: 47]
 these two bows
 "these two bows"

Northern Tepehuan [4]**(1) VSO**

takávo savíli piidúru ihmádu ándiriši múi íkoli áan im-viitári
 yesterday bought Pedro with Andrew many orange me me-for
 gi-tumíñši-ga-kidi [BASCOM 1982: 273]
 their-money-POSSD-with
 "Yesterday Peter and Andrew bought many oranges for me with their own money."

(2) Po

váaki ibígi / giñ-ibígi [BASCOM 1982: 315, 318]
 house behind / my behind
 "behind the house" "behind me"

(3) GN-3

dulíansa kii-d'í-ri [BASCOM 1982: 282]
 Lencho house-his-at
 "at Lencho's house"

(4) AN

kavá vásoi [BASCOM 1982: 340]
 hard grass
 "hard grass"

(5) PN; however, note that in the 3rd person singular the order is NP

giñ-kií / dií-di [BASCOM 1982: 312]
 my house / mother-his
 "my house" "his mother"

(6) DN

go-toóši [BASCOM 1982: 279]
 the rabbit
 "the rabbit"

(7) QN

múíd'u kuukúdagi [BASCOM 1982: 332]
 many lights
 "many lights"

Tarahumara [6]

(1) SOV

huáni hosé ča'pí-le [BURGESS 1984: 9]
 Juan José grab-PAST
 "Juan grabbed José."

(2) Po

gali-mópa [BURGESS 1984: 64]
 house-on top
 "on top of the house"

(3) GN-la

alué kantelário upí-la [BURGESS 1984: 61]
 that Candelario wife-POSS
 "Candelario's wife"

(4) AN

u'tá rió [BURGESS 1984: 54]
 small man
 "small man"

(5) PN

mué si'púča-la [BURGESS 1984: 27]
 you dress-POSS
 "your dress"

(6) DN

alué rió [BURGESS 1984: 9]
 that man
 "that man"

(7) QN

we'ká rió [BURGESS 1984: 85]
 many man
 "many men"

Yaqui [8]**(1) SOV**

inepo em misi-ta biča-k
 I your cat-DEP see-REALIZED
 "I saw your cat."

[LINDENFELD 1973: 54]

(2) Po

in usi-ta bečibo
 my child-DEP for
 "for my child"

[LINDENFELD 1973: 55]

(3) G-ta N

itom pare-ta kari
 our priest-DEP house
 "our priest's house"

[LINDENFELD 1973: 56]

(4) AN

hu b'e'u kari
 this big house
 "this big house"

[LINDENFELD 1973: 66]

(5) PN

bem kari
 their house
 "their house"

[LINDENFELD 1973: 15]

(6) DN

ini-me misi-m
 this-PL cat-PL
 "these cats"

[LINDENFELD 1973: 48]

(7) QN

si'ime usi-m / naiki oow-im
 all child-PL / four man-PL
 "all children" "four men"

[LINDENFELD 1973: 49]

Mayo [9]**(1) SOV**

Dios em čanía
 God you help
 "God help you."

[COLLARD & COLLARD 1979: 219]

(2) Po

kanásta-po
 basket-in
 "in the basket"

[COLLARD & COLLARD 1979: 202]

(3) G-ta N

huan-ta huubi
 Juan-of wife
 "Juan's wife"

[COLLARD & COLLARD 1979: 201]

(4) AN

sáwali wíkit
yellow bird
"yellow bird"

[CRUMRINE 1968: 27]

(5) PN

in sáayo
my enemy
"my enemy"

[COLLARD & Collard 1979: 146]

(6) DN

hiká'a báihewa
this mist
"this mist"

[CRUMRINE 1968: 26]

(7) QN

wohi-bahi palabra-m
two-three word-PL
"two or three words"

[CRUMRINE 1968: 22]

Cora [10]

(1) VSO

ra-a-hé'ika í fidel í t'áška
DISTR:SG-COMP-kill ART Fidel ART scorpion
"Fidel killed the scorpion."

[CASAD 1984: 170]

(2) Po

káuhna-ri kime'e
rope-ABS with
"with a rope"

[CASAD 1984: 238]

(3) GN / N-(a)ra'an G / N-ra G

sáantos ip'áh / híina-ra-'ara'an í dioniisia
Santos chair / spindle-ABS-NONREFL POSS ART Dionisia
"Santo's chair" "Dionisia's spindle"
í nana-ra í pari
ART mother-NONREFL POSS (his) ART boy
"the boy's mother"

[CASAD 1984: 225]

[LANGACKER 1977: 90]

(4) AN

(5) PN

n'e-síiku'u / karíi-ra'an
my-shirt / bone-NONREFL POSS (its)
"my shirt" "its bone"

[CASAD 1984: 162-3]

(6) DN

í t'aakú
ART toad
"the toad"

[CASAD 1984: 183]

(7) QN

anših n'in'e'ira'a cahta'a
five year within
"within five years"

[CASAD 1984: 268]

Huichol [11]**(1) SVO**

ne tei pu ica hiayame
 my mother AUX weave band
 "My mother weaves bands."

[PALAFOX VARGAS 1978: 64]

(2) Po

ne ki-e heima
 my house on
 "on my house"

[PALAFOX VARGAS 1978: 47]

(3) GN-ya

ne macika hiayame-ya
 my brother band-GEN
 "my brother's band"

[PALAFOX VARGAS 1978: 67]

(4) NA

rupureru mihek^wa
 hat new
 "new hat"

[PALAFOX VARGAS 1978: 37]

(5) PN; note that in the 3rd singular the order is either miki + N or N-(e/i)ya.

ne tumi:ni / tumi:ni-e-ya
 my money / money-GEN
 "my money" "his money"
 miki ketá
 his foot
 "his foot"

[LANGACKER 1977: 87]

[PALAFOX VARGAS 1978: 38]

(6) DN

miki ciki
 the dog
 "the dog"

[PALAFOX VARGAS 1978: 36]

(7) QN

uume tumíni
 two bits
 "two bits (money)"

[GRIMES 1960: 163]

Classical Nahuatl [12]**(1) SVO ~ VOS > VSO >> SOV**

A transitive sentence may have VSO, VOS, SVO, or SOV word order, but the sentence types do not occur with equal frequency. Relative frequency is indicated above. The order SOV is very rare [STEELE 1976].

(2) Po/Pr

a-pan / in ał i-itik
 water-in / the water its-into
 "in the water" "into the water"
 no-yaka-pan / i-pan no-yak
 my-nose-in its-in my-nose
 "in my nose"

[STEELE 1976: 34, 37]

[SULLIVAN 1976: 139]

(3) 3-NG /G 3-N

i-peł siłi / in i-teokal łalok
 its-mat grandmother / the its temple Tlaloc
 "grandmother's mat" "the Tlaloc temple"
 in siwał i-yomio / in tonatiw i-nan
 the woman her-bones / the sun his-mother
 "the woman's bone" "the sun's mother"

[SULLIVAN 1976: 52, 65]

[STEELE 1976: 37]

(4) AN/NA

kana:wak k'w'e:ił / k'w'e:ił kana:wak
 thin skirt / skirt thin
 "thin skirts / skirts are thin"

[ANDREWS 1975: 269]

(5) PN

no-kal
 my-house
 "my house"

[SULLIVAN 1976: 46]

(6) DN

inin siwał
 this woman
 "this woman"

[SULLIVAN 1976: 65]

(7) QN

na:w-šiwił
 4-year
 "four years"

[ANDREWS 1975: 185]

Tezcoco Nahuatl (San Jerónimo) [12]

(1) SVO

n šwan ołacacak n pwerta
 ART Juan shut ART door
 "Juan shut the door."

[LAстра DE SUÁREZ 1980: 99]

(2) Po/Pr

mesa-pa / teči n te:pe
 table on / in ART mountain
 "on the table" "in the mountain"

[LAстра DE SUÁREZ 1980: 19, 30]

(3) 3-NG/ N de (n) G

i-ten in komalli / in kabayo den šwan
 his edge ART comal / ART horse of Juan
 "the edge of the comal" "Juan's horse"

[LAстра DE SUÁREZ 1980: 106]

(4) NA

k'awti k'a'k'awtike
 tree tall
 "tall tree"

[LAстра DE SUÁREZ 1980: 18]

(5) PN

no-kone-w
 my-son-POSS
 "my son"

[LAстра DE SUÁREZ 1980: 13]

(6) DN

n teλ
ART stone
"the stone"

[LASTRA DE SUÁREZ 1980: 30]

(7) QN

miyake pipiltoton
many children
"many children"

[LASTRA DE SUÁREZ 1980: 108]

Tetelcingo Nahuatl [12]

(1) SVO

sente λokaλ #-kɪ-pɪya-ya sente puro
one man SUBJ-OBJ-have-IMPERF one donkey
"A man had a donkey."

[TUGGY 1979: 10]

(2) Po/Pr

i-htek no-kɪ / λɔl-pa
its-inside my-foot / earth-on
"in my foot" "on the ground"

[TUGGY 1979: 11, 64]

(3) 3-NG

i-nɔmɪk mali
his-husband Maria
"Maria's husband"

[TUGGY 1979: 11]

(4) NA

i-mɔ wɔhkɪ
his-hand dry
"his withered hand"

[TUGGY 1979: 43]

(5) PN

no-λɔl
my-land
"my land"

[TUGGY 1979: 51]

(6) DN

inu λokaλ
that man
"that man"

[TUGGY 1979: 11]

(7) QN

meyak hiente
much people
"lots of people"

[TUGGY 1979: 71]

North Puebla Nahuatl (Tlaxpanaloya) [12]

(1) SVO/VOS

Entonses E. okikišti in sigaro
then E. took out the cigarette
"Then E. took out a cigarette."

[BROCKWAY 1979: 146]

(2) Po/Pr

mil-ten-ko / i-ten-λa in aλ
field-edge-to / its-edge-at the water
"border of field" "at the edge of the water"

[BROCKWAY 1979: 159, 160]

(3) 3-NG

i-wik i-telpoč in pančo
 his-hoe his-boy the Pancho
 "Pancho's boy's hoe"

[BROCKWAY 1979: 159]

(4) AN

in weyi kali
 the big house
 "the big house"

[BROCKWAY 1979: 158]

(5) PN

no kal
 my house
 "my house"

[BROCKWAY 1979: 158]

(6) DN

inon čiči
 that dog
 "that dog"

[BROCKWAY 1979: 161]

(7) QN

nočin in kafen
 all the coffee
 "all of the coffee"

[BROCKWAY 1979: 164]

Huasteca Nahuatl (Huautila) [12]

(1) VSO/SVO/VOS

ki-ita-k yahaya i-čiči
 it-see-PAST he his-dog
 "he saw his own dog."

[BELLER & BELLER 1979: 218]

(2) Po/Pr

i-pan no-mila / no-kal-teno
 its-place my-field / my-house-outside
 "in my field" "outside my house"

[BELLER & BELLER 1979: 215, 245]

(3) 3-NG

ne i-kone wan
 the his-child Juan
 "Juan's child"

[BELLER & BELLER 1979: 234]

(4) AN

seh weyi mačete
 one big machete
 "one big machete"

[BELLER & BELLER 1979: 236]

(5) PN

no siwa
 my wife
 "my wife"

[BELLER & BELLER 1979: 237]

(6) DN

nopa amał
 that paper
 "that paper"

[BELLER & BELLER 1979: 207]

(7) QN

miak tomin
 much money
 "much money"

[BELLER & BELLER 1979: 216]

Nahual (Pómaro, Michoacan) [13]

(1) SVO

tewal ti-k-cayana-s k'awil
 you you-it-split-FUT wood
 "You will split wood"

[SISCHO 1979: 314]

(2) Po/Pr

šali-pan / pan kostales
 sand-on / in bags
 "on the sand" "in bags"

[SISCHO 1979: 330, 366]

(3) G 3-N/ 3N de G

mo-tah-cin i-cocomahli
 your-father-HON his-clothes
 "your father's clothes"
 i-lahketili de rikarda
 her-loom of Ricarda
 "Ricarda's loom"

[SISCHO 1979: 341]

[SISCHO 1979: 341]

(4) NA

se kali k'ali wan k'ahti-k
 a house good and tall-PERF
 "a good and tall house"

[SISCHO 1979: 347]

(5) PN

i-siwa
 his-woman
 "his wife"

[SISCHO 1979: 336]

(6) DN

in al
 the water
 "the water"

[SISCHO 1979: 323]

(7) QN

miak al
 much water
 "much water"

[SISCHO 1979: 366]

Istmo Nahuat (Mecayapan/Pajapan) [14]

(1) SVO

wa: neh nigitak ho:n gawáh iyikpata tepe:t
 and I saw that horse above mountain
 "And I saw that horse on the mountain."

[GARCÍA DE LEÓN 1976: 74]

(2) Po/Pr

i-pan mi:hli / no-tampa
 its-in milpa / my-below
 "in the milpa" "below me"
 i-te:no šapot
 its-edge cave
 "the edge of the cave"

[WOLGEMUTH 1981: 43, 131]

[GARCÍA DE LEÓN 1976: 85]

(3) 3-NG

i-nagayo ho:n tahta:gat
 its meat those men
 "those men's meat"

[GARCÍA DE LEÓN 1976: 85]

(4) NA

se taba:l yekyekti
 a meal very good
 "a very good meal"

[GARCÍA DE LEÓN 1976: 73]

(5) PN

no-kal
 my-house
 "my house"

[WOLGEMUTH 1981: 47]

(6) DN

ini:n ilwi'
 this fiesta
 "this feast"

[WOLGEMUTH 1981: 60]

(7) QN

miageh hente
 many people
 "many people"

[GARCÍA DE LEÓN 1976: 85]

Pipil [15]

(1) V[sov]OS (SVO~VSO)

ki-ta:lih ne i-čaketah ne ta:ka-cin
 it-place the his-jacket the man-DIMIN
 "The little man put down his jacket."

[CAMPBELL 1985: 103]

(2) Po/Pr

nu-wan / i-tan ne k'awit
 me-with / its-under the tree
 "with me" "under the tree"

[CAMPBELL 1985: 60, 61]

(3) 3-NG

i-ihī:š ne šiwa:pil
 her-eyes the girl
 "the girl's eyes"

[CAMPBELL 1985: 117]

(4) PN

nu-pe:lu
 my-dog
 "my dog"

[CAMPBELL 1985: 117]

(5) AN

ne čihči:ltik caput
 the red zapotes
 "the red zapotes"

[CAMPBELL 1985: 64]

(6) DN

ne pe:lu
 the dog
 "the dog"

[CAMPBELL 1985: 113]

(7) QN

miyak tahta:kamet
 many men
 "many men"

[CAMPBELL 1985: 112]

***Cuitlatec [D7]**

(1) SVO

aškú-ťa čunwi-ti té'li pat'i'i
 husband-her catch-CMP a jaguar
 "Her husband caught a jaguar."

[ESCALANTE 1962: 29]

(2) Pr

a'p-onó
 until there
 "until there"

[ESCALANTE 1962: 22]

(3) NG

dudu-l-úmi
 pot-of-water
 "a pot of water"
 ɬat-ahš'i'i
 tree-plum
 "plum tree"

[ESCALANTE 1962: 22]

[ESCALANTE 1962: 22]

(4) AN

ebó'li piké-la
 thick back
 "thick back"

[ESCALANTE 1962: 31]

(5) NP

ɬa-yí
 house-my
 "my house"

[ESCALANTE 1962: 19]

(6) DN

i-mihku
 the dog
 "the dog"

[ESCALANTE 1962: 31]

Seri [20]

(1) SOV

xuan ki' 'aXš kom i-yo:-k"
 Juan the dog the OBJ-MOOD-kill
 "Juan killed the dog."

[MARLETT 1984b: 225]

(2) Po

'amen ak ano
house ART in
"in the house"

[MARLETT 1984a: 274]

(3) G 3-N

ša: ' ki' i:me ak
sun ART its house ART
"the sun's house"

[MARLETT 1984a: 273]

(4) NA

Xika kipXa
thing that are little
"little things"

[MARLETT 1984a: 273]

(5) PN

'i-ta / mi-nait
my-mother / your-skin
"my mother" "your skin"

[MARLETT 1984b: 232, 227]

(6) ND

ktam ki'
man ART
"the man"

[MARLETT 1984b: 218]

(7) NQ

ktam šo
man a
"a man"

[MARLETT 1984c: 260]

Tarasco [21]

(1) SVO

mariá kačúkuska inté-ni k^{wh}irípita
Maria cut the-OBJ meat
"Mary cut the meat."

[NANSEN DÍAZ 1985: 61]

(2) Po

kučiyu šimpó
knife with
"with a knife"

[NANSEN DÍAZ 1985: 66]

(3) G-ri N / N G-ri

tátu čiti-ri wíču
my father-GEN dog
"my father's dog"
waci ačati-eri
son man-GEN
"the man's son"

[NANSEN DÍAZ 1985: 62]

[FOSTER 1971: 109]

(4) NA

wíču t^harétit-iča
dog old-PL
"old dogs"

[NANSEN DÍAZ 1985: 56]

(5) PN/NP

šuči táti / táti šučí-ti
 my papa / papa my
 "my father"

[NANSEN DÍAZ 1985: 73]

(6) DN

inté cúnsu
 this pot
 "this pot"

[NANSEN DÍAZ 1985: 70]

(7) QN

t^hamičukwa šk^húriča
 three leaves
 "three leaves"

[FOSTER 1971: 109]

Totonac [22]

(1) SVO

hose máqnił lúwa'
 José killed snake
 "José killed the snake."

[HERNÁNDEZ GARCÍA 1982: 36]

(2) Pr

nak čik'i
 in house
 "in the house"

[HERNÁNDEZ GARCÍA 1982: 38]

(3) 3-NG / N šla G

iš puskat hose
 his woman José
 "José's wife"

[HERNÁNDEZ GARCÍA 1982: 129]

liqałtawaq'a šla lik'úc'u
 book 3sg.PRONOUN medicine
 "the book of medicine"

[HERNÁNDEZ GARCÍA 1982: 128]

(4) AN

st'iriki' taqnu'
 round hat
 "a round hat"

[HERNÁNDEZ GARCÍA 1982: 119]

(5) PN

kin čiči'
 my dog
 "my dog"

[HERNÁNDEZ GARCÍA 1982: 65]

(6) DN

he'é číwiš
 this stone
 "this stone"

[HERNÁNDEZ GARCÍA 1982: 75]

(7) QN

túwa' lakc'umahán
 many children
 "many children"

[HERNÁNDEZ GARCÍA 1982: 101]

Chichimec [24]**(1) SOV**

péló ino énu'u
 Pedro he he-sees
 "Pedro sees him."

[LAстра DE SUÁREZ 1984: 34]

(2) Po

mápá súnga
 their-fire edge
 "around the fire"

[LAстра DE SUÁREZ 1984: 34]

(3) GN

cúcé kánthe
 José hair
 "José's hair"

[LAстра DE SUÁREZ 1984: 35]

(4) NA

narhé nánde'
 knife big
 "big knife"

[LAстра DE SUÁREZ 1984: 35]

(5) Noun paradigm for inflection of possessive for "house"

Person	Singular	Dual	Plural
1st	ko'ós	ko'ós-um' (excl.) ko'ós-és (incl.)	ko'os-hu' (excl.) ko'os-ín (incl.)
2nd	ut'ós	ut'ós-és	ut'ós-ín
3rd	ut'ís	ut'ís-és	ur'ós

[LAстра DE SUÁREZ 1984: 23]

(6) DN

kíni síma'an
 this dog
 "this dog"

[LAстра DE SUÁREZ 1984: 37]

(7) QN

nt'á síma'an
 one dog
 "one dog"

[LAстра DE SUÁREZ 1984: 38]

Southern Pame [25]**(1) SVO/SOV**

ka gtao' mugu
 I am cutting meat
 "I am cutting meat."

[MANRIQUE C. 1967: 346]

ka nc'i kyo'a
 I pots make
 "I make pots."

[MANRIQUE C. 1967: 347]

(4) NA

kudù škandóa
 stone white
 "white stone"

[MANRIQUE C. 1967: 346]

(5) PN

nkú'a
my pot
"my pot"

[MANRIQUE C. 1967: 347]

(6) DN

kunu kudù
that stone
"that stone"

[MANRIQUE C. 1967: 346]

(7) QN

bidí kudù
many stone
"many stones"

[MANRIQUE C. 1967: 346]

Matlatzinca [26]

(1) VOS

mán-thi in-téyu the-tio
COMP-bring the-lamp my-uncle
"My uncle was bringing the lamp."

[ESCALANTE: personal communication]

(2) Pr

pi-n-čə-wewi
in-?-ear-DUAL
"in the ears"

[ESCALANTE: personal communication]

(3) 3-NG

ni'-papá wétowá'a
his-father child
"the father of the child"

[ESCALANTE: personal communication]

(4) AN

ni-khaná čhówi
ART-good mushroom
"good mushrooms"

[ESCALANTE: personal communication]

(5) PN

the-tio
my-uncle
"my uncle"

[ESCALANTE: personal communication]

(6) DN

in-téyu
ART (SG)-lamp
"the lamp"

[ESCALANTE: personal communication]

Ocuiltec [27]

(1) SVO

mtaa wira ne-lithaa tyi-ca-hni ne-yoš
yesterday these PL-bird eat PL-worm
"Yesterday these birds ate worms."

[ESCALANTE: personal communication]

(2) Pr

pi skueela
in school
"in the school"

[MUNTZEL 1985: 518]

(4) AN

nto t'uwa
 little child
 "a little child"

[ESCALANTE: personal communication]

(5) PN

p-kučala / li-tumi
 my-spoon / your-money
 "my spoon" "your money"

[MUNTZEL 1985: 518]

(6) DN

wira ne-lithaa
 these PL-bird
 "these birds"
 wiinya nmeša
 this table
 "this table"

[ESCALANTE: personal communication]

[MUNTZEL 1985: 518]

(7) QN/NQ

mnoo šaalu / kasuela mphiuu
 two jug / pot four
 "two jugs" "four pots"

[MUNTZEL 1985: 518]

Otomi [28]

(1) VOS

pě'ca 'na ra ngũ nú'a ra rīko
 he-has-it one the house that the rich-man
 "That rich man has one house."

[HESS 1968: 85]

(2) Pr

xá ra taí
 at the market
 "at the market"

[HESS 1968: 47]

(3) 3-NG

nú rá ngũ ra súwa
 that his house the Juan
 "Juan's house"

[HESS 1968: 46]

(4) AN

'na ra dānga do
 one the big stone
 "one big stone"

[HESS 1968: 49]

(5) PN

ma ngũ
 my house
 "my house"

[HESS 1968: 82]

(6) DN

nú'ə ya ngũ
 those the house
 "those houses"

[HESS 1968: 46]

(7) QN

ndünñi nxeyá
many year
"many years"

[HESS 1968: 54]

Mazahua [29]

(1) VOS/SVO

mi ne ndehe e pihomi
PAST PROG want water ART pig
"The pig wanted water."
e nana na hodi na baši
ART mother is-looking-for one broom
"The mother is looking for a broom."

[AMADOR 1979: 66]

[AMADOR 1979: 66]

(2) Pr

kha khínhni
on metate (grinding stone)
"on the metate"

[ANONYMOUS 1958: 102]

(3) 3-NG

o бага e tinu
her cow ART Tina
"Tina's cow"

[ANONYMOUS 1958: 97]

(4) AN

t'ōš thp
white corn
"white corn"

[PIKE 1951: 40]

(5) PNP

í бага go / i бага gue / nu nana
PRON cow PRON / PRON cow PRON PRON mother
"my cow" "your cow" "his mother"

[ANONYMOUS 1958: 97]

(6) DN

k'i e ngo'o
that ART mouse
"that mouse"

[AMADOR 1979: 67]

(7) QN

c'i'ča burru
five donkey
"five donkeys"

[ANONYMOUS 1958: 105]

Tlapanec [30]

(1) VOS/ VSO~SVO

na³kho³ šu²wi² ja'ma² (O = inanimate)
eat meat boy
"The boy eats meat."
ndi³yo:³ a²da³ a'³go³ (O = animate)
saw child woman
"The woman saw the child."

[SUÁREZ 1983a: 269]

[SUÁREZ 1983a: 269]

(2) Pr

na:¹ me³jo³
to village
"to the village"

[SUÁREZ 1983a: 279]

(3) N-3 G

šti¹ju:² ša³bo³ cu¹kho³
his hat person that
"that person's hat"

[SUÁREZ 1983a: 300]

(4) NA

štj:¹² mi²ša¹
clothes white
"white clothes"

[SUÁREZ 1983a: 299]

(5) NP

šti¹ju:² / štj¹ja:²² / štj¹ju:²
my hat / your hat / his hat
"my hat" "your hat" "his hat"

[SUÁREZ 1983a: 101]

(6) ND

šwa²he ē²ri¹ge³
village this
"this village"

[SUÁREZ 1983a: 299]

(7) QN

mba²a² j²štu²
many basket
"many baskets"

[SUÁREZ 1983a: 241]

Ixcatec [31]

(1) VSO

ci¹ka¹ na²mi¹cye²e² šku² lo¹na¹
seized grandfather point canvas
"The grandfather seized the point of the canvas."

[FERNÁNDEZ DE MIRANDA 1961: 198]

(2) Pr

k'a¹ ya³a³
among tree
"among the trees"

[FERNÁNDEZ DE MIRANDA 1961: 65]

(3) N-3 G

ške¹ ya³a
its-leaf tree
"the leaf of the tree"

[FERNÁNDEZ DE MIRANDA 1961: 18]

(4) NA

nja² nda²dj³j³
house old
"old house"

[FERNÁNDEZ DE MIRANDA 1961: 17]

(5) NP

nje¹ye³-ña²na³
grandson-my
"my grandson"

[FERNÁNDEZ DE MIRANDA 1961: 8]

(6) ND

mi²č'a²-ra²a²
 woman-that
 "that woman"

[FERNÁNDEZ DE MIRANDA 1961: 90]

(7) QN

'u¹ča¹ ši¹ka³
 many grass
 "many grasses"

[FERNÁNDEZ DE MIRANDA 1961: 178]

Popoloc [32]

(1) VSO

khoi¹č'e¹²na² sɿ¹ ni⁴nko²
 built they church
 "They built the church."

[AUSTIN & PICKETT 1974: 68]

(2) Pr

šɛ²hɛ² ni⁴nko²
 inside church
 "inside the church"

[AUSTIN & PICKETT 1974: 71]

(3) NG

še⁴ɛ² valensio
 child Valencio
 "Valencio's child"

[AUSTIN & PICKETT 1974: 66]

(4) NA

čo³hni² hi¹²na²
 person good
 "a good person"

[AUSTIN & PICKETT 1974: 73]

(5) NP

še⁴ɛ² tha³
 child her
 "her child"

[AUSTIN & PICKETT 1974: 62]

(6) DND

ti¹ šha³ a³
 that children that
 "those children"

[AUSTIN & PICKETT 1974: 88]

(7) QN

i³che¹ čo³hni²
 many people
 "many people"

[AUSTIN & PICKETT 1974: 66]

Chocho [33]

(1) SVO[vso]

sa¹ žu³ ndoa³ ndu¹ ku'ni¹-ri³ sa¹ u² nia²
 the NCL man ? killed-he the NCL dog
 "The man killed the dog."
 bi¹kɔ²-a¹-mi²
 saw-I-you
 "I saw you."

[Mock 1977: 146]

[Mock 1977: 40]

(2) Pr

kɔ² nča³ [Mock 1977: 91]
 inside house
 "inside the house"

(3) N-3 G

ndiu^{2-e2'} u² ku^{2'}xa¹ [Mock 1977: 70]
 meat-his NCL armadillo
 "meat of the armadillo"

(4) NA

u² nia^{2'} tie²¹ me¹² [Mock 1977: 150]
 NCL dog black that
 "that black dog"

(5) NP

u² nia²¹ ni¹ / u²nia¹² (<u² nia^{2'}-a²) [Mock 1977: 71]
 NCL dog our (INC) / NCL dog-your
 "our dog" "your dog"

(6) DND/DN/ND

sa¹ nča³ dja¹² / sa¹ ni^{2'}ngu³ / ndaša dja¹ [Mock 1977: 77, 92, 104]
 the house this / the church / basket that
 "this house" "the church" "that basket"

(7) QN

niu²¹ niu³ / ka²tia² na^{3'}ša³ [Mock 1977: 101]
 four tortilla / many sarape
 "four tortillas" "many woolen ponchos"

Mazatec [34]

(1) SVO

eduardo ka²va³ce³ na⁴hno⁴ [GUDSCHINSKY 1959a: 84]
 Eduardo bought tobacco
 "Eduardo bought tobacco."

(2) Pr

ya⁴³ ntia⁴² [GUDSCHINSKY 1959a: 84]
 in road
 "in the road"

(3) NG

nt'ia³ la⁴hao⁴ [GUDSCHINSKY 1959a: 83]
 house stone
 "stone house"

(4) NA

na^{3'}šo¹ ni²³ [GUDSCHINSKY 1959a: 83]
 flower red
 "red flower"

(5) NP

škɔɔ³ / škɔj³ / škɔ⁴ [PIKE 1967: 328]
 my-eye / your-eye / his-eye
 "my eye" "your eye" "his eye"

(6) DND

he² šti³⁴.vi⁴

[GUDSCHINSKY 1959a: 83]

these children-here

"these children"

(7) QN

nkhj² co³hmi²³

[GUDSCHINSKY 1959b: 142]

many thing

"many things"

Amuzgo [35]

(1) VSO

ha⁴ hndæ¹⁴ ya³ cma³ cha¹m he³

[HART 1957: 143]

go sell I cotton town now

"I go to town to sell cotton now."

(2) Pr

se² c'a¹m

[HART 1957: 149]

back tree

"behind the tree"

(3) NG

cua³ tai⁴na²mca³

[HART 1957: 151]

clump pineapple

"a clump of pineapples"

(4) NA

ka¹so⁴ čho¹ cma³i²

[HART 1957: 155]

horse little your animate possession

"your little horse"

(5) NP

ka¹so⁴ cmæ³²a³

[HART 1957: 150]

horse my animate possession

"my horse"

(6) ND

n'a⁴²m ško² maj³

[HART 1957: 151]

word new this

"this new word"

(7) QN

kwi² w'a¹hnde⁴ čho¹

[HART 1957: 155]

one airplane little

"a little airplane"

Mixtec (Atlatlahuca) [36]

(1) VSO

ši¹ko² ña² ɥ² ti¹k^wi³ti² nu¹u³ maestro

[ALEXANDER 1980: 56]

sell woman the potato to teacher

"The woman sells potatoes to the teacher."

(2) Pr

i²ni² ve'e²
 in house
 "in the house"

[ALEXANDER 1980: 79]

(3) NG

le'lu¹ huan
 hat Juan
 "Juan's hat"

[ALEXANDER 1980: 52]

(4) NA

yu²nu² ka'nu²
 tree big
 "a big tree"

[ALEXANDER 1980: 69]

(5) NP

ti³ ki²ti² yo¹
 the animal our
 "our animal"

[ALEXANDER 1980: 57]

(6) ND

ña'a² yu¹k'w'a²
 woman that
 "that woman"

[ALEXANDER 1980: 69]

(7) QN

k'e²he³ ti²k'w'i³ti¹
 many potato
 "many potatoes"

[ALEXANDER 1980: 76]

Cuicatec [37]

(1) SVO

huan¹⁴ ne¹ č'i⁴n'u⁴ sa² ku²č'i¹ ye⁴'e⁴ sa² mm'a³tiā³
 Juan CONJ killed he pig of he in this morning
 "Juan killed his pig this morning."

[ANDERSON & CONCEPCIÓN ROQUE 1983: 250]

(2) Pr

ndu²ku⁴ pre³si³de²nte⁴
 with president
 "with the president"

[ANDERSON & CONCEPCIÓN ROQUE 1983: 105]

(3) NG (N ye⁴'e⁴ G)

tu²⁴ ka⁴ka¹
 stone lime
 "limestone"
 mo³li²no⁴ ye⁴'e⁴ y'u²ne²⁴
 mill of wind
 "wind mill"

[ANDERSON & CONCEPCIÓN ROQUE 1983: 787]

[ANDERSON & CONCEPCIÓN ROQUE 1983: 751]

(4) NA

ya²⁴ nd'a³²
 villages good
 "good villages"

[ANDERSON & CONCEPCIÓN ROQUE 1983: 785]

(5) NP

ča³kú¹
 my-mother (ča³ku³ = mother)
 "my mother"

[ANDERSON & CONCEPCIÓN ROQUE 1983: 259]

(6) ND

sa²a⁴ l'i¹ k'u⁴
 child little this
 "this boy"

[ANDERSON & CONCEPCIÓN ROQUE 1983: 181]

(7) QN

y'a³ 'i⁴ya⁴
 many people
 "many people"

[ANDERSON & CONCEPCIÓN ROQUE 1983: 268]

Trique (Chicahuaxtla) [38]

(1) VSO

gida'a³⁴ žuwe³ 'ngo⁴ žato³
 caught dog one rabbit
 "The dog caught a rabbit."

[GOOD 1979: 56]

(2) Pr

riah³⁴ we'³e
 on wall
 "on the wall"

[GOOD 1979: 75]

(3) NG

ku¹ ro'o'²
 bone our-hand
 "the bone of our hand"

[GOOD 1979: 103]

(4) NA

sa³⁴ lih³
 thing little
 "little thing"

[GOOD 1979: 39]

(5) NP

dukua² zo'⁵
 house your
 "your house"

[GOOD 1979: 112]

(6) ND

nawi³ nah³
 hat this
 "this hat"

[GOOD 1979: 73]

(7) QN

ga'i⁵ žuh³
 many animal
 "many animals"

[GOOD 1979: 21]

Zapotec (Yatzachi) [39]**(1) VSO**

če'eX kabeyən' nis
 horse is drinking water
 "The horse is drinking water."

[BUTLER 1980: 171]

(2) Pr

len mšet
 with machete
 "with the machete"

[BUTLER 1980: 185]

(3) NG

ža no'olən'
 clothes woman
 "woman's clothes"

[BUTLER 1980: 198]

(4) NA

de'e kobə
 thing new
 "new thing"

[BUTLER 1980: 211]

(5) NP

yičX-a'
 head-my
 "my head"

[BUTLER 1980: 192]

(6) ND

yo'o-n(ə')
 house the
 "the house"

[BUTLER 1980: 217]

(7) QN/(NQ)

tag	go'on	/	zan	libr	/	libr	zan	
four	ox	/	many	book	/	book	many	
"four oxen"			"many books"					

[BUTLER 1980: 213, 219]

Chatino [40]**(1) VSO**

ndʷata ngu' kičj re kiñə'
 plant people village this chilli
 "People of this village plant chilli."

[PRIDE & PRIDE 1970: 96]

(2) Pr

loo mesa
 on table
 "on the table"

[PRIDE & PRIDE 1970: 96]

(3) NG

ste' štʷa'a
 clothes his mother
 "his mother's clothes"

[PRIDE & PRIDE 1970: 93]

(4) NA

ska ni'j tɬu
one house big
"a big house"

[PRIDE & PRIDE 1970: 94]

(5) NP

ni'j 'na
house my
"my house"

[PRIDE & PRIDE 1970: 27]

(6) ND

ni'j hua
house that
"that house"

[PRIDE & PRIDE 1970: 94]

(7) QN

tʰu t'a'a na'ni
various animal
"various animals"

[PRIDE & PRIDE 1970: 93]

Chinantec [41]

(1) VSO

rɸh³¹ 'nũ² 'mĩ²² t'iah²³²
wash you clothes mine
"You wash my clothes."

[ROBBINS 1968: 109]

(2) Pr

kɸh³¹ pəh²
with Frank
"with Frank"

[ROBBINS 1968: 55]

(3) N-3 G

šuih²³² t'a³ wó¹
child his Juan
"Juan's child"

[ROBBINS 1968: 72]

(4) NA

ca²ñũh³ cá² feih³
man person big
"a big man"

[ROBBINS 1968: 57]

(5) NP

'ñũh³ nã² / 'ñũh³ hnã²
waist my / waist my
"my waist"

[ROBBINS 1968: 49]

(6) (D)ND

'j² šuih²³² nɔ² [ROBBINS 1968: 117]
the child there
"that child"

kəw¹ la²
rock this
"this rock"

[MERFIELD 1968: 63]

(7) QN

'laih² nĩh¹ li¹
many kind flower
"many kinds of flowers"

[ROBBINS 1968: 66]

Huave [42]**(1) SVO**

a:ga našey kʷim šowiý ambiy mintah neh
 the man there very beat woman his
 "That man beat his wife."

[STAIRS & STAIRS 1981: 31]

(2) Pr

ališ mes
 on table
 "on the table"

[STAIRS & STAIRS 1981: 226]

(3) 3-NG

a-piš mi-kʷal maria
 his-clothes her-son Maria
 "the clothes of Maria's son"

[STAIRS & HOLLENBACH 1981: 293]

(4) AN

ahkiw nambʷor pet kam
 these black dog here
 "these black dogs"

[STAIRS & HOLLENBACH 1981: 310]

(5) PN

še-kʷal
 my-son
 "my son"

[STAIRS & HOLLENBACH 1981: 292]

(6) DND

a:ga nenč kʷah
 the child there
 "that child"

[STAIRS & HOLLENBACH 1981: 310]

(7) QN

šeyay nipilan
 many people
 "many people"

[STAIRS & STAIRS 1981: 182]

Oaxaca Chontal (Huamelultec) [43]**(1) VOS**

tʷéxuy mángo láywʼá
 is-eating mangoes the-my-child
 "My child is eating mangoes."

[WATERHOUSE 1967: 360]

(2) Pr

máx-méxut
 in-the-hammock
 "in the hammock"

[WATERHOUSE 1967: 357]

(3) NG

pikwáana	lakwé'	/	pítʷáata	dábíd
the-sickness	the-man	/	the-father	David
"the sickness of the man"			"David's father"	

[WATERHOUSE 1967: 359]

(4) AN

láv'a awáata
the-little girl
"the little girl"

[WATERHOUSE 1962: 30]

(5) PN

l-ay-míl'ya
the-my-dog
"my dog"

[WATERHOUSE 1962: 63]

(6) DN

lán-mul'i'
the-boys
"the boys"

[WATERHOUSE 1962: 94]

(7) QN

ñúl'i lakán'ó' / kánč'ús múut'a
one woman / six month
"one woman" "six months"

[WATERHOUSE 1967: 358, 359]

Zoque (Copainalá) [44]

(1) VOS

tí'ik čihku suñipi pokskuy is ndata's
Yesterday made pretty chair I my-papa-ERG
"Yesterday my father made a pretty chair."

[HARRISON & GARCÍA 1981: 402]

(2) Po

tuwi-hi'ŋ
dog-with
"with the dog"

[HARRISON & GARCÍA 1981: 441]

(3) G-'is 3-N

te' pi'n-is tyik
the man-ERG his house
"the man's house"

[HARRISON & GARCÍA 1981: 408]

(4) AN

hometa'mbi pokskuy
new chair
"new chairs"

[HARRISON & GARCÍA 1981: 404]

(5) PN

mis n-dik
you your-house
"your house"

[HARRISON & GARCÍA 1981: 405]

(6) DN

te' tuwi-ta'm
the dog-PL
"the dogs"

[HARRISON & GARCÍA 1981: 404]

(7) QN

sone pin
various man
"various men"

[HARRISON & GARCÍA 1981: 404]

Zoque (Francisco León) [44]**(1) SVO**

yomo'is tyiŋvitu'yahpa ane
 woman-ERG turn over tortilla
 "The women turn over tortillas"

[ENGEL & BARTHOLOMEW 1987: 344]

(2) Po

ndik-mi
 my house to
 "to my house"

[ENGEL & BARTHOLOMEW 1987: 356]

(3) G-'is 3-N

une'-is kyi'
 child-ERG his hand
 "the child's hand"

[ENGEL & BARTHOLOMEW 1987: 342]

(4) AN/NA

vihpi kuy / kuy vihpi
 good tree / tree good
 "a good tree"

[ENGEL & BARTHOLOMEW 1987: 353]

(5) PN

ndik
 my house
 "my house"

[ENGEL & BARTHOLOMEW 1987: 343]

(6) DN

yiŋ tuku
 this clothes
 "these clothes"

[ENGEL & BARTHOLOMEW 1987: 350]

(7) QN/NQ

viti pin
 many people
 "many people"
 tuyi meckuy / meckuy tuyi
 dog two / two dog
 "two dogs"

[ENGEL & BARTHOLOMEW 1987: 355]

[ENGEL & BARTHOLOMEW 1987: 354]

Sierra Popoluca [45]**(1) SVO**

iñ-yo:mo i-me'c-pa kawah
 your-wife she-look-INCOMP horse
 "Your wife is looking for the horse."

[MARLETT 1986: 379]

(2) Po/Pr

ká:m-ho:m
 milpa-in
 "in the milpa"
 kon šíwan
 with Juan
 "with Juan"

[ELSON 1960: 39]

[ELSON 1967: 281]

Note: *kon* may be derived from Spanish "con."

(3) 3-NG/G 3-N

i-kinki he'm widya:ya
 his-throat the old man
 "the old man's throat"

[MARLETT 1986: 375]

šiwan i-kawah
 Juan his-horse
 "Juan's horse"

[ELSON 1967: 285]

(4) AN

woyó tík
 round house
 "a round house"

[ELSON 1960: 24]

(5) PN

an-tík
 my house
 "my house"

[ELSON 1960: 32]

(6) DN

yip kawah
 this horse
 "this horse"

[MARLETT 1986: 380]

(7) QN

tun ko:ŋkoy
 one chair
 "one chair"

[MARLETT 1986: 373]

Sayula Popoluca [46]

(1) Free

(2) Po/Pr

tin-tík-m
 my-house-at
 "at my house"
 mit tin-ci'hat
 with my-aunt
 "with my aunt"

[CLARK 1962: 186]

[CLARK 1962: 186]

(3) G 3-N / 3-NG

ki'čwáy i-té:t
 the boy his-father
 "the boy's father"
 i-'áhw ayé koyóte
 his-mouth that coyote
 "that coyote's mouth"

[CLARK 1962: 188]

[CLARK 1962: 188]

(4) NA/AN

tu'k tiendaná' mih
 one store big
 "one big store"
 máhat káhau / mihway káhau
 big jaguar / big jaguar
 "big jaguar"

[CLARK 1962: 188]

[CLARK 1961: 48, 49]

(5) PN

tin-má:m [CLARK 1962: 186]
 my-mother
 "my mother"

(6) DN

ayí:h tó'say [CLARK 1962: 187]
 this woman
 "this woman"

(7) QN

may háyahwat [CLARK 1962: 187]
 many men
 "many men"

Oluta Popoluca [46]

(1) SVO

hamah piyu itohvo'mi:pe i-avo'tik [CLARK 1981: 11]
 that hen is-pecking-at her-young-chick
 "That hen is pecking at her young chick."

(2) Po/Pr

me:ša-pa'tpi [CLARK 1981: 17]
 table-under
 "under the table"
 mi:t hamah pi:yi [CLARK 1981: 51]
 with that sugarcane
 "with that sugarcane"

(3) G 3-N

cu'či i-e:me [CLARK 1981: 10]
 meat its-hide
 "the hide of the meat"

(4) AN

po:po' pu'i [CLARK 1981: 73]
 white sand
 "white sand"

(5) PN

tin-tiki [CLARK 1981: 144]
 my-house
 "my house"

(6) DN

hamah kuyi [CLARK 1981: 59]
 that tree
 "that tree"

(7) QN

seme cači [CLARK 1981: 60]
 many fly
 "many flies"

Mixe (Coatlán) [47]**(1) VSO > SVO / SOV Cf. [CAMPBELL & KAUFMAN & SMITH-STARK 1986: 548]**

ypida:k 'ahkšy mo:kkam [HOOGSHAGEN 1984: 17]

planted they corn

"They planted corn."

he 'uŋdeh:ty ti ymo'oy y'uŋ he 'i:k [HOOGSHAGEN 1984: 13]

the father gave his son the toy

"The father gave his son the toy."

(2) Po/Pr

tu'u-ba'a [HOOGSHAGEN 1984: 9]

road-the edge of

"roadside"

mih:t he ca:y / ma he tihk [HOOGSHAGEN 1984: 12]

with the rope / at the house

"with the rope" "at the house"

(3) G 3-N

he rey ñi:s he'e [HOOGSHAGEN 1974: 35]

the king his-daughter the

"the king's daughter"

(4) AN/NA

mih tihk [HOOGSHAGEN 1984: 9]

big house

"big house"

he koyote iyo:p [HOOGSHAGEN 1974: 35]

the coyote poor

"the poor coyote"

(5) PN

m-yo'ok [HOOGSHAGEN 1984: 4]

your-mother-in-law

"your mother-in-law"

(6) DN

he tihk [HOOGSHAGEN 1984: 12]

the house

"the house"

(7) QN

'oy may ha'ay [HOOGSHAGEN 1984: 9]

very many people

"very many people"

Mixe (San José El Paraíso) [47]**(2) Po/Pr**

me:s-pa't [HAITZMA & HAITZMA 1976: 50]

table-under

"under the table"

mi:d mi:da•š inga:b' me:n'

with fifty centavos money

"with fifty centavos"

[HAITZMA & HAITZMA 1976: 103]

(3) G 3-N

tu"ɡ tʰe:dʷ tʰuht
 one his-father his-gun
 "his father's gun"

[HAITZMA & HAITZMA 1976: 74]

(4) AN

tu"ɡ ma' po:b 'uk
 a big white dog
 "a big white dog"

[HAITZMA & HAITZMA 1976: 74]

(5) PN

n-bahk
 my-bone
 "my bone"

[HAITZMA & HAITZMA 1976: 6]

(6) DN

he maŋ
 the son
 "the son"

[HAITZMA & HAITZMA 1976: 74]

(7) QN

may ha"y
 many people
 "many people"

[HAITZMA & HAITZMA 1976: 42]

Mixe (Tlahuitoltepec) [47](1) VSO > SVO / SOV (a marked, non-basic order used with *tA* "already" [CAMPBELL & KAUFMAN & SMITH-STARK 1986: 547])

yik'awɔ:hc kwɔ:n tAhk
 opened Juan house
 "Juan opened the house."

[LYON 1980: 111]

yA hɔ:'y tA tyik'o:ky yA uk
 that person already killed that dog
 "That person already killed that dog."

[LYON 1980: 124]

tA ʌc hɔ'ɔsy nyikho'ɔty
 already I firewood brought
 "I already brought firewood."

[LYON 1980: 110]

(2) Po/Pr

n-tAhk-hotpy
 my house in
 "in my house"

[LYON 1980: 59]

ma:t mah:ɔ'y mane:r
 with Mr. Manuel
 "with Mr. Manuel"

[LYON 1980: 60]

(3) G 3-N

wekšy pɔ:'
 comal its edge
 "comal's edge"

[LYON 1980: 127]

(4) AN

oy hɔ:'y
 good person
 "a good person"

[LYON 1980: 77]

(5) PN

(mec) n-tahk
 I my-house
 "my house"

[LYON 1980: 55]

(6) DN

yo'ot tahk
 this house
 "this house"

[LYON 1980: 50]

(7) QN

namay yo'ot un'o'hk
 many this child
 "these many children"

[LYON 1980: 131]

Huastec [48]

(1) VSO (S=O)/VOS (S>O)

in k'wəθa' an ušum an inik
 SUBJ hit the woman the man
 "The woman hit the man."

[DAYLEY 1981: 54]

in k'ohow o:š i ahan an inik
 SUBJ picked three the corn the man
 "The man picked three ears of corn."

(2) Pr

tame:t an ata:
 in front of the house
 "in front of the house"

[OCHOA PERALTA 1984: 102]

(3) 3-NG

in k'w'e-e:l i te'
 its branch the tree
 "the branch of the tree"

[OCHOA PERALTA 1984: 86]

(4) AN

at'aš ušum
 bad woman
 "a bad woman"

[OCHOA PERALTA 1984: 97]

(5) PN

nu k'ima:
 my house
 "my house"

[OCHOA PERALTA 1984: 89]

(6) DN

nuwa' te'
 that tree
 "that tree"

[OCHOA PERALTA 1984: 101]

(7) QN

ya:n i pik'o
 many the dog
 "many dogs"

[OCHOA PERALTA 1984: 90]

Yucatec [49]**(1) SVO / VOS**

[DURBIN & OJEDA 1978: 71]

le winik-o' k-u-kins-ik-# (le) h-čakmo'ol-(o')
 the man-there HAB-SUBJ-kill-INCOMP-OBJ (the) MASC-jaguar-(there)
 k-u-kins-ik-# (le) h-čakmo'ol le winik-o'
 HAB-SUBJ-kill-INCOMP-OBJ (the) MASC-jaguar the man-there
 "That man kills jaguars." ("That man kills that jaguar.")

(2) Pr

ti' sum [BARRERA VÁSQUEZ 1946: 250]
 with rope
 "with a rope"

(3) 3-NG

u p'o:k-il huan [BARRERA VÁSQUEZ 1946: 236]
 his hat-POSS Juan
 "Juan's hat"

(4) AN

sak nok' [BARRERA VÁSQUEZ 1946: 243]
 white clothes
 "white clothes"

(5) PN

a suku'un [BARRERA VÁSQUEZ 1946: 217]
 your brother
 "your brother"

(6) DN (D)

le winik-a' [BARRERA VÁSQUEZ 1946: 221]
 the man-here
 "this man"

(7) QN

hač ya:b tunič [BARRERA VÁSQUEZ 1946: 249]
 very many stone
 "lots of stones"

Lacandón [50]**(1) VOS / SVO**

t-u-kins-a balum k'ak' [BRUCE S. 1974: 62]
 PAST-SUBJ-kill-COMP jaguar Kak
 "Kak killed a jaguar"
 hačakyum t-u-ment-ah hač winik [BRUCE S. 1974: 112]
 Hachakyum PAST-SUBJ-make-COMP true man
 "Hachakyum created Lacandóns (true men)."

(2) Pr

y-etel ten [BRUCE S. 1968: 54]
 its-with me
 "with me"

(3) 3-NG

u lu'um nah / u lu'um-in nah [BRUCE S. 1968: 66]
 its land house / its mud-REL house
 "the land of the house" "the mud house / the mud of the house"

(4) AN

in čak nok' [BRUCE S. 1968: 104]
 my red clothes
 "red clothes of mine"

(5) PN

in cimin [BRUCE S. 1968: 103]
 my horse
 "my horse"

(6) DN

lati' nukuč balum [BRUCE S. 1968: 105]
 that big jaguar
 "that big jaguar"

(7) QN

pim winik / hun-tul winik [BRUCE S. 1968: 47]
 many man / one-NUCL man
 "many men" "one man"

Itzá [51]

(1) SVO/VOS

a' winik-eh k-u-kins-ik (a') balum (-eh) [HOFLING 1982: 41]
 the man-TP INCOMP-SUB-kill-INCOMP jaguar
 k-u-kins-ik balum a' winik-eh [HOFLING 1982: 43]
 INCOMP-SUB-kill-INCOMP jaguar the man-TP
 "The man kills (the) jaguar."

(2) Pr

ti beh [HOFLING 1982: 119]
 on road
 "on the road"

(3) 3-NG

u hol a' nah [HOFLING 1982: 113]
 its door the house
 "the door of the house"
 k'oč-e:n t-u y-otoč ah huan-eh [HOFLING 1982: 114]
 arrive-I to-his his-house MASC Juan-TP
 "I arrived at Juan's house."

(4) AN/NA

a' nohoč winik / a' pek' nohoč [HOFLING 1982: 64]
 the big man / the dog big
 "the big man" "the big dog"

(5) PN

u k'ek'en [HOFLING 1982: 113]
 his pig
 "his pig"

(6) DN/DND

a' winik / a' balum he'lo'
 the man / the jaguar there
 "the man" "that jaguar"

[HOFLING 1982: 50, 61]

(7) QN

hun-tul winik
 one-NUCL man
 "one man"

[HOFLING 1982: 91]

Mopán [52]

(1) VOS

u bit'-ah u kal a pek' a kan-a
 SUBJ choke-COMP his neck the dog the snake-DEM
 "The snake choked the neck of the dog."

[ULRICH & ULRICH 1976: 28]

(2) Pr

ič konol
 in store
 "in the store"

[ULRICH & ULRICH 1976: 26]

(3) 3-NG

u kal a pek'
 his neck the dog
 "the neck of the dog"

[ULRICH & ULRICH 1976: 28]

(4) AN

ah c'i' šidal
 MASC little child
 "the little child"

[ULRICH & ULRICH 1976: 10]

(5) PN

u y-otoč
 his-house
 "his house"

[ULRICH & ULRICH 1976: 8]

(6) DN

a nah
 the house
 "the house"

[ULRICH & ULRICH 1976: 8]

(7) QN

ya:b a nah
 many the house
 "many houses"

[ULRICH & ULRICH 1976: 9]

Chol [53]

(1) SVO

ti' miñi išim hini winik
 COMP buy corn the man
 "The man bought maize."

[WARKENTIN & SCOTT 1980: 33]

(2) Pr

y-ik'ot huan
 his-with Juan
 "with Juan"

[WARKENTIN & SCOTT 1980: 27]

(3) 3-NG

i y-išm-al čolel / i y-išim i t'at
 its-corn-REL milpa / his-corn his papa
 "the maize of the milpa" "the maize of his father"

[WARKENTIN & SCOTT 1980: 18]

(4) AN

hini čan bi winik
 the tall REF man
 "the tall man"

[WARKENTIN & SCOTT 1980: 89]

(5) PN

i čič
 his brother
 "his brother"

[WARKENTIN & SCOTT 1980: 15]

(6) DN

hini c'i'
 that dog
 "that dog"

[WARKENTIN & SCOTT 1980: 90]

(7) QN

kabil t'ak'in
 much money
 "much money"

[WARKENTIN & SCOTT 1980: 16]

Chontal [54]

(1) SVO

ah fernando u-hic'e'-# ah yan
 MASC Fernando he-hit-him MASC Juan
 "Fernando hits John."

[KNOWLES 1984: 314]

(2) Pr

pat otot
 behind house
 "behind the house"

[KNOWLES 1984: 306]

(3) 3-NG

u buc'-i (l) k'ak' / u na ih mala'
 its smoke-REL fire / her mother FEM Mary
 "the fire's smoke" "Mary's mother"

[KNOWLES: 197, 304]

(4) AN

pici išik-lop'
 pretty woman-PL
 "the pretty women"

[KNOWLES 1984: 258]

(5) PN

a pap
 your father
 "your father"

[KNOWLES 1984: 194]

(6) DND/DN/ND

hini winik da / ni yok winik / winik da
 that man here / the dear man / man here
 "that man" "the dear man" "this man"

[KNOWLES 1984: 208-209]

(7) QN

mih k'en wah
 very much tortilla
 "lots of tortillas"

[KNOWLES 1984: 204]

Chortí [55]

(1) SVO

e winik u-k'uši e pa'
 the man SUBJ-eat the tortilla
 "The man eats the tortilla."

[OAKLEY 1966: 247]

(2) Pr

ta činam
 in town
 "in the town"

[OAKLEY 1966: 247]

(3) 3-NG

u we'r-ir e wakaš
 his meat-POSS the cow
 "the cow's meat"

[OAKLEY 1966: 245]

(4) AN (NA emphasizes a condition)

e čuču' mis / e mis čuču'
 the little cat / the cat little
 "the young cat" "the little cat"

[OAKLEY 1966: 247]

(5) PN

iw-ihč'ok-tak
 your-daughter-PL
 "your daughters"

[OAKLEY 1966: 245]

(6) DN/DND

e winik-op / e winik-op yaha'
 the man-PL / the man-PL there
 "the men" "those men"

[OAKLEY 1966: 247]

(7) QN

inte' winik / tuno'or hente
 one man / all people
 "one man" "all people"

[FOUGHT 1972: 52, 197]

Tzotzil [56]

(1) VOS

i-s-pet lok'el anc ti t'ul-e
 CMP-he-carry away woman the rabbit-CL
 "The rabbit carried away the woman."

[AISSSEN 1987: 1]

(2) Pr

ta be
 on path
 "on the path"

[AISSSEN 1987: 12]

(3) 3-NG

s-tot li šun-e
 his-father the Xun-CL
 "Xun's father"

[AISSSEN 1987: 4]

(4) AN

sonso kriščano / li k'oš kremo-tik-e
 foolish person / the little boy-PL-CL
 "an ignorant person" "the little boy"

[AISSEN 1987: 3]

(5) PN

h-moč
 my-basket
 "my basket"

[AISSEN 1987: 4]

(6) DN

ti tak'in
 the money
 "the money"

[AISSEN 1987: 5]

(7) QN

ep kremo-tik
 many boy-PL
 "many boys"

[AISSEN 1987: 269]

Tzeltal [57] (1) = Tenejapa, (2)~(7) = Bachajón

(1) VSO (S = O) / VOS (S > O)

la s-mil-# hpetul te hwan
 COMP SUBJ-kill-OBJ Pedro the Juan
 "Pedro killed Juan."

[DAYLEY 1981: 43]

la s-mil-# baka te hpetul-e
 COMP SUBJ-kill-OBJ cow the Pedro-DEM
 "Pedro killed the cow."

(2) Pr

y-elaw na
 its-front house
 "in front of the house"

[SLOCUM & GERDEL 1971: 54]

(3) 3-NG

y-ok'elan mut
 his-song bird
 "the song of birds"

[SLOCUM & GERDEL 1971: 29]

(4) AN

sakwa išim
 white maize
 "white maize"

[SLOCUM & GERDEL 1971: 69]

(5) PN

s-hol
 his-head
 "his head"

[SLOCUM & GERDEL 1971: 27]

(6) DN/DND

te baka [DAYLEY 1981: 43] ha'me winik ine
 the cow the man that
 "the cow" "that man"

[SLOCUM & GERDEL 1971: 139]

(7) QN

bayel tak'in
much money
"much money"

[SLOCUM & GERDEL 1971: 77]

Tojolabal [58]

(1) VOS

s-mak'a hwan manwel
he-hit Juan Manuel
"Manuel hit Juan."

[FURBEE-LOSEE 1976: 200]

(2) Pr

b'a' s-nah
to his-house
"to his house"

[FURBEE-LOSEE 1976: 145]

(3) 3-NG

s-b'ak'(e)t-il čitam
its-meat-REL pig
"pork"

[FURBEE-LOSEE 1976: 75]

(4) AN

tohol winik
honest man
"an honest man"

[FURBEE-LOSEE 1976: 26]

(5) PN

h-nah
my-house
"my house"

[FURBEE-LOSEE 1976: 74]

(6) DND

ha winik-ih
the man-here
"this man"

[FURBEE-LOSEE 1976: 100]

(7) QN

čahb'-wane' winik
two-NUCL man
"two men"
hel ha ton-i
many the stone-here
"these many stones"

[FURBEE-LOSEE 1976: 121]

[LENKERDORF 1979: 146]

Chuj [59]

(1) VOS

iš-#-s-mak' wax šun iš malin
COMP-OBJ-SUBJ-hit MASC Juan FEM Maria
"Maria hit Juan."

[DAYLEY 1981: 35]

(2) Pr

t'ah piŋkah
in/to/from plantations
"in, to, or from the plantations"

[HOPKINS 1967: 153]

(3) 3-NG

y-uk'tak s-mam wiŋ [HOPKINS 1967: 148]
 his-brother his-father MALE ANIMATE
 "his father's brother"

(4) AN

tul kamiš [HOPKINS 1967: 104]
 short shirt
 "short shirt"

(5) PN

hin-xolom [HOPKINS 1967: 133]
 my-head
 "my head"

(6) DN(D)

wiŋ čì' / ha' wiŋ čì' [HOPKINS 1967: 152, 162]
 man there / the man there
 "that man" "that man there"

hep'-iš iš / ha' xun wiŋ animah [HOPKINS 1967: 163]
 PL-FEMALE ANIMATE woman / the one man person
 "the women" "a man"

(7) QN

xantak animah [HOPKINS 1967: 152]
 many people
 "many people"

Jacaltepec [60]

(1) VSO

š-#-y-il nax s čeh [DAY 1973: 65]
 COMP-it-he-see he his horse
 "He saw his horse"

(2) Pr

yul te' ŋah [CRAIG 1977: 9]
 in the house
 "inside the house"

(3) 3-NG

s čeh hin mam [DAY 1973: 67]
 his horse my father
 "my father's horse"

(4) NA/AN

hune' no' čeh sax'iŋ / hune' te' niman saxla šila [CRAIG 1977: 10]
 one animal horse white / one the big white chair
 "one (a) white horse" "one (a) big white chair"

(5) PN

ha melyu [CRAIG 1977: 15]
 your money
 "your money"

(6) DN

te' hum
the book
"the book"

[CRAIG 1977: 9]

(7) QN

č'i'hal no' čeh
many animal horse
"many horses"

[DAY 1973: 69]

Acatec [62]

(1) VOS

či-#-s-ma' nax šunik nax luin
INCOMP-OBJ-SUBJ-hit NCL Juan NCL Pedro
"Pedro hits Juan."

[PEÑALOSA 1987: 283]

(2) Pr

y-ib'an čem
its-on chair
"on the chair"

[PEÑALOSA 1987: 288]

(3) 3-NG

nax y-uštax nax kuin
NCL his-brother NCL Pascual
"Pascual's brother"

[PEÑALOSA 1987: 288]

(4) AN

xeb' nax wač' maštol
PL NCL good teacher
"the good teachers"

[PEÑALOSA 1987: 288]

(5) PN

xa-tumin
your-money
"your money"

[PEÑALOSA 1987: 285]

(6) ND

xun (x)a-kamiš tu' / xun kamioneta ti'
one your-shirt that / one bus this
"that shirt of yours" "this bus"
"that shirt is yours"

[PEÑALOSA 1987: 287, 308]

(7) QN

maasanil wan (x)in-mis ti'
all PL my-cat this
"all these cats of mine"

[PEÑALOSA 1987: 287]

Tectitec [65]

(1) VOS

pwes yaxi o-#-cax-t-uq'le' te t-a:lib' ičan-kv
then already REM-him-come-he-call the his-mother-in-law man-more
"Then his mother-in-law called the other man."

[STEVENSON 1987: 105]

(2) Pr

t-uk'ʔi c'u:c'
its-with hoe
"with a hoe"

[STEVENSON 1987: 127]

(3) 3-NG

š-č'o'č' a šu'x-el
her-clay your wife-POSS
"your wife's clay"

[STEVENSON 1987: 100]

(4) AN

q'an ce:
yellow tree
"yellow tree"

[STEVENSON 1987: 108]

(5) PN

q-ta:t
our-father
"our father"

[STEVENSON 1987: 100]

(6) DN

te xa alagun-ni / te šxal
the this lake-REF / the man
"this lake" "the man"

[STEVENSON 1987: 106, 118]

(7) QN

xun šxal
one man
"one man"

[STEVENSON 1987: 119]

Mam [66]

(1) VSO

ma #-cax t-cyu'n če:p č'it
REC OBJ-DIR (come) SUBJ-grab Jose bird
"Jose grabbed the bird"

[ENGLAND 1983: 212]

(2) Pr

t-i:b' pwe:nt
its-over bridge
"above the bridge"

[ENGLAND 1983: 155]

(3) 3-NG

ky-wic šxa:l
his-head person
"the people's heads"

[ENGLAND 1983: 142]

(4) AN / (XNA)

q'ayna lo'x / xu:n č'ya:n q'aq
rotten fruit / one dog black
"rotten fruit" "one (a) black dog"

[ENGLAND 1983: 146-147]

(5) PN

n-xa:-ya
my-house-CL
"my house"

[ENGLAND 1983: 66]

(6) DN

ax ši:naq
the man
"the man"

[ENGLAND 1983: 150]

(7) QN

naq xu:'nqa šxa:l
that all person
"all those people"

[ENGLAND 1983: 149]

Aguacatec [67] (ä is short)

(1) VSO

xa #-š-ç'ax šna'n b'u'y
PROX PAST it-she-wash woman rag
"The woman washed the rag."

[LARSEN 1981: 137]

(2) Pr

ta'x čex
on horse
"on the horse"

[McARTHUR & McARTHUR 1966: 161]

(3) 3-NG

t-ahb'il qā-tah
his-desire our-father
"the desire of our father"

[McARTHUR & McARTHUR 1980: 63]

(4) AN

xun b'uy šwoq'
one old jug
"an old jug"

[McARTHUR & McARTHUR 1966: 164]

(5) PN

it-aq'wil
your (PL)-rope
"your rope"

[McARTHUR & McARTHUR 1966: 156]

In the second person singular formal there is no prefix on the majority of consonant initial stems and the proclitic *-u'* is added. Although the resultant form is NP, the dominant form is still PN.

(6) DN(D)

yi win-ac
the spirit-DEMONSTRATIVE ENCLITIC
"the spirit"

[McARTHUR & McARTHUR 1966: 162]

(7) QN

kob' čaquum
two messenger
"two messengers"

[McARTHUR & McARTHUR 1966: 161]

Ixil [68]

(1) VSO

kat tečb'u nax šun u le:
COMP eat man Juan the tortilla
"Juan ate the tortilla."

[AYRES 1980: 279]

(2) Pr

wi' u me:ša
on the table
"on the table"

[AYRES 1980: 176]

(3) 3-NG

i-ya:b'il naq šun (Chajul dialect)
his-sick man Juan
"Juan's sick"

[AYRES 1980: 156]

(4) AN

ča'š kami'š
green shirt
"a green shirt"

[AYRES 1980: 158]

(5) PN

i ka:šo
his box
"his box"

[AYRES 1980: 133]

(6) DN

u č'i'
the dog
"the dog"

[AYRES 1980: 154]

(7) QN

lawal čo:
ten animal
"ten animals"

[AYRES 1980: 140]

Kekchí [69]

(1) VOS

š-#-(š)-sak' li c'i' li k'wi:nq
COMP-OBJ-SUBJ-hit the dog the man
"The man hit the dog."

[PINKERTON 1978: 163]

(2) Pr

sa' be
in path
"in the path"

[EUCHUS & CARLSON 1980: 129]

(3) 3-NG

š-ninq'e l-in ko'
her-birthday the-my daughter
"my daughter's birthday"

[EUCHUS & CARLSON 1980: 229]

(4) AN

raši hu
blue/green book
"a green book"

[EUCHUS & CARLSON 1980: 1]

(5) PN

in-c'i'
my-dog
"my dog"

[EUCHUS & CARLSON 1980: 30]

(6) DN/DND

li iʃq / li hu a'in
 the woman / the book this
 "the woman" "this book"

[EUCHUS & CARLSON: 1980: 14, 118]

](7) QN

nabal li bič
 many the song
 "many songs"

[EUCHUS & CARLSON 1980: 177]

Pocomchí [70]

(1) VOS

š-#-i-kač' i ax'uš i c'i'
 COMP-OBJ-SUB-bite the child the dog
 "The dog bit the child"

[BROWN 1979: 101]

(2) Pr

wač me:ša
 on table
 "on the table"

[BROWN 1979: 136]

(3) 3-NG

r-ehk'e:n la:s
 his-wife Francisco
 "Francisco's wife"

[BROWN 1979: 103]

(4) AN / (NA)

nax moma' če:' / nax ni-we:š ak'
 a big tree / a my-pants new
 "a big tree" "my new pants"

[BROWN 1979: 105, 107]

Although modifying adjectives normally precede the noun, there are a few cases in which the adjective follows the noun.

(5) PN

w-alaq
 my-throat
 "my throat"

[BROWN 1979: 136]

(6) DN/DND

i yu:q' / re' pa:t wili
 the hill / DEF house DEM
 "the hill" "this house"

[BROWN 1979: 102, 107]

(7) QN

k'ih taqe r-il'i:b'
 a lot PL his-niece
 "a lot of nieces"

[BROWN 1979: 136]

Pocomam [71]

(1) VOS (I could not find suitable examples. I chose the following example from "Los idiomas mayas de Guatemala," edited by England, 1993, where Pocomchí and Pocomam are treated as Poqom, because they take the same forms.)

š-#-u-to' ma' Nikte' la ma' Lolmay
 PAST-OBJ-SUBJ-help the Nikte ? the Lolmay
 "Lolmay helped Nikte."

[ENGLAND 1993: 93]

(2) Pr

reh ru-wa' nu-kiex
for his-food my-animal
"for my animal's food"

[McARTHUR & McARTHUR 1983: 17]

(3) 3-NG

ru-čaq' ma' Laš
his-sister the Nicholas
"Nicholas' sister"

[McARTHUR & McARTHUR 1983: 13]

(4) AN

ma' raš pak
the green annona
"green annonas"

[McARTHUR & McARTHUR 1983: 17]

(5) PN

nu-so'
my-cloth
"my cloth"

[McARTHUR & McARTHUR 1983: 14]

(6) DN

ma' išoq
the woman
"the woman"

[McARTHUR & McARTHUR 1983: 34]

(7) QN

iši'm q'aha' ahq
three female pig
"three female pigs"

[McARTHUR & McARTHUR 1983: 33]

Uspantec [72]

(1) SVO

xun xox š-tix ox
one raven COMP-eat avocado
"A raven ate an avocado."

[ANONYMOUS 1980: 45]

(2) Pr

pach xun x-q'un
with one his-brother
"with his brother"

[ANONYMOUS 1980: 75]

(3) 3-NG

x-ka' Talin
her-metate stone Catarina
"Catarina's metate (milling stone)"

[ANONYMOUS 1980: 67]

(4) AN

xun reš pera'x
one green shawl
"a green shawl"

[ANONYMOUS 1980: 119]

(5) PN

x-tun
his/her-cat
"her cat"

[ANONYMOUS 1980: 67]

(6) DN

man kuk
the squirrel
"the squirrel"

[ANONYMOUS 1980: 85]

(7) QN

xun tun
one cat
"one cat"

[ANONYMOUS 1980: 49]

Quiché (Totonicapán) [73]

(1) SVO / VSO

ri aci š-u-loq' xun kamiša / š-u-loq' ri aci xun kamiša
the man COMP-SUBJ-buy one shirt
"The man bought a shirt."

[Fox 1973: 29]

(2) Pr

pa ri be
on the road
"on the road"

[Fox 1973: 18]

(3) 3-NG

ki palat ri pamilia
their dish the family
"the dishes of the family"

[Fox 1973: 39]

(4) AN

saq ulew
white land
"white land"

[Fox 1973: 29]

(5) PN

a tat
your father
"your father"

[Fox 1973: 23]

(6) DN

ri kamiša
the shirt
"the shirt"

[Fox 1973: 29]

(7) QN

xun kamiša / k'ia ri kamiša
one shirt / many the shirt
"one shirt" "many shirts"

[Fox 1973: 27]

Quiché (Nahualá-Ixtahuacán) [73]

(1) SVO / VOS (VSO)

le: išoq š-#-r-esax le: ac'iaq
the woman COMP-OBJ-SUBJ-take out the clothes
"The woman took out the clothes."

[MONDLOCH 1978a: 52]

š-#-u:-kunax ri: aci ri: išoq
COMP-OBJ-SUBJ-cure the man the woman

[MONDLOCH 1978b: 5]

"The man cured the woman./The woman cured the man."

(2) Pr

pa tinamit / r-uma:l le: ači
 to town / his-by the man
 "to the town" "by the man"

[MONDLOCH 1978a: 27, 30]

(3) 3-NG

u c'i' le: ala
 his dog the boy
 "the boy's dog"

[MONDLOCH 1978a: 24]

(4) AN

saqa taq xa
 white PL house
 "white houses"

[MONDLOCH 1978a: 17]

(5) PN

a c'i:'
 your dog
 "your dog"

[MONDLOCH 1978a: 22]

(6) DN

le: xa
 that house
 "that house"

[MONDLOCH 1978a: 11]

(7) QN

r-onoxe:l winaq
 every person
 "every person"

[MONDLOCH 1978a: 50]

Cakchiquel [76]

(1) SVO

ri mes š-#-u-tix ri č'oy
 the cat COMP-OBJ-SUBJ-eat the mouse
 "The cat ate the mouse."

[ISCAYA' TALA & CHOXÍN YUCUTÉ 1983: 55]

(2) Pr

pa tinamit
 in/to town
 "to the town"

[ISCAYA' Tala & CHOXÍN YUCUTÉ 1983: 5]

(3) 3-NG

ru-po't ri štan
 her-huipil the girl
 "the girl's huipil"

[ISCAYA' TALA & CHOXÍN YUCUTÉ 1983: 37]

(4) AN

ri nim xay
 the big house
 "the big house"

[BLAIR et al.1981: 447]

(5) PN

nu-c'i'
 my-dog
 "my dog"

[BLAIR et al.1981: 428]

(6) DN

ri aq
the pig
"the pig"

[ISCAYA' TALA & CHOXÍN YUCUTÉ 1983: 5]

(7) QN

k'iy abax
many stone
"many stones"

[ISCAYA' TALA & CHOXÍN YUCUTÉ 1983: 5]

Tzutujil [77]

(1) VOS

š-#-u:-č'ey xun išoq xar a:či
COMP-OBJ-SUB-hit a woman the man
"The man hit a woman."

[DAYLEY 1985: 305]

(2) Pr

r-ma:l xar a:či
his-by the man
"by the man"

[DAYLEY 1985: 154]

(3) 3-NG

xun r-wač r-šahab' r-k'a:xo:l n-b'esi:no
one its-strap his-shoe his-son my-neighbor
"a strap of my neighbor's son's shoe"

[DAYLEY 1985: 286]

(4) AN

reš ki:naq / reš n-ki:naq
green beans / green my-beans
"green beans" "my green beans"

[DAYLEY 1985: 150]

(5) PN

nu:-c'i:'
my-dog
"my dog"

[DAYLEY 1985: 143]

(6) DN

xar i:šoq
the woman
"the woman"

[DAYLEY 1985: 153]

(7) QN

noxe:l xa naqu:n
all the thing
"all the things"

[DAYLEY 1985: 157]

Xinca [78]

(1) VOS

powoy ahuaru na pari
shine all the sun
"The sun shines on all."

[LEHMANN 1920: 748]

c'opohi nen nah urumuwi
bit me the snake
"The snake bit me."

[LEHMANN 1920: 761]

(2) Pr

ti pu / ra maku

[LEHMANN 1920: 746]

with hand / in house

"with the hand" "in the house"

(3) NG

uruh mihya [SCHUMANN 1966: 452]

raha maku [LEHMANN 1920: 740]

egg hen

mouth house

"hen's egg"

"the entrance of the house"

(4) AN/NA

ila uvui / ikal maku čuruku

[LEHMANN 1920: 750, 766]

fresh meat / one house small

"fresh meat" a small house"

(5) NP

pu' / puk / puh

[SCHUMANN 1966: 454]

my hand / your hand / his hand

"my hand" "your hand" "his hand"

(6) DN(D)

nah mihya / nahna frak na

[LEHMANN 1920: 761, 753]

the hen / the man this

"the hen" "this man"

(7) QN

taha suyi

[LEHMANN 1920: 766]

many times

"many times"

Garífuna (Black Carib) [79]

(1) VSO

l-adógo-ba-ŋ t-úmari ába yamádi wáu

[TAYLOR 1956: 6]

SUBJ-make-INCOMP-OBJ her-husband a basket for-us

"Her husband will make us a basket."

(2) Po / Pr

óma-da / ába ugúnei h-ábu muládunu

[TAYLOR 1977: 57-58]

road-in / one boat his-with mulattoes

"in the road" "a boat with (carrying) mulattoes"

(3) 3-NG

t-ebénari l-uba wáguči (<wa-uguči)

[TAYLOR 1977: 57]

its-door his-house our-father

"the door of our father's house"

(4) AN / NA

iséri urúei / ába áufuri uríbatu

[TAYLOR 1977: 63-64]

new king / one aunt bad

"the new king" "a bad aunt"

(5) PN

n-aróna

[TAYLOR 1977: 55]

my-arm

"my arm"

(6) ND

kátai líra / kátaɣ túra
 thing that-MASC / thing that-FEM
 "that thing" "that thing"

[TAYLOR 1977: 63]

(7) QN

órowa guríara túra
 tree canoe that
 "those three canoes"

[TAYLOR 1977: 59]

***Lenca [D14]**

(1) SOV

guagaš ta kori-n-lana
 cattle milpa eat-PERF-they
 "The cattle ate the milpa."

[LEHMANN 1920: 692]

(2) Po

sela ap
 hammock in
 "in the hammock"

[LEHMANN 1920: 692]

(3) GN

ke kural
 stone enclosure
 "stone's enclosure"

[LEHMANN 1920: 688]

(4) NA

u-šaygi poriana
 my-brother-in-law little
 "my little brother-in-law"

[LEHMANN 1920: 687]

(5) PN

u-familia
 my-family
 "my family"

[LEHMANN 1920: 686]

(6) ND

kin-ne
 road-the
 "the road"

[LEHMANN 1920: 687]

(7) NQ

tumin huissiw / lassu eta
 money much / cord one
 "much money" "one cord"

[LEHMANN 1920: 692]

Tol [80]

(1) SOV

miste ve lyaha
 cat tamal eat
 "The cat eats tamales."

[ROYCE DE DENNIS 1982: 15]

(2) Po

malana mpes
pig for
"for the pig"

[ROYCE DE DENNIS 1982: 33]

(3) G 3-N

pepito popay
Pepito his-papa
"Pepito's father"

[ROYCE DE DENNIS 1982: 27]

(4) NA

malana piné
pig big
"a big pig"

[ROYCE DE DENNIS 1982: 33]

(5) PN

na-wa/mwa
my-house
"my house"

[DENNIS and FLEMING 1975: 29]

(7) NQ

peso kont'e / 'anyomat'e
peso three / year two
"three pesos" "two years"

[ROYCE DE DENNIS 1982: 65, 77]

Mískitu [81]

(1) SOV

waykna ba mayrin-ra prük-an
man the woman-ACC hit-PAST
"The man hit the woman."

[HEATH 1913: 58]

(2) Po

li:-ura
water-in
"in the water"

[CONZEMIUS 1929: 76]

(3) GN

waykna watla
man house
"the man's house"

[CONZEMIUS 1929: 76]

(4) NA

waykna yamni
man good
"a good man"

[CONZEMIUS 1929: 75]

(5) NP/Infix

kwa:l-ki: / kwa:l-kam / ay-kwa:l-ka
cloth-my / cloth-your / his-cloth-his
"my cloth" "your cloth" "his cloth"
su-k-lu / su-m-lu
"my dog" "your dog"

[CONZEMIUS 1929: 77]

[CONZEMIUS 1929: 78]

(6) ND

li: kawhla ba
water cold the
"the cold water"

[CONZEMIUS 1929: 75]

(7) NQ

waykna wal
man two
"two men"

[CONZEMIUS 1929: 75]

Sumu [82]

(1) SOV

ma:mah ya baka-ka kau wispai
mother the child-her ACC (at)? whip
"The mother whips her child."

[ANONYMOUS 1989: 84]

(2) Po

a:kusah karak
needle with
"with the needle"

[ANONYMOUS 1989: 3]

(3) G N-3

kataramah tu:-ka butu-ka
hen tongue-his point-his
"the point of hen's tongue"
nawah u:-ka-tak
Jaguar skin (u:tak)-his
"the jaguar's skin"

[ANONYMOUS 1980: 69]

[ANONYMOUS 1980: 75]

(4) NA

u: sikka as
house big one
"a big house"

[ANONYMOUS 1989: 90]

(5) NP/Infixed

su:lu → su:-ki-lu / su:-ma-lu / su:-ka-lu
dog dog-my / dog-your / dog-his
"my dog" "your dog" "his dog"
u: → u:-ki / u:-ma / u:-ka
house house-my / house-your / house-his
"my house" "your house" "his house"

[ANONYMOUS 1989: VII]

(6) ND/DN

yapu ya
alligator the
"the alligator"
a:ka al-ka / yaka su:-ka-lu
this man-his / that dog-his
"this man" "that dog"

[ANONYMOUS 1989: 88]

[ANONYMOUS 1989: VII]

(7) NQ

u: ba:s
house three
"three houses"

[ANONYMOUS 1980: 81]

Rama [84]**(1) SOV**

maiŋ tu:tʊŋ naiŋ usuk kairis-u
 your brother my child hit-COMP
 "Your brother hit my child."

[CONZEMIUS 1927: 338]

(2) Po

si:-ki: / ŋu:-aik
 water-in / house-to
 "in the water" "to the house"

[CONZEMIUS 1927: 336]

(3) GN

ku:má: ain ŋu:
 woman her house
 "woman's house"
 naiŋ pa:pa pani:s
 this manatee flippers
 "this manatee's flippers"

[CONZEMIUS 1927: 338]

[CRAIG 1986: 33]

(4) NA

su:li tara
 animal big
 "a big animal"

[CRAIG 1986: 33]

(5) PN

na:iŋ ta:ta
 my father
 "my father"

[CONZEMIUS 1927: 338]

(6) ND

ka:t ki
 tree the
 "the tree"

[CONZEMIUS 1927: 332]

(7) NQ

ka:t saimiŋ
 tree one
 "one (a) tree"

[CONZEMIUS 1927: 332]

Guatuso [85] (Examples from Lehmann are in original transcription without superscripts.)**(1) SOV**

ni arápĉao i-ři-tóikitáikin maxiókaxuíso
 the child him-he-love teacher
 "The child loves the teacher."

[SÁNCHEZ C. 1984: 157]

tón ti i-laŋeune kórakúru
 I ERG it-eat orange
 "I eat oranges."

[SÁNCHEZ C. 1984: 160]

(2) Po

ná ko / ní ju
 me to / he with
 "to me" "with him"

[SÁNCHEZ C. 1984: 155]

(3) GN

caju-curu / coqui-pu

[LEHMANN 1920: 395, 401]

cacao-ear / tortoise-egg

"cacao pod" "tortoise's egg"

(4) AN/NA

tizaja kuejak / chocpa kuejak

[LEHMANN 1920: 393]

dry firewood / wet firewood

"dry firewood" "wet firewood"

ikasani u / tiageaari u

[LEHMANN 1920: 410]

big house / little house

"a big house" "a little house"

cora puru / yu ora

[LEHMANN 1920: 394, 395]

tree big / road little

"a big tree" "a little road"

(5) PN

i-pú:ru / na-kúri

[SÁNCHEZ C. 1984: 152, 153]

his-body / my-wife

"his body" "my wife"

(6) DN

ni jú / ni arápčao

[SÁNCHEZ C. 1984: 155, 157]

the road / the child

"the road" "the child"

(7) NQ

pintoto ozogetene

[LEHMANN 1920: 393]

bird many

"many birds"

Boruca [86]

(1) SOV

ba jó'kua ki ba' wí'ra

[ABARCA GONZÁLEZ 1988: 108]

your friend AG you take

"Your friend takes you."

(2) Po

ú ta

[ROJAS CHAVES 1988: 132]

house at

"at the house"

(3) GN

kuasráŋ i turi wá' róxx

[ABARCA GONZÁLEZ 1988: 114]

Cuasran his bull son PL

"the offspring of Cuasran's bull"

(4) NA

jí kránj

[ABARCA GONZÁLEZ 1988: 109]

fire great

"a big fire"

(5) PN

ba sasúx

[ROJAS CHAVES 1988: 132]

your grandmother

"your grandmother"

(6) DN

já čiča
that chicha liquor
"that chicha"

[ROJAS CHAVES 1988: 132]

(7) QN

kuñ abí róxk
many person PL
"many persons"

[ABARCA GONZÁLEZ 1988: 108]

Cabécar [87]

(1) SOV

jís kága tí tabéli blflwá
my father ERG machete hid
"My father hid the machete."

[MARGERY PEÑA 1989a: LX]

(2) Po

kal hula wa
tree arm with
"with the branch"

[MARGERY PEÑA 1989a: LX]

(3) GN

bá kága duwá
your father brother-in-law
"your father's brother-in-law"

[MARGERY PEÑA 1989a: XLII]

(4) NA

páiglu siuna
shirt blue
"blue shirt"

[MARGERY PEÑA 1989a: LV]

(5) PN

sá mīna
our mother
"our mother"

[MARGERY PEÑA 1989a: 237]

(6) ND

jaba hí
child this
"this child"

[MARGERY PEÑA 1989a: XLIII]

(7) NQ

du mañatku
bird three
"three birds"

[MARGERY PEÑA 1989a: XLVIII]

Bribí [88]

(1) SOV

Xuan tu uhku pkiwá
Juan ERG door broke
"Juan broke the door."

[DICKEMAN DATZ 1984: 117]

(2) Po

be' ù a
 your house in
 "in your house"

[DICKEMAN DATZ 1984: 121]

(3) GN

u wak
 house owner
 "the owner of the house"

[DICKEMAN DATZ 1983: 178]

(4) NA

u tāj
 house big
 "a big house"

[DICKEMAN DATZ 1983: 174]

(5) PN

be' ù
 your house
 "your house"

[DICKEMAN DATZ 1984: 121]

(6) ND

knè e'
 work this
 "this work"

[DICKEMAN DATZ 1984: 120]

(7) NQ

Xuana ұрке ұškalo таук êt
 Juana went broom buy one
 "Juana went to buy a broom."

[DICKEMAN DATZ 1984: 121]

je kj alà-r kiana-dak bul
 I EXP child-PL wanted-PL two
 "I wanted two children."

[DICKEMAN DATZ 1984: 116]

Térraba [89]

(1) SOV

e bōř jnɔ
 he me saw
 "He saw me."
 tʰa bōř u jk
 I my house see
 "I see my house."

[PORTILLA CHÁVES 1986: 138]

[PORTILLA CHÁVES 1986: 138]

(2) Po

ba u ško
 his house to
 "to his house"

[PORTILLA CHÁVES 1986: 139]

(3) GN/NG

kīōř sɾɪŋ
 tree root
 "the root of tree"

[PORTILLA CHÁVES 1986: 138]

kógs sɔ / mɛ zbu / di dɾuŋ
 head tapir / mother god / water salt
 "the head of tapir" "Virgin" "sea"

[PORTILLA CHÁVES 1986: 138]

(4) NA

φískuo sòksʃe
cat black
"a black cat"

[PORTILLA CHÁVES 1986: 136]

(5) PN

ba u
his house
"his house"

[PORTILLA CHÁVES 1986: 139]

(6) ND

šíti hɸ
dog this
"this dog"

[PORTILLA CHÁVES 1986: 136]

(7) NQ

tʰiʃŋ kɾa-řá
pot NUCL-one
"one pot"

[PORTILLA CHÁVES 1986: 152]

kʰiũmɾo φɾa-řá
cord NUCL-one
"one cord"

[PORTILLA CHÁVES 1986: 152]

Guaymí [90]

(1) SOV

ngoböwe ko dotebare / tiwe niara miti
God land made / I him struck
"God made the world." "I struck him."

[ALPHONSE 1956: 7,51]

(2) Po

mo ben
you with
"with you"

[ALPHONSE 1956: 2]

(3) GN

huan toro-e
Juan book-POSSD
"Juan's book"

[ALPHONSE 1956: 50]

(4) NA

brare wenye
man white
"white man"

[ALPHONSE 1956: 2]

(5) PN

ti toro-e
my book-POSSD
"my book"

[ALPHONSE 1956: 8]

(6) ND

toro ne
book this
"this book"

[ALPHONSE 1956: 7]

(7) NQ

ni kabré
people many
"many people"

[ALPHONSE 1956: 12]

Bocotá [91]

(1) SOV

ča nɔ i gudáble
I AG yuca eat-NON RECENT PAST PERF
"I ate yuca."

[JARA MURILLO 1989: 122]

(2) Po

Francisco álɪŋ
Francisco for
"for Francisco"

[JARA MURILLO 1989: 113]

(3) GN

čubé inɔa
Chube father
"Chube's father"

[MARGERY PEÑA 1989b: 154]

(4) NA

ɲaŋ inɪnwə
world different
"different world"

[MARGERY PEÑA 1989b: 154]

(5) PN

ča ka
my name
"my name"

[JARA MURILLO 1989: 113]

(6) ND

ɲaŋ hái
world this
"this world"

[MARGERY PEÑA 1989b: 154]

(7) NQ

glí gadá-de / kói gabá-de
tree NUCL-one / hen NUCL-one
"one tree" "one hen"

[SOLÍS HERNÁNDEZ 1989: 149-150]

Cuna [92]

(1) SOV

tule ome taysa
man woman saw
"The man saw the woman."

[SHERZER 1983: 40]

(2) Po

neka se
house to
"to the house"

[HOLMER 1946: 196]

(3) GN/ G 3-N

tule talak^wa / tule e-taltak^wa
man eye / man his-eye
"a man's eye" "a man's eye"

[HOLMER 1946: 188]

(4) NA

akk^wa-lele
stone-sacred
"sacred stone"

[HOLMER 1946: 189]

(5) PN

an(i)-pap / pe-pap
my-father / your-father
"my father" "your father"

[HOLMER 1946: 189]

(6) DN

itti tule / ati ome
this man / that woman
"this man" "that woman"

[HOLMER 1946: 190]

(7) NQ

tule war-k^wena
man NUCL-one
"one man"

[HOLMER 1946: 190]

Notes

Note 1) If all the data are counted, distribution in terms of number of consonants is as follows:

Number of phonemes	11	12	13	14	15	16	17	18	19	20	21	22	23	
Number of languages	1	3	1	11	20	15	23	17	13	20	18	20	23	
Number of phonemes	24	25	26	27	28	29	35							Total
Number of languages	7	11	8	7	1	1	2							222

I examined the data on 222 or 233 languages for each entry in Table 2 to Table 22 and found that the data are not markedly different from those of 174 languages; therefore, I eliminated the data of 222 or 233 languages corresponding to each entry in Table 3 to Table 22. For each individual entry see appendices 2 and 3.

Note 2) I use the term “language(s)” loosely throughout this paper. Actually the notion “language” in many cases includes dialects.

Note 3) If similar sets are put together, voiceless fricative series decrease to 17 types and fricative systems with both voiceless and voiced fricatives to 43 types.

Note 4) The phonemes /i e a o/ are phonetically manifested as [i e ʌ u] and the corresponding long vowels are [i: æ: a: o:].

Note 5) The comparative word list of Tol and Tequistlatec Chontal is presented below. It is difficult to find cognate sets.

	Tol [DENNIS, ROYCE DE DENNIS & FLEMING 1975]	Tequistlatec [WATERHOUSE 1980]
1. I	nap ^h	iya'
2. you	hip ^h	ima'
3. we	kup ^h	iyank'
4. this	niná	itka'a
5. that	noná	itkeya
6. who	p ^h ak ^h	nay
7. what	c ^h an	te
8. not	kuwá/lenj/ma	a'i
9. all	p ^h i	titi/haway
10. many	pilik'	ašpela'
11. one	p ^h aní	anuli
12. two	mat'e	oke'
13. big	pine/poné (s)	akweka
14. small	c ^h ik ^h	
15. long	kampa	itoki
16. woman	kep ^h /keppán	ʔaka'no'
17. man	yom/yoméñ	kal šans
18. people	tol/tolpán	lan šanuk'
19. fish	k ^h ul/k ^h ulún	ʔatu
20. bird	cipyay	ʔaka
21. dog	c ^h iyó/c ^h iyós	kal ciki

22. louse	tit'/tit'im	†aykwi
23. tree	yo	al 'ek
24. bark	p ^h olok'/lotot ^h	lišmík'ek
25. leaf	lo	lipela
26. root	c'il	lime
27. seed	setel	†emes
28. blood	'as	†aWac'
29. meat	pis/pwisís	lišík'
30. skin	p'iy	lešmi
31. bone	k ^h elé (s)/k ^h elo	leka†
32. grease	pan	al k'a†'a
33. egg	pehey	lapi'e
34. horn	c ^h eme	
35. tail	sok'	lipo
36. feather	p ^h isús	†ipimi
37. hair	c'il/hic'il (your hair)	†aWak
38. head	hey p ^h uk ^h (your head)	†iWak
39. ear	p ^h ac'/p ^h yac' (your ear)	liš'mas
40. eye	hin (your eye)	†i'u
41. nose	mik ^h /himik ^h (your nose)	†i'nat
42. mouth	lala/lyala (your mouth)	likó
43. tooth	vis/hivis (your tooth)	li'ay
44. tongue	pelam/hepelam (your tongue)	†ipa†
45. claw	pep ^h /hepep ^h (your claw)	†a'na†uk
46. foot	c ^h am/c ^h yam (your foot)	li'mic
47. knee	tik'/hitik' (your knee)	†eƣone
48. hand	mas/myas (your hand)	†imane
49. stomach	kol/kyol (your stomach)	liku'u
50. neck	men/hemen (your neck)	†ehok'
51. breast	has suna/hyas suna (your breast)	latuwe
52. heart	has/hyas (your heart)	†unšahma'
53. liver	kom/kyom (your liver)	leta
54. drink	mis/mi' (you drink)	tišnay
55. eat	la/lah/lyan (you eat)	
56. bite	la/lah/lyan (you bite)	
57. see	nuk/nyuk' (you see)	tišina
58. hear	p ^h ak/p ^h a'/p ^h ok (you hear)	tikweka
59. know	sele/selén (you know)	isina'
60. sleep	ha/hyan (you sleep)	tišmay
61. die	'ipi'i (you die)	timá
62. kill	'na/'inán (you kill)	tima'a'ma
63. swim	p ^h oytés (you swim)	tikafkay
64. fly	hama (you fly)	tiyu
65. walk	win/law (you walk)	
66. come	kui/kul/k ^h il/hak'	ti'wamma
67. lie down	pit'/pi'/pat ^h	tunouya
68. sit	haka/ha'ca/hat ^h a	tikucway
69. stand	toƣ/toƣk/hi/toh/lih	
70. give	'yan/'aya	tepi'i
71. say	velén/vele	tikwa
72. sun	kokoy/loc'ak'/nac'ak'	kal 'ora/kat'ayi'
73. moon	mumuy	kal mu†'a
74. star	p ^h ul/p ^h ulak ^h	kal šamna
75. water	'isí	laha'
76. rain	hiwí	†akwi

77. stone	pe/pwen	tapik
78. sand	sus	kal kwiša
79. earth	'amá/ma/momás	tamac'
80. cloud	mol	tumaway
81. smoke	mus	ikušic
82. fire	'awa	tuŋa
83. ash	'ip ^{hi} /p ^{hi} /p ^{hi} his	taapi'
84. burn	pwen	unayta
85. path	himik ^h	lane
86. mountain	hok'/nevén	
87. red	he	umšali
88. green	c ^{hu}	ašwoyka
89. yellow	lu	ata'eŋka/umta'e
90. white	p ^{he}	afuhka
91. black	te	umi
92. night	piste	lipuki
93. hot	'yawa	inu'
94. cold	c ^h ohose	ašita
95. full	pit'	tema'ne (llenar)
96. new	syase	ac'e
97. good	'ik ^h /'isís	
98. round	t'int'in	
99. dry	p ^h a/c'ic'e	tihuŋi (secar)
100. name	la/lya (you call)	taftine

Note 6) In the literature on ergativity, terms such as transitive, intransitive, subject, and object are treated as "primitive" concepts [See, for example, DIXON 1972]. Since these terms present no major difficulties with respect to Middle American language data, I start this study utilizing them without definition. Concerning this topic, see, for example, [LI 1975, TSUNODA 1985].

Appendices

1. Phoneme Charts

1.1. Consonant Symbols

Stops	Bilabial		Alveolar				Palatal		Velar	Uvular		Glottal				
Voiceless	p	p ^w	t	t̥	tʲ	t ^w	c	ć	č	č̥	kʲ	k	k ^w	q	q ^w	ʔ
Voiced	b	b ^w	d	d̥	dʲ		j		ǰ			g	g ^w			
Glottalized	pʰ	bʰ	ḑ		tʰ		cʰ	ćʰ	čʰ	č̥ʰ	kʰʲ	kʰ	k ^{wʰ}	qʰ		
Aspirated	p ^h		t ^h				c ^h	ć ^h	č ^h			k ^h	k ^{wʰ}			
Prenasalized	^m b		ⁿ d		ⁿ dʲ		nj		nǰ			^ŋ g	^ŋ g ^w			

Notes: /t̚ d̚ č̚ ʔ/ are retroflexed. /tk/ appears in Cabécar and Bribri. /čʲ/ is reported in Jesús María Cora. /ć ćʰ/ 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	ϕ	f	θ	s sʸ	ś ș	š ṣ̌	ç	x xʷ	X Xʷ	h hʸ hʷ
Voiced	β	v	ð ðʸ	z	ž	ẓ̌ ž̥		ɣ		
Glottalized		fʰ								

Nasals	Bilabial	Alveolar	Palatal	Velar
Voiceless	m	n		
Voiced	m ^w m ^y	n	ɲ (n ^y)	ŋ
Glottalized	mʰ	nʰ	ɲʰ	

Laterals	Alveolar approximant	Alveolar fricative	Alveolar affricate	Retroflexed	Flap
Voiceless		l̥	l̥ʲ	ɭ	
Voiced	l	lʲ		ɭ̚	ɭ
Glottalized	lʰ		ɭʰ		

R-Sounds	Non-specified	Alveolar trill	Alveolar flap	Retroflex
	r	ṛ	ɾ	ɻ

Glides	Labio-velar	Palatal
Voiceless	w	ɣ
Voiced	w	y i
Lenis	<u>w</u>	<u>y</u>

Fortis	p	t	c	č	k	k ^w	θ	s	š	ṣ̌	X	m	n	ñ	l	r	w	y
Lenis	b	d	j	č̣	g	g ^w	θ̣	z	ž	ẓ̌	X̣	<u>m</u>	<u>n</u>	<u>ñ</u>	<u>l</u>	<u>r</u>	<u>w</u>	<u>y</u>

Note that Juárez Zapotec has a fortis vs. lenis contrast in both voiceless and voiced consonants and has voiced consonants in addition. See Chapter 2.2.

1.2. Vowel Symbols

		Front		Central		Back	
		Unround	Round	Unround	Round	Unround	Round
High	Higher	i	ü	i	u	ĩ	u
	Lower	ɪ	(ʊ)	(ɨ)	(ʉ)	(ɨ)	ʊ
Mid	Higher	e	ö	ə		ě	o
	Lower	ɛ	(ɔ̃)	ʌ			
Low		æ		a/ɑ			ɔ

Parenthesized phonemes do not appear in Native Middle American languages.

2. Distribution of Number of Consonants in Native Middle American Languages

The number in each column indicates the number of phonemes. Glottal stop and lateral affricate are marked directly by ʔ and λ, 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
- ※: languages omitted in this study

		OBSTRUENTS					SONORANTS					Glides (Semivowels)		NUMBER OF PHONEMES
		Stops		Fricatives			Nasals		Liquids			r		
		VL	VD	A	G	ʔ	VL	VD	G	VD	VL		1 VDVL	
[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 María	7				ʔ	3			3	1	1	2	18
	Cora ² Ixcatán	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	λ	2	15
	Nahuatl San Jerónimo	6				ʔ	3			2	1	λ	2	16
	Nahuatl Tetelcingo	6					3			2	1	λ	2	15
	Nahuatl Amilcingo	6	1				3			2	1	λ	2	16
	×Nahuatl Guapa	6					3			2	1	λ	2	15
	×Nahuatl Ixcatepec	6				ʔ	3			2	1	λ	2	16
	×Nahuatl Ahuacatlán	6				ʔ	2			2	1	λ	2	15
	Nahuatl Tlaxpanaloya	6				ʔ	2			2	1	λ	2	15
	Nahuatl Zongolica	6	1				4			2		1	λ	17
	Nahuatl Matlapa	6					3			2	1	λ	2	15
	Nahuatl Coscatlán	6	1				3			2	1	λ	1	17
	×Nahuatl Cuamelco	6					3			2	1	λ	2	15
	Nahuatl Acaxochitlán	6				ʔ	3			2	1	λ	1	17
	×Nahuatl Huazalinguillo	6				ʔ	3			2	1	λ	1	17
	Nahuatl Huautla	6	1			ʔ	3			2	1	λ	2	18
[13]	Nahual Pómaro	6				ʔ	3			2		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 Mecayapán	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	24
	Paipai ²	5				ʔ	3	1		3	1	1	1	18
[17]	×Cochimi	5	1	1		ʔ	5			2	1	1	2	21
[18]	×Kiliwa ¹	6	1	1		ʔ	5			4	1		1	22
	Kiliwa ²	6				ʔ	4			3	1		1	18

	OBSTRUENTS									SONORANTS				Glides (Semivowels)				NUMBER OF PHONEMES
	Stops				Fricatives					Nasals		Liquids		r		wy		
	VL	VD	A	G	ʔ	VL	VD	G	VD	VL	1	VDVL	r	VD	VL			
[19] ×Cocopa ¹	5	1			ʔ	5				3		1	1	1	2			20
Cocopa ²	8				ʔ	5				3		2	2	1	2			24
[20] Seri ¹	4				ʔ	6				2		1		1	1			16
×Seri ²	4				ʔ	6				3		1	1		1	1		18
[21] Tarasco ¹ Ichupio	5		5			3				2				2	2			19
Tarasco ² Purenchecuario	6		4			3				2				2	2			19
[22] Totonac Xicotepec	6				ʔ	3				2		1	1	λ	2			17
×Totonac Zapotitlán	6				ʔ	3				2		1	1	λ	2			17
Totonac Papantla	6				ʔ	3				2		1	1	λ	2			17
×Totonac Coatepec	7				ʔ	7				2		1	1	λ	1	2		23
×Totonac Ahuacatlán	6				ʔ	(3)				2		1	1	λ	2			17
[23] Tepehua Teachichilco	6				ʔ	3				2		1			2			15
Tepehua Huehuetla	6				6	ʔ	3			2		1	1		2			22
[24] Chichimec ¹	5	4			ʔ	2	1			2	2	1		1	1			20
×Chichimec ²	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] Otomí Mezquital ¹	5	3			ʔ	6	1			3		1		1	2			23
×Otomí Mezquital ²	4				ʔ	6	4			3				1	2			21
Otomí Temoayan	6	4			ʔ	3	2			3		1		1	2			23
Otomí Tenango	3	3			ʔ	5	1			2				1	2			18
Otomí Sierra	4	4			ʔ	2				2				1	2			16
[29] Mazahua	6	4			ʔ	3	2			3		1		1	2			23
[30] Tlapanec ¹	5	4			ʔ	4				2		1		1	2			20
×Tlapanec ²	4	4	3		ʔ	4				3		1		1	2			23
[31] Ixcatec	5	5			ʔ	4				3		1		2	2			23
[32] Popoloc Western ¹	5				ʔ	4	4			3		1		1	2			21
×Popoloc Western ²	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 Chiquihuitlán	5				ʔ	3	1			3				1	1			15
Mazatec Jalapa de Díaz	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 Pedro ¹	6	3			ʔ	3				3		1		2	2			21
×Amuzgo San Pedro ²	6				ʔ	3	1			2		1			2			16
Amuzgo Xochistlahuaca	8	4(PN)			ʔ	3	1			3		1		2	2			25
[36] Mixtec Acatlán	5	5(PN)			ʔ	3	2			3		1			2			22
Mixtec Huajuapán	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 Ayutla ¹	6	5(PN)			ʔ	4	1			3		1		1	1			23

	OBSTRUENTS					Fricatives			SONORANTS			Glides (Semivowels)			NUMBER OF PHONEMES
	Stops								Nasals		Liquids				
	VL	VD	A	G	ʔ	VL	VD	G	VD	VL	I	r	wy	VD	
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 Atlatlahuca	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 Coatzacoapan	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	3			ʔ	3	2		2	2	1	1	1	2	25
Trique Copalá	6	3			ʔ	4	3		2		1		2		22
[39] ※Zapotec Sierra	6				ʔ	5	5		2		1	2	1		23
Zapotec Juárez	6	6	1	1	3VD	ʔ	3	3	2	2	1	1	1	1	35
Zapotec Ixtlan	7	4			ʔ	4	1		2	1	1	1	1		24
Zapotec Rincón	5	5			ʔ	3	2		1		1	1	2		21
Zapotec Zoogocho	4	4			ʔ	5	3		2	2	1	1	1	1	25
Zapotec Yatzaquí	5	5			ʔ	6	3		2	1	1	1	1		26
※Zapotec Villa Alta	5	5			ʔ	5	3		2	1	1	1	1		25
Zapotec Cajonos	5	5			ʔ	3	3		2	2	1	1	1	2	27
Zapotec Yalalag	5	5			ʔ	4	3		2	1	1	1	1	1	25
Zapotec Yatee	4	4			ʔ	2	1	2	1	1	1	1	2		20
Zapotec Choapan	5	5			ʔ	2	2		2		1	1			19
Zapotec Albarradas	5	4			ʔ	2	2		2	1	1	1	1	2	23
※Zapotec Mitla ¹	4	4			ʔ	5	2		2	2	1	1	2	2	26
Zapotec Mitla ²	6	6			ʔ	4	2		2	2	1	1	1	2	29
Zapotec Tlacoachahuaya	5	5			ʔ	2	2		2	1	1	1	1		21
Zapotec Guelavía ¹	5	5			ʔ	2	2		2	2	1	1	2		23
※Zapotec Guelavía ²	6	5			ʔ	3	3		2	2	1	1	1	2	27
Zapotec Chichicapán	6	6			ʔ	2	2		3	3	1	1	2		27
Zapotec Quioquitani	6	6			ʔ	3	2		3		1	1	2		25
Zapotec Ayoquesco	5	5			ʔ	2	2		2		1	1	2		21
Zapotec Lachixio	7	3(PN)			ʔ	4	3	1(PN)	3		1	1	2		26
Zapotec Guevea	5	5			ʔ	2	2		2	2	1	1	1	2	26
Zapotec Isthmus ¹	4	4			ʔ	2	2		3	2	1	1	1	2	23
※Zapotec Isthmus ²	4	4			ʔ	4	2		3		1	2	2		23
[40] Chatino Yaitepec	3	3			ʔ	3			2		1	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								SONORANTS				Glides (Semivowels)				NUMBER OF PHONEMES
		Stops				Fricatives				Nasals		Liquids		r	wy			
		VL	VD	A	G	ʔ	VL	VD	G	VD	VL	1	VDVL		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 Ojitlán	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	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 Ostucán	6	5			ʔ	3				4		1			2		22
	※Zoque Rayón	6	5			ʔ	3				4		1			2		22
	Zoque Copainalá	6	5			ʔ	3				4		1			2		22
	Zoque León	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 Coatlán	4	3			ʔ	2				3					2		15
	Mixe Paraíso	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 Potosí	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]	Lacandón	5	1			5	ʔ	3			2		1			2		20
[51]	※Itzá ¹	5	1			5	ʔ	3			2		1		1	2		21
	Itzá ²	5	1			5	ʔ	3			2		1			2		20
[52]	Mopán	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]	Chortí	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					SONORANTS					Glides (Semivowels) r wy VD VL	NUMBER OF PHONEMES		
		Stops		Fricatives			Nasals		Liquids						
		VL	VD	A	G	ʔ	VL	VD	G	VD	VL	1 VDVL			
[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]	Jacaltepec	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]	Tectitepec	8			8	ʔ	4			2		1		2	26
[66]	Mam	8			8	ʔ	4			2		1		2	26
[67]	Aguacatepec	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]	Kekchí	6			6	ʔ	4			2		1	1	2	23
[70]	Pocomchí ¹	6	1		6	ʔ	4			2		1	1	2	24
	Pocomchí 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]	×Quiché ¹ Totonicapán	6			6	ʔ	3			2		1	1	2	22
	Quiché ² Zunil	6			6	ʔ	4			2		1	1	2	23
	Quiché ³ Nahuala	6			6	ʔ	3			2		1	1	2	22
[74]	Sacapultec	7			7	ʔ	3			3		1	1	2	25
[75]	Sipacapeño	7			7	ʔ	3			2		1	1	2	24
[76]	Cakchiquel ¹ Patzicia	6			6	ʔ	3	1		2		1	1	1	22
	Cakchiquel ² Comalapa	6			6	ʔ	3	1		2		1	1	1	22
[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	20
	Xinca ²	3			4	ʔ	2			2		1	1	1	17
[79]	Garífuna	4	3				3			2		1	1	2	16
[80]	Tol	4		4	4	ʔ	2			3		1		3	22
[81]	Mískitu	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]	Cabécar	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]	Térraba	3	3	2			4	2		4		1		2	21
[89]	Teribe	3	3	3			3	2		4			2	2	23
[90]	Guaymí	3	3				2	1		4		1			15
[91]	Bocotá	3	4				2					1		1	11
[92]	Cuna	5					1			2		1	1	2	12

	Vowels	Number of phonemes
	i ɪ e ɛ æ a ɔ o u i ə ʌ ü ö u i ě	
[2] Papago	i a o u i	5
(geminate)	+ + + + +	5 10
[4] Northern Tepehuan	i a o u i	5
(geminate)	+ + + + +	5 10
[5] Southeastern Tepehuan	i a o u i ě	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
Guarijio	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 i	5
(geminate)	+ + + + +	5 10
Cora ²	i e æ a u ə	6
(geminate)	+ + + + +	6 12
[11] Huichol ¹	i e a u i	5
(geminate)	+ + + + +	5 10
※Huichol ²	i e a u i	5
(geminate)	+ + + + +	5 10
[12] Nahuatl Classical	i e a o	4

[illegible]

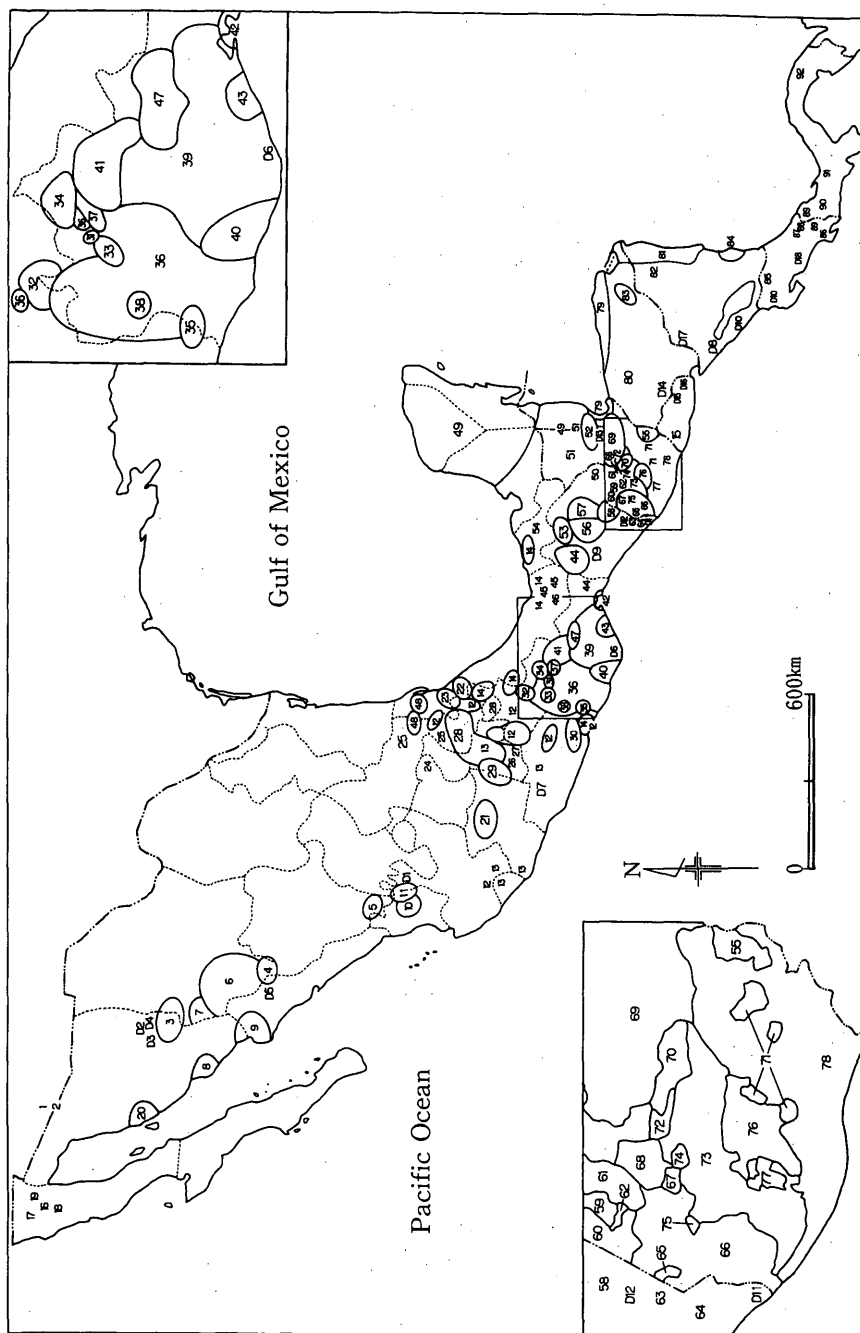
		i	ɪ	e	ɛ	æ	a	ɔ	o	u	ɨ	ə	ʌ	õ	ü	ɯ	ĩ	ẽ	Number of phonemes
D6	Pochutec	i		e		a		o		u									5
	(L)	+	+			+	+	+	+										5 10
D7	Cuitlatec ¹	i		e		a		o		u	i								6
	※Cuitlatec ²	i		e		æ		ɔ		o	u	i		ʌ					8
[16]	※Paipai ¹	i		e		a		o		u	i								6
		+	+			+	+	+	+	+	+								6 12
	Paipai ²	i		e		a		o		u									5
		+	+			+	+	+	+										5 10
[17]	※Cochimí	i		e		a		o		u									5
[18]	※Kiliwa ¹	i		e		a		o		u	i								6
	(L)	+	+			+	+	+	+	+									6 12
	Kiliwa ²	i				a				u									3
	(L)	+				+			+										3 6
[19]	※Cocopa ¹	i		e		a		o		u	i								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	i								6
[22]	Totonac Xicotepec	i		e		a		o		u									5
	(L)	+	+			+	+	+	+										5 10
	※Totonac Zapotitlán	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 Ahuacatlán	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	i								6

		i	ɪ	e	ɛ	æ	a	ɔ	o	u	ɨ	ə	ʌ	ö	ü	ʉ	ĩ	ẽ	Number of phonemes
	(N)	+		+	+		+	+		+									6 12
	※Cuicatec Concepción ²	i		e			a		o	u									5
	(N)	+		+			+	+	+										5 10
	Cuicatec Santa María	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 Copalá	(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 Juárez GL	i		e			a		o	u									5
	Zapotec Ixtlán	i		e			a		o	u									5
	Zapotec Rincón	i		e		æ	a		o	u							ĩ		7
	Zapotec Zoogocho	i		e			a		o										4
	Zapotec Yatzachi	i		e			a		o			ə							5
	※Zapotec Villa Alta	i		e			a		o								ĩ		5
	Zapotec Cajonos GL	i		e			a		o										4
	glottalized	i'		e'			a'		o'										
	laryngealized	i'ĩ		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 Tlacoahuaya	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							ĩ		6
	Zapotec Lachixio	i		e			a			u									4
	lengthened	ii		ee			aa			uu									4 8
	checked	i'		e'			a'			u'									
	interrupted	i'ĩ		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

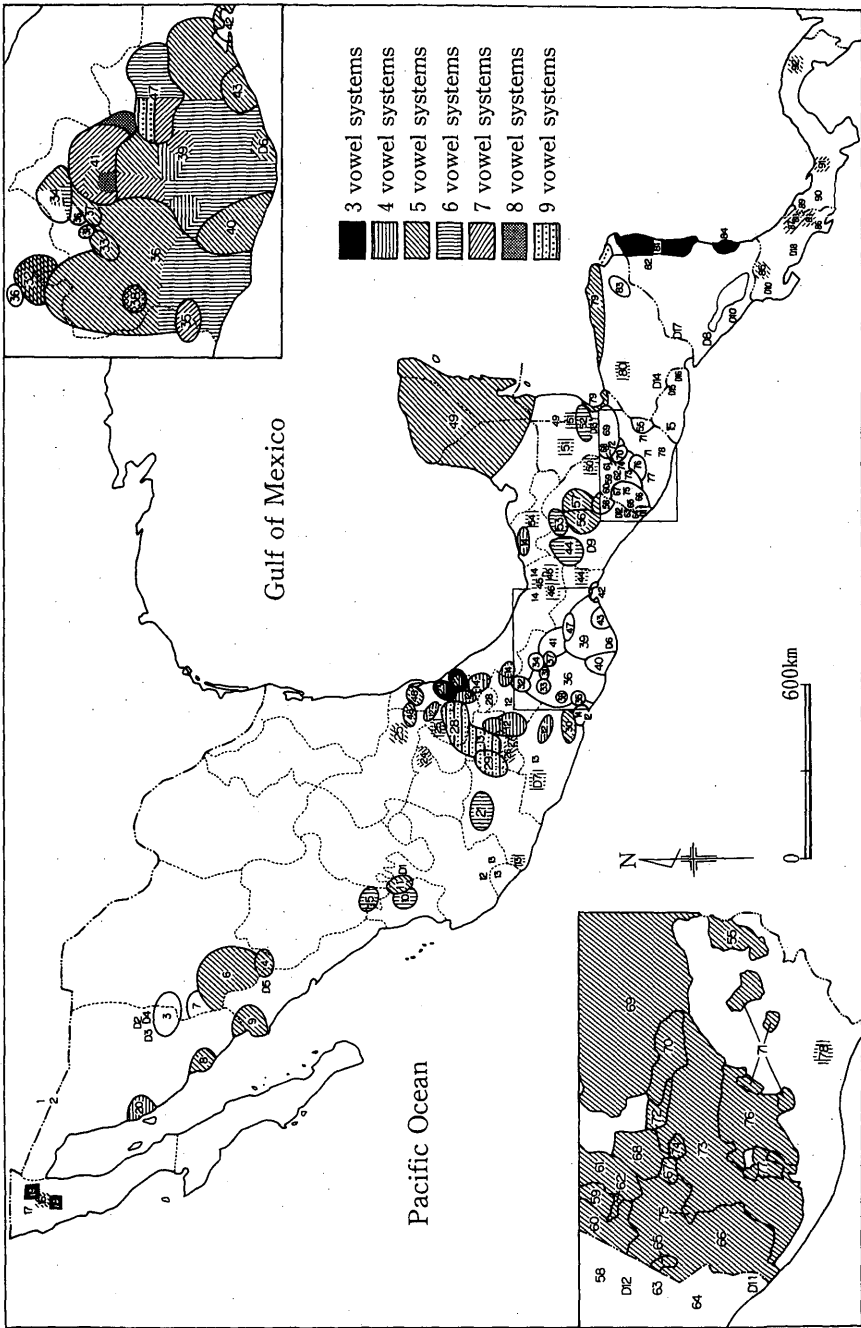
		i	ɪ	e	ɛ	æ	a	ɔ	o	u	ɨ	ɘ	ʌ	ö	ü	ʉ	ĩ	ẽ	Number of phonemes
	(N)	+	+						+	+									4
	(L)	+	+				+		+	+									9 × 2 18
	※Chatino Zozontepec	i	e				a		o	u									5
	(L)	+	+				+		+	+									5
	(N)	+	+				+		+	+									5 × 2 20
[41]	Chinantec Lealao	i	e				a		o	u							ĩ		6
	(L)	+	+				+		+	+							+		6
	(N)	+	+				+		+	+							+		6 × 2 24
	※Chinantec Lalana	i	e				a		o	u	ɨ	ɘ		ö					8 + N + L
	Chinantec Comaltepec	i	e				æ	a		o	u						ĩ	ẽ	8
	(N)	+	+				+	+		+	+						+		7
	(L)	+	+	+			+		+	+							+	+	8 + 7 30
	※Chinantec Yolox	i	e				a		o	u	ɨ	ɘ			ü				8 + N
	Chinantec Quiotepec	i	e				a		o	u					ü		ĩ	ẽ	8
	(N)	+	+				+		+	+					+		+	+	8
	(L)	+	+				+		+	+					+		+	+	8 × 2 32
	※Chinantec Ozumacín	i	e				a		o	u	ɨ			ö					7 + N
	※Chinantec Valle	i	e				a		o	u	ɨ	ɘ							7 + N
	Chinantec Palantla	i	e				a		o	u							ĩ	ẽ	7
	(N)	+	+				+		+	+							+	+	7 14
	Chinantec Tepetotutla	i	e				a		o	u							ĩ	ẽ	7
	(N)	+	+				+		+	+							+	+	7 14
	Chinantec Sochiapan	i	e				a		o	u							ĩ	ẽ	7
	(N)	+	+				+		+	+							+	+	7 14
	※Chinantec Usila	i	e				a		o	u									5 + N
	Chinantec Tlacoatzin	i	e				a		o	u							ĩ	ẽ	7
	(N)	+	+				+		+	+							+	+	7 14
	※Chinantec Ojitlán	i	e				a		o	u	ɨ	ɘ							7 + N
	※Chinantec Chiltepec	i	e				a		o	u	ɨ	ɘ							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 Ostucán	i	e				a		o	u	ɨ								6
	※Zoque Rayón	i	e				a		o	u	ɨ								6
	Zoque Copainalá	i	e				a		o	u				ʌ					6
	Zoque León	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	e	ɛ	æ	a	ɔ	o	u	ɨ	ə	ʌ	õ	ü	ɯ	ĩ	ẽ	Number of phonemes
	(L)	+	+			+	+	+			+							6
	Oluta Popoluca	i	e			a		o	u	i								6
	(L)	+	+			+	+	+	+									6
[49]	Mixe Coatlán	i	e			a		o	u	i								6
	(L)	+	+			+	+	+	+									6
	(EL)	+	+			+	+	+	+									6
	Mixe Paraíso	i	e			a		o	u	i								6
	(L)	+	+			+	+	+	+									6
	(EL)	+	+			+	+	+	+									6
	Mixe Tlahuitoltepec	i	e			a	ɔ	o	u			ʌ						7
	(L)	+	+			+	+	+	+			+						7
	Mixe Totontepec ¹	i	e		æ	a	ɔ	o	u	i	ə							9
	(L)	+	+		+	+	+	+	+	+	+							9
	※Mixe Totontepec ²	i	e		æ	a		o	U	u	i	ʌ						9
	(L)	+	+		+	+		+	+	+	+	+						9
[48]	Huastec Veracruz	i	e			a		o	u									5
	(L)	+	+			+	+	+	+									5
	Huastec Potosí	i	e			a		o	u									5
	(L)	+	+			+	+	+	+									5
[49]	※Yucatec ¹	i	e			a		o	u									5
	Yucatec ²	i	e			a		o	u									5
	(L)	+	+			+	+	+	+									5
[50]	Lacandón	i	e			a		o	u		ə							6
	(L)	+	+			+	+	+	+		+							6
[51]	Itzá ^{1,2}	i	e			a		o	u	i								6
	(L)	+	+			+	+	+	+									5
[52]	Mopán	i	e			a		o	u	i								6
	(L)	+	+			+	+	+	+	+								6
[53]	Chol ¹	i	e			a		o	u			ʌ						6
	※Chol ²	i	e			a		o	u	i								6
[54]	Chontal	i	e			a		o	u	i								6
[55]	Chortí	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]	Jacaltepec	i	e			a		o	u									5
[61]	Kanjobal	i	e			a		o	u									5
[62]	Acatepec ^{1,2}	i	e			a		o	u									5
	(L)	+	+			+	+	+	+									5
[65]	Tectitepec	i	e			a		o	u									5
	(L)	+	+			+	+	+	+									5

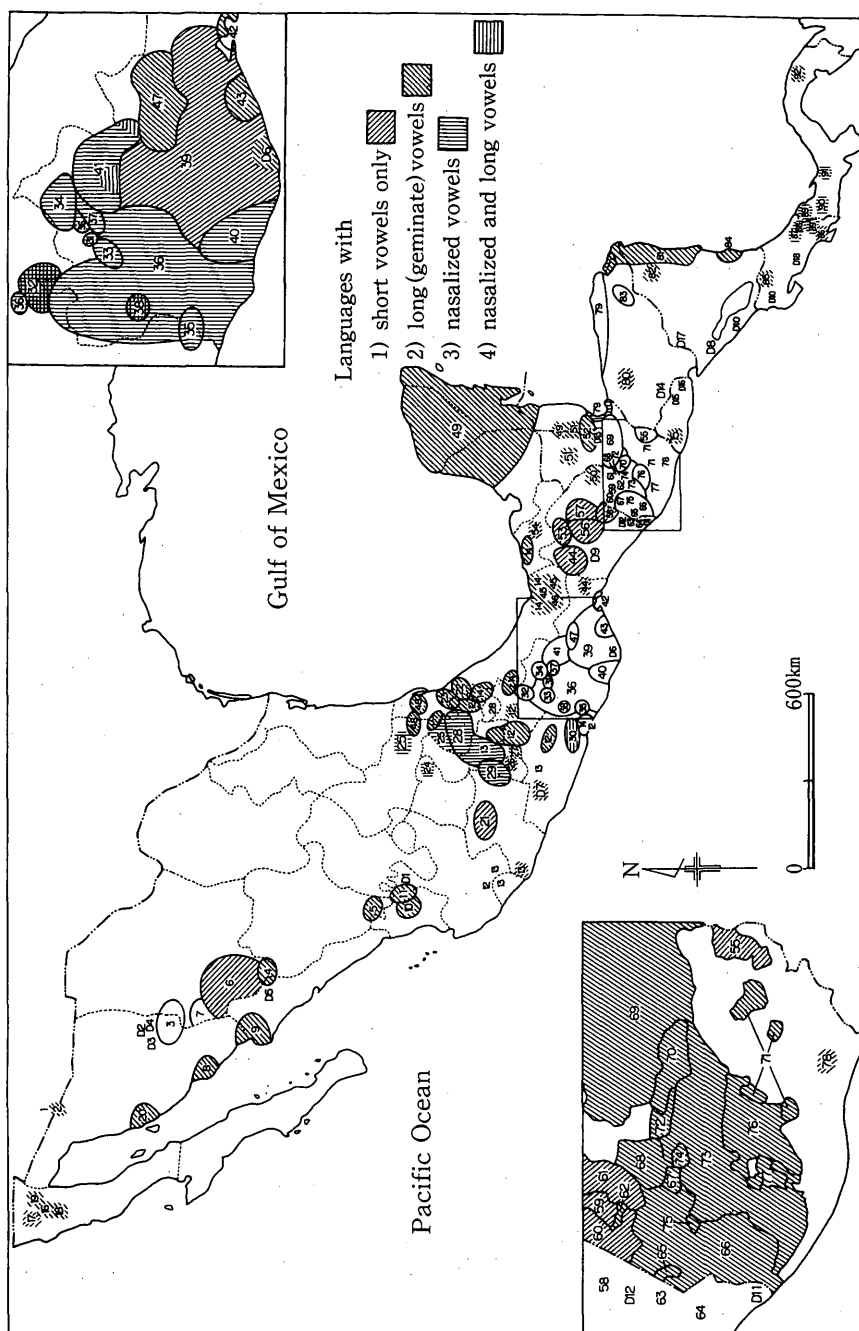
		i	ɪ	e	ɛ	æ	a	ɔ	o	u	ɨ	ɘ	ʌ	ö	ü	ɯ	ë	Number of phonemes
[66]	Mam	i		e			a		o	u								5
	(L)	+	+				+	+	+									5 10
[67]	Aguacatec	i		e			a		o	u								5
	(L)	+	+				+	+	+									5 10
[68]	Ixil ^{1,2,3}	i		e			a		o	u								5
	(L)	+	+				+	+	+									5 10
[69]	Kekchí	i		e			a		o	u								5
	(L)	+	+				+	+	+									5 10
[70]	Pocomchí ^{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]	※Quiché ¹	i		e			a		o	u		ə						6
	Quiché ^{2,3}	i		e			a		o	u								5
	(L)	+	+				+	+	+									5 10
[74]	Sacapultec	i		e			a		o	u								5
	(L)	+	+				+	+	+									5 10
[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		u								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]	Garífuna	i		e			a		o	u								5
	(N)	+	+				+	+	+									5 10
[80]	Tol	i		e			a		o	u	ɨ							6
[81]	※Miskitu ¹	i		e			a		o	u								5
	(L)	+	+				+	+	+									5 10
	Miskitu ²	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



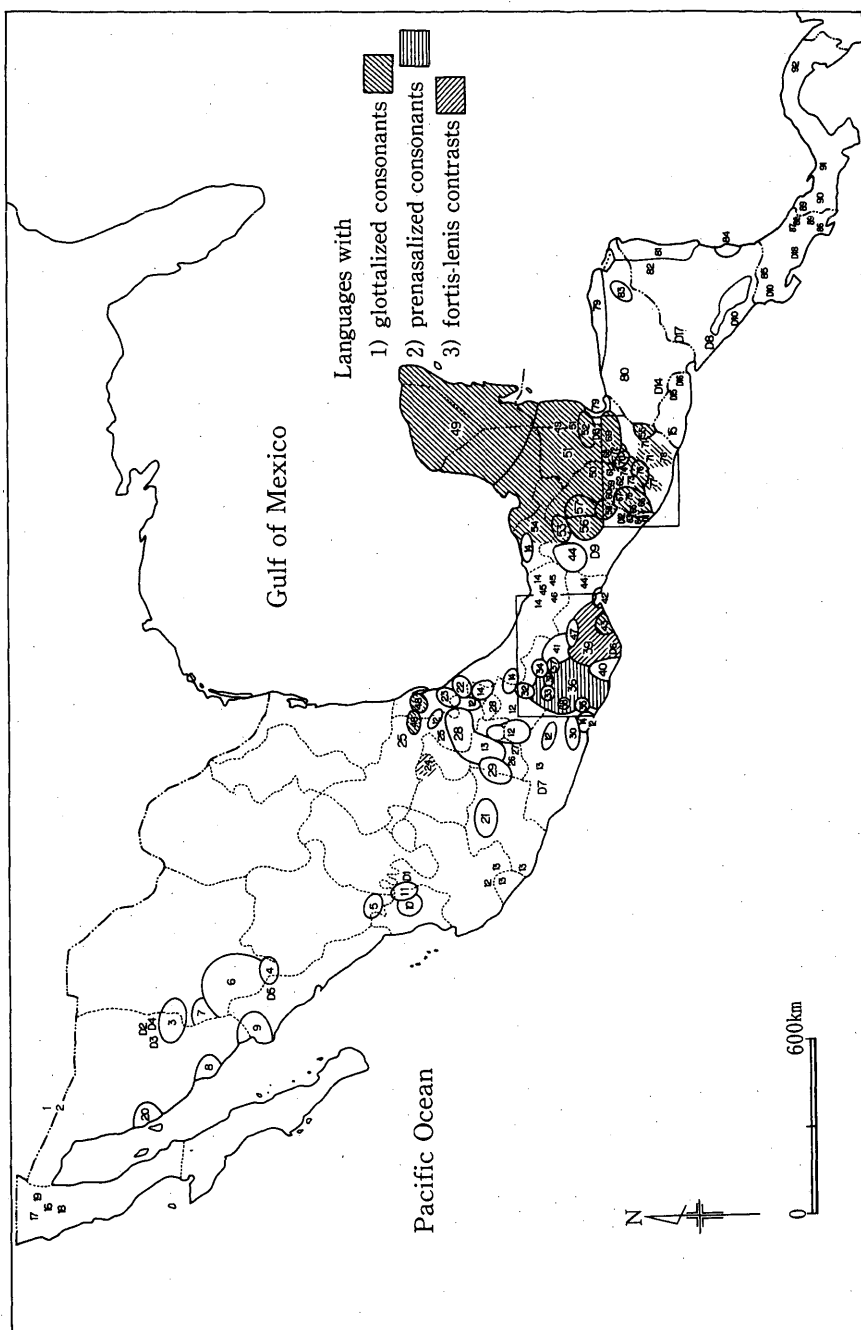
Map 1. Distribution of Native Middle American languages



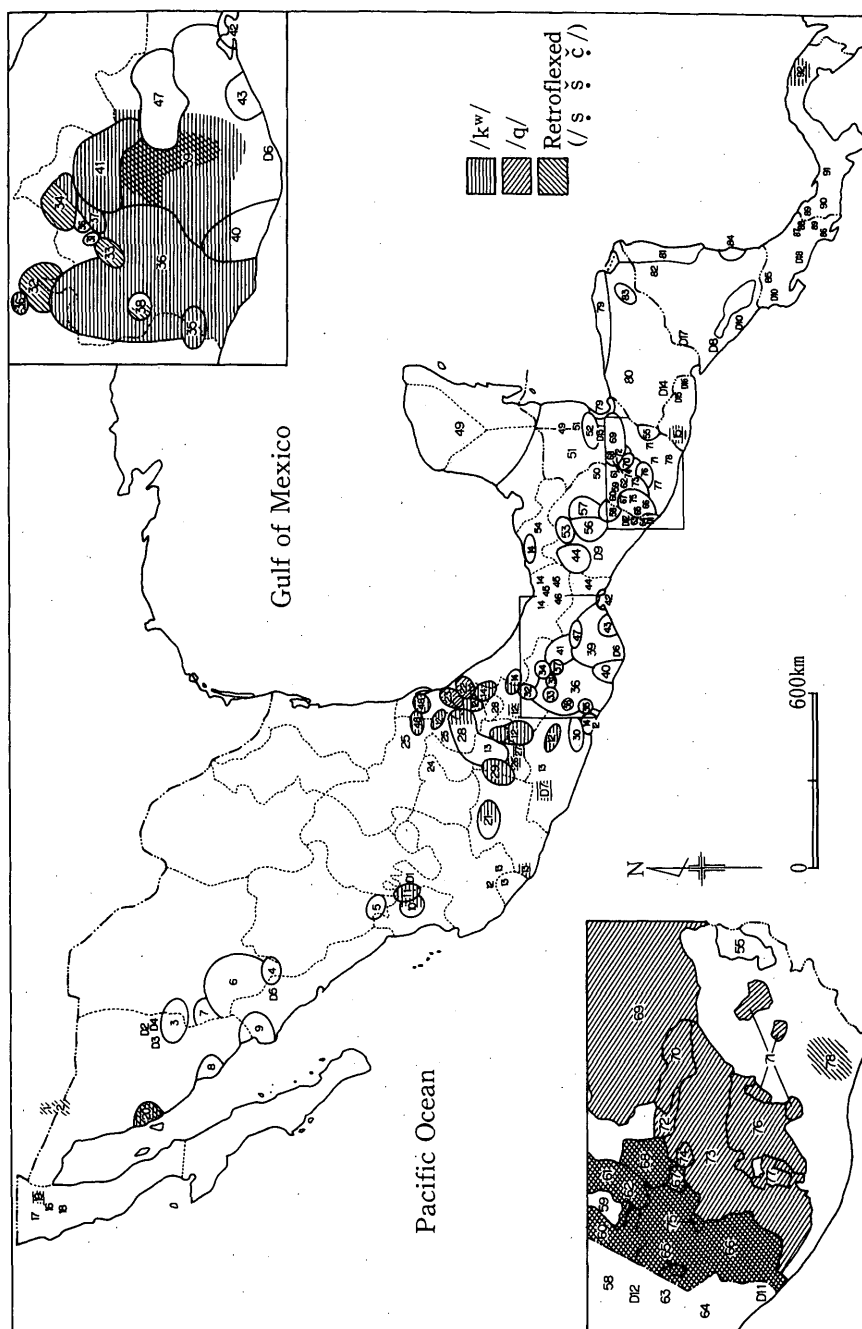
Map 2. Distribution of vowel systems



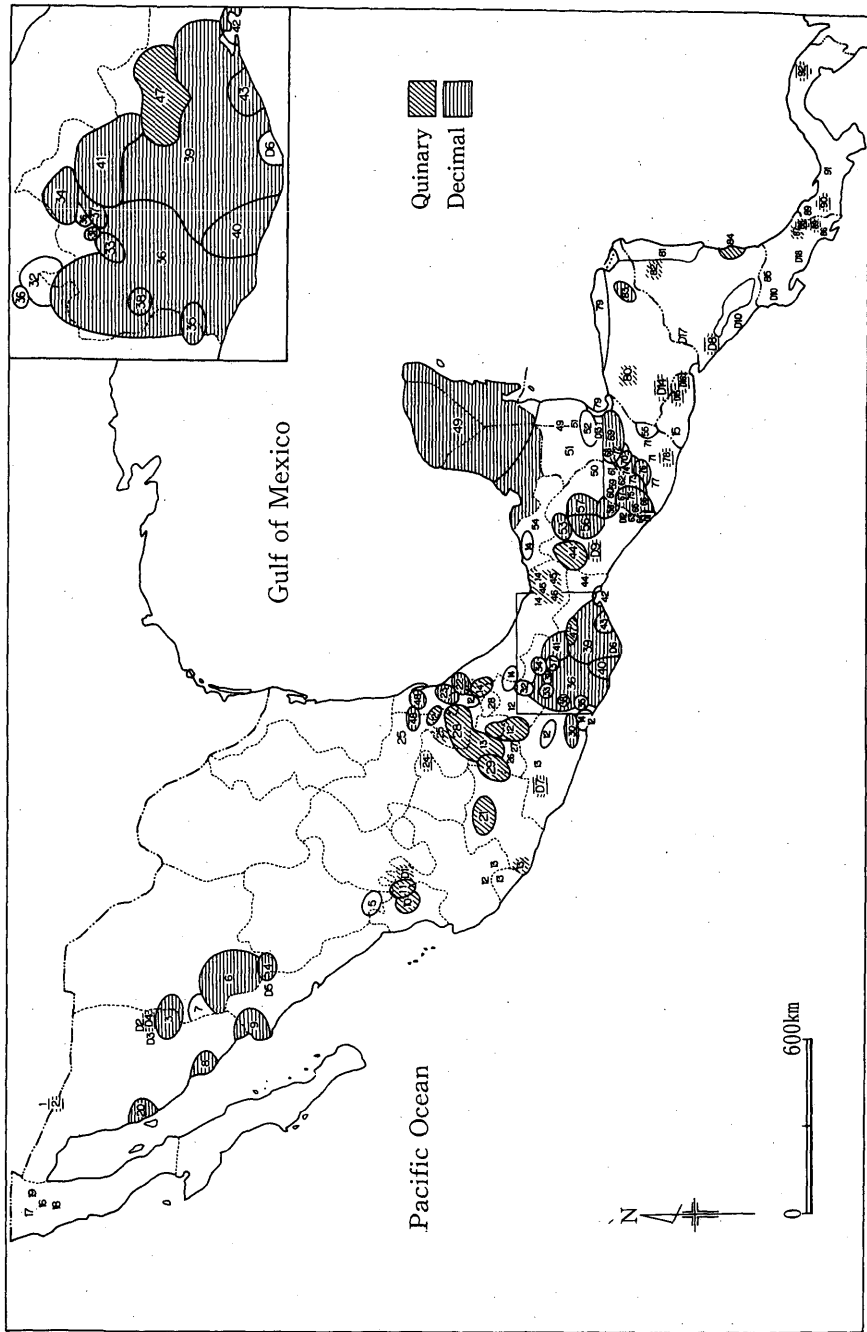
Map 3. Distribution of vowel quality and nasality



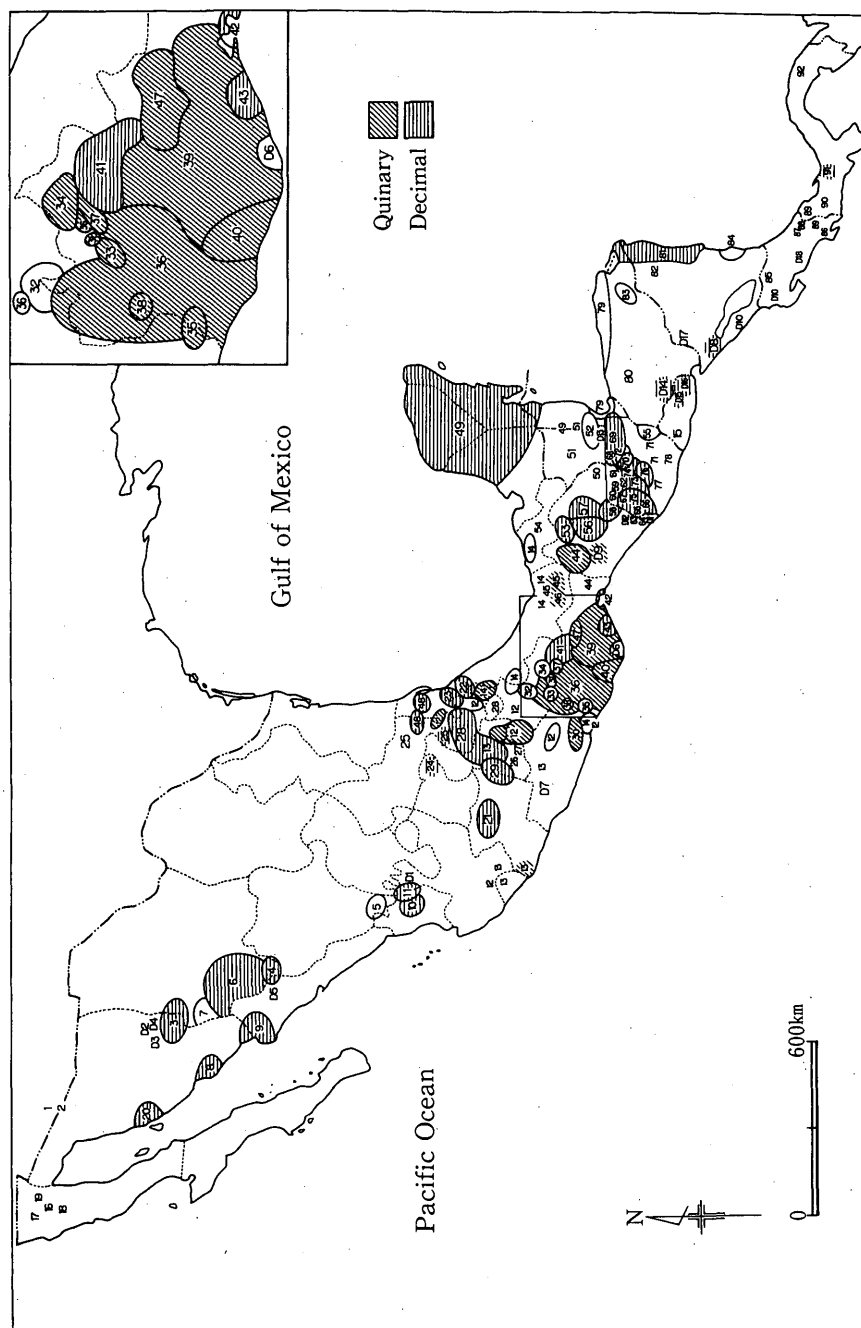
Map 4. Distribution of glottalized, prenasalized, and fortis-lenis consonants



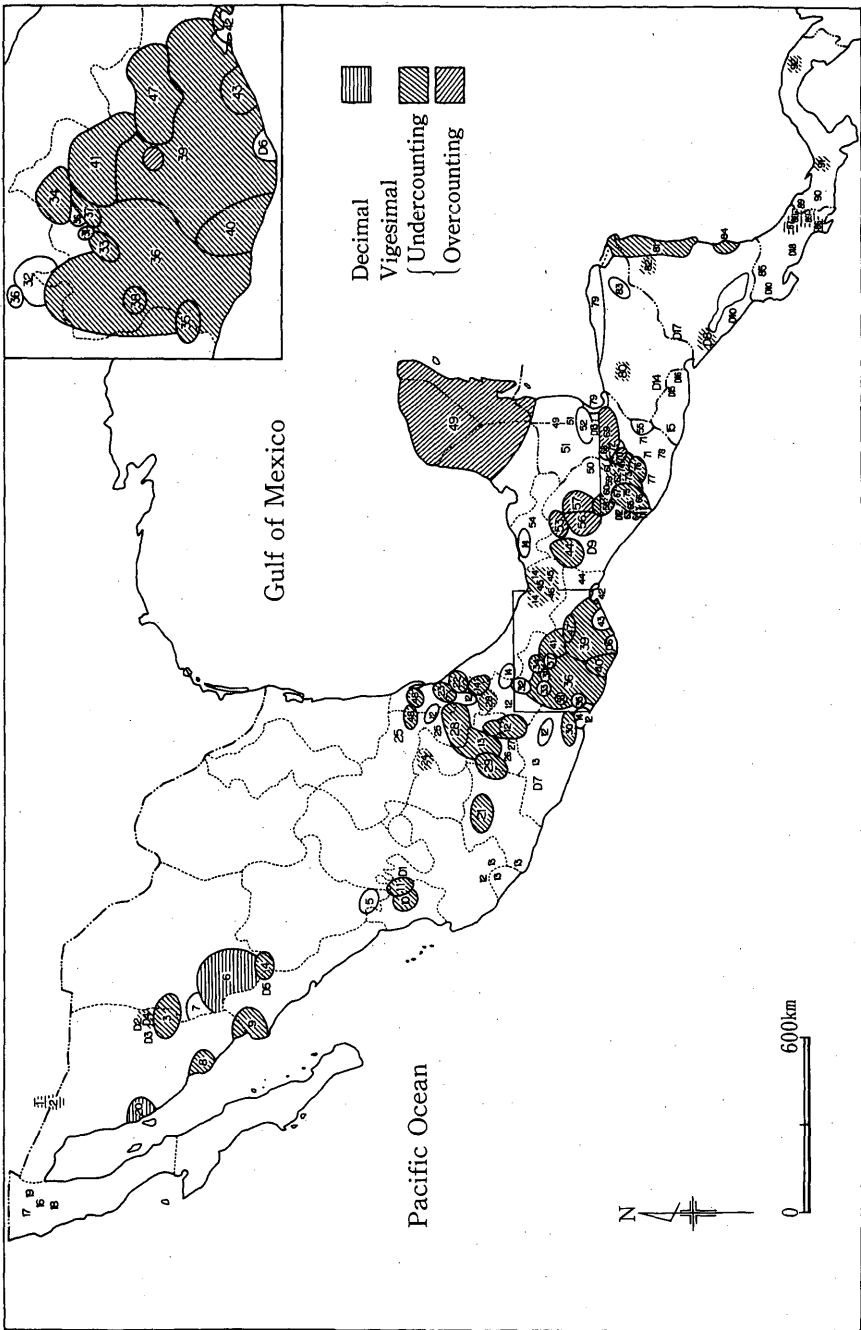
Map 5. Distribution of /kʷ/, /q/ and retroflexed consonants



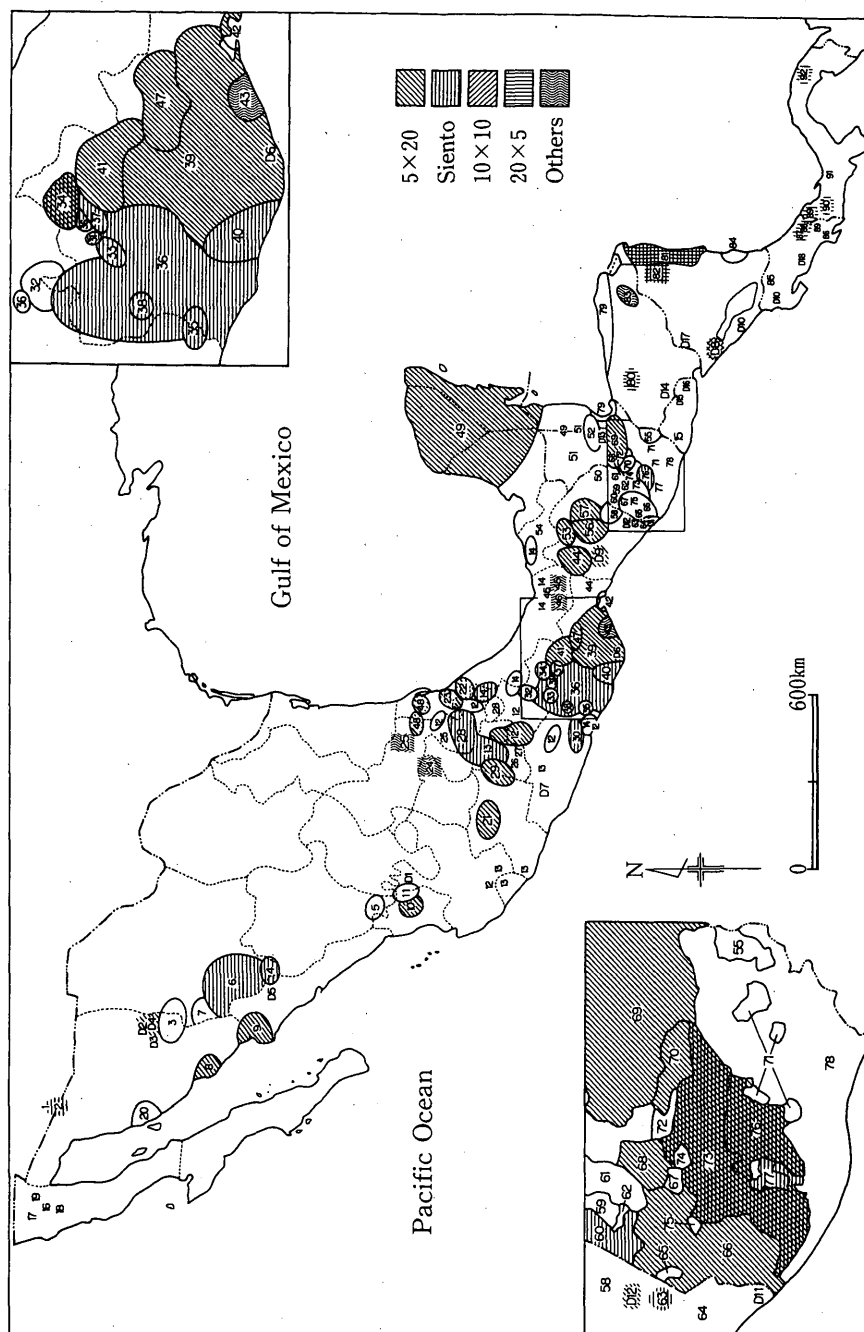
Map 6. Distribution of methods of counting from 1 to 10



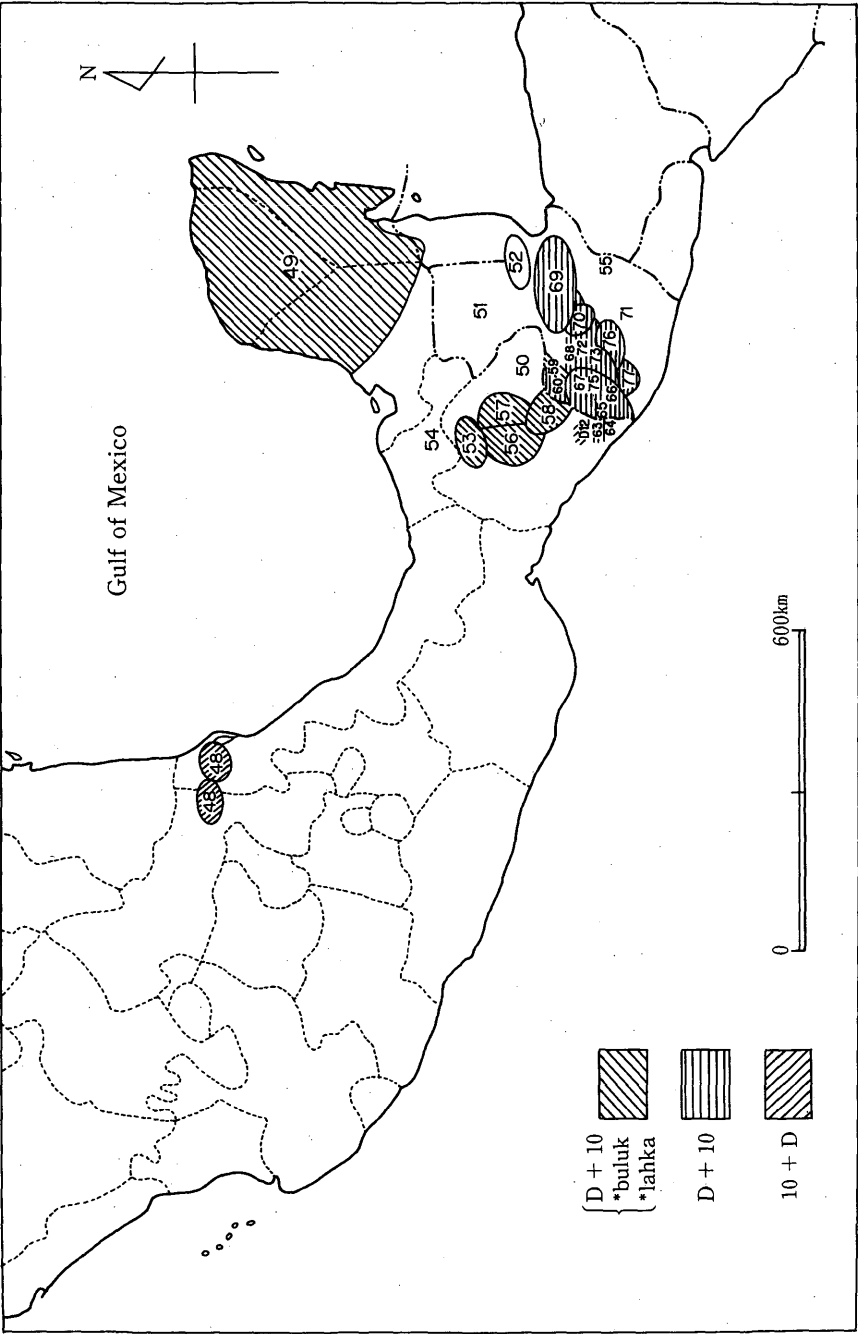
Map 7. Distribution of methods of counting from 10 to 20



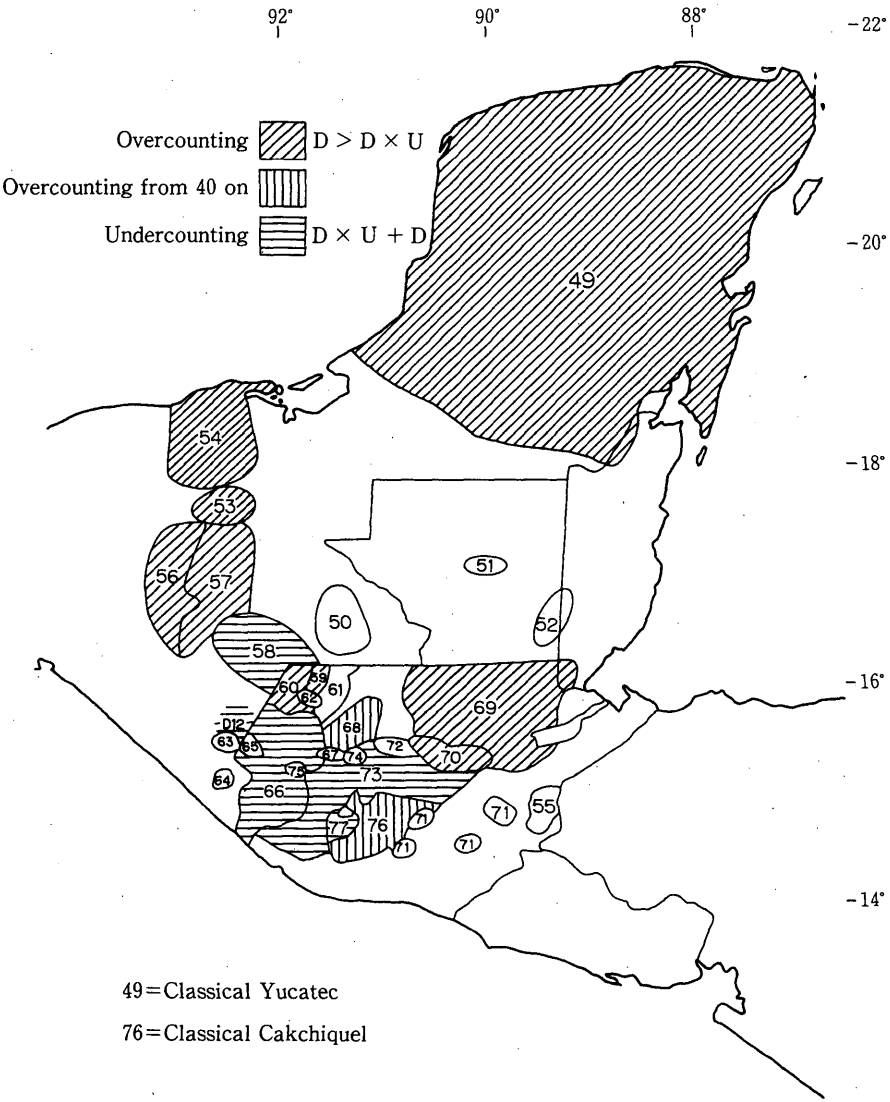
Map 8. Distribution of methods of counting from 20 on



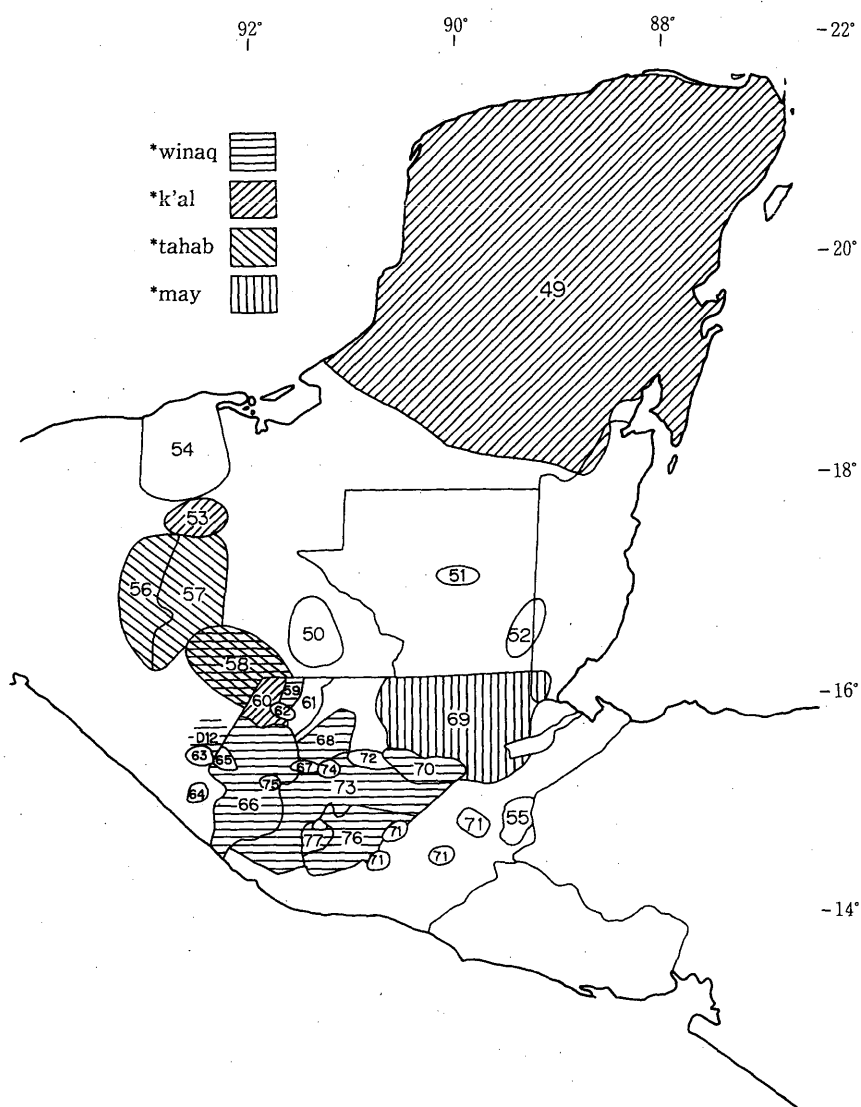
Map 9. Distribution of methods of forming the word for 100



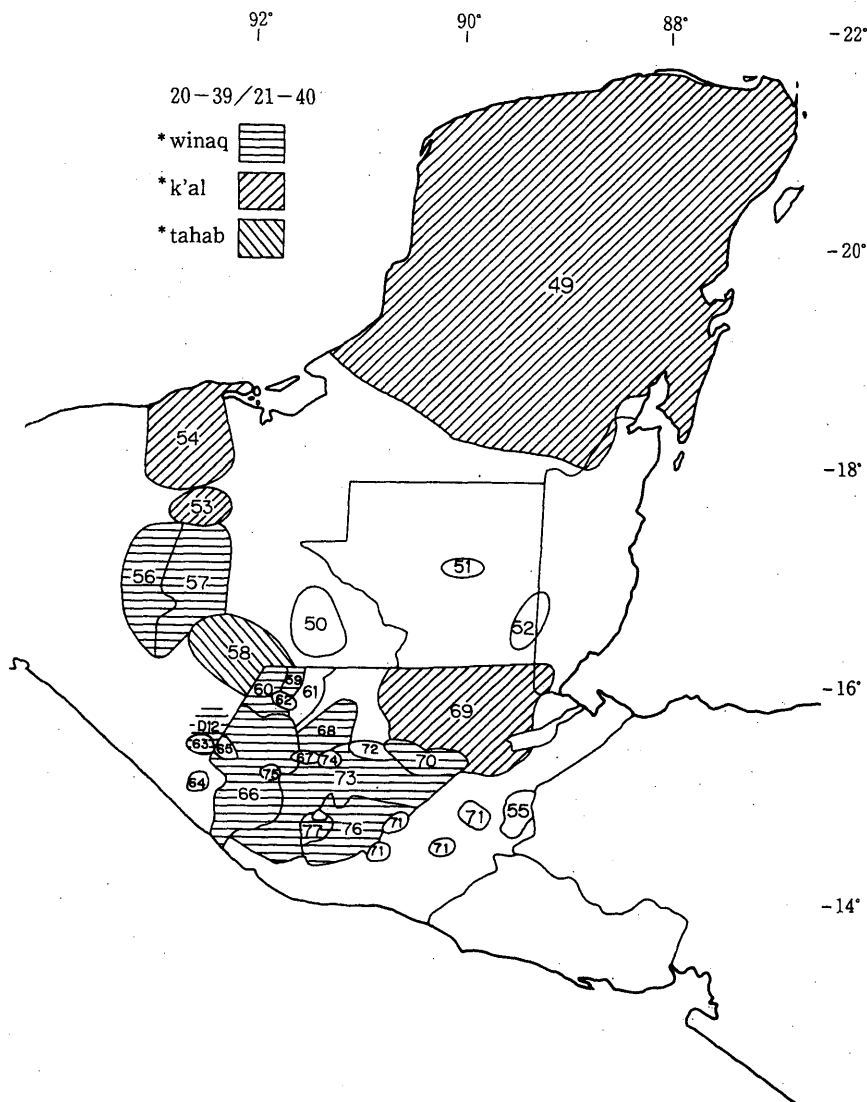
Map 10. Distribution of methods of counting from 10 to 20 in Mayan languages



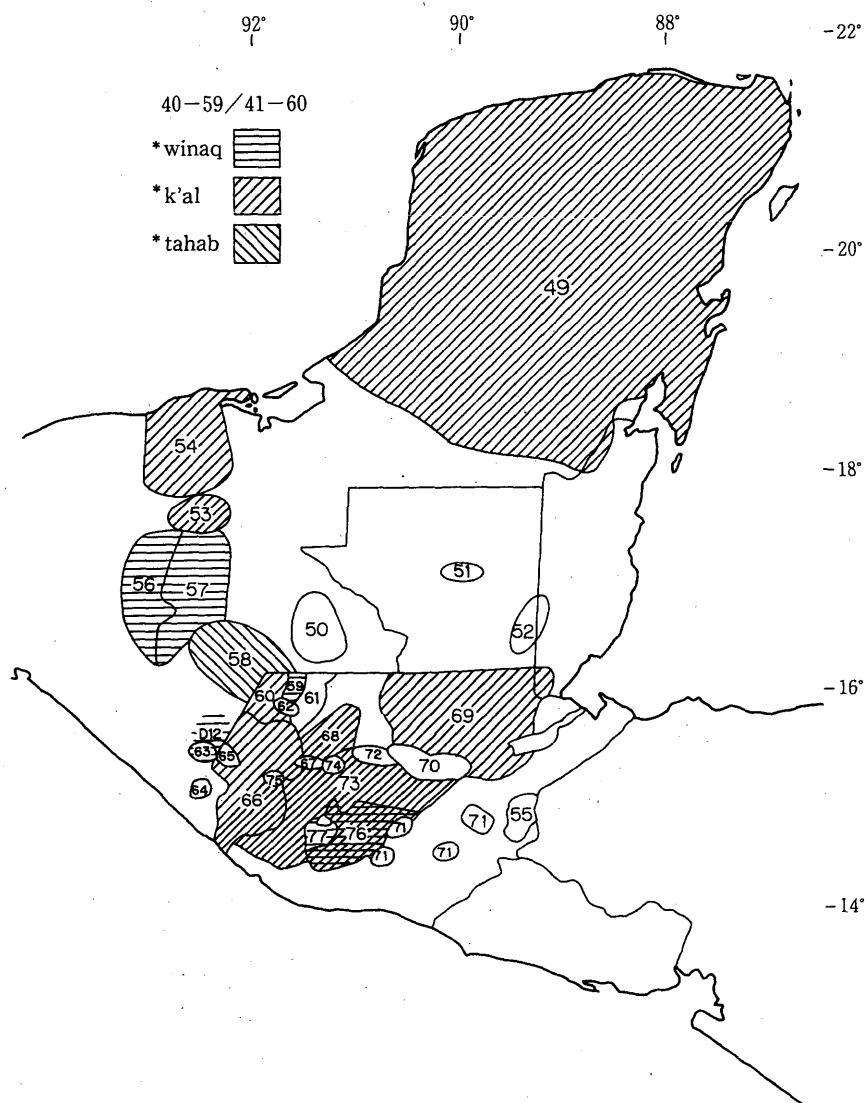
Map 11. Distribution of methods of counting from 20 on in Mayan languages



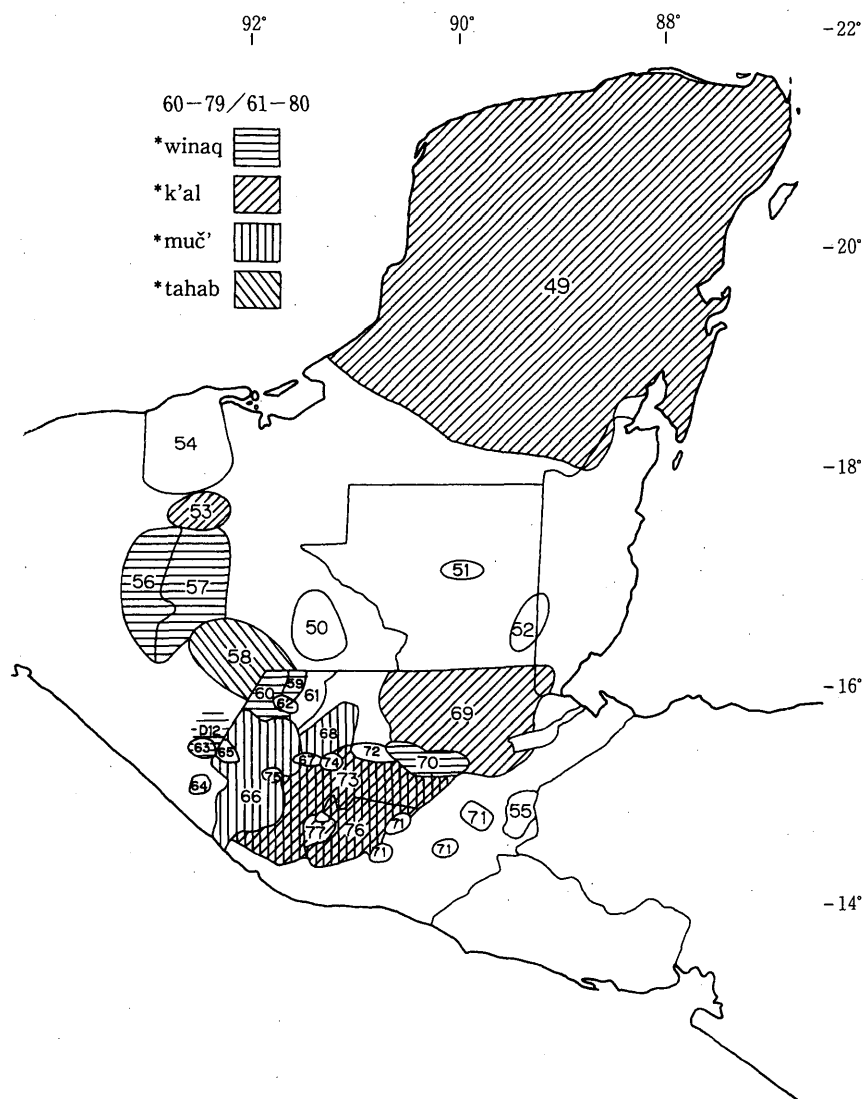
Map 12. Distribution of different words for 20



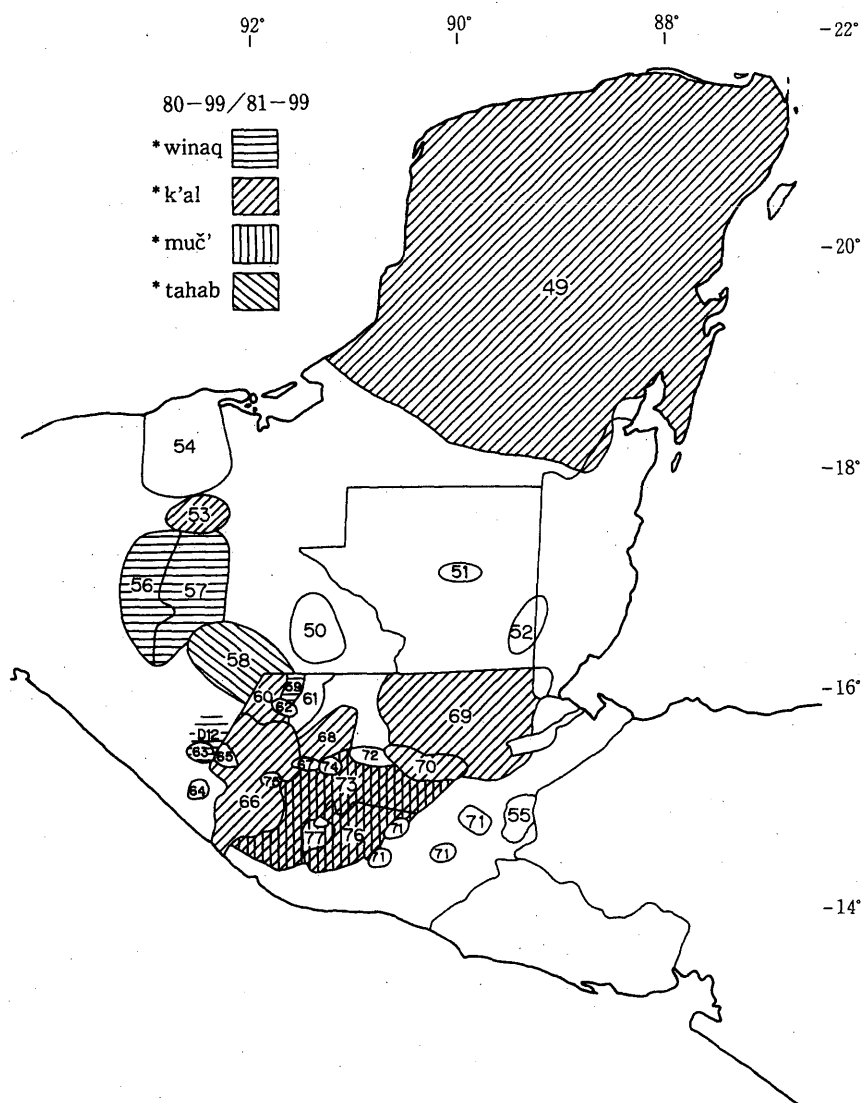
Map 13. Distribution of methods of counting from 20/21 to 39/40



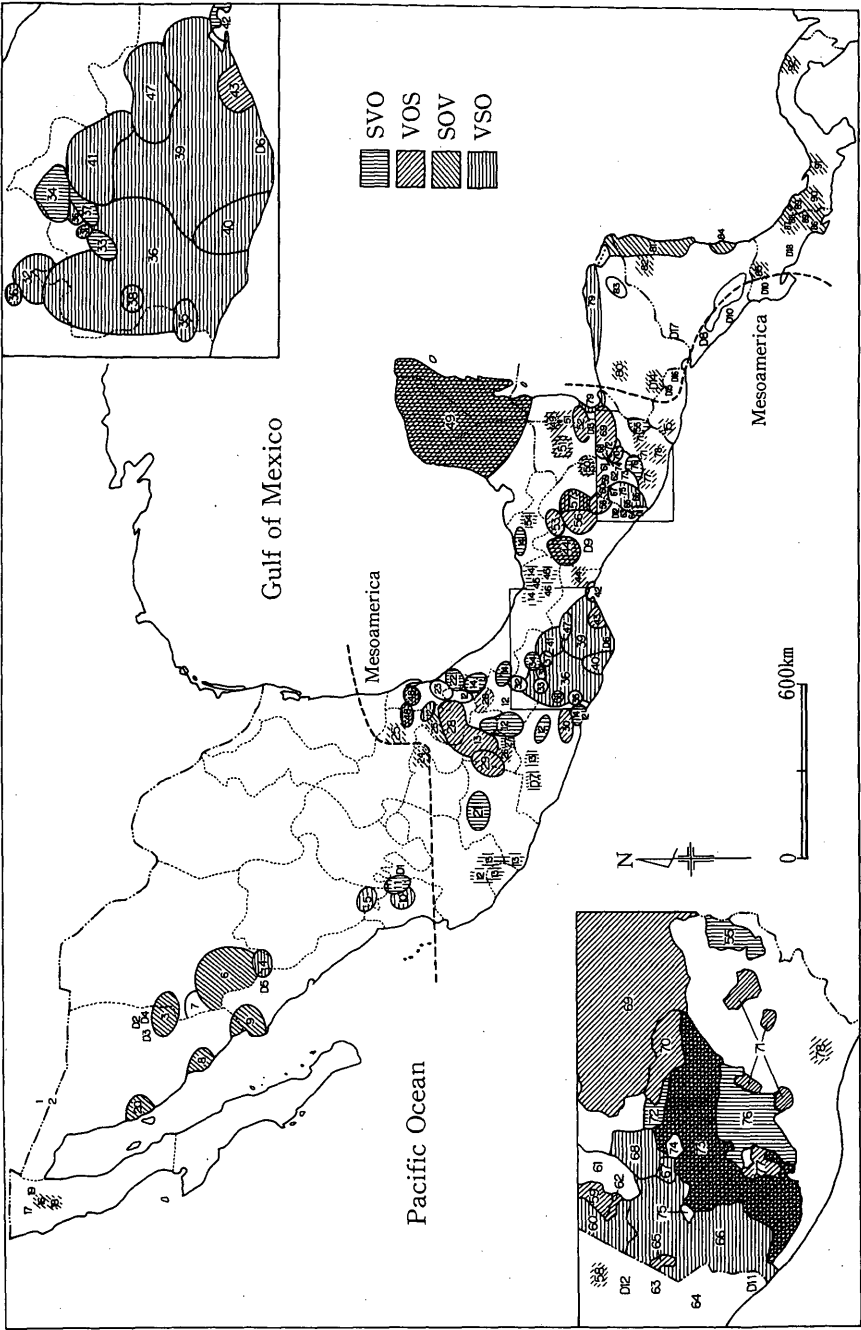
Map 14. Distribution of methods of counting from 40/41 to 59/60



Map 15. Distribution of methods of counting from 60/61 to 79/80



Map 16. Distribution of methods of counting from 80/81 to 99



Map 17. Distribution of SOV, SVO, VOS, and VSO

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