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NATIVE MIDDLE
AMERICAN LANGUAGES

AN AREAL-TYPOLOGICAL PERSPECTIVE

by

Yoshiho YASUGI

National Museum of Ethnology, Osaka
1995
Acknowledgments

I wish to express my deep appreciation and gratitude to Lyle Campbell for his valuable comments and suggestions. This work is an outgrowth of my doctoral dissertation, entitled "An Areal-Typological Study of Middle American Indian Languages" (The Graduate University for Advanced Studies, 1993). Chapters 2, 3 and 6 were written as part of the project titled "A Comprehensive Study of the Function and Typology of Language" headed by Masayoshi Shibatani, with a grant-in-aid from the Ministry of Education, Science and Culture of the Japanese Government. I would like to thank Tasaku Tsunoda, a member of my dissertation committee, for supplying numerous references as well as for his helpful comments and criticisms on earlier versions of this study. I owe a considerable debt to him for pointing out to me that the square proposed in Chapter 6 has a cyclic nature and that this is a new type of relation. I would like to acknowledge the advice and support of the other members of my committee: Etsuko Kuroda, Osahito Miyaoka, Hiroyasu Tomoeda, Osamu Sakiyama, and Yasuhiko Nagano. I am so much indebted to them that it is unlikely that I will be able to repay their kindness fully.

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 : distributior
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
<table>
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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>MASC</td>
<td>masculine</td>
</tr>
<tr>
<td>MOOD</td>
<td>mood</td>
</tr>
<tr>
<td>N</td>
<td>nasalized vowel(s)</td>
</tr>
<tr>
<td>NCL</td>
<td>noun classifier</td>
</tr>
<tr>
<td>NUCL</td>
<td>numeral classifier</td>
</tr>
<tr>
<td>NONREFL</td>
<td>non-reflexive</td>
</tr>
<tr>
<td>OBJ</td>
<td>object</td>
</tr>
<tr>
<td>PASS</td>
<td>passive</td>
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<td>perfective</td>
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<td>possessive</td>
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<td>proximate (past, future)</td>
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<td>REALIZED</td>
<td>realized</td>
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<tr>
<td>REC</td>
<td>recent past</td>
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<tr>
<td>REF</td>
<td>reflexive</td>
</tr>
<tr>
<td>SG</td>
<td>singular</td>
</tr>
<tr>
<td>SUBJ</td>
<td>subject</td>
</tr>
<tr>
<td>TP</td>
<td>topicalization</td>
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<tr>
<td>V</td>
<td>vowel(s)</td>
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<tr>
<td>/ /</td>
<td>phonemic transcription</td>
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<tr>
<td>[ ]</td>
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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-Aztecan 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 (Garifuna) 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 Nahuan group of Uto-Aztecan has intruded deeply into Mesoamerica and some Nahuan 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 Nahuan 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 [Anonymus 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

<table>
<thead>
<tr>
<th>Family, Branch, Language, Dialect</th>
<th>Location</th>
<th>Number of speakers</th>
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<tbody>
<tr>
<td><strong>1. Uto-Aztecanc</strong></td>
<td></td>
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</tr>
<tr>
<td>Northern Uto-Aztecan (Shoshonean, Yutan, Oregonian)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Numic (Plateau Shoshonean)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Western Numic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mono (=Monachi), Paviotso (Northern Paiute, Bannock)</td>
<td>California, Nevada, Oregon, South Idaho</td>
<td>100~500</td>
</tr>
<tr>
<td>2. Central Numic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoshone-Goshiute</td>
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<tr>
<td>Comanche</td>
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</tr>
<tr>
<td>Panamint (Koso), Tümpisa</td>
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</tr>
<tr>
<td>3. Southern Numic</td>
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<td></td>
</tr>
<tr>
<td>Ute (Chemehuevi, Southern Paiute)</td>
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</tr>
<tr>
<td>Kawaiisu</td>
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<tr>
<td>B. Tubatulabal</td>
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<td></td>
</tr>
<tr>
<td>C. Takic (California Shoshonean)</td>
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<td>1. Serranan</td>
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<td>Serrano</td>
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<td>*Kitanemuk, *Vanyume, *Alliklik</td>
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<td>2. Cupan</td>
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<td>a. Luiseño (*Juaneño)</td>
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<tr>
<td>b. *Gabrieleño</td>
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<tr>
<td>*Gabrieleño, *Fernandeño</td>
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<td>*Nicoleño</td>
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<td>c. Cahuilla</td>
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<td>Cupeño</td>
<td></td>
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</tr>
<tr>
<td>D. Hopi</td>
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<tr>
<td>Southern Uto-Aztecan (Sonoran)</td>
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<td>A. Tepiman (Pimic)</td>
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<td>1. Piman</td>
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</tr>
<tr>
<td>Pima Alto</td>
<td>[1]</td>
<td>10,000</td>
</tr>
<tr>
<td>Papago</td>
<td>[2]</td>
<td>15,000</td>
</tr>
<tr>
<td>Pima Bajo (Nevome, Ure, Yecora)</td>
<td>[3]</td>
<td>2,000?</td>
</tr>
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<td>Southern Tepehuan</td>
<td>[5]</td>
<td></td>
</tr>
<tr>
<td>*Tepecano</td>
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<td>B. Taracaitan (Taracahitic)</td>
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<td>1. Tarahumaran</td>
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<td>Tarahumara (Rarámuri)</td>
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<td>Guarjio (Varohio)</td>
<td>[7]</td>
<td>3,000?</td>
</tr>
<tr>
<td>2. Opatan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Opata (Teguima)</td>
<td>D2</td>
<td>#12</td>
</tr>
<tr>
<td>*Jova</td>
<td>D3</td>
<td>0</td>
</tr>
<tr>
<td>*Eudeve (Heve, Dohema)</td>
<td>D4</td>
<td>0</td>
</tr>
<tr>
<td>3. Cahitan</td>
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<tr>
<td>Yaqui (Cahita)</td>
<td>[8]</td>
<td>10,990</td>
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<td>Mayo (Cahita)</td>
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<td>37,410</td>
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<td>4. *Tubar</td>
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<tr>
<td>C. Corachol</td>
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<td>Cora</td>
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<th>Number of speakers</th>
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<td><strong>Huichol</strong></td>
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<td>19,360</td>
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<td><strong>Aztec</strong></td>
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<td>D. <strong>Nahuan</strong></td>
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<td>1. Aztec (General Aztec)</td>
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<tr>
<td>Central, Huasteca: Nahuatl</td>
<td>[12]</td>
<td>1,197,330</td>
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<td>Western Peripheral: Nahual</td>
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</tr>
<tr>
<td>Eastern Peripheral: Nahuat</td>
<td>[14]</td>
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</tr>
<tr>
<td>Pipil</td>
<td>[15]</td>
<td>2,000?~200</td>
</tr>
<tr>
<td>2. *Pochutec</td>
<td>D6</td>
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<td>*<em>II. <em>Cuitlatec</em></em></td>
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<td><strong>III. Yuman (includes only Yuman languages of Mexico)</strong></td>
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<td>Paipai</td>
<td>[16]</td>
<td>220</td>
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<td>Cochimi (Kumyai, Kimiai)</td>
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<td>160</td>
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<td>Kiliwa</td>
<td>[18]</td>
<td>40</td>
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<tr>
<td>Cocopa (Cucapa)</td>
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<tr>
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<td><strong>VII. Otomanguean</strong></td>
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<td>B. <strong>Otopamean</strong></td>
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<td>Central Pame</td>
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<td>South Pame</td>
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<td>Southwestern Otomi</td>
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<tr>
<td>Ixtenco Otomi</td>
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<td>b. Mazahua</td>
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<td>El Salvador</td>
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<td><strong>D. Popolocan</strong></td>
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# Table 1—continued.

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<td>G. Zapotecan</td>
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<td>H. Chinantecan</td>
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<tr>
<td>(*Chorotega)</td>
<td>Nicaragua</td>
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<td>(*Nicoya)</td>
<td>Honduras</td>
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<td>VIII. Huave</td>
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<td>Oluta Popoluca</td>
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<td>d. Mopán</td>
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<td>C. Southern Lowland Maya</td>
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<td>b. Tzeltal</td>
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<td>Location</td>
<td>Number of speakers</td>
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<td><strong>D. Western Highland Maya</strong></td>
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<td>Mam [Mam]</td>
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<td>[68]</td>
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<td><strong>E. Eastern Highland Maya</strong></td>
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<td>[74]</td>
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<td>[77]</td>
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<td><strong>XII. Xinca</strong></td>
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<td><strong>XIII. Arawakan (includes only a Central American language.)</strong></td>
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<td><strong>XVI. Misumalpan (Misuluan)</strong></td>
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<td>B. Sumu (Ulwa=Southern Sumu)</td>
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<td>Bawihka, Tawahka, Kukra, Panamaka</td>
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<td>*Matagalpa</td>
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<td>B. Rama</td>
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<td>C. Guatuso (Malecu)</td>
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<td>F. Viceita</td>
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<td>Cabecar (Chiripó, Estrella)</td>
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<td>G. Teribe/Térraba</td>
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<td>H. Guaymi</td>
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<tr>
<td>I. Bocotá</td>
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<tr>
<td>J. Cuna</td>
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</table>
sionally calculated the numbers of speakers of those languages in the following way.

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<th>Other States</th>
<th>Total</th>
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<td>20,033</td>
<td>857</td>
<td>23,779</td>
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<tr>
<td>Chontal de Oaxaca</td>
<td>1,781</td>
<td>8</td>
<td>443</td>
<td>2,232</td>
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<tr>
<td>Chontal de Tabasco</td>
<td>1</td>
<td>10,110</td>
<td>145</td>
<td>10,256</td>
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</tbody>
</table>

(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.

<table>
<thead>
<tr>
<th></th>
<th>Puebla</th>
<th>Oaxaca</th>
<th>Veracruz</th>
<th>Other States</th>
<th>Total</th>
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<tbody>
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<td>313</td>
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<tr>
<td>Popoluca de Oluta</td>
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<td>2</td>
<td>3</td>
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<tr>
<td>Popoluca de Texistepec</td>
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<td>0</td>
<td>170</td>
<td>2</td>
<td>172</td>
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</tbody>
</table>

(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], Narbey [1979] and others associated with the Stanford Phonology Archive (SPA) and UCLA Phonological Segment Inventory Database
Native Middle American Languages

(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:

\[
\begin{array}{cccccccc}
\text{p} & \text{t} & \text{k} & \text{k}^w & \text{m} & \text{n} & \text{l} & \text{r} & \text{s} & \text{w} & \text{y} \\
\text{pp} & \text{tt} & \text{kk} & \text{kk}^w & \text{mm} & \text{nn} & \text{ll} & \text{rr} & \text{c} & \text{yy} \\
\end{array}
\] [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, /s/ is replaced by /\$/ when the /\$/ 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 /\text{i/} 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 Otomi and Chatino data in Maddieson (1984: 376, 378) can be compared with my data. Maddieson tried to regularize phonological systems. In Otomi, 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 Nahuan, 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 (/γ/). 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 (vocoid approximants). The first two of these are obstruents, the rest, sonorants. I use "liquids" here as a cover term for so-called ɾ and l 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 Nahuan, 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 Nahuan in Database 1. If I cite all the Nahuan 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):

<table>
<thead>
<tr>
<th>Number of phonemes</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of dialects</td>
<td>1</td>
<td>12</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Number of phonemes</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of dialects</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

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 Nahuan, 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 system

<table>
<thead>
<tr>
<th>Number of phonemes</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of languages</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>8</td>
<td>17</td>
<td>11</td>
<td>18</td>
<td>12</td>
<td>10</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>18</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Number of phonemes</td>
<td>26</td>
<td>27</td>
<td>28</td>
<td>29</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of languages</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Number of stop series</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of languages</td>
<td>37</td>
<td>121</td>
<td>16</td>
</tr>
<tr>
<td>Percent of languages</td>
<td>21%</td>
<td>70%</td>
<td>9%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Number of languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voiceless only</td>
</tr>
<tr>
<td>Voiceless vs. voiced</td>
</tr>
<tr>
<td>Voiceless vs. prenasal</td>
</tr>
<tr>
<td>Voiceless vs. aspirated</td>
</tr>
<tr>
<td>Voiceless vs. glottalized</td>
</tr>
<tr>
<td>Fortis vs. lenis</td>
</tr>
<tr>
<td>Voiceless vs. voiced vs. glottalized</td>
</tr>
<tr>
<td>Voiceless vs. voiced vs. aspirated</td>
</tr>
<tr>
<td>Voiceless vs. aspirated vs. glottalized</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

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 \(CV? > CV > C?V > C'V\). 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

<table>
<thead>
<tr>
<th>Manner Contrast</th>
<th>Number of Languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voiceless only</td>
<td>98</td>
</tr>
<tr>
<td>Voiceless vs. voiced</td>
<td>52 (of which 36 are Otomanguean)</td>
</tr>
<tr>
<td>Fortis vs. lenis</td>
<td>20</td>
</tr>
<tr>
<td>Voiceless vs. glottalized</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>173</strong></td>
</tr>
</tbody>
</table>

Note that although Yatee Zapotec has a non-contrastive /γ/, 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

Voice vs. Voiceless:
Tequistlatec Chontal, Mixtec(Atatlaluca)

Fortis vs. Lenis:
Chichimec1, Trique(Chicahuaxtl), Zapotec(Juárez, Ixtlán, Zoogocho, Yatzachi, Cajonos, Yalalag, Yatee, Albarradas, Mitla2, Guelavia1, Chichicapan, Guevea, Isthmus1)

Voiced vs. Glottalized:
Huamelultec Chontal

2.2.1.2.3.2. Liquids (l-sound)

Voice vs. Voiceless:
Cuitlatec1, Paipá2, Cocopa2, Seri1, Totonac (Xicotepec, Papantla), Tepehua (Huehuetla), Te-
Fortis vs. Lenis:
Trique (Chicahuaxtla), 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 (Huautla), Nahual (Pómaro), Serí¹, Tequistlatec¹²

Fortis vs. Lenis:
Trique (Chicahuaxtla), 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>
<thead>
<tr>
<th>Voiceless stops</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of places of articulation (Number of languages having no /ʔ/)</td>
<td></td>
</tr>
<tr>
<td>Number of places of articulation</td>
<td>3</td>
</tr>
<tr>
<td>Number of languages including /ʔ/</td>
<td>12</td>
</tr>
<tr>
<td>(Number of languages including /ʔ/)</td>
<td>15</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Voiced stops</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of places of articulation (Number of languages)</td>
<td></td>
</tr>
<tr>
<td>Number of places of articulation</td>
<td>0</td>
</tr>
<tr>
<td>Number of languages</td>
<td>68</td>
</tr>
</tbody>
</table>
Table 8. Prenasalized stops: number of places of articulation and number of languages

<table>
<thead>
<tr>
<th>Prenasalized stops</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of places of articulation</td>
<td>1  2  3  4  5  6</td>
</tr>
<tr>
<td>Number of languages</td>
<td>1  3  3  7  3  2  19</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Lenis stops</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of places of articulation</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>Number of languages</td>
<td>2  5  9  3  19</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Voiceless fricatives</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of places of articulation</td>
<td>1  2  3  4  5  6</td>
</tr>
<tr>
<td>Number of languages</td>
<td>2  37  87  36  7  5  174</td>
</tr>
<tr>
<td>Voiced fricatives</td>
<td>Total</td>
</tr>
<tr>
<td>Number of places of articulation</td>
<td>0  1  2  3  4  5  6</td>
</tr>
<tr>
<td>Number of languages</td>
<td>101 31 25 14 1 1 1 174</td>
</tr>
<tr>
<td>(Lenis fricatives)</td>
<td>Total</td>
</tr>
<tr>
<td>Number of places of articulation</td>
<td>1  13  6</td>
</tr>
<tr>
<td>Number of languages</td>
<td>20</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Nasals</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of places of articulation</td>
<td>0  1  2  3  4</td>
</tr>
<tr>
<td>Number of languages</td>
<td>2  3  95  64  10  174</td>
</tr>
</tbody>
</table>
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 Bribri 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 /ⁿbⁿdⁿg/ with /m n ñ/, following Rensch [WESTLEY 1991, RENSCH 1989] (See Section 2.4).

2.2.2. Stop Systems

I treat affricates (except lateral affricate /λ/) 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

<table>
<thead>
<tr>
<th>Number of phonemes</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of variations</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td>42</td>
</tr>
<tr>
<td>Number of languages</td>
<td>7</td>
<td>7</td>
<td>35</td>
<td>54</td>
<td>54</td>
<td>11</td>
<td>5</td>
<td>1</td>
<td>174</td>
</tr>
<tr>
<td>(Number of languages with /ʔ/)</td>
<td>0</td>
<td>5</td>
<td>29</td>
<td>45</td>
<td>54</td>
<td>11</td>
<td>5</td>
<td>1</td>
<td>150</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Phoneme variation</th>
<th>Languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 p t k</td>
<td>Miskitu, Sumu, Rama, Térraba, Teribe</td>
</tr>
<tr>
<td>3 t č k</td>
<td>Guaymí, Bocotá</td>
</tr>
<tr>
<td>4 p t č k</td>
<td>Garifuna, Guatuso</td>
</tr>
<tr>
<td>4 p t k ?</td>
<td>Southern Tepehuani, Otomí (Tenango), Chinantec (Lealao), Chato (Yaipec)</td>
</tr>
<tr>
<td>5 p t tʰ k ?</td>
<td>Nahuat (Pajapan, Jalupa), Pochute, Tarasco¹, Huave</td>
</tr>
<tr>
<td>5 p t c č k</td>
<td>Otomi (Sierra), Chinantec (Pantalpa, Tepetotulpa, Sochiapan, Tlahootintepec), Tequistlatec, Zoque (León, Chimalapa), Mixe (Coatlán, Paraíso, Tlahuitoltepec), Tol</td>
</tr>
<tr>
<td>5 p t č k k*</td>
<td>Cuna</td>
</tr>
<tr>
<td></td>
<td>Native Middle American Languages</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>5 pot c k ?</td>
<td>Papago, Tarahumara², Yaqui¹, Mayo, Zapotec (Zoogocho, Yatec, Isthmus³), Chinantec (Comaltepec)</td>
</tr>
<tr>
<td>5 pot k k* ?</td>
<td>Sérí¹</td>
</tr>
<tr>
<td>5 t c c k ?</td>
<td>Boruca</td>
</tr>
<tr>
<td>5 t c k k* ?</td>
<td>Mixteco (Huajuapan, Alacatlazala, Chalcatongo, Diúxi², Peñoles)</td>
</tr>
<tr>
<td>6 pot t' k k* ?</td>
<td>Mixteco (Chayuco)</td>
</tr>
<tr>
<td>6 pot t' c k ?</td>
<td>Northern Tepehuan</td>
</tr>
<tr>
<td>6 pot c c k k*</td>
<td>Chichimeco¹, South Pame, Mezquital Otomí¹, Tiapaneco¹, Trique (Chicahuaxtla), Tequistlateco², Zapotec (Cajonos, Rincón, Choapan, Guelavia¹, Guevea), Sayula Popoluca, Oluta Popoluca, Mixte (Totlepec³), Mayan (Yucateco², Lacandón, Itzá³, Mopán, Chontal, Chortí, Tzotzil³, Tzeltal, Tolulabal, Chuj)</td>
</tr>
<tr>
<td>6 pot c k ?</td>
<td>Nahuatl (Tetelcingo, Amilcingo, Zongolica, Matlapa, Coscatlán), Nahuat (Zacapoaxtla, Mecayapan), Pipil, Tarasco²</td>
</tr>
<tr>
<td>6 pot c c k ?</td>
<td>Huichol¹</td>
</tr>
<tr>
<td>6 pot c k k* ?</td>
<td>Cuitlateco¹, Mixteco (Acatlán, Molinos, Ocotepec², Silacayoapan, Atatlahuca, El Grande), Cuicateco², Zapotec (Yatzachi, Yalalag, Albarradas, Tlacochahuaya, Ayoquesco)</td>
</tr>
<tr>
<td>6 pot c k q ?</td>
<td>Paipai²</td>
</tr>
<tr>
<td>6 pot t' k q ?</td>
<td>Ixcatec, Mazateco (Chiquihuitlán)</td>
</tr>
<tr>
<td>6 pot c c k ?</td>
<td>Western Popoloca¹</td>
</tr>
<tr>
<td>6 pot c k k* ?</td>
<td>Jalapa Mazateco</td>
</tr>
<tr>
<td>7 pot t' c k k* ?</td>
<td>Amuzgo (San Pedro²), Huameluitco Chontal, Sierra Popoluca, Zoque (Copainalá), Chol¹</td>
</tr>
<tr>
<td>7 pot t' c k k* ?</td>
<td>Mixteco (Jamiltepec, Jicaltepec, Colorado), Zapotec (Chichicapa)</td>
</tr>
<tr>
<td>7 pot t' k k k* ?</td>
<td>Mixteco (Ayutla³)</td>
</tr>
<tr>
<td>7 pot t c k k*</td>
<td>Kiliwa³</td>
</tr>
<tr>
<td>7 pot t c t k k ?</td>
<td>Cabécar, Bribrí³</td>
</tr>
<tr>
<td>7 pot t c c k k*</td>
<td>Nahuatl (Clásico, San Jerónimo, Tlaxpanaloya, Acaxochitan, Huautla), Pómaro Nahual, Matlatzincá, Oucuitco, Otomi (Temoayán), Mazahua, Mixteco (Mixtepec, Coatzospán), Zapotec (Juárez, Mitla², Quioquitani), Huastec (Vera Cruz, Potosí)</td>
</tr>
<tr>
<td>7 pot t c c k q ?</td>
<td>Totonac (Xicotetco, Papantla), Tepehua (Teachichilco, Huehuetla), Central Pame, Mayan (Jacaltec, San Miguel Acatec, Kekchi, Pocomchi², Pocomam, Usantec, Quiché³, Cakchiquel³, Tzutujil³²)</td>
</tr>
<tr>
<td>7 pot c c k ?</td>
<td>Eastern Popoloca, Tlacoyalco Popoloca, Chocho,</td>
</tr>
</tbody>
</table>
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 Nahuan, which are over-represented in the data.

<table>
<thead>
<tr>
<th>Phoneme</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>/p/</td>
<td>35</td>
</tr>
<tr>
<td>/pʰ/</td>
<td>2</td>
</tr>
<tr>
<td>/t/</td>
<td>42</td>
</tr>
<tr>
<td>/tʰ/</td>
<td>1</td>
</tr>
<tr>
<td>/tʃ/</td>
<td>10</td>
</tr>
<tr>
<td>/c/</td>
<td>26</td>
</tr>
<tr>
<td>/tʃ/</td>
<td>2</td>
</tr>
<tr>
<td>/k/</td>
<td>32</td>
</tr>
<tr>
<td>/kʰ/</td>
<td>1</td>
</tr>
<tr>
<td>/q/</td>
<td>5</td>
</tr>
<tr>
<td>/kʷ/</td>
<td>5</td>
</tr>
<tr>
<td>/kw/</td>
<td>42</td>
</tr>
<tr>
<td>/qʷ/</td>
<td>19</td>
</tr>
<tr>
<td>/kʷ/</td>
<td>9</td>
</tr>
<tr>
<td>/qʷ/</td>
<td>1</td>
</tr>
<tr>
<td>/kw/</td>
<td>36</td>
</tr>
</tbody>
</table>

The hierarchy of occurrence can be implicationally represented as follows:


Every language has /t/ and /k/; /p/ is lacking in some Otomanguean and Chibchan languages. In the Chibchan group, however, Boruca, Guaymi 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 /ç/ and /c/; /kʰ/ and /tʰ/ 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. /ç/ 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 /pʰ tʃ t ç ʃ/ 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 /kʷ/ is the most common. Labialized labial /pʰ/ and uvular /qʷ/ are also found but are quite rare. Palatalization is observed in alveolar /tʃ/, palato-alveolar /çʃ/ and velar /kʰ/, /tʰ/ being more common than /kʰ/. /çʃ/ 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>
<thead>
<tr>
<th>Number of phonemes</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of languages</td>
<td>8</td>
<td>9</td>
<td>17</td>
<td>2</td>
<td>1</td>
<td>37</td>
</tr>
<tr>
<td>(Number of languages with /ʔ/)</td>
<td>7</td>
<td>7</td>
<td>17</td>
<td>2</td>
<td>1</td>
<td>34</td>
</tr>
</tbody>
</table>

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>
<thead>
<tr>
<th>Number of voiceless stops</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of voiced stops</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Number of languages</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>52</td>
</tr>
</tbody>
</table>

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 Tepehuan³, Otomí (Tenango), Chatino (Yaltepec), Miskitu, Sumu
4:4 Otomí (Sierra), Chinantec (Comaltepec, Quiootepec, 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 j g) stops, while both Guaymi, with 3 voiceless (t č k) and 3 voiced (b j g) stops, and Ixcatec, with 5 voiceless (t t’ c č k) and 5 voiced (b d d’ j 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/.

<table>
<thead>
<tr>
<th>Chinantec (Lealao)</th>
<th>Bocotá</th>
<th>Papago</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t k</td>
<td>t č k</td>
<td>p t č k</td>
</tr>
<tr>
<td>b d j g</td>
<td>b d j g</td>
<td>b d j g</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Number of voiceless stops</th>
<th>Number of prenasal stops</th>
<th>Number of languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The languages with a symmetrical set are only two, Mixtepec Mixtec and Coatzospán Mixtec. Note that Cholcatongo 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 kʷ // mb n d n̂ j n̂ j n̂ g).

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 /č/, /č/, /č/ or /kʷ/. These phonemes, except /č/, 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

<table>
<thead>
<tr>
<th></th>
<th>Number of fortis stops</th>
<th>Number of lenis stops</th>
<th>Number of languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>5 6 4 5 7 5 6</td>
<td>3 3 4 4 5 6</td>
<td>1 1 3 1 9 3 19</td>
</tr>
</tbody>
</table>

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:

\[
p \ t \ c \ č \ č' \ k' \ k \ q \b' \ t' \ c' \ č' \ č' \ k' \ k' \ q' \q'
\]

Two different systems of bilabials are observed, namely, /p p' b⁰/ and /p b⁰/.
Roughly speaking, the former is found in Lowland Mayan, and the latter in Highland Mayan. However, Cotzal Ixil is reported to have /p b' pʰ/, 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 ċ k q/ vs. /p' t' c' ċ' 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.

Terraba 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. /pʰ tʰ kʰ/, while Terraba lacks /pʰ/ 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

<table>
<thead>
<tr>
<th>Affricates</th>
<th>Sibilants</th>
<th>Types</th>
<th>Number of attested languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>VL</td>
<td>VD</td>
<td>VL</td>
<td>VD</td>
</tr>
<tr>
<td>1.2</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>2.1</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>2.2</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.3</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>2.4</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.5</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.6</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 (Huichol). Acatlán Mixtec lacks the voiceless counterpart of /ŋj/ but has /č ŋj/. 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. Languages with Sibilants Only

- **s** Miskitu, Sumu, Southern Tepehuan
- **s ɨ** Chatino (Yaitpec), Chinantec (Quiotepec), Rama
- **s ifecycle** Seri
- **θ s ɨ** Mixtec (Chayuco)
- **s s** Mixtec (Ayutla)

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

- **s ɨ ɨ** Otomi (Tenango)
- **s ɨ ɨ** Térabra, Teribe

[c] and [ç] are interpreted as consonant clusters [ts] and [tš] in Yaitpec Chatino. In Southern Tepehuan [ç ñ ɨ] are interpreted as palatalized /t d s/ contiguous to /i/. Affricates may also occur in other languages, (excepting Miskitu, Sumu and Rama), but they are interpreted not as the phonemes /c ɟ/ 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, Zoque (León, Chimalapa), Garifuna
- **c ɨ** Mixte (Coatlán, Paraíso)
- **c ɨ** Mixtec (Colorado), Mixte (Tlahuitoltepec)
- **c θ s** Chinantec (Sochiapán, Tlacatintecpe)
- **c s ɨ ɨ** Cocopa
- **c s** Tarahumara, Yaqui, Mayo, Cuicatec, Cuna
- **c ɨ** Cuitlatec
- **c s ɨ** Northern Tepehuan, Paipaí, Mixtec (Alacatilazala, Jamiltepec, Jicaltepec)
Native Middle American Languages

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There are 60 sampling languages (including dialects) in 15 combinations, of which /c s/ (4 samples), /c s s/ (31) and /c c s s s/ (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 s/, /c s s/, and /c c s s/, the total reaches 46 (77%). /c s s/ is observed in 5 languages. Other combinations are attested in only a few languages.

2.2.2.2.2. Voiceless Affricates and Voiced Sibilants: 1 language

This type is attested in only one language.

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.

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.

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.
2.2.2.2.2.6. 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 j j/ and /c 6j j/, show symmetry.

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, Xinca and Tequistlatec.

Symmetrical systems in affricates are of 5 subtypes, /c j/, /c 6 nj nj/, and /c 6j j/. If sibilants are taken into consideration, then there are 3 subtypes of symmetrical systems, /c j s/, /c 6j j s/, and /c 6j nj s/.

Symmetrical systems in affricates are of 5 subtypes, /c j/, /c 6 nj nj/, and /c 6j j/. If sibilants are taken into consideration, then there are 3 subtypes of symmetrical systems, /c j s/, /c 6j j s/, and /c 6j nj s/.

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Symmetrical systems in affricates are of 5 subtypes, /c j/, /c 6 nj nj/, and /c 6j j/. If sibilants are taken into consideration, then there are 3 subtypes of symmetrical systems, /c j s/, /c 6j j s/, and /c 6j nj s/.
The hierarchy of occurrence can be described as follows:

**Voiceless sibilants:**
- s (55) > ŋ (40) > ñ (15) > θ (6) > ñ (4) > θ (1), ñ (1), s (1)

**Voiced sibilants:**
- z (9), ŋ (9) > z (6) > ñ (5), ñ (5) > ñ (2) > z (1), or z z > ŋ ŋ > ŋ ŋ

**Voiceless affricates:**
- č (42) > c (39) > č (8) > c' (8) > č' (6) > cʰ, čʰ, č' (1)

**Voiced affricates:**
- j (7) > ŋ (5) > j (4) > ŋ (3) > j (1), or j, j > j j > ŋ j > ŋ j

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 ŋ 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. All languages except Huichol have /s/. Voiceless fricatives may include, besides /s/, any of the following: /θ, ŋ, h, x, f/; other fricatives are exceedingly rare.

\( \text{/h/} \) is often called a glottal fricative, although the turbulent air stream, characteristic of fricatives, is scarcely audible; hence some linguists exclude \( \text{/h/} \) from the fricatives altogether [cf. Maddieson 1984, chap.3]; however, \( \text{/h/} \) 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 /ŋ/, and is sometimes placed in a special class of laryngeals along with /ŋ/. This is recognized in Nahuan languages, where 2 dialects have only /ŋ/, and 10 dialects have only /ŋ/, while 5 other dialects have /ŋ ŋ/.

I was embarrassed to find when I found that the retroflexed sibilant is transcribed by either \( s \) or \( ŋ \) in my data. Bright notes that the sound \( s \) is between \( s \) and \( ŋ \), and \( ŋ \) is strongly retroflexed [BRIGHT 1984]. These two sounds, \( s \) and \( ŋ \), 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 \( s \); however, retroflex is also expressed by \( s \). That is, \( s \) is used for either the retroflex or the apico-alveolar sibilant. Moreover, \( s \) is sometimes transcribed as \( s \). 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, \( \delta \) is used for Papago, Guarijio, Cocopa and Xinca. \( \delta \) is interpreted as an apico-domal retroflexed sibilant. This \( \delta \) represents an areal feature of Californian languages [BRIGHT 1984]. On the other hand, southern languages such as Zapotecan and Mayan have an alveo-palatal retroflex \( \delta \). Chajul Ixil, a dialect of Ixil, has an alveo-alveolo-palatal \( \delta \) in addition to \( s, \delta, \) and \( \delta \). This \( \delta \) may be the same as \( s \). Therefore I distinguish two retroflexed sibilants as follows:

<table>
<thead>
<tr>
<th>Alveolar Retroflexed</th>
<th>Alveo-palatal Retroflexed</th>
</tr>
</thead>
<tbody>
<tr>
<td>( s )</td>
<td>( \delta )</td>
</tr>
</tbody>
</table>

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

#### 2.2.3.1.2. Languages with Two Fricatives

<table>
<thead>
<tr>
<th>( s )</th>
<th>( h )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tarahumara(^1), Yaqui(^1), Mayo, Zoque (León, Chimalapa), Chinantec (Comaltepec), Tol, Miskitu, Sumu, Bocotá</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>( s )</th>
<th>( x )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sierra Otomi, Mixe (Coatlán, Paraiso)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>( s )</th>
<th>( \delta )</th>
<th>( h )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xinca(^2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>( s )</th>
<th>( \delta )</th>
<th>( \delta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nahuatl (Classical, Tlaxpanaloya), Mixtec (Jicaltepec), Rama</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 2.2.3.1.3. Languages with Three Fricatives

<table>
<thead>
<tr>
<th>( s )</th>
<th>( \delta )</th>
<th>( h )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papago</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>( s )</th>
<th>( \delta )</th>
<th>( h )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cora(^1), Nahuan (14: Jerónimo, Tetelcingo, Amilcingo,</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Native Middle American Languages

Matlapa, Coscatlán, Acaxochitlán, Huautla, Pómaro, Zacapoaxtlá, Mecayapán, Pajapán, Jalupa, Pipil, Pochoytec), Totonacan (Xicotepec, Papantla), Tepehua1,2, Central Pame, South Pame, Mazatec (Jalapa, Soyaltepec), Amuzgo (San Pedro), Chatino (Yaitpec), Huave, Zoque (Copainalá), Sierra Popoluca, Oluta Popoluca, Mixe (Tlahuitoltepec), Yucatec, Lacandón, Itzá, Mopán, Chol, Chontal, Chortí, Tzeltal, Tojolabal, Cabécar, Bribri

2.2.3.1.4. Languages with Four Fricatives

<table>
<thead>
<tr>
<th>s</th>
<th>š</th>
<th>x</th>
<th>h</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>š</td>
<td>x</td>
<td>h</td>
</tr>
<tr>
<td>s</td>
<td>š</td>
<td>x</td>
<td>h</td>
</tr>
<tr>
<td>s</td>
<td>š</td>
<td>š</td>
<td>x</td>
</tr>
<tr>
<td>θ</td>
<td>s</td>
<td>š</td>
<td>h</td>
</tr>
<tr>
<td>f</td>
<td>s</td>
<td>š</td>
<td>h</td>
</tr>
<tr>
<td>f</td>
<td>s</td>
<td>š</td>
<td>h</td>
</tr>
</tbody>
</table>

2.2.3.1.5. Languages with Five Fricatives

<table>
<thead>
<tr>
<th>s</th>
<th>š</th>
<th>h</th>
<th>h'</th>
<th>h&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>š</td>
<td>h</td>
<td>h'</td>
<td>Chatino (Tataltepec1)</td>
</tr>
<tr>
<td>s</td>
<td>š</td>
<td>x</td>
<td>x&quot;</td>
<td>Cocopa2</td>
</tr>
<tr>
<td>s</td>
<td>š</td>
<td>š</td>
<td>x</td>
<td>Jalitec, Kanjobal</td>
</tr>
<tr>
<td>s</td>
<td>š</td>
<td>š</td>
<td>h</td>
<td>Ixil1 (Chajul)</td>
</tr>
<tr>
<td>f</td>
<td>f'</td>
<td>s</td>
<td>š</td>
<td>Huamelultec, Tequistlatec2</td>
</tr>
<tr>
<td>f</td>
<td>f'</td>
<td>s</td>
<td>š</td>
<td>Tequistlatec1</td>
</tr>
</tbody>
</table>

2.2.3.1.6. Language with Six Fricatives

<table>
<thead>
<tr>
<th>φ</th>
<th>s</th>
<th>š</th>
<th>x</th>
<th>X</th>
<th>X'</th>
</tr>
</thead>
<tbody>
<tr>
<td>φ</td>
<td>s</td>
<td>š</td>
<td>x</td>
<td>X</td>
<td>X'</td>
</tr>
</tbody>
</table>

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 | Huichol1 |

2.2.3.2.2. Languages with Two Voiceless and One Voiced Fricatives

<table>
<thead>
<tr>
<th>s</th>
<th>h</th>
<th>z</th>
<th>Chichimec1</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>h</td>
<td>v</td>
<td>Southern Tepehuan</td>
</tr>
<tr>
<td>s</td>
<td>h</td>
<td>β</td>
<td>Cora2</td>
</tr>
<tr>
<td>s</td>
<td>x</td>
<td>δ</td>
<td>Guaymi</td>
</tr>
<tr>
<td>s</td>
<td>š</td>
<td>v</td>
<td>Mixtec (Mixtepec)</td>
</tr>
</tbody>
</table>
### 2.2.3.2.2. Languages with Two Voiceless and Two Voiced Fricatives

<table>
<thead>
<tr>
<th>s</th>
<th>h</th>
<th>β</th>
<th>δ</th>
<th>Tarahumara¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>x</td>
<td>v</td>
<td>δ</td>
<td>Cuicatec²</td>
</tr>
<tr>
<td>s</td>
<td>ŋ</td>
<td>z</td>
<td>ŋ</td>
<td>Zapotec (Choapan, Tlacochahuaya, Guevea, Isthmus³)</td>
</tr>
<tr>
<td>s</td>
<td>ŋ</td>
<td>z</td>
<td>ŋ</td>
<td>Zapotec (Albarradas, Guelavía¹, Chichicapán, Ayoquesco)</td>
</tr>
</tbody>
</table>

### 2.2.3.2.3. Languages with Two Voiceless and Three Voiced Fricatives

<table>
<thead>
<tr>
<th>ŋ</th>
<th>h</th>
<th>β</th>
<th>δ</th>
<th>γ</th>
<th>Cuitlatec¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>ŋ</td>
<td>ŧ</td>
<td>β</td>
<td>γ</td>
<td>Mixtec (Huajuapan)</td>
</tr>
<tr>
<td>s</td>
<td>ŋ</td>
<td>ŧ</td>
<td>β</td>
<td>δ</td>
<td>Mixtec (Coatzospan)</td>
</tr>
<tr>
<td>s</td>
<td>ŋ</td>
<td>ŧ</td>
<td>β</td>
<td>γ</td>
<td>Zapotec (Yatee)</td>
</tr>
</tbody>
</table>

### 2.2.3.2.3.1. Languages with Three Voiceless and One Voiced Fricatives

| s  | ŋ | h  | ŧ | Mixtec (Chalcatongo) |
| s  | ŋ | h  | v | Tzotzil¹, Mixe (Totontepec¹) |
| s  | ŋ | h  | β | Matlatzinca, Ocuiltec, Amuzgo (Xochistlahuaca), Mixtec (Alacatlahuaca) |
| s  | ŋ | x  | v | Northern Tepehuan, Paipai², Mixtec (Jamiltepec, Colorado), Cakchiquel¹, ᵃ² |
| s  | ŋ | h  | β | Mazatec (Chiquihuitlán) |
| s  | ŋ | h  | v | Mazatec (Huautla) |
| θ  | s  | ŋ | h  | δ | Chinantec (Tlacozintemec) |
| θ  | s  | ŋ | h  | v | Mixtec (Chayuco) |
| θ  | s  | ŋ | 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  | ŋ | h  | v | δ | Mixtec (Acatlan) |
| s  | ŋ | x  | v | δ | Mixtec (Ocotepac²) |
| s  | ŋ | h  | ŧ | v | Mixtec (Molinos) |
| s  | ŋ | h  | ŧ | v | Mixtec (Silacayoapan) |
| s  | ŋ | h  | ŧ | β | Mixtec (Silacayoapan) |
| s  | ŋ | h  | ŧ | v | Temoayan Otomi, Mazahua, Teribe |
| s  | ŋ | h  | ŧ | v | Trique (Chicahuaxtlá, Zapotec (Quioquitani)) |
| φ  | s  | ŋ | ŧ | v | Zapotec (Rincón) |
| φ  | s  | ŋ | ŧ | v | Mixtec (Peholes) |

### 2.2.3.2.3.3. Languages with Three Voiceless and Three Voiced Fricatives

| s  | ŋ | h  | ŧ | β | δ | Mixtec (Atatlahuaca, El Grande) |
| s  | ŋ | x  | v | ŧ | X | Zapotec (Cajonos) |
| θ  | s  | ŋ | ŧ | v | Zapotec (Juárez) |

### 2.2.3.2.4.1. Languages with Four Voiceless and One Voiced Fricatives

| s  | ŋ | x  | v | Mixtec (Ayutla²) |
2.2.3.2.4.2. Languages with Four Voiceless and Two Voiced Fricatives

- Chinantec (Quiotepec)
- Zapotec (Mitla²)
- Térraba

2.2.3.2.4.3. Languages with Four Voiceless and Three Voiced Fricatives

- Mixtec (Diuixi²)
- Zapotec (Yalalag)
- Chiquite (Copolá)
- Chinantec (Sochiapán)
- Zapotec (Lachixio)

2.2.3.2.4.4. Language with Four Voiceless and Four Voiced Fricatives

- Western Popoloc¹

2.2.3.2.5.1. Language with Five Voiceless and One Voiced Fricatives

- Tenango Otomí

2.2.3.2.5.2. Language with Five Voiceless and Three Voiced Fricatives

- Zapotec (Zoogocho)

2.2.3.2.6.1. Language with Six Voiceless and One Voiced Fricatives

- Mezquital Otomi¹

2.2.3.2.6.2. Language with Six Voiceless and Three Voiced Fricatives

- Zapotec (Yatzachi)

2.2.3.2.6.3. Language with Six Voiceless and Five Voiced Fricatives

- Tlacoyalco Popoloc

2.2.3.2.6.4. Language with Six Voiceless and Six Voiced Fricatives

- 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) > š (51) > h (50) > x (22) > ŝ (21) > ď (18) > β (15) > v (13) > Ź (12) > z (11) > f (10) > Ź, ť (10) > z, ť (9) > Ź (8) > γ (7) > X (6) > s (4) > Ź, x², X² (3) > f (2) > ť Ź

The most common set is /s š h/. In fact, there are 42 languages having /s š h/. If we include /s š x/ and /s š h/, this total rises to 51.
Some phonemes such as /θ ʃ/ show an areal bias. Languages having /θ/ or
/ʃ/ are as follows:

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

/ʃ/: Seri¹, Eastern Popoloc, Tlacoyalco Popoloc, Western Popoloc¹, Chocho, Mazatec (Chi-
quihuitlán, Huautla), Mixtec (Mixtepec), Zapotec (Juárez, Yalalag, Yatee, Cajonos, Ya-
tzachi, Albarradas, Zoogocho, Guelavia¹, Chichacapan, Ayoquesco), Trique (Copalá), Sayula
Popoluca, Mayan (Jabaltec, Kanjobal, Acatec¹, Tectitec, Mam, Aguaucatec, Ixil²,³)

/θ/ is found in two areas, the Otomí-Huastec region and the area stretching
from northern Oaxaca to southern Puebla. The areal distribution of /ʃ/ 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.

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

/ʃ/ and /θ/ 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 Térraba.

/ʃ/: Nahuaal (Zongolica), Otomí (Mezquital¹), Zapotec (Mitla², Lachixio), Chinantec (Lealao,
Tepetotutla, Quioytepec), Huamelultec, Tequistlatec¹,², Térabba

/θ/: 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 (Jicaltec, Kanjobal, Chuj, Kekchi, Pocomchi¹,²,
Pocomam, Quiché⁶)

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 Xw/ are found only in northern Zapotec and
Seri.

/Xw/: Kiliwa², Cocopa², Mixtec (Diuxi²)

/hw/: Chatino (Tataltepec¹)

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

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

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,
Native Middle American Languages

Cuitlatec, Paipai, Mixe (Totontepec), Huastec (Veracruz), Tzotzil, Ixil, Cakchiquel, Tërabra, Teribe, and Guaymi; of these, Northern Tepehuan, Southern Tepehuan, Mixe (Totontepec), Tzotzil, Ixil and Cakchiquel 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. Cuitlatec has /β 6γ/, which are fricativized /b d g/. /6/ of Guaymi seems to fill a gap in the stop series /t 6kbj g/. Note that Bocotá’s stop series is /t 6k b j g/. If we eliminate Cuitlatec and Guaymi, we are left with Tarahumarai, Cora, Huichol, Paipai, Huastec (Veracruz), Tërabra, 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, Huastec (Veracruz)
/v/ Paipai
/β δ/ Tarahumarai
/ζ/ Huichol
/ζ ζ/ Teribe, Tërabra

Furthermore, we have data from other languages closely related to Cora, Huastec (Veracruz), Tarahumarai, and Paipai, which show an absence of voiced fricatives. If these preceding languages are also eliminated, only Huichol, Teribe and Tërabra 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 Bribri and Cabécar for which no nasals are reported (although /η/ 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 η/, so that [m n η] are considered allophones of /b d j 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 Bribri and Cabécar m n h 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 Chinantece, /m n η/ have actually been analyzed as /b d g/ with simultaneous nasalization, because of the fact that [m n η] occur before nasalized vowels and [b d g] before oral vowels so that the two groups are in complementary distribution. However, /m n η/ are now recognized as phonemes [Westley 1991, Renesch 1989].

Now the nasal position lacking a position contrast is not the expected bilabial /m/ but alveolar /n/ instead. In Cabécar only /η/ is registered as nasal, but Cabécar and Bribri 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 n/ and /m n n/. These can be seen in 38 and in 20 languages, respectively. The /m n n/ type has four subtypes. Each subtype is seen in only one sampling unit. Chichicapan Zapotec has /m n n m n n/, but Isthmus Zapotec lacks the lenis /m/. Huamelultec Chontal has glottalized nasals /m'/ n' n'/ corresponding to /m n n/. Atlatlahuca Mixtec has voiceless /n/ besides /m n n/. The other major type, /m n n/, has one subtype which has a voiceless /n/. Cora2 has labialized /m n n/ in addition to /m n n/.

Languages with four position nasals demonstrate three different patterns: /m n n n/, /m n n n n/, and /m n n n n/. The latter two are rare. The major type /m n n n/ is attested in 8 languages. Tequistanate Chontal as analyzed by Waterhouse has voiceless /n/ as well as /m n n n/. However, Turner analyzes it differently from Waterhouse and gives /m n n n n/. /m n n n n/ are attested in Mixtec (Ayutla2). Although /n n/ 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 /n/, but Ayutla2 Mixtec gives both /n n/ and /n n/, while Ayutla1 Mixtec has only /m n n/. Only a phoneme list is supplied for Ayutla2 Mixtec, so it is difficult to see how /n n/ and /n n/ are different, although I have found /n n/ (written as ny in the text by Hills) in some morphemes such as n'y3 'they, their,' n'y3 n'y3 "come," n'y3 q3 q3 "evil," q3 n'y3 n'y3 "eight" [Hills 1990]. Incidentally, /ny/ or /n n/ is used in the inventories of the following languages:

ny = Xochistlahuaca Amuzgo, Tataltepec Chatino
n'y = Kiliwa2, Cocopa1-2, Cora1, Chatino (Tataltepec2, Zenzontepec)

They are represented by /n/ 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)
ñ Cabécar

3) Two position contrast types:

m n Southern Tepehuan1, Tarahumara1-2, Yaqui1, Mayo, Huichol1, Nahuan (15 dialects), Pipil, Cuitlatec1, Seri1, Tarasco1-2, Totonaq (Xicotepac, Papantla), Tepehua (Teachichilco, Huehtuala), South Pame, Matlatzinca, Ocuiltec, Otomi (Tenango, Sierra), Tlapa1, Eastern Popoloc, Chocho, Cuicatec2, Trique (Copalá), Zapotec (Choapan, Ayoquesco), Chatino (Yatepec), Huave, Sayula Popoluca, Otla Popoluca, Mixe (Tlahuitoltepec), Mayan (Veracruz Huastec, Potosi Huastec, Yucatec2, Lacandón, Itzá2, Mopán,
Chontal, Chortí, Tzotzil1, Tzeltal, Tojolabal, Kanjobal, Acatec1,2, Tectitec, Mam, Aguacatec, Ixil1,2,3, Kekchi, Pocomchi1,3, Pocomam, Ushtanec, Quiche2,3, Sipacapeño, Cakchiquel1,2, Tzutujil1,2, Xinca2, Garifuna, Cuna Chichimec1, Trique (Chichahuaxtla), Zapotec (Juárez, Cajonos, Zoogocho, Mitla2, Guelavia1, Guevea) Zapotec (Ixtlán, Yatzachi, Yalalag, Albarradas, Tlacochahuaya)

4) Three position contrast types:

- Papago, Northern Tepehuan1, Cora1, Pochutec, Paipai2, Kiliwá2, Cocopa2, Otomí (Temoayan, Mezquital1), Mazahua, Ixcatec, Tlacoyalco Popoloc, Western Popoloc1, Mazatec (Chiquihuitlán, Díaz, Huautla, Soyaltepec), Amuzgo (San Pedro1, Xochistlahuaca), Mixtec (Acatlán, Huajuapan, Silacyoapan, Mixtepec, Alacalazala, Ocotepec2, El Grande, Chalcatongo, Duxí2, Peñoles, Coatzospan, Jamiltepec, Colorado, Chayuco, Jicaltepec), Zapotec (Quioquitani, Lachixio), Chatino (Tataltepec1), Tila Chol

- Huamelulote Chontal

- Zapotec (Chichicapan)

- Zapotec (Isthmus1)

- Mixtec (Atatlahuaca)

- Central Pame, Zapotec (Isthmus2), Chinantec (Comaltepec Lealao, Tepetotutla, Palantla, Sochiapan, Tlacozintecopec), Zoque (León, Chimalapa), Mixe (Coatlán, Paraíso, Totontepec1), Chuj, Jacaltec, Sacapulote, Tol, Miskitu, Sumu, Rama, Guatuso

- Tequistlatec2

- Cora2

5) Four position contrast types:

- Mixtec (Molinos), Chinantec (Quiotepec), Zoque (Copainalá), Sierra Popoluca, Boruca, Térraba, Teribe, Guaymi

- Tequistlatec1

- Mixtec (Ayutla2)

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>
<thead>
<tr>
<th>Number of position contrasts</th>
<th>Number of languages</th>
<th>Nasal inventory</th>
<th>Number of languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>3</td>
<td>n</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>η</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>n n</td>
<td>1</td>
</tr>
<tr>
<td>Two</td>
<td>95</td>
<td>m n</td>
<td>82</td>
</tr>
</tbody>
</table>
Table 18—continued.

<table>
<thead>
<tr>
<th>Number of position contrasts</th>
<th>Number of languages</th>
<th>Nasal inventory</th>
<th>Number of languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three</td>
<td>64</td>
<td>m n m n</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m n n</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m n ̃</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m n ̃ m' n' ̃ n'</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m n ̃ m ̃ m ̃ n ̃</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m n ̃ n ̃ ̃ n ̃</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m n ̃ N</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m n η</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m n η N</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m m* η</td>
<td>1</td>
</tr>
<tr>
<td>Four</td>
<td>10</td>
<td>m n ̃ η</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m n ̃ η N</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m n ̃ n ̃ ̃ η</td>
<td>1</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Number of nasals</th>
<th>Number of languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>83</td>
</tr>
<tr>
<td>3</td>
<td>64</td>
</tr>
<tr>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

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 Otomi 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 intervocically; 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 Kekchi, /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:

<table>
<thead>
<tr>
<th>Unspecified</th>
<th>Trill</th>
<th>Flap/Tap</th>
<th>Retroflex</th>
<th>Lenis</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>ř</td>
<td>r</td>
<td>r</td>
<td>r</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Lateral</th>
<th>Approximant</th>
<th>Fricative</th>
<th>Affricate</th>
<th>Retroflexed</th>
<th>Flap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voiceless</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voiced</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glottalized</td>
<td>1'</td>
<td>1'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lenis</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 /l/ 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:

<table>
<thead>
<tr>
<th>Number of r/l sounds</th>
<th>Number of languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>5</td>
</tr>
<tr>
<td>1 r-sound</td>
<td>12</td>
</tr>
<tr>
<td>2 r-sounds</td>
<td>2</td>
</tr>
<tr>
<td>1 lateral and 1 r-sound</td>
<td>83</td>
</tr>
<tr>
<td>1 lateral and 2 r-sounds</td>
<td>7</td>
</tr>
<tr>
<td>2 laterals and 1 r-sound</td>
<td>11</td>
</tr>
<tr>
<td>2 laterals and 2 r-sounds</td>
<td>6</td>
</tr>
<tr>
<td>1 l</td>
<td>1</td>
</tr>
<tr>
<td>1 lateral</td>
<td>27</td>
</tr>
<tr>
<td>2 laterals</td>
<td>5</td>
</tr>
<tr>
<td>1 lateral + λ</td>
<td>8</td>
</tr>
<tr>
<td>1 lateral + 1 r-sound + λ</td>
<td>2</td>
</tr>
<tr>
<td>2 laterals + λ</td>
<td>2</td>
</tr>
<tr>
<td>2 laterals + λ'</td>
<td>1</td>
</tr>
<tr>
<td>4 laterals + 1 r-sound</td>
<td>1</td>
</tr>
<tr>
<td>6 laterals + 2 r-sounds</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>174</td>
</tr>
</tbody>
</table>
The following lists *r*- and *l*-sounds in reported inventories for the languages which have them.

0

Native Middle American Languages

Zoque (León), Mixe (Coatlán, Paraíso, Totontepec), Mixtec (Ocotepex)
Huichol, South Pame, Otomí (Tenango, Sierra), Amuzgo (San Pedro),
Boruca
Cabécar
Southern Tepehuan, Mazatec (Chiquihuitlán), Western Popoloc, Otomí
(Temoayan), Bribrí
Tarasco

1

r

Northern Tepehuan, Yaqui, Mayo, Cora, Kiliwa, Chichimec, Otomí
(Mezquital), Mazahua, Tlapaneč, Eastern Popoloc, Mazatec (Jalapa de
Díaz), Amuzgo (Xochistlahuaca), Mixtec (Molinos, Atlatlahuca, El
Grande, Chalcautongo, Dixut, Jamiltepec, Colorado), Cuiicatec, Trique
(Copalá, r = ž), Zapotec (Rincón, Choapan, Tlacochahuaya, Quio-
quiani, Ayoquesco), Chatino (Yaipepec), Chinanteck (Lealao,
Tepehuan, Tlacoaitzinepec), Zoque (Chimalapa), Sierra Popoluca,
Mixe (Tlahuitoltepec, Potosí Huastec, Chontal, Chortí, Tzotzil, Tzeltal,
Tojolabal, Chuj, Jalapa, Kanjobal, Acatece, Ixil, Kekchi, Pocomchi,
Pocon一本, Pocomam, Uspantec, Quiche, Zacate, Zacate, Zacate, Zacate,
Zapotec (Yutla, Chichicapa, Guelavia)

1

r

Mixtec (Peñoles, Coatzospan, Alacatla, Aytul, Mixtepec, Chayuco,
Jicaltepec), Zapotec (Lachixio), Ixil, Tzutujil

1

r

Chinantec (Quitepec), Sayula Popoluca

1

Coro, Chinantec (Comaltepec, Sochiapán), Guaymí

1

r

Tarahumara

1

R (r)

Tarahumara (r = a voiced stop)

1

r

Chocho

1

r

Térraba, Teribe

1

r

Ixcatel, Tlacoalco Popoloc, Mazatec (Soyaltepec), Huave

1

r

Central Pame, Chatino (Tataltepec)

1

Zapotec (Yatee, Chichicapa, Guelavia)

1

r

Trique (Chichahuaxtla), Zapotec (Yalalag, Guevea, Isthmus)

1

Zapotec (Zoogocho, Yatzachi)

1

Zapotec (Ixtlan, Juárez, Cajones, Albarradas, Mitla)

†

Serí

1

Cuitlatec, Tepehuan (Huehuetla),

1

r

Paiapai, Tequistlatec, Xinca

1

r

Guatuso

1

P, r, r

Cocopá

1

Chi

Nahuatl (Classical, Jerónimo, Tetelcingo, Amilcingo, Taxpanaloya,
Matlapa, Huautla)

1

r

Nahuatl (Coscatlán, Acaxochitlán)

‡

Chi

Nahuatl (Zongolica)
The most common combination in languages investigated here was to have one \( l \)- 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. 

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

### 2.2.6. Glide Systems

Glides are generally represented by \( /w/ \) and \( /y/ \). They are also termed vocoid approximants, semivolwels, and even semiconsonants. Interpreted as semivolwels, \( /y/ \) and \( /w/ \) are not recognized as phonemes in such languages as Cabecar and Bribri, and the high vowels \( /i/ \) and \( /u/ \) are used in their stead, respectively. In Tol even \( /i/ \) is interpreted as a semivolwel. The phonemes \( /v/ \) and \( /\beta/ \) 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>
<thead>
<tr>
<th></th>
<th>With /y/</th>
<th>No /y/</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>With /w/</td>
<td>129(74.1%)</td>
<td>5(2.9%)</td>
<td>134(77.0%)</td>
</tr>
<tr>
<td>No /w/</td>
<td>21(12.1%)</td>
<td>19(10.9%)</td>
<td>40(23.0%)</td>
</tr>
</tbody>
</table>

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, Kekchi \( /w/ \) and \( /y/ \) are manifested by \([kw] \sim [gw] \sim [w]\) and \([dv] \sim [k\v] \sim [y]\), respectively. (2) It is also possible that \( /w/ \) has been replaced by \( /v/ \) or \( /\beta/ \). I have heard a Quiché informant pronounce three distinct versions of the word “paper” \([wux] \sim [vux] \sim [vux]\) (labio-dental approximant) \( \sim [\betaux]\). 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 semivolwels, except for the fact that the
latter are ultra-short [CATFORD 1988:71-72]. The absence of semivowels in Cabécar and Bribri 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 /kʷ/ also:
   Mixtec (Huajuapan)

   with /kʷ/ also:
   Mixtec (Chalcatongo)

2) Languages with /y/
   with /v/ also:
   Southern Tepehuani1, Mazatec (Huautla), Cuicatec2, Mixe (Totontepec1), Tzotzil1, Cakchiquel1.2

   with /β/ also:
   Tlacoyalco Popoloc, Mazatec (Chiquihuitlán)

   with /kʷ/ also:
   Zapotec (Yalalag, Tlacochahuaya), Ixil3

   with both /β/ and /kʷ/ also:
   Mixtec (Silacayoapan, Alacatlazala, Atatlahuca)

   with both /v/ and /kʷ/ also:
   Mixtec (Mixtepec, Ayutla2, Ocotepec2, Jamiltepec, Colorado, Chayuco)

3) Languages with /w/ and /y/:
   Tarahumara1.2, Yaqui1, Mayo, Cora1.2, Huichol1, Nahuan (15 dialects), Cuitlatec1, Paipaí2, Kiliwa2, Cocopa2, Tarasco1.2, Totonac (Xicotepex, Papantla), Tepehua (Teachichilo, Huehuete), Central Pame, South Pame, Matlatzinca, Ocuiltec, Otomi (Mezquital1, Temoayan, Tenango, Sierra), Mazahua, Tlapane1, Ixcatec, Western Popoloc1, Eastern Popoloc, Mazatec (Jalapa de Díaz, Soyaltepec), Amuzgo (San Pedro1, Xochistlahuaca), Mixtec (Acotla1, Jicaltepec), Trique (Copalá), Zapotec (Rincón, Cajonos, Yatee, Albarradas, Mitla2, Guelavia1, Chicicapán, Quiquitani, Ayoquesco, Lachixio, Isthu01), Chatino (Yaiotepec, Tataltepec1), Chinante (Quiootepec, Palantal, Tepeicotla, Tlacozintepec), Huave, Zoque (Copainalá, León, Chimalapa), Sierra Popoloca, Sayula Popoloca, Otuta Popoloca, Mixe (Coatlán, Paraíso, Tlahuitoltepec), Huastec (Veracruz, Potosí), Yucatec2, Izá1, Lacandón, Mopán, Chol1, Chontal, Chortí, Tzeltal, Tojolabal, Chuj, Jacaltec, Kanjobal, Acatec1.2, Tectitec, Mam, Aguacatec, Ixil1.2, Kekchi, Pocomchi1.2, Pocomam, Usontec, Quiché2.3, Sacapultec, Sipacapeño, Tzutujil1.2, Xinca2, Garifuna, Miskitu, Sumu, Rama, Boruca, Teribe, Cuna

   with /β/ also:
   Tarahumara1, Cuicatec1, Huastec (Veracruz)

   with /v/ also:
   Paipaí2

   with /kʷ/ also:
   Cora2, Huichol1, Nahuan (13 dialects), Otomi (Temoayan), Mazahua, Mazatec (Jalapa de Díaz), Amuzgo (Xochistlahuaca), Zapotec (Albarradas, Mitla2, Chicicapán, Ayoquesco,
Phonological Systems

Quioquitani
with both /β/ and /kʷ/ also:
Matlatzinca, Ocuiltec, Zapotec (Lachixio)
with both /v/+/kʷ/ also:
Mixtec (Acatlán)

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

5) Languages with neither /w/ or /y/:
Zapotec (Choapan), Chinantec (Comaltepec), Guatuso, Cabécar, Bribri, Térraba, Guaymi, Bocotá
with /v/:
Northern Tepehuan, Chinantec (Lealao)
with /β/:
Chocho, Chinantec (Sochiapán)
with /kʷ/:
Mixtec (Peñoles), Zapotec (Ixtlán, Yatzachi)
with both /β/ and /kʷ/:
Mixtec (El Grande, Diuxi², Coatzospán)
with both /v/ and /kʷ/:
Mixtec (Molinos)

6) Languages with contrasts in voicing:
/w/ and /w/+/y/ and /y/:
Pómaro Nahual
/w/ and /w/+/y/:
Nahuatl (Huautla), Tequistlatec
/w/+/y/+/kʷ/:
Serí

7) Languages with contrasts of fortis and lenis:
[w y w y] : Trique (Chicahuaxtlá), 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 /kʷ/ is not. Most languages with /kʷ/ in the list are Mixtecan, in which */kʷ/ 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
 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
Following his normalization, the Nahuatl system depicted above would be rewritten as follows:

\[
\begin{align*}
&i & o & i: & o: \\
&e & a & e: & a:
\end{align*}
\]

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 Otomi has nine vowels with three nasalized vowels; and Tenango Otomi has nine vowels with four nasalized vowels.

\[
\begin{align*}
&i & u & i: & i & o & i: & o: \\
&e & o & e: & o: \\
&\alpha & a: & e & \alpha c & a & \alpha & c & \alpha & a
\end{align*}
\]

Orizaba Nahuatl  Temoayan Otomi  Tenango Otomi

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 Otomi system “9V+3N (nasal vowels).” The Tenango Otomi 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 Otomi and Temoayan Otomi. 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>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 vowel systems</td>
<td>7</td>
<td>+3L: 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 vowel systems</td>
<td>21</td>
<td>4V: 3, +4L: 15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 vowel systems</td>
<td>78</td>
<td>5V: 19, +4L: 1, +5L: 30, +3N: 1, +4N: 4, +5N: 1, +6N: 5L3S8N:1 +5G: 9, +5N: 15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 vowel systems</td>
<td>40</td>
<td>6V: 18, +5L: 1, +6L: 5, +4N: 1, +5N: 2, +6N: 1, +6G: 2 +L+EL: 2, +6N: 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 vowel systems</td>
<td>18</td>
<td>7V: 3, +5L: 1, +7L: 2, +5N: 5, +6N: 1, +7N: 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 vowel systems</td>
<td>4</td>
<td>+7N: 1, +8N: 1, +7N: 1, +8N: 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 vowel systems</td>
<td>6</td>
<td>+9L: 1, +3N: 1, +4N: 3, +6N: 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>174</td>
<td>43</td>
<td>73</td>
<td>51</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

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 Nahuan 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
the languages having nasalized vowels show asymmetry, while asymmetry is present in only 4\% (3/71) of the languages having long vowels. We can conclude from this that languages having nasalized vowels show more asymmetry than languages with long vowels. The table below further indicates that 24.7\% of the languages have normal length oral vowels only.

<table>
<thead>
<tr>
<th>Subtotal</th>
<th>Normal length oral vowels only (V)</th>
<th>Symmetrical systems</th>
<th>Asymmetrical systems</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>43</td>
<td>68</td>
<td>31</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>43(24.7%)</td>
<td>105(60.3%)</td>
<td>26(15.0%)</td>
<td>174</td>
</tr>
</tbody>
</table>

2.3.2. Typological Survey

I will survey vowel systems by dividing them according to the number of qualities, which ranges from three to nine. Some vowel systems have lengthened and/or nasalized vowels, with some being symmetrical and others asymmetrical.

2.3.2.1. Three-Vowel Systems

Three-vowel systems in Middle American languages show only one pattern. It is a high-low triangular system; two high vowels and one low vowel, with added length.\n
\[
\text{i} \quad \text{u} \quad \text{i}: \quad \text{u}: \\
\text{a} \quad \text{a}:
\]

This system is seen in Kiliwa\(^2\), Cocopa\(^2\), Totonac (Papantla), Tepehua (Huehuetla), Miskitu, Sumu, and Rama.

2.3.2.2. Four-Vowel Systems

Four-vowel systems show a positional asymmetry. The system with normal length oral vowels only is limited to one pattern, as is the system with nasal vowels. The systems having length contrasts show two patterns, /i e a o/ and /i e a u/. Tetelcingo Nahuatl has a comparatively rare vowel system; four tense (/i i e o u/) and four lax (/i e a o/). Language samples and vowel positional schema of each pattern are as follows:

\[4V: \quad \text{Zapotec (Zoogocho, Cajonos, Yatee)}\]
\[4V+4L: \quad \text{Nahuan (12 dialects), Pipil, Seri}^1, \text{Zapotec (Lachixio)}\]
\[4T\&4LX: \quad \text{Nahuatl (Tetelcingo)}\]
\[4V+4N: \quad \text{Huautla Mazatec}\]
\[4V+4N+L: \quad \text{Tlacoyalco Popoloc}\]

\[
i \quad i \quad i: \quad i \quad u \quad i: \quad u: \quad i \quad j \]
\[e \quad o \quad e \quad o: \quad o: \quad e \quad e: \quad e \quad o \quad e \quad o\]
\[a \quad a \quad a: \quad a \quad a: \quad a \quad a\]

\[4V \text{ system} \quad 4V+4L \quad 4V+4L \quad 4V+4N \quad \text{Zapotec (Lachixio)}\]
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.

\[
\begin{array}{cccc}
i & u & i & i \\
e & o & e & o \\
a & a & a & a \\
\end{array}
\]

Zapotec (Yatzachi)  Zapotec (Villa Alta)

The languages with the leftmost pattern are: Tarahumara\(^1,2\), Pómaro Nahual, Zapotec (Juárez, Ixtlán, Yalalag, Guevea, Isthmus\(^1\)), Tequistlatec Chontal\(^1,2\), Chortí, Tzotzil, Tzeltal, Tojolabal, Chuj, Jalalec, Kanjobal, and Boruca.

Plain vowels may have corresponding lengthened or nasalized counterparts.

\[
\begin{array}{cccc}
i & u & i & u: i & u & i & j & u \\
e & o & e: o: e & o & e & o & e \oslash & o \oslash \\
a & a & a & a & a & a & a & a \\
\end{array}
\]

5V + 5L  5V + 5G  5V + 5N

5V + 5L: Pochutec, Paipai\(^2\), Totonac (Xicotepec), Tepehua (Teachichileco), Huamelutec Chontal, Huastec (Veracruz, Potosí), Yucatec\(^2\), Acatec\(^1,2\), Tectitec, Mam, Aguacatec, Ixí\(^1,2,3\), Kekchi, Pocomchi\(^1,2\), Pocomam, Uspacec, Quiche\(^2,3\), Sacapulco, Pipacapeño, Tzutujil\(^1,2\), Guatuso, Cuna

5V + 5G: Yaqui\(^1\), Mayo

5V + 5N: Ixcatec, Western Popoloc\(^1\), Eastern Popoloc, Chocho, Mazatec (Soyaltepec), Mixtec (Acatalán, Mixtepec, Alacatlazala, Molinos, Ocotepec\(^2\), Jicaltepec), Cuicatec\(^2\), Garifuna

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

\[
\begin{array}{cccc}
i & i & u & i: i \\
i & u & i & u \\
a & a & a & a \\
\end{array}
\]

Papago,  Huichol\(^1\)  Cora\(^1\)

Northern Tepehua\(^1\)

\[
\begin{array}{cccc}
i & i & i & i \\
\oslash & e & o & e \\
\oslash & a & a & a \\
\end{array}
\]

Huave  Central Pame  Mazatec (Jalapa)

The following languages have asymmetrical sets.

5V + 4L:  5V + 3N:

\[
\begin{array}{cccc}
i & u & i: i \\
e & o & e: e \\
a & a & a & a \\
\end{array}
\]

Nahuatl (Zongolica)  Chatino (Tataltepec\(^1\))
Native Middle American Languages

5V+4N:

\[
\begin{align*}
\text{Mixtec} & : \quad i \quad u \quad i \quad u \quad i \quad u \\
\text{Mixtec} & : \quad e \quad o \quad e \quad o \quad e \quad o \\
\text{Chatino} & : \quad \text{a} \quad \text{a} \quad \text{a} \quad \text{a} \\
\text{(Huahuapan)} & \quad \text{a} \\
\text{(Silacayoapan)} & \quad \text{a} \\
\text{(Yaitepec)} & \quad \text{a}
\end{align*}
\]

Tlapanec\(^1\) has both length and nasalization contrasts.

5V+5N+20L:

\[
\begin{align*}
\text{Copalá Trique} & : \quad i \quad u \quad i: \quad u: \quad j \quad u: \quad j: \\
\text{Copalá Trique} & : \quad e \quad o \quad e: \quad o: \quad \varepsilon \quad \varrho: \quad \varepsilon \quad \varrho:
\end{align*}
\]

2.3.2.4. Six-Vowel Systems

The leftmost pattern below represents the most common one for six-vowel systems, but /\varepsilon/ or /\varrho/ 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 [\lambda], so that it is the feature of centrality that becomes important here.

\[
\begin{align*}
\text{Somiel Mixtec} & : \quad i \quad i \quad u \quad i \quad i \quad u \\
\text{Somiel Mixtec} & : \quad e \quad o \quad e \quad o: \quad e \quad o \quad e \quad o 
\end{align*}
\]

6V:

\[
\begin{align*}
\text{Cuitlatec}^1, & \text{ Tarasco}^1\text{-}2, \text{ Zapotec (Tlacochahuaya, Guelavia}^1, \text{ Chichicapán), Zoque (Copainalá, León, Chimilapa), Chol}^1, \text{ Chontal, Cakchiquel}^1, \text{ Xinca}^2, \text{ Tol} \\
\text{6V+6L:} & \text{ Sierra Popoluca, Sayula Popoluca, Oluta Popoluca, Lacandón, Mopán} \\
\text{6V+6N:} & \text{ South Pame, Mixtec (Dixi}^3, \text{ Peñoles, Jamiltepec, Colorado, Chayuco)
\end{align*}
\]

Somewhat different systems are also observed:

\[
\begin{align*}
\text{Zapotec (Choapan)} & : \quad i \quad u \quad i \quad u \\
\text{Zapotec (Mitla}^2, \text{ Quiroquiti) & : \quad e \quad o \\
\text{Zapotec (Ayoquesco)} & : \quad \varepsilon \quad \varepsilon \quad \varepsilon
\end{align*}
\]

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:
Asymmetrical patterns are as follows:

6V+5L:

\[
\begin{align*}
i & \quad \hat{i} \\
e & \quad \hat{o} \\
a & \quad \hat{a}
\end{align*}
\]

Izta₂

6V+5N:

\[
\begin{align*}
i & \quad \hat{i} \\
e & \quad \hat{o} \\
a & \quad \hat{a}
\end{align*}
\]

Mixtec (El Grande)  Mixtec (Coatzospán)

6V+4N:

\[
\begin{align*}
i & \quad \hat{i} \\
e & \quad \hat{o}
\end{align*}
\]

Mixtec (Chalcatongo)

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

6V+6N+12L:

\[
\begin{align*}
i & \quad \hat{i} \\
e & \quad \hat{o} \\
a & \quad \hat{a}
\end{align*}
\]

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:

\[
\begin{align*}
i & \quad \hat{i} \\
e & \quad \hat{o} \\
a & \quad \hat{a}
\end{align*}
\]

Matlatzinca  Zapotec (Rincón)  Zapotec (Albarradas)

Seven-vowel systems with length are attested in only two languages.
7V+7L:

\[
\begin{align*}
i & \quad i \quad u \quad i: \quad u: \\
e & \quad \alpha & \quad e: \quad \alpha: \\
a & \quad \alpha & \quad a: \quad \alpha:
\end{align*}
\]

Ocuiltec  Tlahuitoltepec Mixe

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

7V+5N:

\[
\begin{align*}
i & \quad i \quad u \quad i \quad u \quad i \quad u \quad i \quad u \\
e & \quad \alpha \quad e \quad \alpha \quad e \quad \alpha \quad e \quad \alpha \\
e/\varepsilon & \quad \varepsilon/\varepsilon \quad \varepsilon & \quad e \quad \varepsilon \quad \varepsilon \\
a & \quad a & \quad a & \quad a & \quad a
\end{align*}
\]

Amuzgo (San Pedro), Cabécar, Bribri, Térraba

Amuzgo (San Pedro), Cabécar, Bribri, Térraba

7V+6N:

\[
\begin{align*}
i & \quad i \quad i \quad u \quad j \quad j \quad u \\
e & \quad \alpha \quad e \quad \alpha \quad e \quad \alpha \quad e \quad \alpha
\end{align*}
\]

Trique (Chichahuaxtla)

7V+7N:

\[
\begin{align*}
i & \quad j & \quad u \quad j \quad u \quad j \quad u \quad j \quad u \\
e & \quad \alpha \quad e \quad \alpha \quad e \quad \alpha \quad e \quad \alpha
\end{align*}
\]

Chichimec, Chinantec (Palantla, Bocotá, Tepetotutla, Tlacoatzintepec, Sochiapan)

Chichimec, Chinantec (Palantla, Bocotá, Tepetotutla, Tlacoatzintepec, Sochiapan)

Cakchiquel (Comalapa) has the following system, which is regarded as

7V+5L:

\[
\begin{align*}
i & \quad e \quad a \quad o \quad u \quad i \quad e \quad u \quad o
\end{align*}
\]

short: i, e, a, o, u; 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:

\[
\begin{align*}
i & \quad u \quad j \quad u \\
i & \quad u \quad j \quad u \\
e & \quad \varepsilon \quad \varepsilon \quad \varepsilon
\end{align*}
\]

Teribe

Teribe
8V+7N:
\[
\begin{array}{c}
i \quad i \quad u \quad j \quad \ddot{u} \\
e \quad \ddot{e} \quad \ddot{o} \quad \ddot{a} \quad \ddot{u} \\
a \quad \ddot{a} \quad \ddot{a}
\end{array}
\]

Guaymi

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

8V+7N+L:
\[
\begin{array}{c}
i \quad i \quad u \quad i \quad u \\
e \quad \ddot{e} \quad o \quad e \quad o \\
a \quad \ddot{a} \quad \ddot{a}
\end{array}
\]

Chinantec (Comaltepec)

Note that /æ/ becomes higher when nasalized.

8V+8N+L:
\[
\begin{array}{c}
i \quad \ddot{u} \quad i \quad u \quad i \quad u \\
e \quad \ddot{e} \quad o \quad e \quad o \\
a \quad a \quad a
\end{array}
\]

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 Mixe. Long vowels have corresponding oral vowels.

9V+9L:
\[
\begin{array}{c}
i \quad i \quad u \quad i \quad u \\
e \quad o \quad \ddot{a} \quad \ddot{a} \quad o \quad \ddot{a} \\
a \quad \ddot{a} \quad \ddot{a} \quad \ddot{a}
\end{array}
\]

Mixe (Totontepec)¹

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

9V+3N:
\[
\begin{array}{c}
i \quad u \quad j \quad u \\
e \quad \ddot{a} \quad \ddot{a} \\
\end{array}
\]

Otomí (Temoayan)

9V+4N:
\[
\begin{array}{c}
i \quad i \quad i \quad u \quad j \quad u \\
e \quad o \quad e \quad \ddot{a} \quad \ddot{a} \\
\end{array}
\]

Otomí (Tenango, Sierra) Otomí (Mezquital)¹
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 Tepehuan*, Cuitlatec', Chichimec', Boruca, Cabécar, Térraba (accent), Teribe, Guaymi, Bocotá
1, glide: Ocuitect

Two tones plus combinations:
1, 2, 12: Kiliwa', Central Pame, South Pame, Mazahua, Mixtec (Coatzospán), Zapotec (Cajonos, Tlacochahuaya)
1, 2, 21: Otomi (Mezquital', Temoayan, Tenango), Zapotec (Guevea, Isthmus')
1, 2, 12, 21: Otomi (Sierra), Bribri'

Three tones:
1, 2, 3: *Ixcatec, Mixtec (Acatlán, Huajuapan, Silacayoapan, Alacatlazala, Ayutla,

Three tones plus combinations:
1, 2, 3, 13: Mixtec (*Dixui*, 12, 13, 21, 23, 32, 31 on vowel geminates)
1, 2, 3, 23: Zapotec (Yalalag)
1, 2, 3, 23, ?: Mazatec (Jalapa)
1, 2, 3, 13, 31 : Zapotec (Yatee, Juarez: rising, falling)
1, 2, 3, 12, 21, 23, 31, ?: Zapotec (Choapan)
1, 2, 3, 12, 21, 32: Chocho (high-falling, mid-rising, low-rising)
1, 2, 3, 13, 21, 32: Amuzgo (Xochistlahuaca)
1, 2, 3, 13, 31, 32: Chinantec (Palantla)
1, 2, 3, 12, 13, 32, 31: Chinantec (Comaltepec)
1, 2, 3, 23, 21, 31, 32+ accent: Chinantec (Quioquepec)
1, 2, 3, 13, 23, 31, 32: Mixtec (Mixtepec)
1, 2, 3, 13, 21, 32: Chinantec (Sochiapan)
1, 2, 3, 12, 21, 23, 31, 32: Chinantec (Tepetotutla)
1, 2, 3, 12, 13, 21, 23, 31, 32, 323: Tlapanec
1, 2, 3, 12, 13, 21, 31, 32, 132, 312, 323 ?: *Western Popoloc*

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 (Yaitpec)
1, 2, 3, 4, 12, 21, 23, 24, 31, 32, 34, 41, 42, 43: Mazatec (Soyaltepec)
1, 2, 3, 4, 13, 14, 21, 23, 24, 32, 34, 43, 42, 424, 423: Mazatec (Huautla)
1, 2, 3, 4, 11, 14, 21, 24, 31, 34, 41, 42, 214, 314, 414, 424: Mazatec (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 (Atatlaha)
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 (Chichahuaxtl)

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 (Quiquikian)
(high, low, mid-rising, low-rising)
21, 23, 2: Zapotec (Albarradas)
(rising, falling, low)
2, 3, 21, 32, 34: Zapotec (Chichicapan)
(high, low, high-rising, low-falling, high-falling)
2, 4, 21, 32, 43, 23, 45: Chatino (Tataltepec³)
3, 4, 5, 21, 32, 34, 35, 53: Trique (Copalá)
1, 3, 5, 12, 34, 35, 31, 53: Amuzgo (San Pedro³)

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 Bartolomé 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.

\[ \text{kudu} \quad \text{"devil"} \quad \text{kudu} \quad \text{"stone"} \]
\[ \text{tiki} \quad \text{"arrow"} \quad \text{tiki} \quad \text{"rubber"} \quad \text{[MANRIQUE C. 1967: 334]} \]

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 \( \text{vēēesko} \) “to gather,” \( \text{vēēesko}^{13} \) "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 \( \text{nīl wi} \) "people" change according to the tone patterns of preceding words.

\[ \text{nīl wi} \quad \text{"people"} \]
\[ \text{dūwa nīl wi} \quad \text{"The people are falling."} \]
\[ \text{dēkū nīl wi} \quad \text{"The people are sitting."} \]

Two Mixtecan languages have been reported to have terraced-tone systems. The downstepping terraced system with two levels occurs in Coatzospan 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:

\[
\begin{align*}
\text{p} & \quad \text{t} & \quad \text{c} & \quad \text{k} & \quad \text{q} \\
\text{s} & \quad \text{ʃ} & \quad \text{h} \\
\text{m} & \quad \text{n} \\
\text{l} & \quad \text{r} \\
\text{w} & \quad \text{y}
\end{align*}
\]

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:

\[ /p^h \ t^h \ c^h \ ch^h \ k^h/ : \text{Tarascan}^1 \ (\text{Ichupio}) \]
\[ /p^h \ t^h \ k^h \ k^h/ : \text{Tarascan}^2 \ (\text{San Jerónimo}) \]
\[ /p^h \ t^h \ c^h \ k^h/ : \text{Tol} \]
\[ /t^h \ k^h/ : \text{Térraba lacks } /p^h/ \]
\[ /p^h \ t^h \ k^h/ : \text{Teribe} \]

### 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 Chichimec\(^1\), Trique (Chicahuaxtla), and Zapotecan. Chichimec\(^1\) 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/.

\[ /β \ δ \ y/ \ : \text{Cuitlatec}^1 \ \text{and } /δ/ \ of \text{Guaymi} \text{are fricativized stops. If these 2 languages are eliminated, only 7 languages (Tarahumara}^1, \text{Cora}^2, \text{Huichol}^1, \text{Paipai}^2, \text{Huastec (Veracruz), Térraba and Teribe) can be said to have fricative(s), but they are limited to only one or two. Therefore, we can conclude that Native Middle American languages, with the exception of the Otomanguean group, do not develop a voiced fricative series.} \]

### 3.1.1.6. Postvelar or Uvular Stop /q/

/q/ is attested in Paipai\(^2\), Kilia\(^2\), Cocopa\(^2\), Totonac, Tepehua, Central Pame, and Highland Mayan. Cocopa\(^2\) has in addition a labialized uvular /q\(^\text{v}/, and Huehuetla Tepehua and Highland Mayan have a glottalized counterpart /q\(^\text{h}/

(Map 5).
3.1.1.7. Retroflexed Consonants

Retroflexion is found in both sibilants and affricates.

$ : Seri¹, Mazatec (Chiquihuitlán), Mixtec (Mixtepec), Sayula Popoluca
$( : Zapotec (Yatee, Albaradas, Chichicapán, Ayoquesco, Yalalag, Zoogocho, Yatzachi, Cajonos, Guelavia¹, Juárez)
$ : Cocopa², Papago, Xinca²
$ : Huichol¹
$ $ : Mazatec (Soaltepec)
$ $ $ : Eastern Popoloc, Tlacoyalco Popoloc, Mazatec (Huautla)
$ $ $ $ : Western Popoloc¹, Chocho, Trique(Copalá)
$ $ $ $ $ : Jacaltec, Kanjobal, Acatéc¹-², Tectitec, Mam, Aguacatec, Ixil¹-³
$ $ $ $ $ $ : Ixil¹ (Chajul)

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

3.1.1.8. Interdental Sibilant /$/

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

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

3.1.1.9. /$/ or /$/

/$/ and /$/ never co-occur and have areally interesting distributions.

/$/ : Nahuatl (Zongolica), Otomí (Mezquital¹), Zapotec (Mitla², Lachixio), Chinantec (Lealao, Tepetotutla, Quioctepac), Huamelultec, Tequistlatec¹-², Térraba
/$/ : Seri¹, Otomí (Tenango), Tlapapec¹, Tlacoyalco Popoloc, Chocho, Ixcatec, Mixtec (Peñoles), Chinantec (Palantla, Sochiapan), Guatuso

Although at first blush /$/ and /$/ 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 /$/ Contrasting with Glottal Fricative /$/

Otomí (Mezquital¹, Tenango), Mayan (Jacaltec, Kanjobal, Chuj, Kekchí, Pocomchí¹-², Pocomam, Quiche²)

The contrast of /$/ vs. /$/ is found in two Otomian languages and in northern
Native Middle American Languages

Highland Guatemalan languages.

3.1.1.11. Uvular Fricative /x/
/X/ Zapotec (Rincón)
/X X/ Zapotec (Cajonos, Zoogocho)
/X X\/ Seri1, Zapotec (Yalalag, Yatzachi)

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

3.1.1.12. Lateral Affricate /χ/:
/χ/ is found in Nahuatl languages, Totonac, and Tequistlatec.

3.1.1.13. Voiceless Sonorants

3.1.1.13.1. Voiceless Lateral /\}/
\}/ Nahuatl (Zongolica), Paipai2, Cocopa2, Seri1, Cuitlatec1, Totonac, Tepehua (Huautla), Tequistlatec1-2, Huamelultec, Xinca2

3.1.1.13.2. Voiceless Nasal /\n/
\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 /\n/ and Palatalized Nasal /\nY/(/\nY/)
The following is the list of languages having /\n/ and/or /\n/.
/\n/: Central Pame, Zapotec (Isthmus2), Chinantec (Comaltepec, Lealao, Tepetotutla, Palantla, Sochiapan, Tlacoyalco Tepetutla), Tequistlatec2, Zoque (León, Chimalapa), Mixe (Coatlan, Paraíso, Totontepec1), Chuj, Jicalteco, Sacapaltac, Tol, Misquitn, Suma, Rama, Cacéar, Guatuso
/\n/: Papago, Northern Tepehuán1, Corá1, Pochute, Paipai2, Kiliwa2, Cocopa2, Otomí (Temoałan, Mezquital1), Mazahuia, Ixcatec, Tlacoyalco Popoloc, Western Popoloc1, Mazatec (Chiquipitiún, Díaz, Huautla, Soyaltepec), Amezgo (San Pedro1, Xochistlahuaca), Mixtec (Acatlán, Haujaapan, Silacayoapan, Mixtepec, Alacatlazala, Ayutla2, Ocotépec2, Atatlahuca, El Grande, Chalcatongo, Díaz2, Peñoles, Coatzospan, Jamiletpec, Colorado, Chayuco, Jicaltepec), Zapotec (Quioquitani, Lachixio, Chichicapán, Isthmus1-2), Chatino (Tataltepec1), Huamelulte Chontal, Chol1 (Tila)
/\n\n/: Mixtec (Molinos), Chinantec (Quíotepec), Tequistlatec1, Zoque (Copainalá), Sierra Popoluca, Boruca, Térabasa, Teribe, Guaymi

/\n/ extends eastward centering around Chinantecan, whereas /\n/ 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.
/t\/: Northern Tepehuan, Cora, Ixcatec, Mazatec, Mixtec, Zapotec, Chatino,
Northern Tepehuan, Cora, Ixcatec, Mazatec, Mixtec, Zapotec, Chatino
/Tataltepec, Zoque (Copainalá), Chol
/d\/: Northern Tepehuan, Ixcatec, Amuzgo (San Pedro), Zapotec, Chatino
/Tataltepec, Zoque (Copainalá), Sierra Popoluca
/\d\/: Amuzgo (Xochistlahuaca; n\d\), Mixtec (Ayutla, Jamiltepec, Colorado, Chayuco, Jicaltepec)
/\/: Cora ( Jesús María)
/k\/: Amuzgo (Xochistlahuaca), Mixtec (Ayutla\d), Zapotec (Lachixio), Tectitec, Mam, Aguacatec, Sacapulcote, Sipacapeño
/s\/: Mixtec (Ayutla\d)
/h\/: Chatino (Tataltepec\d)
/\d\/: Mixtec (Coatzospan)
/\/: Cocopa\d, Central Pame, Chatino (Tataltepec\d), Huamelultec
/l\/: Cocopa\d, Huamelultec
/\n\/: Cora\d, Paipai\d, Cocopa\d, Amuzgo (Xochistlahuaca), Chatino (Tataltepec\d)
/t\/: 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 /t\/ crosses a genetic boundary is Chiapas, which includes Zoque and Chol. /\d\/ is /t\/'s voiced cognate here. /\n\d\/ may turn out to be an areal feature of southwestern Oaxaca. /k\/: 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.

/p\w/: Cora\d, Ixiil\d
/b\w/: Mayo, Nahuatl (Jalupa)
/k\w/: Cocopa\d, Seri\d, Cora\d, Huichol\d, Nahuatl (all except Pajapan, Jalupa and Pochute), Cuitlatec\d, Tarasco\d, Matlatzinca, Ocuitlec, Otomi (Temoayan), Mazahua, Mazatec (Jalapa), Mixtec (all), Amuzgo (Xochistlahuaca), Zapotec (Juárez, Ixtlán, Yatzachi, Yalalag, Albaradas, Mixteca, Tlacochahuaya, Chichicapan, Quioquitani, Ayoquesco, Lachixio), Chatino (Tataltepec\d), Huastec, Ixil\d, Cuna
/g\w/: Mazatec (Jalapa de Díaz), Zapotec (Juárez, Ixtlán, Yatzachi, Yalalag, Mitla\d, Tlacochahuaya, Chichicapan, Quioquitani, Ayoquesco), Chatino (Tataltepec\d)
/g\n\w/: Mixtec (Ayutla\d, Peñoles, Coatzospan)
/q\w/: Cocopa
/h\w/: Kiliwa\d, Chatino (Tataltepec\d)
/x\w/: Cocopa\d, Mixtec (Diuxi\d)
/X\w/: Seri\d, Zapotec (Yatzachi, Yalalag)
/k\w/ occurs in most Uto-Aztecan and Otomanguean languages. Huastec and Tarasco may have acquired it from neighboring languages. /g\w/ is /k\w/’s voiced
cognate.

3.1.1.17. Coarticulation

A coarticulation phoneme is reported only for Cabécar and Bribrí. 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, Tarahumar2, Cora1, Cuitlatec1,2, Cocopa2, Kiliwa2, All Otomanguean, Huave, Yucatec, Uspantec, Tzotzil (San Bartoló), Boruca, Guatuso, Cabécar, Bribrí, Térraba, Teribe, Guaymí, Bocotá

3.1.1.19. Nasalized Vowels

Otomanguean except Matlatzinca, Ocuiltec, Zapotecan
Chibchan (Cabécar, Bribrí, 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 /kʷ/ [CAMPBELL 1979: 914]. The following languages are reported to have no bilabial stop.

Ixcaté, Popoloc, Mazatec (Chiquihuitlan, Jalapa), Amuzgo (San Pedro1, rare), Mixtec (Huatjapan, Alacatlazala, Chalcatongo, Díuxí, 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, Serí, 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, Coatsatlán, Cuamelco, Zacapoaxtla, Pajapan, Jalupa, Pipil, Pochuteq), Tarasco1,2, Huave, Garífuna, Miskitu, Sumu, Rama, Guatuso, Térraba, Teribe, Guaymí, Bocotá, Cuna

Tarasco, Huave and Garífuna are the only languages other than the Nahuan and Chibchan groups in which the absence of /ʔ/ is attested.
3.1.2.4. No Velar, Uvular, or Glottal Fricatives: /x/ 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 (Huajuapan, Coatzospan, Peñoles, Mixtepec, Jicaltepec, Chayuco), Zapotec (Juárez, Yatee, Albarrada, Guelavia1, Chichicapan, Ayoquesco, Choapan, Tlacochahuaya, Guavea, 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 (Coatlan, Paraíso, Totontepec1)

3.1.2.8. No Glides /w y/

Zapotec (Choapan), Chinantec (Comaltepec), Guatuso, Cabécar, Bribri1, Térraba, Guaymi, 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 Narrey and by Maddieson for consonants and by Crothers for vowels.

Narrey 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
Native Middle American Languages

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 Popoloc has 3 affricates but only 2 stops. Its system is /t c č č k ʔ/. Eastern Popoloc is considered to have the same system, although it does have /p/, albeit rarely.

The voiceless stop series of Guaymi and Bocotá is /t č k/, but both languages also have a voiced series. Guaymi has /b d 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 /č/. The probability of encountering a language having /č/ is about 27% (20/75). My data reveal that 12 languages are restricted to /č/, whereas 15 languages have only /č/; these numbers do not seem to support Narty'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 d 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, Guaymi 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 state-
ment.

<table>
<thead>
<tr>
<th>Number of phonemes</th>
<th>Number of languages</th>
<th>Number of languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
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<tr>
<td>12</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>16</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

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. Xinca\(^2\) has 3 plain, but 4 glot-
talized 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.

<table>
<thead>
<tr>
<th>Mixtecan languages</th>
<th>Primary stops</th>
<th>Prenasalized stops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acatlán</td>
<td>4 (excluding /k\textsuperscript{w}/)</td>
<td>5</td>
</tr>
<tr>
<td>Silacayoapan</td>
<td>4 (excluding /k\textsuperscript{w}/)</td>
<td>4</td>
</tr>
<tr>
<td>Mixtepec</td>
<td>5</td>
<td>5 (excluding /\textsuperscript{g}\textsuperscript{w}/)</td>
</tr>
<tr>
<td>Ayutla(^2)</td>
<td>3 (excluding /\textsuperscript{v} k\textsuperscript{w}/)</td>
<td>3 (excluding /\textsuperscript{d}\textsuperscript{v} \textsuperscript{g}\textsuperscript{w}/)</td>
</tr>
<tr>
<td>Atatlahuca</td>
<td>4 (excluding /k\textsuperscript{w}/)</td>
<td>4</td>
</tr>
<tr>
<td>El Grande</td>
<td>4 (excluding /k\textsuperscript{w}/)</td>
<td>4</td>
</tr>
<tr>
<td>Pe\’ñoles</td>
<td>3 (excluding k\textsuperscript{w}/)</td>
<td>4 (excluding /\textsuperscript{g}\textsuperscript{w}/)</td>
</tr>
<tr>
<td>Chayuco</td>
<td>3 (excluding /\textsuperscript{v} k\textsuperscript{w}/)</td>
<td>3 (excluding /\textsuperscript{d}\textsuperscript{v}/)</td>
</tr>
</tbody>
</table>

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

/\textsuperscript{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 /s/ 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\(^1\)  \(\dot{c} \ h / \beta \ \delta \ \gamma\)
Mixtec (Huajuapan)  \(s \ \dot{s} / \beta \ \dot{z}\)
Mixtec (Coatzospan)  \(s \ \dot{s} / \beta \ \delta \ \delta'\)

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 (/f\(W\ s\ t \dot{s} x x x^w/\), in which /x\(W/ may be regarded as a secondary fricative) but only 5 stops /p t k k^w 2/.

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

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>15</td>
<td>1</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>18</td>
<td>51</td>
<td>3</td>
<td>54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>55</td>
<td>6</td>
<td>61</td>
<td>19</td>
<td>(1)</td>
<td>15</td>
<td>34</td>
</tr>
<tr>
<td>4</td>
<td>17</td>
<td>27</td>
<td>44</td>
<td>10</td>
<td>(2)</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>19</td>
<td>22</td>
<td>0</td>
<td>(2)</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>8</td>
<td>9</td>
<td>0</td>
<td>(1)</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>(3)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>(0)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(0)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

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, Bribri 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 ň] are interpreted phonetically as nasal variants of /b d g/ before nasal vowels. It should be noted that a closely related language, Bribri, is reported to have no nasals. Both Cabécar and Bribri, 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>
<thead>
<tr>
<th>Table 25. Number of nasals and number of languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of nasals</td>
</tr>
<tr>
<td>Number of languages</td>
</tr>
</tbody>
</table>

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 /ɾ r/ 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 /l/, 
Seri /\l/, and Zongolica Nahuatl /\k/.

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 pro-
duced 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 excep-
tion 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 state-
ment, 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 /e/. 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
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 e a/ + /o/ or /u/

 Languages with five vowels: 78
 /i e a o u/
 /i e a o/ + central /i/ or /a/ or /u/  
 /i e a o/ + back /i/  
 /i e a o/ + front /ü/ or /e/  
 /i e a u/ + central /i/ or /a/  
 /i e a u/ + back /i/  
 /i e a u/ + front /i/  
 /i a o u/ + central /i/  
 /i a o u/ + front /æ/  

 Languages with six vowels: 40
 /i e a o u/ + central /i/ or /a/  
 /i e a o u/ + back /i/  
 /i e a o u/ + front /e/ or /æ/  
 /i a o u/ + back /i e/ or front /e æ/  
 /i e a u/ + /æ æ/  

 Languages with seven vowels: 18
 /i e a o u/ + central /i/ + /a/ or /æ/  
 /i e a o u/ + back /i/  
 /i e a o u/ + front /i æ/  
 /i e a o u/ + front /e/ or /æ/ or /i/ + back /a/ or /u/  
 /i e a o u/ + central /a/ + back /a/  
 /i e a u/ + /i a/ or /i u/  

 Languages with eight vowels: 4
 /i e a o u/ + front /æ/ or /ü/ + back /i e/  
 /i e a o u/ + front /i/ + back /a u/  
 /i e a o u/ + back /i e æ/  

 Languages with nine vowels: 6
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.

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 Otomi has two central vowels, but both these two are mid /a a/.

7) The number of vowels in a column of interior vowels cannot exceed the number in the front or back columns (Crothers 11).

By definition interior vowels include back unrounded, front rounded and non-low central or centralized vowels. The maximum number of interior vowels in my data is three (Quiotepec Chinantec with /o e a o u ù ê/). Southeastern Tepehuan has /i a o u ù ê/, 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:
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Front Back

Papago and Northern Tepehuan with /i a o u i/ 1 2
Southern Tepehuan with /i a o u i ê/ 1 2
Tlahuitoltepec Mixe with /i e a ò o u ø/ 2 3
Guaymi with /i e a ò o u ë/ 2 3

9) There is a tendency for high and low vowels of a short vowel system to be more central than the corresponding long vowels (Crothers 13).

I 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 ê æ u

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 (Yaitpec) /ã/ is missing rather than mid /ê ê/. In Trique (Copalá) and Amuzgo (San Pedro1, Xochistlahuaca) it is high /i u/ that are missing. Mixtec (El Grande) lacks /ê/, having /ø/ instead, whereas Mixtec (Coatzospan) lacks/ø/, but has /ê/.

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 Nahuan languages, 4 to Zapotecan ones, and the remaining 3 to Seri, Huautla 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 Nahuan varieties, which have four-vowel systems, while Southeastern Tepehuan and Cora 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 [JOSERAND 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. Cholan 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 Narrey [1979] and Maddieson [1980a, 1984]. Turning to vowel system universals, I have evaluated 12 of Crothers' claims [1978].
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: \[2 \times 20\]
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 \times 5). In this chapter I will discuss the various indigenous systems, which show interesting typological variety and areal distribution. At
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, unit(3) × base(10) + unit(3). In German, however, 33 is expressed in terms of unit + unit × base, drei-und-drei-ig (3 + 3 × 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 (B¹), 100 (B²), 1000 (B³) in the decimal and 20 (B¹), 400 (B²), 8000 (B³) in the vigesimal system. B¹ 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.

<table>
<thead>
<tr>
<th></th>
<th>20</th>
<th>30</th>
<th>35</th>
<th>38</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>. .</td>
<td>. .</td>
<td>. .</td>
<td>. .</td>
<td>. .</td>
</tr>
<tr>
<td>2)</td>
<td>→</td>
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<td>→</td>
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<tr>
<td>3)</td>
<td>→</td>
<td>→</td>
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<td>→</td>
<td>→</td>
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<tr>
<td>4)</td>
<td>→</td>
<td>→</td>
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<td>→</td>
<td>→</td>
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<tr>
<td>5)</td>
<td>→</td>
<td>→</td>
<td>→</td>
<td>→</td>
<td>→</td>
</tr>
</tbody>
</table>

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:
$U = \{1...9\}, \quad B^1 = \{10\}, \quad B^2 = \{100\}$

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 Nm-n. For example, the numbers from one to nine are N₁₉.
   Example: N₁₉ = \{1...9\}

ix) Addition is expressed by the symbol /+/.
   Example: 18 = 10 + 8

x) Multiplication is expressed by /×/.
   Example: 40 = 2 × 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: N₁₀₁₉ = B¹ ± \{N₁₉\}
   This formula may be written as N₁₀₁₉ = B¹ + \{N₀₉\}, which introduces the symbol N₀. However, since N₀ 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 “N₁₀₁₉ = B¹ ± \{N₁₉\}” is the same as “N₁₀ = B¹, N₁₁₉ = B¹ + \{N₁₉\}.” However, when the concrete number word is nonexistent, I use the symbol /#/.
   Example: \{#,2,3,4\} × B² = \{B², 2 × B², 3 × B², 4 × B²\}

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 + \{N₁₉\}

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×/.
   Example: 4" = 8 (4 = gi’ik, 8 = gigi’ik),
   2 × 4 = 8 (2 = wóí, 4 = náií, 8 = wónaií)

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 ($2 \times 20$)." 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, $20 \times 2$ for 40, while coefficients are prefixed to 20 in Mesoamerica, for example, $2 \times 20$ 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
Native Middle American Languages

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}. Yatzachi 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 $3 \times 5 \times 20 +$ half, and in Tarahumara, where 150 is represented as $1 \times 100 +$ 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 Fernandeño, 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>
<thead>
<tr>
<th>Western Numic</th>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mono, N. Fork</td>
<td>šimu</td>
<td>wahai</td>
<td>pahi</td>
<td>wacikwi-t</td>
<td>maniki</td>
<td>navahi</td>
<td>dacwi</td>
<td>wościwi</td>
<td>gwanići-t</td>
</tr>
<tr>
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<td>šimu</td>
<td>wahai</td>
<td>pahi</td>
<td>wacikw</td>
<td>manuki</td>
<td>naapai</td>
<td>daceiwi</td>
<td>wościwi</td>
<td>wanić</td>
</tr>
<tr>
<td>Mono, Inyo</td>
<td>šiwi</td>
<td>wahai</td>
<td>pahi</td>
<td>waciniw</td>
<td>manigi</td>
<td>navai</td>
<td>tacwi</td>
<td>wościwi</td>
<td>wanići</td>
</tr>
<tr>
<td>Shikaviyam</td>
<td>šewi-te</td>
<td>wahai-pahi</td>
<td>wacuwidi-manogi-du</td>
<td>navai</td>
<td>dacuwidi-du</td>
<td>wościwi-du</td>
<td>wanići-t</td>
<td>šiwano</td>
<td></td>
</tr>
<tr>
<td>Northern Paiute</td>
<td>simi</td>
<td>waha</td>
<td>pahi</td>
<td>waci</td>
<td>manigi</td>
<td>naapahi</td>
<td>natakwi</td>
<td>namiwaci</td>
<td>simi-kadupi</td>
</tr>
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<td>pa'</td>
<td>wici</td>
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<td>kwanama-supli</td>
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<td>pa'</td>
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<td>suuk'ta'</td>
<td>lóeyom</td>
<td>pahom</td>
<td>lałoyom</td>
<td>čivot</td>
<td>navay</td>
<td>cag'</td>
<td>nanalt</td>
<td>pevt</td>
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</table>

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

Table 28. Numeral systems in Northern Uto-Aztecan

<table>
<thead>
<tr>
<th>Numeral Systems</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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<tbody>
<tr>
<td>11</td>
<td>amhaijiŋ ti čič</td>
<td>wo:m amhaijiŋa</td>
<td>nomnjinam amhaijiŋa</td>
<td>10+1</td>
<td>2×10</td>
<td>7×10</td>
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<td><strong>Serrano</strong> [Kroeber 1909:254]</td>
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<td>pahai</td>
<td>wač'kuvik</td>
<td>wa'wuč</td>
<td>ma'kuvik</td>
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<td>pu'pa haupk</td>
<td>pu'pa wör</td>
<td>pu'pa mahač</td>
<td>wohö wörmahač</td>
<td>pahi wörmahač</td>
<td>wača wörmahač</td>
<td>10+1</td>
<td>10+2</td>
<td>10+5</td>
<td>2×10</td>
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<td>wi'</td>
<td>pa'</td>
<td>wiču</td>
<td>namu-qwan-ani/namakwanon</td>
<td>qwan-supli/kwanama-supli</td>
<td>qon-wi'/kwanama-wi</td>
<td>qon-pa'/pitaba</td>
<td>qon-wiču(qon-wičwǐ)/dawiču</td>
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<td>wi'</td>
<td>pa'</td>
<td>wiču</td>
<td>namu-qwan-ani/namakwanon</td>
<td>qwan-supli/kwanama-supli</td>
<td>qon-wi'/kwanama-wi</td>
<td>qon-pa'/pitaba</td>
<td>qon-wiču(qon-wičwǐ)/dawiču</td>
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<td>supli</td>
<td>wi'</td>
<td>pa'</td>
<td>wiču</td>
<td>namu-qwan-ani/namakwanon</td>
<td>qwan-supli/kwanama-supli</td>
<td>qon-wi'/kwanama-wi</td>
<td>qon-pa'/pitaba</td>
<td>qon-wiču(qon-wičwǐ)/dawiču</td>
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<td>3×10</td>
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<td>6×10</td>
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</table>

Hopi: civot  
Papago: hitasp  
Pima Bajo: utaspo  
Northern Tepehuan: taama  
Tepecano: iš-tumaːm

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-busáni 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: maamáka vo 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-vušt'áma  
Tarahumara: ki-makói
Eudeve: ves-macóí
Ten is denoted by $2 \times 5$ only in Yaqui and Mayo.

Yaqui, Mayo: woh-mámmíni $2 \times 5$

The quinary system is found in southern Uto-Aztecan.

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 Nahuat, but the coefficients prefixed to 100 are indigenous. In Yaqui, Mayo and Cora, on the other hand, 100 is expressed as $5 \times 20$, based on the vigesimal principle (Map 9).

As is seen above, some characteristics observed in the northern branch of Uto-Aztecan 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-Aztecan 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 (syen:ta < 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-Aztecan numeral system, it had to have been either decimal or vigesimal above 20. If the proto system had been decimal, Uto-Aztecan 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-Aztecan, 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-Aztecan 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-Aztecan 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-Aztecan languages conserve the proto system. Therefore we cannot definitively say that proto Uto-Aztecan 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 Nahuan, Cora, Huichol, and that the duplicative method such as $2 \times 3$ for 6 and $2 \times 4$ 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 Otomi 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, ju'n 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.
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’a pámef (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, tenspnta, 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 Otomi 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.

**Otomi:**

1 n’da 6 ‘da-to 1×20 ‘do-te
2 yoho 7 yo-to 2×20 yo-te
3 hyu 8 hya-to 3×20 hya-te
4 goho 9 gi-to 4×20 goho-‘do-te
5 ki-t’a 10 ‘dae-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 ŋi-n-cho 3×20 ŋhi-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/roșu 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. tïi 7. tik-tï 5+2
3. hñju’ 8. tig-nyiu 5+3
4. pyë 9. na-ühwë -1+10
5. šuthunt 10. sthû

*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 nyiu found in 6 and 8 are different from the morphemes for 1 and 3, but tïi 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(mw’), 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-/tsa- 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 ('de') 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 Otomanguean, 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. Otomanguean 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 Otomanguean 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 Otomanguean 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.)
- ùr’i Chichimec
- te’e Pame
- $5 \times 20$ Zapotec, Chinantec

2) Native words $\times$ borrowed words (The borrowed Spanish word for 100 such as sye’onto, siénto, sye’ontu, siento, etc. is used as the base and is combined with a native coefficient)
- Otomi, Tlapanec, Ixcatec, Mixtec, Cucicatec, 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 *hulšluc* 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 *hulšluc* 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 *hunluhun* 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 Otomi and Totonac, which have the same 10+U order. Chicomuceltec 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'at*, *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. Kekchi replaces *may* with *k'at* 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'ín*; from 21 up only does *winik* serve as the base. The most unusual case is seen in Jacaltec, where 20 is *k'at* and then up to 40 *winax* is used; upward from 40 *k'at* is again used up to until 60, *winax* appears up to 80 and finally *k'at* reappears up to 99. Thus *k'at* and *winax* alternate. Either the *k'at* or *winaq* type is typically used after 21, but in Pocomché *k'at* and *winaq* are used alternately in every 20th interval as in Jacaltec (Maps 13, 14, 15, and 16).

The word for 80 is *muc' or muc* in Mam, Ixil and the Quiché group. Interestingly, *muc' or muc* is used differently depending on whether the language in question uses undercounting or overcounting. In Mam and Ixil *muc' becomes the base between 61 and 80 (overcounting), whereas in the Quiché group *muc' is used as the base between 80 and 99 (undercounting). In Classical Quiché and Cakchiquel *muc' was also used from 61 to 80 (overcounting), while in modern Quiché and Cakchiquel *muc' 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.

*muc' was used for 400, which was referred to as 5 × muc' in Classical Quiché and Cakchiquel. k'at and tuk were also used for the numbers multiplied by 5 as is shown below.

<table>
<thead>
<tr>
<th>Classical Mam</th>
<th>Classical Quiché</th>
<th>Classical Cakchiquel</th>
</tr>
</thead>
<tbody>
<tr>
<td>o-k'at = 5 × 20 = 100</td>
<td>o-kal</td>
<td>o-qal</td>
</tr>
<tr>
<td>o-tuk = 5 × 40 = 200</td>
<td>o-chuk</td>
<td>o-tuk</td>
</tr>
<tr>
<td>o-muc' = 5 × 80 = 400</td>
<td>o-mucx</td>
<td>o-much</td>
</tr>
</tbody>
</table>

[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 Kekchi 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 mehek vuš-toht-ik mak-mehck mak-uš-toht viš-tk-
3 to:tk to-doht-ik mak-to:tk mak-to-doht to:g-
4 mak-ta:šk taš-toht-ik mak-mahkc mak-taš-toht mahk-t-
5 mug-ö:šk mahk mak-mokš i:'pš mak-

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 taš-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 (huštukuhuko) = 2+3+5 (huštukuh-uhko), 8 (tukutuhko) = 3+5 (tuku-tuhko), 9 (taštutuhko) = 4+1+5 (taš-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-
interpret. 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 $5 \times 20$, $10 \times 20$, and $15 \times 20$, 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 $6 \times 20$, $7 \times 20$, and so forth do not exist. Instead, only the multiples of 100, such as $5 \times 20$, $10 \times 20$ and $15 \times 20$, 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 $5 \times 20$ 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 $k'ant$ 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, $5 \times 20$, so that the vigesimal system is not retained throughout. Among the Totonacan languages, Xicotépec Totonac uses *cien*, a borrowing from Spanish, for 100 [Reed 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 $5 \times 20$.

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 $5 \times 20$. As a result, it is not clear whether the intervals are counted according to the vigesimal method or whether the next base is $10 \times 20$.

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 $5 \times 20$ 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 $5^1 \times 2$ and $5^1 \times 3$, 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 Bribrí 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, Jacaltec 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 × 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 xu’n-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, muć’ or muć 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:

<table>
<thead>
<tr>
<th>Modern Cakchiquel</th>
<th>Classical Cakchiquel</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>oš-k’al</td>
</tr>
<tr>
<td>61</td>
<td>oš-k’al</td>
</tr>
<tr>
<td>80</td>
<td>xu-muć’</td>
</tr>
<tr>
<td>90</td>
<td>xu-muć’axux</td>
</tr>
</tbody>
</table>

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-Aztecan 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-Aztecan 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 Nahuan. 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-Aztecan languages in Middle America belong to the southern Uto-Aztecan group [cf. MILLER 1984], but Table 29 suggests that they should instead be classified into two groups, Sonoran and Aztecan. 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

<table>
<thead>
<tr>
<th></th>
<th>S/O/V</th>
<th>Pr/Po</th>
<th>GN/NG</th>
<th>AN/NA</th>
<th>PN/NP</th>
<th>DN/ND</th>
<th>QN/NQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Papago</td>
<td>(VSO)</td>
<td>Po/Pr</td>
<td>GN/N-j</td>
<td>G</td>
<td>AN</td>
<td>PN</td>
</tr>
<tr>
<td>3</td>
<td>Pima Bajo</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>4</td>
<td>Northern Tepehuan</td>
<td>VSO</td>
<td>Po</td>
<td>GN</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>5</td>
<td>Southern Tepehuan</td>
<td>VSO</td>
<td>Po</td>
<td>GN</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>6</td>
<td>Tarahumara</td>
<td>SOV</td>
<td>Po</td>
<td>GN-la</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>8</td>
<td>Yaqui</td>
<td>SOV</td>
<td>Po</td>
<td>G-ta N</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>9</td>
<td>Mayo</td>
<td>SOV</td>
<td>Po</td>
<td>G-ta N</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>10</td>
<td>Cora</td>
<td>VSO</td>
<td>Po</td>
<td>GN/N-ra G</td>
<td>PN</td>
<td>DN</td>
<td>QN</td>
</tr>
<tr>
<td>11</td>
<td>Huichol</td>
<td>SVO</td>
<td>Po</td>
<td>GN-ya</td>
<td>NA</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>12</td>
<td>Classical Nahuatl</td>
<td>SVO/VOs</td>
<td>Po/Pr</td>
<td>GN/NG</td>
<td>AN/NA</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>12</td>
<td>Tezococo Nahuatl</td>
<td>SVO</td>
<td>Po/Pr</td>
<td>NG/N de G</td>
<td>NA</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>12</td>
<td>Tetelcingo Nahuatl</td>
<td>SVO</td>
<td>Po/Pr</td>
<td>NG</td>
<td>NA</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>12</td>
<td>North Puebla Nahuatl</td>
<td>SVO/VEs</td>
<td>Po/Pr</td>
<td>NG</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>12</td>
<td>Huasteca Nahuatl</td>
<td>VSO</td>
<td>Po/Pr</td>
<td>NG</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>13</td>
<td>Michoacan Nahuatl</td>
<td>VSO</td>
<td>Po/Pr</td>
<td>GN/N de G</td>
<td>NA</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>14</td>
<td>Istmo Nahuatl</td>
<td>SVO</td>
<td>Po/Pr</td>
<td>NG</td>
<td>NA</td>
<td>PN</td>
<td>DN</td>
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<tr>
<td>15</td>
<td>Pipil</td>
<td>VOS</td>
<td>Po/Pr</td>
<td>NG</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>16</td>
<td>Cuitlatec</td>
<td>SVO</td>
<td>Pr</td>
<td>NG</td>
<td>AN</td>
<td>NP</td>
<td>DN</td>
</tr>
<tr>
<td>20</td>
<td>Seri</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>PN</td>
<td>ND</td>
</tr>
<tr>
<td>21</td>
<td>Tarasco</td>
<td>SVO</td>
<td>Po</td>
<td>NG-ri/-G-ri N</td>
<td>NA</td>
<td>PN/NP</td>
<td>DN</td>
</tr>
<tr>
<td>22</td>
<td>Totonac</td>
<td>SVO</td>
<td>Pr</td>
<td>NG/N ¿la G</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>24</td>
<td>Chichimec</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
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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. 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:

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<td>imá'</td>
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<td>3 sg.</td>
<td>šqúwá</td>
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<td>NA-</td>
</tr>
<tr>
<td>2 sg.</td>
<td>o-</td>
<td>-y-/hE-</td>
</tr>
<tr>
<td>3 sg.</td>
<td>i-</td>
<td>-w-/hU-</td>
</tr>
<tr>
<td>1 pl.</td>
<td>a+t</td>
<td>k\textsuperscript{\textregistered}is</td>
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<tr>
<td>2 pl.</td>
<td>o+t</td>
<td>±nu±nu±w-/his</td>
</tr>
<tr>
<td>3 pl.</td>
<td>i+t</td>
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[WATERHOUSE 1962, 1967] [ROYCE DE DENNIS 1982]

Plural formations:

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<td>yom</td>
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<tr>
<td>&quot;grandson&quot;</td>
<td>kón'í?</td>
<td>kón'í?</td>
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<tr>
<td>&quot;brother&quot;</td>
<td>tám</td>
<td>na-t'ampan (&quot;my brothers&quot;)</td>
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</table>

[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.

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</tbody>
</table>

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, Otomi 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 Jacaltec, 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, Jacaltec, Mam and Pocomché 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, Kekché, and Pocomché. 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.

Garifuna (Black Carib), an Arawakan language, is a VSO language. Arawakan languages are postpositional, but Garifuna also has a few prepositions derived from relational nouns. This is a well-known pathway for grammaticalization in Middle American linguistics. Garifuna 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, Miskitu 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>
<thead>
<tr>
<th>A</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>V[osv]OS : Kekchí, Pocomchí, Quiché, Tzutujil</td>
<td>V[sv]OS</td>
</tr>
<tr>
<td>SV[svo]O: Chontal, Chortí</td>
<td>SV[sv]O</td>
</tr>
<tr>
<td>V[osv]SO: Jacaltec, Mam, Aguacatec</td>
<td>V[sv]SO</td>
</tr>
<tr>
<td>V[svo]SO: Ixil</td>
<td>V[sv]SO</td>
</tr>
</tbody>
</table>

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.

\[
\begin{array}{llllll}
\text{ma} & \text{či} & \text{kub'} & t-b'iy'o'n & \text{šwa:n} & \text{ši:naq} \ [\text{ENGLAND 1983: 141}]
\end{array}
\]

\[
\begin{array}{llllll}
\text{REC} & \text{OBJ} & \text{DIR} & \text{(down)} & \text{SUBJ-hit} & \text{Juan man}
\end{array}
\]

"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 directionalss (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.

\[
\begin{array}{llllll}
k-u-kins-ik & \text{balum} & \text{winik} \ [\text{HOFLING 1984: 42}]
\end{array}
\]

\[
\begin{array}{llllll}
\text{HAB-SUBJ-kill-INCOMP} & \text{jaguar} & \text{man}
\end{array}
\]

"Man kills jaguars," or "Jaguars kill man."
Native Middle American Languages

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: acih 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: acih 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

<table>
<thead>
<tr>
<th>S/O/V</th>
<th>Pr/Po</th>
<th>GN/NG</th>
<th>AN/NA</th>
<th>PN/NP</th>
<th>DN/ND</th>
<th>QN/NQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>[3] Pima Bajo</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[6] Tarahumara</td>
<td>SOV</td>
<td>Po</td>
<td>GN-la</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[8] Yaqui</td>
<td>SOV</td>
<td>Po</td>
<td>G-ta N</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[20] Seri</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>PN</td>
<td>ND</td>
</tr>
<tr>
<td>[24] Chichimec</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>DN</td>
<td>QN</td>
</tr>
<tr>
<td>D14 Lenca</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>PN</td>
<td>ND</td>
</tr>
<tr>
<td>[80] Tol</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>PN</td>
<td>NQ</td>
</tr>
<tr>
<td>[81] Miskitu</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>NP/1</td>
<td>ND</td>
</tr>
<tr>
<td>[82] Sumu(Ulwa)</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>NP/1</td>
<td>ND/DN</td>
</tr>
<tr>
<td>[84] Rama</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>PN</td>
<td>ND</td>
</tr>
<tr>
<td>[85] Guatuso</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA/AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>S/O/V</td>
<td>Pr/Po</td>
<td>GN/NG</td>
<td>AN/NA</td>
<td>PN/NP</td>
<td>DN/ND</td>
<td>QN/NQ</td>
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<td>-------</td>
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<td>-------</td>
</tr>
<tr>
<td>[86] Boruca</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[87] Cabécar</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>PN</td>
<td>ND</td>
</tr>
<tr>
<td>[88] Bribri</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>PN</td>
<td>ND</td>
</tr>
<tr>
<td>[89] Térabba</td>
<td>SOV</td>
<td>Po</td>
<td>GN/NG</td>
<td>NA</td>
<td>PN</td>
<td>ND</td>
</tr>
<tr>
<td>[90] Guaymí</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>PN</td>
<td>ND</td>
</tr>
<tr>
<td>[91] Bocotá</td>
<td>SOV</td>
<td>Po</td>
<td>GN</td>
<td>NA</td>
<td>PN</td>
<td>ND</td>
</tr>
<tr>
<td>[92] Cuna</td>
<td>SOV</td>
<td>Po</td>
<td>GN/G3N</td>
<td>NA</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[44] Francisco León Zoque</td>
<td>SVO</td>
<td>Po</td>
<td>G-is N</td>
<td>AN/NA</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[21] Tarasco</td>
<td>SVO</td>
<td>Po</td>
<td>NG-ri/G-ri N</td>
<td>NA</td>
<td>PN/NP</td>
<td>DN</td>
</tr>
<tr>
<td>[46] Oluta Popoluca</td>
<td>SVO</td>
<td>Po/Pr</td>
<td>GN</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[13] Michoacan Nahual</td>
<td>SVO</td>
<td>Po/Pr</td>
<td>GN/N de G</td>
<td>NA</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[45] Sierra Popoluca</td>
<td>SVO</td>
<td>Po/Pr</td>
<td>GN/NG</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[12] Tetelcingo Nahuatl</td>
<td>SVO</td>
<td>Po/Pr</td>
<td>NG</td>
<td>NA</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[14] Istmo Nahuatl</td>
<td>SVO</td>
<td>Po/Pr</td>
<td>NG</td>
<td>NA</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[12] Tezoco Nahuatl</td>
<td>SVO</td>
<td>Po/Pr</td>
<td>NG/N de G</td>
<td>NA</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[27] Ocuitlec</td>
<td>SVO</td>
<td>Pr</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
<td>QN/NQ</td>
</tr>
<tr>
<td>[27] Cuitlatec</td>
<td>SVO</td>
<td>Pr</td>
<td>NG</td>
<td>AN</td>
<td>NP</td>
<td>DN</td>
</tr>
<tr>
<td>[33] Chocho</td>
<td>SVO</td>
<td>Pr</td>
<td>NG</td>
<td>NA</td>
<td>NP</td>
<td>DND</td>
</tr>
<tr>
<td>[34] Mazatec</td>
<td>SVO</td>
<td>Pr</td>
<td>NG</td>
<td>NA</td>
<td>NP</td>
<td>DND</td>
</tr>
<tr>
<td>[37] Cuicatec</td>
<td>SVO</td>
<td>Pr</td>
<td>NG</td>
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<td>Pr</td>
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</tr>
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<td>[76] Cakchiquel</td>
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<td>Pr</td>
<td>NG</td>
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<td>[22] Totonac</td>
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<td>Pr</td>
<td>NG/N iša G</td>
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<td>PN</td>
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</tr>
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<td>[25] Pame</td>
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<td>[12] Classical Nahual</td>
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<td>Po</td>
<td>G-is N</td>
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<td>[28] Otomí</td>
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<td>Pr</td>
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<td>NG</td>
<td>AN</td>
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<td>Pr</td>
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<td>PN</td>
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<td>[62] Acatec</td>
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<td>NG</td>
<td>AN</td>
<td>PN</td>
<td>ND</td>
</tr>
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<td>[65] Tectitec</td>
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<td>Pr</td>
<td>NG</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
</tr>
<tr>
<td>[69] Kekché</td>
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Table 31—continued.

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<td>QN</td>
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<td>AN</td>
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<td>DN</td>
<td>QN</td>
</tr>
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<td>QN</td>
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<tr>
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<td>QN</td>
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<td>AN</td>
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<td>QN</td>
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<td>NP</td>
<td>DN(D)</td>
<td>QN</td>
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<td>NP</td>
<td>DN</td>
<td>QN</td>
</tr>
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<td>NA</td>
<td>PN</td>
<td>NP</td>
<td>ND</td>
<td>QN</td>
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<td>VOS/SVO Pr</td>
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<td>AN</td>
<td>PN</td>
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<td>QN</td>
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<tr>
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<td>AN</td>
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<td>VSO</td>
<td>Po</td>
<td>GN</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
<td>QN</td>
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<tr>
<td>Southern Tepehuan</td>
<td>VSO</td>
<td>Po</td>
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<td>QN</td>
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<tr>
<td>Cora</td>
<td>VSO</td>
<td>Po</td>
<td>GN/N-ra G</td>
<td>PN</td>
<td>DN</td>
<td>QN</td>
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<tr>
<td>Papago</td>
<td>(VSO)</td>
<td>Po/Pr</td>
<td>GN/N-j G</td>
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<td>PN</td>
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<td>QN</td>
</tr>
<tr>
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<td>Po/Pr</td>
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<td>PN</td>
<td>DN</td>
<td>QN</td>
</tr>
<tr>
<td>Coatlán Mixe</td>
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<td>Po/Pr</td>
<td>GN</td>
<td>AN/NA</td>
<td>PN</td>
<td>DN</td>
<td>QN</td>
</tr>
<tr>
<td>Tlahuitoltepec Mixe</td>
<td>VSO</td>
<td>Po/Pr</td>
<td>GN</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
<td>QN</td>
</tr>
<tr>
<td>Garifuna</td>
<td>VSO</td>
<td>Po/Pr</td>
<td>NG</td>
<td>NA/AN</td>
<td>PN</td>
<td>ND</td>
<td>QN</td>
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<td>VSO</td>
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<td>QN</td>
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<td>NG</td>
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<td>ND</td>
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<td>NG</td>
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<td>NP</td>
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<td>QN</td>
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<td>NP</td>
<td>ND</td>
<td>QN</td>
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<tr>
<td>Chinantec</td>
<td>VSO</td>
<td>Pr</td>
<td>NG</td>
<td>NA</td>
<td>NP</td>
<td>(D)ND</td>
<td>QN</td>
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<tr>
<td>Jacaltec</td>
<td>VSO</td>
<td>Pr</td>
<td>NG</td>
<td>AN/NA</td>
<td>PN</td>
<td>DN</td>
<td>QN</td>
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<tr>
<td>Mam</td>
<td>VSO</td>
<td>Pr</td>
<td>NG</td>
<td>AN/XNA PN</td>
<td>DN</td>
<td>QN</td>
<td></td>
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<td>Aguacatec</td>
<td>VSO</td>
<td>Pr</td>
<td>NG</td>
<td>AN</td>
<td>PN</td>
<td>DN(D)</td>
<td>QN</td>
</tr>
<tr>
<td>Ixil</td>
<td>VSO</td>
<td>Pr</td>
<td>NG</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
<td>QN</td>
</tr>
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<td>VSO/SVO Pr</td>
<td>NG</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
<td>QN</td>
<td></td>
</tr>
<tr>
<td>SJ Paraíso Mixe</td>
<td>Po/Pr</td>
<td>GN</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
<td>QN</td>
<td></td>
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<td>Colonial Mixe</td>
<td>VO</td>
<td>Po/Pr</td>
<td>GN</td>
<td>AN</td>
<td>PN</td>
<td>DN</td>
<td>QN</td>
</tr>
<tr>
<td>Sayula Popoluca</td>
<td>Free</td>
<td>Po/Pr</td>
<td>GN/NG</td>
<td>AN/NA</td>
<td>PN</td>
<td>DN</td>
<td>QN</td>
</tr>
</tbody>
</table>
We may sum up the relations between S/O/V and Pr/Po as follows:

<table>
<thead>
<tr>
<th></th>
<th>SVO</th>
<th>VSO</th>
<th>VOS</th>
<th>SOV</th>
<th>SVO/VOS</th>
<th>VOS/SVO</th>
<th>VOS/VO</th>
<th>VSO/SVO</th>
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</thead>
<tbody>
<tr>
<td>Pr</td>
<td>11</td>
<td>12</td>
<td>15</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>Po</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>19</td>
<td>2</td>
<td>14</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Po/Pr</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>87</td>
</tr>
</tbody>
</table>

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 Garifuna. 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 Garifuna 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.

<table>
<thead>
<tr>
<th></th>
<th>SVO</th>
<th>VSO</th>
<th>VOS</th>
<th>SVO/VOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Po/Pr</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Postposition / Preposition</th>
<th>Possessive construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>no-yaka-pan / i-pan no-yak</td>
<td>i-peX siXa</td>
</tr>
<tr>
<td>my-nose-in its-in my nose</td>
<td>her-mat grandmother</td>
</tr>
</tbody>
</table>

"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 Garifuna. 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
by most Uto-Aztecanists [e.g., Langacker 1977]. If we presume that the coexistence of variant orders reflects one stage of linguistic change, that is, one word order is being displaced by the other, we might also presume that the process of change began with a change in G-N order or A-N order. If the genitive was the first to change its order, process (1) may be postulated. On the other hand, process (2) may have been the scenario if instead it was the adjective that first changed its order.

(1) Po GN/NG AN → Po/Pr GN/NG AN → Po/Pr NG AN
    → Po/Pr GN/NG AN/NA → Po/Pr NG NA
(2) *Po GN AN/NA → Po GN NA → Po/Pr GN/NG NA

All sets except the set with an asterisk are attested in Table 29.

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.

(3) Po/Pr GN AN → Po/Pr GN AN/NA → Po/Pr GN/NG AN/NA.

5.3.4. GN/NG

As for genitive-noun relations, languages with GN tend to be postpositional, but postpositional languages do not always have GN. Some languages in Middle America have NG alongside GN. Most languages with Po & Pr have GN or both GN and NG, but some have only NG. It is interesting to note that Classical Nahuatl, which reflects an old form chronologically, as well as Michoacan Nahual and Tarasco, which are situated at the border of Mesoamerica, that is, in “transitional” areas, all have both orders GN & NG. Other Nahuan languages in the “core” area, Mesoamerica, have already made the transition from GN to NG. Therefore we may say that NG languages in Mesoamerica exercised a strong influence on the languages of Middle America at some time in the past.

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

Garifuna : tebenari luban wagući
its-door his-house our-father

Arawak : oathinاثi bǎ(h)isibo
our-father house-door

[Taylor 1977:57]

Spanish has NG. Texcoco Nahuatl has N de(n) G alongside NG, while Michoacan Nahual has N de G together with GN. It is clear that the Spanish construction has affected both Texcoco Nahuatl and Michoacan Nahual.

The suffix -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 ūla 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 Kekchi 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:

<table>
<thead>
<tr>
<th></th>
<th>SVO</th>
<th>VSO</th>
<th>VOS</th>
<th>SOV</th>
<th>SVOS/VOS</th>
<th>VOS/VSO</th>
<th>VSO/SVO</th>
<th>SVO/SOV</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>9</td>
<td>8</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>33</td>
</tr>
<tr>
<td>AN</td>
<td>11</td>
<td>7</td>
<td>14</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>NA/AN</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Pr</th>
<th>Po</th>
<th>Po/Pr</th>
<th></th>
<th>NG</th>
<th>GN</th>
<th>GN/NG</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>12</td>
<td>16</td>
<td>4</td>
<td>32</td>
<td>NA</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>AN</td>
<td>30</td>
<td>7</td>
<td>9</td>
<td>46</td>
<td>AN</td>
<td>32</td>
<td>11</td>
</tr>
<tr>
<td>NA/AN</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>NA/AN</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>AN/NA</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>AN/NA</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

|     | 47  | 25  | 17   | 89   | 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:

\[(1) \text{ (SOV} \& \text{ NG)} \supset \text{ NA} = \text{ AN} \supset \sim \text{ (SOV} \& \text{ GN)}\]
\[(2) \text{ VSO} \supset \text{ NA} = \text{ AN} \supset \sim \text{ VSO}\]
\[(3) \text{ AN} \supset \text{ DN} = \text{ ND} \supset \text{ NA}\]
\[(4) \text{ AN} \supset \text{ QN} = \text{ NQ} \supset \text{ NA}\]

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.
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, Otomi, 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 Nahuan languages. This phenomenon seems to be due to language contact, the result of influence from languages having NA. The only Nahuan 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 Jacaltèc 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, Miskitu, 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 quantitatives. We should first consider numerals separately from the quantitatives, 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 quantitatives in this study. However, such quantitatives as “all” and “many” frequently exhibit the same behavior as the numerals, so numerals were used in some cases where good example sentences with quantitatives were lacking. However, in some cases it is difficult to decide whether quantitatives 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 tükhar
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 Otomi, Mazahua and Pame, take the reverse orders, ND and QN. The ND & QN pair is also found in Acatec and Garifuna, and the mirror-image pair, DN & NQ, in Guatuso and Cuna. Ocuitec 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. Tlapanco 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 Otomi 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 (Otomi, 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 among 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 Nahuaatl, 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 Nahuan, 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.

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-ï'nïvitï'-yah-pa ane
   woman-ERG 3sg. (y)-turn over (ï'nïvitï')-PL-INCOMP tortilla
   "The women turn over the tortillas." [ENGEL & BARTHOLOMEW 1987: 344]

(2) tihki-yah pin
   entered-PL man

(3) une-'is k-y-i'
   child-GEN his-hand (<y-ki')
   "a child's hand" [ENGEL & BARTHOLOMEW 1987: 342]

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)

<table>
<thead>
<tr>
<th>Preconsonantal</th>
<th>Prevocalic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg. nu:-/ (n-)</td>
<td>in-/ (#-)</td>
</tr>
<tr>
<td>2sg. a:-/ (a-)</td>
<td>a:w-/ (aw-)</td>
</tr>
<tr>
<td>3sg. ru:-/ (r-)</td>
<td>u:-/ (#-)</td>
</tr>
<tr>
<td>1pl. qa:-/ (qa-)</td>
<td>r-</td>
</tr>
<tr>
<td>2pl. e:-/ (e-)</td>
<td>q-</td>
</tr>
<tr>
<td>3pl. ke:-/ (ki-)</td>
<td>e:w-/ (ew-)</td>
</tr>
</tbody>
</table>

The Absolutive Person Markers (Set B)

<table>
<thead>
<tr>
<th>1sg.</th>
<th>2sg.</th>
<th>3sg.</th>
<th>1pl.</th>
<th>2pl.</th>
<th>3pl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in-</td>
<td>at-</td>
<td>#-</td>
<td>oq-</td>
<td>iš-</td>
<td>e:-/e'</td>
</tr>
</tbody>
</table>
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:tuŋ [ELSON 1960: 32]
you = my-father
"You are my father."

(10) mi-míñ-pa [ELSON 1960: 31]
you-come-INCOMP
"You come."

(11) an-tak [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.

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.

<table>
<thead>
<tr>
<th>A</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>O</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>A</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>O</td>
</tr>
</tbody>
</table>

Fig. 4

In contrast to the Mayan languages, Uto-Aztecan languages show accusative patterns. For example, Classical Nahuatl has three different sets of person markers as listed below [SULLIVAN 1976]:

**Classical Nahuatl**

<table>
<thead>
<tr>
<th>Subject (A = S)</th>
<th>Object (O)</th>
<th>Possessive (G)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg. ni-</td>
<td>neč-</td>
<td>no-</td>
</tr>
<tr>
<td>2sg. ti-</td>
<td>mic-</td>
<td>mo-</td>
</tr>
<tr>
<td>3sg. #-</td>
<td>k-/ki-</td>
<td>i-</td>
</tr>
<tr>
<td>1pl. ti-</td>
<td>teč-</td>
<td>to-</td>
</tr>
<tr>
<td>2pl. an-</td>
<td>ameč-</td>
<td>amo-</td>
</tr>
<tr>
<td>3pl. #-</td>
<td>kin-</td>
<td>in-</td>
</tr>
</tbody>
</table>

These different sets produce the following figure.
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.

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

<table>
<thead>
<tr>
<th>Auxiliary (A = S)</th>
<th>Imperfective</th>
<th>Perfective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Long form</td>
<td>Short form</td>
</tr>
<tr>
<td>1sg.</td>
<td>'aŋ</td>
<td>ŵ</td>
</tr>
<tr>
<td>2sg.</td>
<td>'ap</td>
<td>p</td>
</tr>
<tr>
<td>3sg.</td>
<td>'o</td>
<td>'o</td>
</tr>
</tbody>
</table>
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...
Toward a New Typology of Language

1982].

Totonac

<table>
<thead>
<tr>
<th>Possessive markers</th>
<th>Object markers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg. ki-/kin-</td>
<td>ki-/kin-</td>
</tr>
<tr>
<td>2sg. mi-/min-</td>
<td>-ni/-n</td>
</tr>
<tr>
<td>3sg. iš-/ič-</td>
<td>-#</td>
</tr>
<tr>
<td>1pl. ki-/kin-</td>
<td>ki-/kin-+PL...</td>
</tr>
<tr>
<td>2pl. mi-/min-</td>
<td>+PL...-ni/-n</td>
</tr>
<tr>
<td>3pl. iš-/ič-</td>
<td>+PL...-#</td>
</tr>
</tbody>
</table>

Subject Markers for CVC-V/CVCC-V roots

<table>
<thead>
<tr>
<th>Incompletive</th>
<th>Completive</th>
<th>Continuative</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg. k-...</td>
<td>-V</td>
<td>k-...-ma</td>
</tr>
<tr>
<td>2sg. -V-ya</td>
<td>-#</td>
<td>-p'a:t</td>
</tr>
<tr>
<td>3sg. -V</td>
<td>-t</td>
<td>-ma</td>
</tr>
<tr>
<td>1pl. -V-ya</td>
<td>-u</td>
<td>-ma:nmáw</td>
</tr>
<tr>
<td>2pl. -V-yá:tit</td>
<td>-tit</td>
<td>-p'a:nántít</td>
</tr>
<tr>
<td>3pl. ta-...</td>
<td>-V</td>
<td>ta-...-ma:na</td>
</tr>
</tbody>
</table>

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.

Cora

<table>
<thead>
<tr>
<th>Subject (A=S)</th>
<th>Object (O)</th>
<th>Possessive (G)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg. nya-/nu=</td>
<td>na-</td>
<td>nya-</td>
</tr>
<tr>
<td>2sg. pa-/pa=</td>
<td>mwa-</td>
<td>a-</td>
</tr>
</tbody>
</table>
Native Middle American Languages

3sg. #-/pu= y-/ #-/ra-h- ra’an
1pl. ta/-tu= ta- ta-
2pl. sa-, ša/- šu= hamw- há’anmwa-
3pl. ma-/mu= wa’- vá’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.

Fig. 9a: Pronominals

<table>
<thead>
<tr>
<th>A</th>
<th>S</th>
<th>G</th>
<th>O</th>
</tr>
</thead>
</table>

Fig. 9b: NPs

Yaqui

Subject (A = S) Object (O) Possessive (G)

1sg. ine po, 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) ine po em misi-ta biča-k [LINDENFELD 1973: 53]
I your cat-DEP see-REALIZED
“I saw your cat.”

(18) itom pare-ta kari [LINDENFELD 1973: 56]
our priest-DEP house
“Our priest’s house”

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.

![Fig. 10](image)

Zapotecan and Mixtecan languages in Oaxaca do not formally distinguish among A, S, O and G. The pattern is drawn as follows:

![Fig. 11](image)

Isthmus Zapotec

(19) má be'eda be
    has come he
    "He has come."

(20) má bi'ni ne ni
    has done he it
    "He has done it."

(21) ike be
    head he
    "his head"

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) hini de ná
    know he she
    "He knows her."

(23) hini de sa ná
    know he I (independent)
    "He knows me."

[PICKETT 1960: 55]

[ALEXANDER 1980: 64]
Jamiltepec Mixtec

(24) kañi sutu ra či ra  
hit-COM father he OBJ he  
"His father hit him."

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)

<table>
<thead>
<tr>
<th></th>
<th>Present</th>
<th>Future</th>
<th>Past</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg.</td>
<td>sa-</td>
<td>-na-</td>
<td>-as, -ias, -os</td>
</tr>
<tr>
<td>2sg.</td>
<td>i-</td>
<td>-me-</td>
<td>-e-</td>
</tr>
<tr>
<td>3sg.</td>
<td>a-</td>
<td>-ma-</td>
<td>a-</td>
</tr>
</tbody>
</table>

Set 2 Present Future Past Set 3 Present Future Past

| 1sg. | ši- | -ni- | -as | 1sg. | si- | -ni- | -iš |
| 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- 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:

<table>
<thead>
<tr>
<th></th>
<th>ni-</th>
<th>ne-</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg.</td>
<td>na-</td>
<td>ni-</td>
</tr>
<tr>
<td>2sg.</td>
<td>me-</td>
<td>me-</td>
</tr>
<tr>
<td>3sg.</td>
<td>ma-</td>
<td>mi-</td>
</tr>
</tbody>
</table>

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 ašiin "yet," gno "no," netam "necessarily,"
(25) ngo ma-rang nahiit  
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 tigem  
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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg.</td>
<td>šike</td>
</tr>
<tr>
<td>2sg.</td>
<td>ike</td>
</tr>
<tr>
<td>1,2sg.</td>
<td>ikora</td>
</tr>
<tr>
<td>3sg.</td>
<td>neh</td>
</tr>
<tr>
<td>1pl.</td>
<td>šikona</td>
</tr>
<tr>
<td>2pl.</td>
<td>ikona</td>
</tr>
<tr>
<td>1,2pl.</td>
<td>ikooca</td>
</tr>
<tr>
<td>3pl.</td>
<td>nehiw</td>
</tr>
</tbody>
</table>

(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

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 Cabecar, 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 Cabecar, *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 Cabecar are often called ergative, they seem to have started out as non-ergative languages, judging from the patterns shown in Fig. 13.

Cabecar

<table>
<thead>
<tr>
<th>1sg.</th>
<th>jis</th>
</tr>
</thead>
<tbody>
<tr>
<td>2sg.</td>
<td>bá</td>
</tr>
<tr>
<td>3sg.</td>
<td>hié/ihé/ié</td>
</tr>
<tr>
<td>1pl.excl.</td>
<td>sá</td>
</tr>
</tbody>
</table>
1pl.incl. sé
2pl. bás
3pl. hiéwá

(28) jís ksa hír
I sang today
“I sang today.”

(29) jís tr di jé
I ERG chicha drink
“I drink chicha.”

(30) jís tr i súwá
I ERG it saw
“We saw it.”

(31) hiét ti jís ppá kal hula wa
he ERG I hit tree arm with
“He hit me with a stick.”

(32) jís miña
I mother
“my mother”

(33) i tabéli
he machete
“his machete”

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 /niaratrewé, iwetre, kwetre [Alphonse 1956: 4]
(34) ti toro-e
I book-POSS
"my book"

(35) ti blite
I speak
"I speak."

(36) ti-we blitaba
I-NOM spoke
"I spoke."

(37) ti-we niara miti
I-NOM he struck
"I struck him."

(38) niara ti toen
he I see
"He sees me."

(39) toma-gwe hu
Tom-G house
"Tom's house"

(40) Juan toro-e
Juan book-POSS
"Juan's book"

(41) čo-we tata ňokoni
Cho-NOM father cursed
"Cho cursed father."

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

\[
\begin{array}{c|c}
A & S \\
G & O \\
\end{array}
\]

II) Di-partite

\[
\begin{array}{c|c|c}
A & S & A & S \\
G & O & G & O \\
\end{array}
\]

a b

III) Tri-partite

\[
\begin{array}{c|c|c|c}
A & S & A & S \\
G & O & G & O \\
\end{array}
\]

a b c d

IV) Quadri-partite

\[
\begin{array}{c|c}
A & S \\
G & O \\
\end{array}
\]

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

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
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<tbody>
<tr>
<td>A</td>
<td>S</td>
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<td></td>
</tr>
<tr>
<td>G</td>
<td>O</td>
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<tbody>
<tr>
<td>A</td>
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<td>G</td>
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<tbody>
<tr>
<td>A</td>
<td>S</td>
<td></td>
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<tr>
<td>G</td>
<td>O</td>
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<th></th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>O</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These patterns are found in the formally marked cases of Chibchan languages.

**One-marked languages:**
- c) A-marked: Cabécar, Bribri
- d) G-marked: Guaymi non-perfective

**Three-marked:**
- e) ASG-marked: Guaymi 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:

\[
\begin{array}{cccc}
A & S & O & G \\
\end{array}
\]

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 Bribri 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:
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, retrofiexed 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 mub', meaning 80, was utilized for the numbers from 61 to 80. On the other hand, modern Cakchiquel uses mub' 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, oślahun, 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 Nahuan. Nahuan 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 Nahuan 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 Nahua, 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).
### Conclusions

<table>
<thead>
<tr>
<th>Language</th>
<th>Ordinal formation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mazatec</strong></td>
<td>noun-numeral (for 1),</td>
</tr>
<tr>
<td><strong>Atatlahuca Mixtec</strong></td>
<td>noun X-numeral (for 2 on)</td>
</tr>
<tr>
<td><strong>Silacayoapan Mixtec</strong></td>
<td>noun-numeral</td>
</tr>
<tr>
<td><strong>Jicaltepec Mixtec</strong></td>
<td>noun-numeral</td>
</tr>
<tr>
<td><strong>Jamiltepec Mixtec</strong></td>
<td>noun X-numeral (for 1),</td>
</tr>
<tr>
<td><strong>San Juan Colorado Mixtec</strong></td>
<td>X-numeral-noun (for 2 on)</td>
</tr>
<tr>
<td><strong>Cuicatec</strong></td>
<td>noun-numeral (for 1,2),</td>
</tr>
<tr>
<td><strong>Juárez Zapotec</strong></td>
<td>X-numeral-noun (for 3 on)</td>
</tr>
<tr>
<td><strong>Yatzachi Zapotec</strong></td>
<td>noun X-numeral</td>
</tr>
<tr>
<td><strong>Mitla Zapotec</strong></td>
<td>X-numeral-noun</td>
</tr>
<tr>
<td><strong>Classical Zapotec</strong></td>
<td>X-numeral-noun?</td>
</tr>
<tr>
<td><strong>Valle Zapotec (18c.)</strong></td>
<td>X-numeral-noun?</td>
</tr>
<tr>
<td><strong>Chatino</strong></td>
<td>noun-X-numeral</td>
</tr>
<tr>
<td><strong>Chinantec</strong></td>
<td>noun-X-numeral (YASUGI 1990b)</td>
</tr>
</tbody>
</table>

If we postulate that in ancient times the language had noun-numeral order, we arrive at the following schema.

<table>
<thead>
<tr>
<th>In ancient times</th>
<th>After A.D. 900</th>
<th>In modern times</th>
</tr>
</thead>
<tbody>
<tr>
<td>noun-cardinal</td>
<td>cardinal-noun</td>
<td>a) cardinal-noun, X-ordinal-noun</td>
</tr>
<tr>
<td>noun-ordinal</td>
<td>noun-ordinal</td>
<td>b) cardinal-noun, noun-X-ordinal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) cardinal-noun, noun-ordinal</td>
</tr>
</tbody>
</table>

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:

\[
\text{tuyi meckuy / meckuy tuyi } \quad [\text{ENGEL and BARTHOLOMEW 1987: 354}]
\]

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 Nahuan. 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-
Native Middle American Languages

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 Nahuan 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 Nahuan languages have NG-NA. We deduce from these phenomena that the Nahuan 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
Database 1: Phonological Systems

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

Consonants: Vowels:

\[
\begin{array}{cccc}
\text{p} & \text{t} & \text{c} & \text{k} \\
\text{b} & \text{d} & \text{j} & \text{g} \\
\text{s} & \text{\&} & \text{h} \\
\text{m} & \text{n} & \text{\&} \\
\end{array}
\quad
\begin{array}{cccc}
\text{i} & \text{i} & \text{u} & \text{\&}
\\
\text{o} & \text{oo} \\
\text{a} & \text{aa} \\
\end{array}
\]

/w/ is an apico-alveolar lateral flap. /d/ is an apico-alveolar retroflexed lax stop and is restricted in occurrence to medial position. /\&/ is an apico-domal retroflexed sibilant. /w/ is a fricative preceding i/a. /g/ 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: Vowels:

\[
\begin{array}{cccc}
\text{p} & \text{t} & \text{v} & \text{c} & \text{k} \\
\text{b} & \text{d} & \text{d\&} & \text{g} \\
\text{v} & \text{s} & \text{\&} & \text{x} \\
\text{m} & \text{n} & \text{\&} \\
\end{array}
\quad
\begin{array}{cccc}
\text{i} & \text{i} & \text{u} & \text{\&}
\\
\text{o} & \text{oo} \\
\text{a} & \text{aa} \\
\end{array}
\]

Vowel length is interpreted as geminate clusters. There are two tones, high and low. Stress is non-contrastive. /\&/ is found in relatively few words. In most of these /\&/ fluctuates with [s] or [t\&] 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: Vowels:

\[
\begin{array}{cccc}
\text{p} & \text{t} & \text{v} & \text{c} & \text{k} \\
\text{b} & \text{d} & \text{d\&} & \text{g} \\
\text{v} & \text{s} & \text{\&} & \text{x} \\
\text{m} & \text{n} & \text{\&} \\
\end{array}
\quad
\begin{array}{cccc}
\text{i} & \text{u} & \text{\&} & \text{uu}
\\
\text{e} & \text{\&} & \text{ee} & \text{\&}
\\
\text{a} & \text{aa} \\
\end{array}
\]

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### Southern Tepehuan [5]

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

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p, t, c, k, ?</td>
<td>i, i, u</td>
</tr>
<tr>
<td>b, d, j, g</td>
<td>ē, o, ē, o</td>
</tr>
<tr>
<td>v, s, š, h</td>
<td>a, a</td>
</tr>
<tr>
<td>m, n, ŋ</td>
<td></td>
</tr>
<tr>
<td>r, y, ĭ</td>
<td></td>
</tr>
</tbody>
</table>

Parentheses enclose allophones. /d t s n i/ are palatalized contiguous to /i/ as [dě tš š ř gl]. The voiced stops and the palatal affricate have preglottalized nasals [ʔm ?n ?ń ?ŋ] at the same point of articulation as variants in syllable coda position. /e/ is replaced by /a/ in Willett [1988], who notes that seven different diphthongs occur; /ui ii oi ai io ia ua/. I give below another analysis by the same author for reference.

*Southeastern Tepehuan* [Willett 1978]

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p, t, c, k, ?</td>
<td>i, i, u</td>
</tr>
<tr>
<td>b, d, j, g</td>
<td>ē, o</td>
</tr>
<tr>
<td>v, s, š, h</td>
<td>a</td>
</tr>
<tr>
<td>m, n, ŋ</td>
<td></td>
</tr>
<tr>
<td>r, y</td>
<td></td>
</tr>
</tbody>
</table>

### Tarahumara [6]

**Western Tarahumara** [Burgess 1970, 1984] (15C, 5V)

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p, t, c, k, ?</td>
<td>i, u</td>
</tr>
<tr>
<td>b, d, j, ř, g</td>
<td>ē, o</td>
</tr>
<tr>
<td>s, h</td>
<td>a</td>
</tr>
<tr>
<td>m, n</td>
<td></td>
</tr>
<tr>
<td>l, r</td>
<td></td>
</tr>
<tr>
<td>w, y</td>
<td></td>
</tr>
</tbody>
</table>

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 /ř/ for them. /l/ is a voiced alveolar retroflexed lateral. /ř/ is an alveolar retroflexed vibrant and has both trilled and forward-flapped allophones. The syllable types are C, CV, CCV. Stress is phonemic.
Norogachi Tarahumara [LIONNET 1966] (16C, 5V)

Consonants:  Vowels:
 pt č k ?  i u
 br g  e o
 s x  a
 mn
 l R
 w y

/tr/ 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 /t/ in Western Tarahumara.

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

Consonants:  Vowels:
 pt č k ?  i u ii uu
 bd (g)  e o ee oo
 s x  a  aa
 mn
 r
 w y

/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 iâ ia io iu io ia oe ua ui/.

※Guarijio (Chihuahua) [7]
[ESCALANTE 1967] (17C, 5V)

Consonants:  Vowels:
 pt č k ?  i u
 b g  e o
 s š x  a
 mn
 l l
 r
 w y

/l/ is a voiced retroflexed lateral. /x/ is interpreted as a velar fricative but is symbolized as /h/ and positioned under /l/ in the phonemic inventory in the original source. /τ/ is a vibrant. The syllable types are V, CV, CVC.
Yaqui [8]

Yaqui¹ [LINDENFELD 1973] (16C, 5V+5G)

Consonants: Vowels:

\[
\begin{array}{c|c|c|c|c}
| p | t | č | k | ? | i | u | ii | uu \\
| b | b^w | g | e | o | ee | oo \\
| s | h | a | aa \\
| m | n | l | r \\
| w | y |
\end{array}
\]

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

Yaqui² [JOHNSON 1962] (14C, 5V+5G)

Consonants: Vowels:

\[
\begin{array}{c|c|c|c|c}
| p | t | č | k | ? | i | u | ii | uu \\
| b | e' | e | ee | oo \\
| s | h | a | aa \\
| m | n | l | r \\
| w | y |
\end{array}
\]

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

Arizona Yaqui³ [FRAENKEL 1959] (16C, 5V+5G)

Consonants: Vowels:

\[
\begin{array}{c|c|c|c|c}
| p | t | č | k | ? | i | u | ii | uu \\
| b^w | e | o | ee | oo \\
| s | h | a | aa \\
| β \\
| m | n \\
| l \\
| (r) \\
| w | y |
\end{array}
\]

Historically speaking, the fricatives /f d ɣ/ occur only in Spanish loans. /t/ occurs only in a single instance in an affix, the suffix -reo/-leo. Since Fraenkel writes that there is only one stop series but /p^w/ is always voiced, /b^w/ is set up instead of /p^w/. Stress is phonemic. The syllable types are CV, CVV, CVVCVC, CVCV, CVCVC, CVCCV, CVCVCV.
Mayo [9]
[COLLARD and COLLARD 1979] (15C, 5V+5G)

Consonants:  Vowels:
\[
\begin{array}{cccccccc}
\text{p} & \text{t} & \text{c} & \text{k} & \text{?} & \text{i} & \text{u} & \text{ii} & \text{uu} \\
\text{b} & \text{b}^w & \text{s} & \text{h} & \text{a} & \text{ee} & \text{aa} \\
\text{m} & \text{n} & \text{l} & \text{r} & \text{w} & \text{y} \\
\end{array}
\]

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) Cora [CASAD 1984] (18C, 5V+5L)

Consonants:  Vowels:
\[
\begin{array}{cccccccc}
\text{p} & \text{t} & \text{v} & \text{c} & \text{?} & \text{i} & \text{i} & \text{u} & \text{i}: \text{i} & \text{u}: \\
\text{s} & \text{h} & \text{e} & \text{e}: \\
\text{m} & \text{n} & \text{n}^y & \text{a} & \text{a}: \\
\text{l} & \text{r} & \text{w} & \text{y} \\
\end{array}
\]

Tone is phonemic.

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

Consonants:  Vowels:
\[
\begin{array}{cccccccc}
\text{p} & \text{p}^w & \text{t} & \text{c} & \text{?} & \text{k} & \text{k}^w & \text{i} & \text{u} & \text{i} & \text{i} & \text{uu} \\
\beta & \text{s} & \text{h} & \text{æ} & \text{æ} & \text{æ} & \text{æ} & \text{æ} & \text{æ} & \text{æ} & \text{æ} & \text{æ} \\
\text{m} & \text{m}^w & \text{n} & \text{l} & \text{r} & \text{w} & \text{y} \\
\end{array}
\]

/\beta/ has a stop allophone after nasal and fricative allophones elsewhere. /\epsilon/ 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]


Consonants: Vowels:

\[
\begin{array}{cccccccc}
\text{p} & \text{t} & \text{c} & \text{k} & \text{kw} & \text{z} & \text{h} & \text{ee} \\
\text{m} & \text{n} & \text{r} & \text{w} & \text{y} & \text{i} & \text{ii} & \text{uu} \\
\end{array}
\]

/\text{i}/ is a high back unrounded vowel. /\text{z}/ is a voiced retroflex sibilant. Syllables are either high or low in tone, short (CV, CVC) or long (CVV, CVVC) in length.

**Huichol\(^2\)** [McIntosh 1945] (15C, 5V+5G)

Consonants: Vowels:

\[
\begin{array}{cccccccc}
\text{p} & \text{t} & \text{c} & \text{c} & \text{k} & \text{kw} & \text{z} & \text{h} & \text{ee} & \text{óó} \\
\text{m} & \text{n} & \text{r} & \text{w} & \text{y} & \text{i} & \text{iu} & \text{ií} & \text{uú} \\
\end{array}
\]

/\text{z}/ is a voiced backed alveolar grooved spirant, somewhat retroflexed. /\text{r}/ is a voiced lateral with alveolar apical articulation. /\text{í}/ is a voiced retroflex alveolar flap. /\text{i}/ is a high central close unrounded vowel. This is written as /\text{A}/ 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:

\[
\begin{array}{cccccccc}
\text{p} & \text{t} & \text{c} & \text{k} & \text{i} & \text{i} & \text{u} & \text{ií} & \text{uú} \\
\text{m} & \text{n} & \text{r} & \text{w} & \text{y} & \text{a} & \text{aá} \\
\end{array}
\]

Nahuatl [12]

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

Consonants: Vowels:

\[
\begin{array}{cccccccc}
\text{p} & \text{t} & \text{c} & \text{c} & \text{k} & \text{kw} & \text{i} & \text{ií} & \text{uú} \\
\text{m} & \text{n} & \text{r} & \text{w} & \text{y} & \text{a} & \text{á} \\
\end{array}
\]

/\text{z}/ is a voiced backed alveolar grooved spirant, somewhat retroflexed. /\text{r}/ is a voiced lateral with alveolar apical articulation. /\text{i}/ is a voiced retroflex alveolar flap. /\text{i}/ is a high central close unrounded vowel. This is written as /\text{A}/ 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 Classical Nahuatl by Andrew [1975] seems to be as follows:

\[
\begin{array}{cccccccc}
\text{p} & \text{t} & \text{c} & \text{c} & \text{k} & \text{kw} & \text{i} & \text{ií} & \text{uú} \\
\text{m} & \text{n} & \text{r} & \text{w} & \text{y} & \text{a} & \text{á} \\
\end{array}
\]

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

Consonants: Vowels:

\[
\begin{array}{cccccccc}
\text{p} & \text{t} & \text{c} & \text{c} & \text{k} & \text{kw} & \text{s} & \text{š} & \text{e} & \text{e} & \text{e} & \text{o} \\
\text{m} & \text{n} & \text{r} & \text{w} & \text{y} \\
\end{array}
\]
San Jerónimo Amanalco (México) [LASTRA DE SUÁREZ 1980a] (16C, 4V + 4L)

Consonants: \( p \ t \ \dot{c} \ c \ \acute{c} \ k \ k^w \)  
Vowels: \( i \ i: \)  
\( s \ \ddot{s} \ h \ e \ o \ e: \ o: \)  
\( m \ n \ a \ a: \)  
\( l \)  
\( w \ y \)

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

Consonants: \( p \ t \ \dot{c} \ c \ \acute{c} \ k \ k^w \)  
Vowels: \( i \ u \ i \ o \)  
\( s \ \ddot{s} \ h \ i e \ o \ e: \ a \)  
\( m \ n \)  
\( l \)  
\( w \ y \)

/b d g f r/ occur predominantly in Spanish loan words.

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

Consonants: \( p \ t \ \dot{c} \ c \ \acute{c} \ k \ k^w \)  
Vowels: \( i \ i: \)  
\( s \ \ddot{s} \ h \ a \ a: \)  
\( m \ n \)  
\( l \)  
\( w \ y \)

※San Augustín Guapa (Guerrero) [DAKIN 1979] (15C,4V+4L)

Consonants: \( p \ t \ \dot{c} \ c \ \acute{c} \ k \ k^w \)  
Vowels: \( i \ i: \)  
\( s \ \ddot{s} \ h \ e \ o \ e: \ o: \)  
\( m \ n \ a \ a: \)  
\( l \)  
\( w \ y \)

※Ixcatepec (Guerrero) [MCQUOWN 1940] (16C, 4V)

Consonants: \( p \ t \ \dot{c} \ c \ \acute{c} \ k \ k^w \)  
Vowels: \( i \ o \)  
\( s \ \ddot{s} \ h \ e \ a \)  
\( m \ n \)  
\( l \)  
\( w \ y \)

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:    Vowels: 4 short and 3 long vowels

p t x c č k kw ? i i:
    s ś e o eː oː
m n a a:
l
w y

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

Consonants:    Vowels: 4 short and 3 long vowels

p t x c č k kw ? i i:
    s ś e o eː oː
m n a a:
l
w W y

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:    Vowels: 4 short and 3 long vowels

p t x c č k kw ? i u i:
g e o eː oː
f s ś h a a:
m n l
(f)

w y

/f/ occurs only infrequently. Alveolar flap /ɾ/ 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 Luis Potosi) [Croft 1951] (15C, 4V+4L)

Consonants:    Vowels: 4 short and 3 long vowels

p t x c č k kw ? i i:
    s ś h e o eː oː
m n a a:
l
w y
Coscatlán (San Luis Potosí) [Dakin 1979] (17C, 4V+4L)
Consonants: pt x c č k k* i i:
              b e o e: o:
              s š h a a:
              m n l r w y

Cuamelco (Hidalgo) [Dakin 1979] (15C, 4V+4L)
Consonants: pt x c č k k* i i:
              s š h e o e: o:
              m n a a:
              l w y

Acaxochitlán (Hidalgo) [Lastra de Suárez 1980b] (17C, 4V+4L)
Consonants: pt x c č k k* i i:
              s š h e o e: o:
              m n a a:
              l r w y

Huazalingillo, Huautla (Hidalgo) [Kimball 1990] (17C, 4V+4L)
Consonants: pt x c č k k* i i:
              s š h e o e: o:
              m n a a:
              l r w y

<table>
<thead>
<tr>
<th>Language</th>
<th>Region</th>
<th>Date</th>
<th>Vowels</th>
<th>Consonants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuatenahuatl, Huautla</td>
<td>Hidalgo</td>
<td>18C, 4V+4L</td>
<td>i:</td>
<td>p t x c č k kʷ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>e o:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a:</td>
<td>m n lw W y</td>
</tr>
</tbody>
</table>

**Nahual [13]**

**Pómaro (Michoacan)**

<table>
<thead>
<tr>
<th>Region</th>
<th>Date</th>
<th>Vowels</th>
<th>Consonants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17C, 5V</td>
<td>i u</td>
<td>p t c č k kʷ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e o</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a</td>
<td>m n lw W y</td>
</tr>
</tbody>
</table>

**Nahuat [14]**

**Nauzontla (North Puebla)**

<table>
<thead>
<tr>
<th>Region</th>
<th>Date</th>
<th>Vowels</th>
<th>Consonants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15C, 4V</td>
<td>i o</td>
<td>p t c č k kʷ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e a</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>m n lw W y</td>
</tr>
</tbody>
</table>

See Ixcatepec (Guerrero).

**Zacapoaxtla (Puebla)**

<table>
<thead>
<tr>
<th>Region</th>
<th>Date</th>
<th>Vowels</th>
<th>Consonants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15C, 4V+4L</td>
<td>i i:</td>
<td>p t c č k kʷ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e o:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a a:</td>
<td>m n lw W y</td>
</tr>
</tbody>
</table>

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

Consonants:  Vowels:
  p  t  c  ê  k  kʷ  i  i:
  g          e  o  e:  o:
  s  š  h     a  a:
  m  n
  l
  w  y

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

Consonants:  Vowels:
  p  t  c  ê  k  kʷ  ñ  i  i:
  d          e  o  e:  o:
  s  š  h     a  a:
  m  n
  l
  w  y
/b  f  r  v  z  ll/ occur in Spanish loans.

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

Consonants:  Vowels:
  p  t  c  ê  k  i  i:
  b          e  o  e:  o:
  s  š  h     a  a:
  m  n
  l
  w  y
/d  f  ŋ  r  ũ/ occur in Spanish loans.

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

Consonants:  Vowels:
  p  t  c  ê  k  i  i:
  bʷ  s  š  h  e  o  e:  o:
  m  n
  l
  w  y

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

Consonants:  Vowels:
  p  t  c  ê  k  kʷ  i  i:
  s  š  h  e  o  e:  o:
  m  n
  l
  w  y
Pochutec (Oaxaca) [D6]
[Boas 1917] (17C, 5V+5L)

Consonants:  
\[
\begin{array}{llllll}
ptc\hat{c}k & i & u & i:\ u:
\end{array}
\]
\[
\begin{array}{llllll}
b\hat{d}g & e & o & e:\ o:
\end{array}
\]
\[
\begin{array}{llllll}
s\hat{s} & h & a & a:
\end{array}
\]
\[
\begin{array}{llllll}
mn\hat{n} & l
\end{array}
\]
\[
\begin{array}{llllll}
w & y
\end{array}
\]

Cuitlatec [D7]

Cuitlatec\(^1\) [Escalante 1962] (17C, 6V)

Consonants:  
\[
\begin{array}{llllll}
p\hat{t}\hat{c}k\hat{w} & i & i & u
\end{array}
\]
\[
\begin{array}{llllll}
\hat{b}\hat{d}g & e & o
\end{array}
\]
\[
\begin{array}{llllll}
s\hat{s} & h & a
\end{array}
\]
\[
\begin{array}{llllll}
mn & Tones: ' (high)
\end{array}
\]
\[
\begin{array}{llllll}
l & l
\end{array}
\]
\[
\begin{array}{llllll}
w & y
\end{array}
\]

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

Cuitlatec\(^2\) [McQuown 1940a] (18C, 8V)

Consonants:  
\[
\begin{array}{llllll}
p\hat{t}\hat{c}k\hat{w} & i & i & u
\end{array}
\]
\[
\begin{array}{llllll}
\hat{b}\hat{d}g\hat{g} & e & o
\end{array}
\]
\[
\begin{array}{llllll}
s\hat{s} & h & \Lambda
\end{array}
\]
\[
\begin{array}{llllll}
mn & æ & ò
\end{array}
\]
\[
\begin{array}{llllll}
l & l
\end{array}
\]
\[
\begin{array}{llllll}
w & y
\end{array}
\]

/s r ŋ/ are found in Spanish loans. Since McQuown uses /o/ as high, central, and /a/ as low, front, these are replaced here by /i/ and /æ/ respectively. /l/ is a voiceless fricative lateral.

Notes:

According to Escalante, /\beta \delta \gamma/ are voiced fricatives, although he writes them as /b d g/. He does not admit the /gʷ ò ò/ presented by McQuown. Later authors such as Campbell [1979], Suárez [1983b] and Valiñas et al. [1984] follow Escalante’s inventory.
Paipai [16]

Paipai¹ [Robles and Bruce 1975] (24V, 6V+6L)
Consonants:  Vowels:
  p  t  tʰ  č  k  kʰ  kʷ ? i  i  u  i:  i:  u:
  b  bʰ  g  e  o  e:  o:
  ʃ  ʃ  x  h  a  a:
  m  mʰ  n  nʰ  l  l  r
  w  y

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

Paipai² [Langdon 1971, 1976] (18C, 5V+5L)
Consonants:  Vowels:
  p  t  (c)  č  k  q  ?, i  u  i:  u:
  v  s  ʃ  x  e  o  e:  o:
  m  n  nʰ  a  a:
  l  l  r
  w  y

Cochimi [17]

[Robles and Bruce 1975] (21C, 5V)
Consonants:  Vowels:
  p  t  tʰ  č  k  kʰ  kʷ ?, i  u
  b  s  ʃ  x  h  hʰ  a
  m  n
  l  l
  r  ř
  w  y

Kiliwa [18]

Kiliwa¹ [Robles and Bruce 1975] (22C, 6V+6L)
Consonants:  Vowels:
  p  pʰ  t  tʰ  č  k  kʰ  kʷ ?, i  i  u  i:  i:  u:
  b  s  ʃ  x  h  hʰ  a  a:
  m  mʰ  n  nʰ  l  r
  w  y
Kiliwa\textsuperscript{2} [Mixco 1985] (18C, 3V+3L)

Consonants:
\begin{align*}
\text{pt} & \quad \text{t} & \quad \text{c} & \quad \text{k} & \quad \text{kw} & \quad \text{q} & \quad ? \\
\text{(v)} & \quad \text{s} & \quad \text{(ss)} & \quad \text{x} & \quad \text{x} & \quad \text{(h)} & \quad \text{h} \\
\text{m} & \quad \text{n} & \quad \text{n̚} & \quad \text{l} & \quad \text{r} & \quad \text{(rr)} & \quad \text{w} & \quad \text{y}
\end{align*}

Vowels:
\begin{align*}
\text{i} & \quad \text{u} & \quad \text{i:} & \quad \text{u:} \\
\text{a} & \quad \text{a:}
\end{align*}

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]

\textit{Cocopai} \textsuperscript{1} [Robles and Bruce 1975] (20C, 6V+6L)

Consonants:
\begin{align*}
\text{pt} & \quad \text{t} & \quad \text{c} & \quad \text{k} & \quad ? \\
\text{b} & \quad \text{s} & \quad \text{x} & \quad \text{h} & \quad \text{h} & \quad \text{w} \\
\text{m} & \quad \text{n} & \quad \text{n̚} & \quad \text{l} & \quad \text{r} & \quad \text{w} & \quad \text{y}
\end{align*}

Vowels:
\begin{align*}
\text{i} & \quad \text{i} & \quad \text{u} & \quad \text{i:} & \quad \text{u:} \\
\text{e} & \quad \text{o} & \quad \text{e:} & \quad \text{o:}
\end{align*}

\text{Stress: high, medium, emphatic low}

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

Seri [20]

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

Consonants:
\begin{align*}
\text{pt} & \quad \text{t} & \quad \text{k} & \quad \text{kw} & \quad ? \\
\text{φ} & \quad \text{W} & \quad \text{s} & \quad \text{l} & \quad \text{š} & \quad \text{x} & \quad \text{X} & \quad \text{X} & \quad \text{w} \\
\text{m} & \quad \text{n} & \quad \text{æ} & \quad \text{a} & \quad \text{æ:} & \quad \text{a:}
\end{align*}

\text{y}
/i/ occurs in loanwords. /s/ represents a voiceless retroflexed alveopalatal fricative, /W/ a voiceless spirantized [w], and /X/ a voiceless uvular fricative. The rounded consonants /kw/, /W/, and /Xw/ 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.

**XSeri2 [MOSER and MOSER 1965] (18C, 4V+4L)**

Consonants:  
<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>k</th>
<th>kw</th>
<th>s</th>
<th>n</th>
<th>ʔ</th>
<th>i</th>
</tr>
</thead>
<tbody>
<tr>
<td>ɾ</td>
<td>l</td>
<td>ʃ</td>
<td>x</td>
<td>Xw</td>
<td>e</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>ɲ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vowels: a, V, VV, VVV

/i/ 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 /e/ in the above chart. Stress /ˈ/ 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 /kw/. (The only exceptions are ji "yes" and ʔɪʔɪki "a nickname.")

**Tarasco [21]**

**Ichupio and Tarerio Tarasco¹ [FOSTER 1969, 1971] (19C, 6V)**

Consonants:  
<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>c</th>
<th>č</th>
<th>k</th>
<th>s</th>
<th>ʃ</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td>ph</td>
<td>th</td>
<td>ch</td>
<td>kʰ</td>
<td>s</td>
<td>š</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ɾ</td>
<td>ɾ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>w</td>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

/b d g f l ŋ/ occur in Spanish loans.

**San Jerónimo Purencuévaro Tarasco² [NASEN DÍAS 1985] (19C, 6V)**

Consonants:  
<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>c</th>
<th>č</th>
<th>k</th>
<th>kw</th>
<th>s</th>
<th>š</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td>ph</td>
<td>th</td>
<td>kʰ</td>
<td>kʰwh</td>
<td>s</td>
<td>š</td>
<td>x</td>
<td>a</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ɾ</td>
<td>ɾ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>w</td>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Totonac [22]

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

Consonants: Vowels:

- p t c č k q ? i u i: u:
- s š h e o e: o:
- m n a a:
- l l ħ CV?
- w y

Zapotitlan [Aschmann 1946, 1983] (17C, 3V+3L)

Consonants: Vowels:

- p t c č k q ? i u i: u:
- s š h a a:
- m n CV?
- l l ħ
- w y

/r/ is added in Aschmann’s Dictionary [1983].

Papantla [Aschmann 1973; Hernández García 1982; Levy 1987](17C, 3V+3L)

Consonants: Vowels:

- p t c č k q ? i u i: u:
- s š h a a:
- l l ħ CV?
- m n
- w y

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

Coatepec [Levy 1987 (from McQuown 1940, 1983)] (23C, 3V+3L)

Consonants: Vowels:

- p t c č k kw q ? i u i: u:
- f š š x xw h h w a a:
- m n
- l l ħ
- r
- w y

McQuown added /f/ and /xw/ to his 1983 edition. /b g e o/ appear in Spanish loans.
Ahuacatlán [LEVY 1987 (from ESPINOZA 1978)] (14+3C, 3V+3L)

Consonants: Vowels:

\[
\begin{array}{cccc}
ptc & \\
q & i \\
? & u \\
mn & a \\
l & i \\
w & y \\
\end{array}
\]

/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: Vowels:

\[
\begin{array}{cccc}
ptc & \\
q & i \\
? & u \\
mn & a \\
l & i \\
w & y \\
\end{array}
\]

/f/ is attested only in Spanish loan words and in a few onomatopoetic words. [l] occurs in syllable-final position or before a consonant.

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

Consonants: Vowels:

\[
\begin{array}{cccc}
p't'c' & \\
q' & a \\
? & a \\
mn & h \\
l & l \\
w & y \\
\end{array}
\]

/e:/ contrast with /i i: 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:

\[
\begin{array}{cccc}
C'V & \sim & CV & \sim & CV' & \sim & CV \\
(V \text{ represents a laryngealized vowel.})
\end{array}
\]

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.
Native Middle American Languages

Chichimec [24]

Chichimec₁ [LASTRA DE SUÁREZ 1984] (20C, 7V+7N)

Consonants: Vowels:
\[ \begin{align*}
& \text{p t c č k ?} & \text{i ü u j ŭ ŭ} \\
& \text{b d j g} & \text{e o ě ŏ} \\
& \text{s h} & \text{æ a æ ā} \\
& \text{z} & \\
\end{align*} \]

Fortis m n
Lenis m n
l r

/w/ 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: Vowels:
\[ \begin{align*}
& \text{p t c č k ?} & \text{i ü u j ŭ ŭ} \\
& \text{b d j g} & \text{e o ě ŏ} \\
& \text{s h} & \text{æ a æ ā} \\
& \text{z} & \text{Tones: high, low} \\
& \text{m n} & \\
& \text{l r} & \\
& \text{w} & \\
\end{align*} \]

Pame [25]

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

Consonants: Vowels:
\[ \begin{align*}
& \text{p t c č k q ř} & \text{i j} \\
& \text{b d j g} & \text{e ě} \\
& \text{s š h} & \text{e o ě ŏ} \\
& \text{m n ř} & \text{a ā} \\
& \text{l ř r} & \text{Tones: high, low, falling glide} \\
& \text{w y} & \\
\end{align*} \]

/l/ occurs in Spanish loanwords.

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

Consonants: Vowels:
\[ \begin{align*}
& \text{p t c č k ?} & \text{i i u j j ŭ} \\
& \text{b d j j g} & \text{e o ě ŏ} \\
& \text{s š h} & \text{a ā} \\
& \text{m n} & \text{Tones: high, low, glide} \\
& \text{r} & \\
& \text{w y} & \\
\end{align*} \]
Matlatzinca [26]
[SCHUMANN 1975] (16C, 7V)

Consonants:  

\begin{align*}
\text{p} & \quad \text{t} & \quad \text{c} & \quad \text{č} & \quad \text{k} & \quad \text{kw} & \quad ? \\
\text{s} & \quad \text{š} & \quad \text{h} \\
\beta & \\
\text{l} \\
\text{m} & \quad \text{n} \\
\text{w} & \quad \text{y}
\end{align*}

Vowels:  

\begin{align*}
\text{i} & \quad \text{i} & \quad \text{u} \\
\text{e} & \quad \text{a} & \quad \text{o} \\
\text{a:} & \\
\text{Tones: high, glide}
\end{align*}

Schumann describes both Matlatzinca and Ocuiltec phonemes. His Ocuiltec inventory differs from Muntzel's analysis displayed below in the following points:
1) /d z ř/ 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:  

\begin{align*}
\text{p} & \quad \text{t} & \quad \text{c} & \quad \text{č} & \quad \text{k} & \quad \text{kw} & \quad ? \\
\text{(s)} & \quad \text{š} & \quad \text{h} \\
\beta & \\
\text{l} & \quad \text{(r)} \\
\text{m} & \quad \text{n} \\
\text{w} & \quad \text{y}
\end{align*}

Vowels:  

\begin{align*}
\text{i} & \quad \text{i} & \quad \text{u} & \quad \text{i:} & \quad \text{:u:} \\
\text{e} & \quad \text{a} & \quad \text{o} & \quad \text{a:} & \quad \text{:o:} \\
\text{Tones: high, glide}
\end{align*}

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

Otomí [28]

Mezquital [SINCLAIR and PIKE 1948; HESS 1968] (23C, 9V+4N)

Consonants:  

\begin{align*}
\text{p} & \quad \text{t} & \quad \text{c} & \quad \text{č} & \quad \text{k} & \quad ? \\
\text{b} & \quad \text{d} & \quad \text{g} \\
\text{f} & \quad \text{θ} & \quad \text{s} & \quad \text{š} & \quad \text{x} & \quad \text{h} \\
\text{z} \\
\text{m} & \quad \text{n} & \quad \text{ń} \\
\text{l} & \quad \text{r} \\
\text{w} & \quad \text{y}
\end{align*}

Vowels:  

\begin{align*}
\text{i} & \quad \text{i} & \quad \text{u} & \quad \text{i} & \quad \text{u} \\
\text{e} & \quad \text{a} & \quad \text{o} & \quad \text{e} & \quad \text{a} & \quad \text{e} & \quad \text{a} & \quad \text{a} \\
\text{Tones: high, low, rising}
\end{align*}
Native Middle American Languages

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

Consonants:  
\[ \begin{array}{lll}
\text{p} & \text{t} & \text{c} \\
\text{θ} & \text{ð} & \text{s} \\
\text{ʃ} & \text{z} & \text{ɣ} \\
\text{m} & \text{n} & \text{ñ} \\
\text{w} & \text{y} \\
\end{array} \]

Vowels:  
\[ \{
i \ i' \ e \ æ \ a \ c \ u \ o \ \} \]

Tones: high, low, rising

/ç ʃ l/ 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:  
\[ \begin{array}{lll}
\text{p} & \text{t} & \text{c} \\
\text{b} & \text{d} & \text{g} \\
\text{ʃ} & \text{z} & \text{ţ} \\
\text{m} & \text{n} & \text{ñ} \\
\text{w} & \text{y} \\
\end{array} \]

Vowels:  
\[ \{
i \ i' \ e \ æ \ a \ c \ u \ o \ \} \]

Tones: high, low, rising

/s ʃ l/ are rare phonemes.

**Tenango** [Blight and Pike 1976] (18C, 9V + 4N)

Consonants:  
\[ \begin{array}{lll}
\text{p} & \text{t} & \text{k} \\
\text{b} & \text{d} & \text{g} \\
\text{ʃ} & \text{z} & \text{ľ} \\
\text{m} & \text{n} & \text{ň} \\
\text{w} & \text{y} \\
\end{array} \]

Vowels:  
\[ \{
i \ i' \ e \ æ \ a \ c \ u \ o \ \} \]

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:  
\[ \begin{array}{lll}
\text{p} & \text{t} & \text{c} \\
\text{b} & \text{d} & \text{j} \\
\text{ʃ} & \text{h} & \text{ľ} \\
\text{m} & \text{n} & \text{ň} \\
\text{w} & \text{y} \\
\end{array} \]

Vowels:  
\[ \{
i \ i' \ e \ æ \ a \ c \ u \ o \ \} \]

Tones: high, low, falling, rising
Mazahua [29]
[SpoTTS 1953, 1956] (23C, 9V + 6N)

Consonants:
- \( p, t, c, k, k' \)
- \( b, d, g, g' \)
- \( s, ss, h \)
- \( z, zh \)
- \( m, n, \text{ñ} \)
- \( l, r \)
- \( w, y \)

Vowels:
- \( i, i: u, j, u: j: u: \)
- \( e, o, e: o: e: o: e: \)
- \( a, a: a: a: a: \)

Tones: high, low, falling

Tlapanec [30]

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

Consonants:
- \( p, t, c, k, ? \)
- \( b, d, j, g \)
- \( s, ss, h \)
- \( m, n, \text{ñ} \)
- \( l, r \)
- \( w, y \)

Vowels:
- \( i, u, i: u: j, u: j: u: \)
- \( e, o, e: o: e: o: e: \)
- \( a, a: a: a: a: \)

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

Tlapanec\(^2\) [TiTo MorÁn 1988] (23C, 5V + 5N + 10L)

Consonants:
- \( p, t, c, k, ? \)
- \( b, d, j, g \)
- \( ph, th, kh \)
- \( s, ss, h \)
- \( m, n, \text{ñ} \)
- \( l, r \)
- \( w, y \)

Vowels:
- \( i, u, i: u: j, u: j: u: \)
- \( e, o, e: o: e: o: e: \)
- \( a, a: a: a: a: \)

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)

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>t t' c c' k k'</td>
<td>i u j u</td>
</tr>
<tr>
<td>b d d' j g</td>
<td>e o ç ø</td>
</tr>
<tr>
<td>φ s š h</td>
<td>a a</td>
</tr>
<tr>
<td>m n ŋ</td>
<td>Tones: high, mid, low</td>
</tr>
<tr>
<td>l ř ř</td>
<td></td>
</tr>
<tr>
<td>w y</td>
<td></td>
</tr>
</tbody>
</table>

/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 nd' nj ng/.

Popoloc [32]

Western Popoloc¹ (Otlaltepec) [WILLIAMS and PIKE 1968] (21C, 5V+5N)

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>t c c' k k'</td>
<td>i u j u</td>
</tr>
<tr>
<td>s š s' h</td>
<td>e o ç ø</td>
</tr>
<tr>
<td>(z) (ž) y</td>
<td>a a</td>
</tr>
<tr>
<td>m n ŋ</td>
<td>Tones: high, mid, low</td>
</tr>
<tr>
<td>l ř</td>
<td></td>
</tr>
<tr>
<td>w y</td>
<td></td>
</tr>
</tbody>
</table>

/p/ is found only in loan words. /ř/ is found in loan words except in one native word. /l/ is a rare phoneme. Except for /ř/, the voiced fricatives are rare. /ž/ 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)

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>t c c' k k'</td>
<td>i u j u</td>
</tr>
<tr>
<td>d j j'</td>
<td>e o ç ø</td>
</tr>
<tr>
<td>s š s' h</td>
<td>a a</td>
</tr>
<tr>
<td>v y</td>
<td>Tones: high, mid, low</td>
</tr>
<tr>
<td>m n</td>
<td>12, 13, 21, 23, 31, 32,</td>
</tr>
<tr>
<td>l ř</td>
<td>131, 121, 213, 312, 313</td>
</tr>
<tr>
<td>y</td>
<td></td>
</tr>
</tbody>
</table>

/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: Vowels:
(p) t c č č k ? i u j u
s š š h e o e o
(ð) a a
m n
l r
w y

Consonants: Tones: 1 (high), 2, 3, 4 (low)
(p) t c č č k ? i u j u
s š š h e o e o
(ð) a a
m n
l r
w y

Consonants: Tones: 131, 121, 213, 312, 313
(p) t c č č k ? i u j u
s š š h e o e o
(ð) a a
m n
l r
w y

/Tlacoalco Popoloc [STARK and MACHIN 1977] (24C, 4V+4N+8L)
Consonants: Vowels:
(p) t c č č k ? i i i: i:
ð ź ź ź h e o e o e: o: e: o:
β ð z ý a a a: a:
m n ſ Tones: 1 (high), 2, 3, 4 (low)
 l ř ř

/₁/ is rare phoneme found in few native words. /θ t c č č k/ are voiced following /n/ when not preceding /h/.

Chocho [33]
[Mock 1977] (24C, 5V+5N)
Consonants: Vowels:
ð p t c č č k ? i u j u
φ ð s š š x e o e o
β ð z ý a a
m n Tones: 1 (high), 2, 3 (low), 12, 21, 32
 l ř ř

Accent generally falls on the penultimate syllable. /ð ř/ are pronounced [d g] after nasals.

Mazatec [34]
Consonants: Vowels:
(p) t c č č k ? i u j u
s š š h e o e o
m n ſ Tones: 1 (high), 2, 3, 4 (low), 14, 24,
 l ř ř

/₁/ are found in Spanish loans.
Native Middle American Languages

Jalapa de Díaz [SCHRAM and PIKE 1978] (21C, 5V+5N)

Consonants: Vowels:
\[
\begin{align*}
\text{t} & \quad \text{c} & \quad \text{č} & \quad \text{k} & \quad \text{kw} & \quad \text{i} & \quad \text{u} & \quad \text{j} & \quad \text{u} \\
\text{d} & \quad \text{j} & \quad \text{g} & \quad \text{gw} & \quad \text{o} & \quad \text{ø} \\
\text{s} & \quad \text{š} & \quad \text{h} & \quad \text{æ} & \quad \text{a} & \quad \text{æ} & \quad \text{a} \\
\text{m} & \quad \text{n} & \quad \text{ñ} & \quad \text{Tones: high, mid, low} \\
\text{l} & \quad \text{r} \\
\text{w} & \quad \text{y}
\end{align*}
\]

Huatla de Jiménez [PIKE 1967] (17C, 4V+4N)

Consonants: Vowels:
\[
\begin{align*}
\text{p} & \quad \text{t} & \quad \text{c} & \quad \text{č} & \quad \text{k} & \quad \text{i} & \quad \text{j} \\
\text{s} & \quad \text{š} & \quad \text{h} & \quad \text{e} & \quad \text{o} & \quad \text{ɛ} & \quad \text{ø} \\
\text{m} & \quad \text{n} & \quad \text{ñ} & \quad \text{a} & \quad \text{a} \\
\text{l} & \quad \text{(ř)} & \quad \text{Tones: 1 (high), 2, 3, 4 (low), 13, 14,} \\
\text{v} & \quad \text{y} & \quad 23, 24, 34, 43, 42, 32, 21, 424, 423 \\
\text{w} & \quad \text{y}
\end{align*}
\]

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

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

Consonants: Vowels:
\[
\begin{align*}
\text{p} & \quad \text{t} & \quad \text{c} & \quad \text{č} & \quad \text{k} & \quad \text{i} & \quad \text{u} & \quad \text{j} & \quad \text{u} \\
\text{s} & \quad \text{š} & \quad \text{h} & \quad \text{e} & \quad \text{o} & \quad \text{ɛ} & \quad \text{ø} \\
\text{m} & \quad \text{n} & \quad \text{ñ} & \quad \text{a} & \quad \text{a} \\
\text{l} & \quad \text{ř} & \quad \text{ř} & \quad \text{Tones: 1 (high), 2, 3, 4 (low), 12, 21,} \\
\text{w} & \quad \text{y} & \quad 23, 24, 31, 32, 34, 41, 42, 43 \\
\end{align*}
\]

Amuzgo [35]

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

Consonants: Vowels:
\[
\begin{align*}
(p) & \quad \text{t} & \quad \text{v} & \quad \text{c} & \quad \text{č} & \quad \text{k} & \quad \text{?} & \quad \text{i} & \quad \text{u} \\
\text{b} & \quad \text{d} & \quad \text{g} & \quad \text{e} & \quad \text{o} & \quad \text{ɛ} & \quad \text{ø} \\
\text{s} & \quad \text{š} & \quad \text{h} & \quad \text{ɛ} & \quad \text{a} & \quad \text{ɔ} & \quad \text{ɛ} & \quad \text{a} & \quad \text{ø} \\
\text{m} & \quad \text{n} & \quad \text{ñ} & \quad \text{Tones: 1 (high), 3, 5 (low),} \\
\text{(l)} & \quad \text{r} & \quad \text{(ř)} & \quad 12, 34, 35, 31, 53 \\
\text{w} & \quad \text{y}
\end{align*}
\]
Database 1: Phonological Systems

San Pedro Amuzgo² [Cuevas Suárez (Tapia García) 1985] (16C, 7V+5N)

Consonants:

- Consonants: t tʰ c č k kʷ ʔ
- Vowels: i u j ɨ
- Tones: 1 (high), 2, 3 (low), 13, 31

Although the informant for both Amuzgo charts is the same person, the inventories are different.

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

Consonants:

- Consonants: (p) t c č k kʰ kʷ ʔ
- Vowels: i u e o ɨ ɨ ɨ
- Tones: 1 (high), 2 (mid), 3 (low), 13, 32, 21

- Parenthesized phonemes are extremely rare.

Mixtec [36]

Acatlán [Pike and Wistrand 1974] (24C, 5V+5N)

Consonants:

- Consonants: p t č k kʷ ʔ
- Vowels: i u j ɨ
- Tones: high, mid, low

- Parenthesized phonemes are extremely rare. /w h/ are rare. /ɾ ɨɾ/ are rare and found mostly in loan words.
### Huajuapan [Pike and Cowan 1967] (17C, 5V+4N)

**Consonants:**

<table>
<thead>
<tr>
<th>t</th>
<th>c</th>
<th>k</th>
<th>kw</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>nd</td>
<td>(ng)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>s</td>
<td>š</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ꞏ</td>
<td>ź</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>ń</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Vowels:**

<table>
<thead>
<tr>
<th>i</th>
<th>ü</th>
<th>j</th>
<th>ṭ</th>
</tr>
</thead>
<tbody>
<tr>
<td>e</td>
<td>o</td>
<td>ě</td>
<td>ø</td>
</tr>
<tr>
<td>a</td>
<td>a</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tones:**

- high, mid, low

/nd w/ are rare phonemes. /p mb φ h ɣ r ţ/ 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:**

<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>c</th>
<th>k</th>
<th>kw</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(mb)</td>
<td>nd</td>
<td>(ŋj)</td>
<td>(ŋg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ꞏ</td>
<td>s</td>
<td>š</td>
<td>ź</td>
<td>h</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>ń</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Vowels:**

<table>
<thead>
<tr>
<th>i</th>
<th>u</th>
<th>j</th>
<th>ṭ</th>
</tr>
</thead>
<tbody>
<tr>
<td>e</td>
<td>o</td>
<td>ě</td>
<td>ø</td>
</tr>
<tr>
<td>a</td>
<td>a</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tones:**

- 1 (high), 2 (mid), 3 (low)

/mb ng/ are rare. /ń/ occurs in Spanish loans with a few exceptions.

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

**Consonants:**

<table>
<thead>
<tr>
<th>(p)</th>
<th>t</th>
<th>c</th>
<th>k</th>
<th>kw</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(mb)</td>
<td>nd</td>
<td>nj</td>
<td>j̊</td>
<td>ng</td>
<td>(ngw)</td>
</tr>
<tr>
<td>s</td>
<td>ś</td>
<td>¶</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>ń</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Vowels:**

<table>
<thead>
<tr>
<th>i</th>
<th>u</th>
<th>j</th>
<th>ṭ</th>
</tr>
</thead>
<tbody>
<tr>
<td>e</td>
<td>o</td>
<td>ě</td>
<td>ø</td>
</tr>
<tr>
<td>a</td>
<td>a</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tones:**

- 1 (high), 2 (mid), 3 (low)

 formulations 13, 23, 31, 32

/v/ varies from labiodental to bilabial. /p mb ngw/ are rare. /ŋ/ occurs only in one morpheme, -ŋ “we exclusive.”

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

Consonants: Vowels:

- t c k kw ? i u j u
- nd (6g) e o ë õ
- ß s ß (h) a ñ
- m n ñ Tones: high, mid, low
- l ñ

/t ß k kw bd mb nd sSxvm n fi 1ry?ieaouiaQ v/ (19C, 5V+4N)
/p mb/ occur only in loan words. /ng/ occurs only in one morpheme, /in'gà/ “other.” The phoneme /ß/ has an allophone [w] before the vowel /a/ and is realized as [ţ] elsewhere. /h/ is a rare phoneme. Zylstra [1991]’s inventory is as follows:
/t c k kw b d mb nd s s x v m n ñ l r y ? i e a o u j a ô û/ (19C, 5V+4N)
/p g f/ occur in Spanish loans.

Ayutla1 [Pankratz and Pike 1967] (23C, 5V+4N)

Consonants: Vowels:

(p) t t’ c k kw ? i u j u
(m) ñ d ñ ñ ñ (6g) (6g”)
- s ß (h) (h”) a ñ
- m n ñ Tones: high, mid, low
- l ñ

/b ß y

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

Ayutla2 [Hills 1990] (23C+? , 5V+3N)

Consonants: Vowels:

(p) t t’ (k’v) k kw i u j u i? u? j? u?
(m) n n ñ ñ (6g”)
- s (s”) ñ (x) a a a? a?
- (m) n n ñ Tones: high, mid, low
- l ñ

/v y

/p kv mb ng ngw sv x m/ are rare.
Native Middle American Languages

**Ocotepec** [Mak 1958] (18C, 5V+5N)

Consonants:

- (p) t č k kʷ (?)
- s š h
- z ž
- ñ ñ
- l

Vowels:

- i u j u
- e o ə ə
- /y/ are rare. /mb nd νg/ are treated as clusters /mp nt nč nk/.

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

Consonants:

- (p) t č k kʷ (?)
- s š x
- v (ð)
- (m) n ŋ
- (l)

Vowels:

- i u j u
- e o ə ə
- /y/ are rare. /mb f g r f/ have been introduced through Spanish loanwords.

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

Consonants:

- p t č k kʷ (?)
- d
- s š h
- v ž
- m n ŋ
- l r

Vowels:

- i u j u
- e o ə ə
- /y/ is rare and occurs as second member of a consonant cluster. Alexander [1980] reports Atatlahuca has a three tone system /1, 2, 3/.

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

Consonants:

- p t č k kʷ (?)
- mb nd νg
- s š h
- ž
- m n N ŋ
- l r

Vowels:

- i i u j j u
- e o ə ə
- /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 [Max 1950] (21C, 6V+5N)
Consonants: Vowels:
p t č k kW ? i i’ u j j’ u
mb nd nj ng e o 0
s š h a a
β δ ž Tones: high, mid, low
m n ŋ
l r

/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].
/z/ is [y] after /l/ or /š/, [ž] or [y] elsewhere.

Chalcatongo [Macauley 1987] (17C, 6V+5N)
Consonants: Vowels:
t č k kW ? i i’ u j j’ u
b nd s š h e o
ž Tones: high, mid, low
m n ŋ
l r
w

Diuxi [Pike and Oram 1976] (18C, 6V+6N)
Consonants: Vowels:
t č k kW ? i i’ u j j’ u
d e o 0
s š h h’ a a
β δ ž Tones: high, low
m n ŋ
l ř

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

Diuxi2 [Kuiper and Oram 1991] (19C, 6V+6N)
Consonants: Vowels:
t č k kW ? i i’ u j j’ u
nd nd’ s š x x’ e o (e) 0
β δ ž Tones: high, mid, low,
m n ŋ high downglide
l r

Since it is reported that d and g occur only after n, they are symbolized as /nd nd’/ here. /ž/ is transcribed by y in the source. /p b g’ f/ occur in loanwords.
Peñoles [Daly 1973; Daly and Daly 1977] (20C, 6V+6N)

Consonants: t č k kw? ṭ ṭ
mb nd nj ng ngw
s š
φ ð ź
m n ŋ l ř

/p f h ř/ are found in Spanish loans.

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

Consonants: (p) t č k kʷ?
mb nd nj ng ngw
s š
β ð δγ
m n ŋ
l ř

/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 č k kʷ?
mb nd ndy ng
v s š x
m n ŋ
l r

/p mb/ are rare.

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

Consonants: p t č k kʷ?
mb nd ndy
s š x
m n ŋ
l r
v y

Vowels: i i u j j ŭ
ɛ θ ɛ ə
Tones: high, mid, low
Chayuco [Pensinger and Lyman 1975] (20C, 6V+6N)

Consonants: Vowels:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>t</td>
<td>t'</td>
</tr>
<tr>
<td>k</td>
<td>ʔ</td>
<td>kʷ</td>
</tr>
<tr>
<td>m_b</td>
<td>n_d</td>
<td>n_d_y</td>
</tr>
<tr>
<td>v</td>
<td>θ</td>
<td>s</td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>ň</td>
</tr>
<tr>
<td>l</td>
<td>ř</td>
<td></td>
</tr>
</tbody>
</table>

/i/ possibly is /kʷ/, although it is noted that /q/ represents [ky].

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

Consonants: Vowels:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>t</td>
<td>t'</td>
</tr>
<tr>
<td>č</td>
<td>k</td>
<td>ʔ</td>
</tr>
<tr>
<td>m_b</td>
<td>n_d</td>
<td>n_d_y</td>
</tr>
<tr>
<td>s</td>
<td>š</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>ň</td>
</tr>
<tr>
<td>l</td>
<td>ř</td>
<td></td>
</tr>
</tbody>
</table>

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

Cuicatec [37]

Concepción Pápalo¹ [Needham and Davis 1946] (14C, 6V+6N)

Consonants: Vowels:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>t</td>
<td>ċ</td>
<td>k</td>
</tr>
<tr>
<td>s_x</td>
<td>e</td>
<td>ɛ</td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>(l)</td>
</tr>
</tbody>
</table>

/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: Vowels:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>t</td>
<td>č</td>
</tr>
<tr>
<td>k</td>
<td>ʔ</td>
<td>kʷ</td>
</tr>
<tr>
<td>s</td>
<td>x</td>
<td>e</td>
</tr>
<tr>
<td>v</td>
<td>Δ</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>l</td>
</tr>
</tbody>
</table>

/f/ occurs in Spanish loanwords.
Santa María Pápalo [Anderson and Concepción Roque 1983]

Vowels:

\[ \begin{align*}
\text{i} & \quad \text{u} \\
\text{e} & \quad \text{o} \\
\text{a} & \quad \text{e} \\
\end{align*} \]

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]


Consonants:

Fortis: \( p \ t \ k \ s \ \dot{s} \ m \ n \ l \ y \ w \)

Lenis: \( b \ d \ g \ z \ \dot{z} \ m \ n \ l \ y \ w \)

\( c \ \dot{c} \ r \ ? \ h \)

Vowels:

\[ \begin{align*}
\text{i} & \quad \text{i} \quad \text{u} \\
\text{e} & \quad \text{a} \\
\text{a} & \quad \text{a} \\
\end{align*} \]

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

\( /\ddot{c}/ \) occurs but \( /\ddot{z}/ \) does not in Good's inventory [1979].
San Juan Copalá [HOLLENBACH 1977] (22C, 5LV + 3SV)

Consonants:

Fortis:  p  t  k  s  ž  š
Lenis:   b  d  g  z  ž  r
Affricates: c  č  č
Resonants: m  n  1  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  e  o  e!  o!
Short: a  a!

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; 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 [JOSERAND 1983: 177].
Sierra Zapotec (Atepec) [Nellis 1947] (23C, 5V + 3N)
Consonants:
\[
\begin{array}{cccccccc}
\text{p} & \text{t} & \text{c} & \text{ç} & \text{k} & \text{kw} \\
\text{s} & \text{ʃ} & \text{f} & \emptyset & \text{x} \\
\text{z} & \text{ʒ} & \text{v} & \text{ð} & \text{ɣ} \\
\text{m} & \text{n} & \text{l} & \text{r} & \text{ɾ} & \text{w}
\end{array}
\]
Vowels: \( i \ e \ a \ o \ u \)
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) [Bartolomew 1983] (35C, 5V)
Consonants:
\[
\begin{array}{cccccccc}
\text{p} & \text{b} & \text{t} & \text{d} & \text{c} & \text{c} & \text{k} & \text{g} & \text{kw} & \text{g} & \emptyset \\
\text{s} & \text{ʃ} & \text{f} & \emptyset & \text{x} \\
\text{m} & \text{n} & \text{l} & \text{r} & \text{y} \\
\text{w} & ?
\end{array}
\]
Vowels: \( i \ e \ a \ o \ u \)
Vowels can be nasalized.
  simple: \( \text{V} \)
  glottalized (cortada): \( \text{V}? \)
  laryngealized (quebrada): \( \text{V}?\text{V} \)
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 \( \text{p} \text{t} \text{t}: \text{c} \text{c} \text{k} \text{kw} \text{s} \text{ʃ} \text{n} \text{l} \text{r} \)
  Lenis \( \text{b} \text{d} \text{g} \text{gw} \text{ʒ} \text{n} \text{l} \text{r} \)
  Non-contrast \( \emptyset \text{x} \text{m} \text{?} \)
Vowels: \( i \ e \ a \ o \ u \)
  simple: \( \text{V} \)
  laryngealized (interrupted): \( \text{V}?\text{V} \)

Rincón (Villa Alta district) [Earl 1968] (21C, 7V)
Consonants:
  Fortis \( \text{p} \text{t} \text{c} \text{ç} \text{k} \text{s} \text{ʃ} \)
  Lenis \( \text{b} \text{d} \text{j} \text{j} \text{g} \text{z} \text{ʒ} \)
  Non-contrast \( \text{l} \text{n} \text{r} \text{w} \text{y} \text{?} \text{X} \)
Vowels: \( i \ e \ a \ o \ u \text{í} \text{æ} \)
/X/ varies between uvular trill and [h]. /m ñ f/ are borrowed from Spanish.
Consonants:
Fortis   p  t  č  k  s  š  š  m  n  l
Lenis    b  d  j  g  z  ž  ž  m  n  l
Non-contrast ř  w  č  X  ř
Vowels:  i  e  a  o
/b f x ř y(II) u/ occur in Spanish loans.

Yatzachi [Butler 1976, 1980] (26C, 5V)
Consonants:
Fortis   p  t  č  k  kʷ  s  š  š  n  l
Lenis    b  d  į  g  gʷ  z  ž  ž  n  l
Non-contrast m  ř  X  Xʷ  ř
Vowels:  i  e  a  o  ř
/f x Xʷ y ř ř/ 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  kʷ  s  š  š  n  l
Lenis    b  d  į  g  gʷ  z  ž  ž  n  l
Non-contrast m  y  X  Xʷ  ř
Vowels:  i  e  a  o  i (high back unround)
Tones:   1(high), 2(mid), 3(low), 12, 13, 21, 23, 32
/f x Xʷ x r ř/ occur in borrowed words.

Cajonos [Nellis and Hollenbach 1980] (26C+?, 4V)
Consonants:
Fortis   p  t  č  k  kʷ  s  š  š  m  n  l  r  X
Lenis    b  d  į  g  gʷ  z  ž  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  kʷ  s  š  n  l
Lenis    b  d  į  g  gʷ  z  ž  ž  n  l
Non-contrast m  r  X  Xʷ  ř
Vowels:  i  e  a  o  ř
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 ĵ j g z ż n l
  Non-contrast  r w y
Vowels:   i e a o
          iʔ eʔ aʔ oʔ
          iʔi eʔe aʔa oʔo
/ʔ/ 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 ĵ j g z ż
  Non-contrast  m n 1 r ?
Vowels:  i e e a o u
          simple:  V
          laryngealized:  VʔV
          checked:  Vʔ
Tones:  high, mid, low

Albarradas [Kreikebaum 1987] (22C+?, 7V)
Consonants:
  Fortis  p t č k kʷ s š n l r
  Lenis  b d j j g (g*)z ż n l r
  Non-contrast  m w y (f) (x)
Vowels:  i e a o u e ü (ʔ?)
          simple:  V
          laryngealized:  VʔV
          interrupted:  Vʔ?
          aspirated:  Vh
Tones:  rising, falling, low
Parenthesized phonemes occur in Spanish loans. There are two non-standard orthographic symbols, ę and ń. 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.
Database 1: Phonological Systems

mitla\textsuperscript{1} [ Briggs 1961] (26C, 6V)

Consonants:

<table>
<thead>
<tr>
<th>Fortis</th>
<th>p t k k$^w$ s ʃ m n l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenis</td>
<td>b d g g$^w$ z ž m n l</td>
</tr>
<tr>
<td>Non-contrast</td>
<td>f x ř ř h ? w y</td>
</tr>
</tbody>
</table>

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.

mitla\textsuperscript{2} [ Stubblefield and Hollenbach 1991] (29C, 6V)

Consonants:

<table>
<thead>
<tr>
<th>Fortis</th>
<th>p t c č k k$^w$ s ʃ m n l r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenis</td>
<td>b d j j g g$^w$ z ž m n l r</td>
</tr>
<tr>
<td>Non-contrast</td>
<td>f h w y ?</td>
</tr>
</tbody>
</table>

Vowels: i e æ a o u

checked (glottalized): V?

laryngealized: VV

aspirated: Vh

Tlacochahuaya [ Rendon 1970] (21C, 6V)

Consonants:

<table>
<thead>
<tr>
<th>Fortis</th>
<th>p t č k k$^w$ s ʃ n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenis</td>
<td>b d j j g g$^w$ z ž n</td>
</tr>
<tr>
<td>Non-contrast</td>
<td>m l r y ?</td>
</tr>
</tbody>
</table>

Vowels: i e a o u i

Tones: high, low, rising

Guelavia\textsuperscript{1} [ Jones and Church 1985] (22C + ?, 6V)

Consonants:

<table>
<thead>
<tr>
<th>Fortis</th>
<th>p t c č k s ʃ m n l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenis</td>
<td>b d j j g z ž m n l</td>
</tr>
</tbody>
</table>
| Non-contrast | w y (?)

Vowels: i e a o u i

simple: V

laryngealized: V?V

checked: V?
204 Native Middle American Languages

Guelavía² [Jones and Knudson 1977] (26C+?, 6V)

Consonants:
- Fortis: p t c č ċ k ğ s š ș m n l
- Lenis: b d j j ğ g z ž ț m n l
- Non-contrast: ř w y (?)

Vowels:
- Simple: i e a o u i
- 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 tř č ċ k ğ s š ș m n ř l
- Lenis: b d dř j ğ g ğ z ž ț m n ř l
- Non-contrast: w y ř

Vowels:
- Simple: i e a o u +
- 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 ċ k ğ s š
- Lenis: b d j j ğ g ğ z ž
- Non-contrast: m n ř l r h w y

Vowels:
- Simple: i e æ a o u
- Laryngealized: V?V

Tones: high, low, low-rising, mid-rising
### Database 1: Phonological Systems

**Ayoquesco** [MacLAury 1989] (20C+?, 6V)

**Consonants:**
- **Fortis:** p t č k kʷ s ʃ
- **Lenis:** b d j ɡ gʷ ʒ ʒ
- **Non-contrast:** m n l r w y

**Vowels:** i e a o u ɪ (high back unrounded)

**simple:** V

**laryngealized:** Vʔ (creaky)

**glottalized**: 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+?, 6V)

**Consonants:**
- p t c č k kʷ m b n d n z n g f s ʃ h β ð ʒ
- m n ñ l ř w y

**Vowels:** i e a o u

**lengthened:** VV

**checked:** Vʔ

**interrupted:** VʔV

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

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

**Consonants:**
- p t c č k s ʃ s m n l w y
- b d j j ɡ z ʒ m n l w y

**Vowels:** i e a o u

**simple:** V

**glottal interruption:** Vʔ

**aspiration:** Vʰ

**Tones:** high, low, rising

/f x n r/ occur in Spanish loans.
**Isthmus** [MARLETT and PICKETT 1987] (23C, 5V)

Consonants:
- Fortis: p t č k s š n ň l
- Lenis: b d j g z ž n ň l
- Non-contrast: m r w y ?

Vowels:
- simple: i e a o u
- checked: V?
- laryngealized: VV

Tones: high, low rising, low

/f ř h/ occur in loanwords or interjections.

**Isthmus** [PICKETT 1967] (23C, 5V)

Consonants:
- Fortis: p t č k s š
- Lenis: b d j g z ž
- Non-contrast: m n ň l ř ř w y f h ?

Vowels:
- simple: i e a o u
- 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.

**Isthmus** [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]


Consonants:
- p t k ?
- b d g
- s š h m n
- 1 r
- w y

Vowels:
- i u j u
- e o € ø
- a

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

/c/ and /ʃ/ 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 c č k kw ?
- d dy g gw
- s š h hw
- m n n
- 1 r
- w y

Vowels:
- i u j u
- e o € ø e: o: €: ø:
- a

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

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.

Tataltepec2 [UPSON and LONGACRE 1965] (18C, 5V+4N+9L)

Consonants:
- t tv c č k kw ?
- s š h hw
- m n n
- 1 r
- w y

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

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

Consonants:
- t tv c č k kw ?
- s š h hw
- m n n
- 1 r
- w y

Only segmental phonemes are presented and there is no description of the tonal system.
Chinantec [41]

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

**Consonants:**

<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>k ?</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>d</td>
<td>j g</td>
</tr>
<tr>
<td>f</td>
<td>s</td>
<td>h</td>
</tr>
<tr>
<td>v</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Vowels:**

<table>
<thead>
<tr>
<th>i</th>
<th>i u</th>
<th>j</th>
<th>ĵ υ</th>
<th>i:</th>
<th>i: u:</th>
<th>j:</th>
<th>ĵ: υ:</th>
</tr>
</thead>
<tbody>
<tr>
<td>e</td>
<td>o</td>
<td>ē</td>
<td>e</td>
<td>ū</td>
<td>u</td>
<td>ē:</td>
<td>e:</td>
</tr>
<tr>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

**Stress:** controlled, ballistic

---

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

**Consonants:**

<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>k ?</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>d</td>
<td>j g</td>
</tr>
<tr>
<td>s</td>
<td>š</td>
<td>s ė</td>
</tr>
<tr>
<td>z</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Vowels:**

<table>
<thead>
<tr>
<th>i</th>
<th>i'</th>
</tr>
</thead>
<tbody>
<tr>
<td>e</td>
<td>a</td>
</tr>
</tbody>
</table>

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

**Stress:**

---

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

<table>
<thead>
<tr>
<th>s</th>
<th>š</th>
<th>s ė</th>
</tr>
</thead>
<tbody>
<tr>
<td>z</td>
<td>j</td>
<td></td>
</tr>
</tbody>
</table>

in Lalana, in Ozumacín

---

I take /j/ at face value and regard it as a voiced affricate. Consonant clusters are /hm hn hñ hŋ hw hl hy m nň nŋ mŋ ?m ?n ?ñ ?ŋ ?w ?l ?y/.

---

**Comaltepec** [Anderson 1989; Anderson, Martínez and Pace 1990]

(16C, 8V+7N+15L)

**Consonants:**

<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>ķ ?</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>d</td>
<td>j g</td>
</tr>
<tr>
<td>s</td>
<td>h</td>
<td></td>
</tr>
</tbody>
</table>

**Vowels:**

<table>
<thead>
<tr>
<th>i</th>
<th>i u</th>
<th>j</th>
<th>ĵ υ</th>
<th>i:</th>
<th>i: u:</th>
<th>j:</th>
<th>ĵ: υ:</th>
</tr>
</thead>
<tbody>
<tr>
<td>e</td>
<td>ē</td>
<td>ć</td>
<td>e</td>
<td>ū</td>
<td>e</td>
<td>ē:</td>
<td>e:</td>
</tr>
<tr>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

---

/ʃ/ is a retroflexed palatal that varies between a spirant [ʂ] and a trill [f]. /æ/ is in near complementary distribution with the sequence /ia/, only contrasting after laryngeals /h ʔ/. /ē/ is least common of the vowels and is the only one which never occurs with nasalization.
**Yolox** [Rensch 1968] (19C, 8V+N)

Consonants: | Vowels: |
---|---|
\[ptk\] | [iüiu] |
\[bdg\] | [eəo] |
\[fsh\] | [a] |
\[z\] |
\[mn(ŋ)ŋ\] |
\[l\] |
\[r\] |
\[w y\] |

Consonant clusters are /ky kw gy gw/ and /hm hn (hŋ) hŋ hl ŋm ŋŋ (ŋŋ) ŋl ŋw ŋy/. 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: | Vowels: |
---|---|
\[tk\] | [iiu] |
\[b\] | [eəo] |
\[fsh\] | [a] |
\[z\] |
\[n ŋ\] |
\[l\] |

Consonant clusters are /gy gw/ and /hn hl ŋm/. 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:  
\[
\begin{array}{cccc}
p & t & \ddag & k \\
& b & d & \ddag \\
& f & s & h \\
w & \delta & \gamma \\
m & n & \ddot{n} & \ddot{\eta} \\
\end{array}
\]

Vowels:  
\[
\begin{array}{cccc}
i & \ddot{i} & u & \ddot{u} \\
e & \ddot{e} & o & \ddot{o} \\
& a & \ddot{a} \\
\end{array}
\]

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/; /\ddag/ or /h/ followed by any nasal, /l/ or /g/; or /\ddag/ followed by /w/ or /\gamma/. Another analysis of syllable types by Gardner and Merrifield [1990] is as follows:  
syllable types: short ballistic checked \( CV!\ddag \)  
short ballistic open \( CV! \)  
short controlled checked \( CV? \)  
long controlled open \( CV: \)  
long ballistic open \( CV!: \)  

※Ozumacin [Rensch 1968] (19C, 7V+N)

Consonants:  
\[
\begin{array}{cccc}
p & t & \ddag & k \\
& b & j & g \\
& s & h \\
m & n & \ddot{n} & \ddot{\eta} \\
l & \ddag & \ddag \\
w & (\gamma) \\
\end{array}
\]

Vowels:  
\[
\begin{array}{cccc}
i & i & u \\
e & \ddot{e} & o & \ddot{o} \\
& a \\
\end{array}
\]

Consonant clusters are /ky kw gy gw/ and /hm hn h\ddot{n} h\ddot{j} hw hl ?m ?n ?\ddot{n} ?w ?l ?\ddag \ddag ?y/. /\gamma/ 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:            Vowels:
p t c k ?             i i u
b g h                e o o
z                        a
m n η
l
w (y)

Consonant clusters are /ky kw gy gw/, /ty zy cy ny/ and possibly /ny/; also /hm hn

Palantla [MERRIFIELD 1968] (19C, 7V+7N)
Consonants:            Vowels:
p t c k ?             i i u j j u
b d j g              e ē o ē ę ę o
φ s r h               a ą
m n η
l
w y

Consonants:            Vowels:
p t c k ?             i i u j j u
b d j g              e ē o ē ę ę o
m n η
f s r h               a ą
l
w y

/r/ is a lightly voiced lamino-domal spirant. Formerly /m n η/ were interpreted as
/mb nd ng/ [WESTLEY 1971].
Sochiapan [FORIS 1973] (17C, 7V+7N)

Consonants:

\[ p t c k ? \]
\[ \delta \]  
\[ \phi \]  
\[ m n \]  
\[ l r \]

Vowels:

\[ i u j i u \]
\[ e e o e e o \]
\[ Tones: 1, 2, 3, 21, 32, 13, 23 \]

Stress: ballistic, controlled

/e/ is mid front retracted, occurring only after laryngeals and only in certain ideolects. /ɛ/ is retroflexed and slightly voiced, phonetically [ɛ]. Semivowels are expressed by /u/ and /i/. /ɪ/ occurs in Spanish loans. /ɪ/ 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:

\[ i u e e o \]
\[ \eta \]

※Usila [RENsCH 1968] (19C, 5V+N)

Consonants:

\[ p t t' c k ? \]
\[ b d d' g \]
\[ f s h \]
\[ m n n \]  
\[ l r \]

Vowels:

\[ i u e o \]
\[ a \]
\[ Tones: 1, 2, 3, 4, 5, 23, 34, 43, 32 \]

Consonant clusters are /hm hn n̥ n̥ h̥ h̥ d̥ v̥ m̥ n̥ ?̥ n̥ ?̥ n̥ ?̥ v̥ d̥ v̥/. Vowels may be optionally nasalized and checked by /?/.

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

Consonants:

\[ p t c k ? \]
\[ \theta \]  
\[ m n \]  
\[ l r \]
\[ w y \]

Vowels:

\[ i u j i u \]
\[ e e o e e o \]
\[ a \]
\[ Tones: 1, 2, 3, 4, 12, 34, 42 \]

/t/ is a retroflexed alveopalatal grooved affricate in a stressed syllable; in unstressed syllables it is an alveolar flap. /t c θ l s n ñ k g h/ may be palatalized through the addition of the semivowel /y/. /p n ñ 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 loan-words.
Ojitlan [RENSCH 1968] (16C, 7V+N)

Consonants:
- p t c ć k ?
- s h
- m n ň ŏ
- l r
- w y

Vowels:
- i i u
- e ŏ o
- a

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


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

Consonants:
- p t c k ?
- d g
- ō s h
- m n ŏ
- l r
- w y

Vowels:
- i i u
- e ŏ o
- a

Syllable finals may be nasalized and/or checked by /?/ 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 crescento or an extra pulse, whereas the controlled syllable has a decrescendo or at least lack of crescento. 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)


Consonants:
- p t c ć k
- b d g
- s š h
- m n
- l ř ř
- w y

Vowels:
- i i i: i:
- e ŏ e: o:
- a a:
/ɨ/ contrasts with /i/ only in intervocalic position. /ɨ/ 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]**


Consonants:

<table>
<thead>
<tr>
<th>Voiceless</th>
<th>Central</th>
<th>Lateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstruent</td>
<td>p t c t' č k</td>
<td></td>
</tr>
<tr>
<td>Continuant</td>
<td>f s š x l l'</td>
<td></td>
</tr>
<tr>
<td>Glottalic</td>
<td>f' c' č' k' ?</td>
<td>l'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voiced</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstruent</td>
<td>b d g</td>
<td></td>
</tr>
<tr>
<td>Continuant</td>
<td>m n ŋ y w l</td>
<td></td>
</tr>
<tr>
<td>Glottalic</td>
<td>m' n' ŋ' w' l'</td>
<td></td>
</tr>
</tbody>
</table>

Vowels:

short: i e a o u

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

/ɬ'/ is a lightly glottalized affricate [tɬ'] and is the same as /L'/(X') described by Waterhouse and Morrison [1950], who additionally list /N y w/, which are not considered phonemes later.

**Tequistlatec¹ [WATERHOUSE 1980] (27C, 5V)**

Consonants:

<table>
<thead>
<tr>
<th>Voiceless</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstruent</td>
<td>p t c k</td>
<td></td>
</tr>
<tr>
<td>Continuant</td>
<td>f s š w h l</td>
<td></td>
</tr>
<tr>
<td>Glottalic</td>
<td>f' c' č' k' ?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voiced</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstruent</td>
<td>b d g</td>
<td></td>
</tr>
<tr>
<td>Continuant</td>
<td>m n ŋ y w l</td>
<td></td>
</tr>
</tbody>
</table>

Vowels: i e a o u

**Tequistlatec² [TURNER 1967; TURNER and TURNER 1971] (27C, 5V)**

Consonants:

<table>
<thead>
<tr>
<th>Voiceless</th>
<th>Central</th>
<th>Lateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstruent</td>
<td>p t c č k</td>
<td></td>
</tr>
<tr>
<td>Continuant</td>
<td>f s š w h l</td>
<td></td>
</tr>
<tr>
<td>Glottalic</td>
<td>f' c' č' k' ?</td>
<td>X'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voiced</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstruent</td>
<td>b d g</td>
<td></td>
</tr>
<tr>
<td>Continuant</td>
<td>m n y ŋ w l</td>
<td></td>
</tr>
</tbody>
</table>

Vowels: i e a o u
The sequence tl', a voiceless glottalized alveolar lateral affricate, is written as /k'/. /l/ is a voiceless alveolar fricative and frictionless lateral. /n/ is a voiceless nasal. /w/ is a voiceless non-syllabic high, close, back, slightly rounded vocoid. /ð r ñ f/ occur in words of Spanish origin. Syllable consonant-vowel patterns that occur are: CV, CVC, CVCC, CCV, CCVC, CVCC, CCCC, and CCCVC.

Comparing both sources' systems, the difference is seen in /ñ/, /l'/ and /r/. /l'/ is interpreted as /l2/ 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 /t'/ /t'/, and three glottalized nasals /m' n' ŋ'/, plus a glottalized vocoid /w'/, while Tequistlatec has a phoneme /ŋ/.

Zoque [44]

※Ostucán [Engel and Longacre 1963] (22C, 6V)

Consonants: Vowels:
\[
\begin{array}{llll}
  p & t & t' & c \\
  b & d & d' & j \\
  s & ŋ & h \\
  m & n & ŋ & ą \\
  w & y \\
\end{array}
\]

/f r ñ/ may appear in Spanish loans. Since /A/ in the original is described as a high, central, unrounded vowel, it is replaced by /i/.

※Rayón [Harrison et al. 1984] (22C, 6V)

Consonants: Vowels:
\[
\begin{array}{llll}
  p & t & t' & c \\
  b & d & d' & j \\
  s & ŋ & h \\
  m & n & ŋ & ą \\
  w & y \\
\end{array}
\]

Since it is noted that /A/ is pronounced just like /u/ but with unrounded lips, /A/ must be high, central /i/.
Copainalá [Wonderly 1951; Harrison et al. 1981] (22C, 6V)

Consonants: Vowels:
- pt ty ck i u
- bd dy jg e o
- s ŝ h a
- mn "ñ "
- r y

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

Francisco León [Engel and Bartholomew 1987] (12C, 6V)

Consonants: Vowels:
- pt ck i i u
- sh e o
- mn "ñ " a
- w y

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

Chimalapa [Knuudson 1980] (14C, 6V)

Consonants: Vowels:
- pt ck i i u
- sh e o
- mn "ñ " a
- l r
- w y

Veracruz Zoque/Popoluca Zoque [45]

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

Consonants: Vowels:
- pt ty ck i u i: u:
- bd dy g e o e: o:
- s ŝ h a a:
- mn "ñ " a
- l r
- w y
Veracruz Mixe/Mixe Popoluca [46]

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

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c ċ k ?</td>
<td>i u i: u:</td>
</tr>
<tr>
<td>b d g</td>
<td>e ο e: o:</td>
</tr>
<tr>
<td>s š h</td>
<td>a a:</td>
</tr>
<tr>
<td>m n</td>
<td>l ũ</td>
</tr>
<tr>
<td>w y</td>
<td></td>
</tr>
</tbody>
</table>

/φ β δ r/ appear in Spanish loans.

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

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c ċ k ?</td>
<td>i i u i: i: u:</td>
</tr>
<tr>
<td>s š h</td>
<td>e o e: o:</td>
</tr>
<tr>
<td>m n</td>
<td>a a:</td>
</tr>
<tr>
<td>l</td>
<td>w y</td>
</tr>
</tbody>
</table>

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

**Mixe** [47]

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

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels: Short</th>
<th>Long</th>
<th>Extra long</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c k ?</td>
<td>i i u</td>
<td>i· i· u·</td>
<td>i: i: u:</td>
</tr>
<tr>
<td>b d g</td>
<td>e o e: o:</td>
<td>e: o:</td>
<td></td>
</tr>
<tr>
<td>š h</td>
<td>a a:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>m n ŋ</td>
<td>w y</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

/f s l ũ/ appear in Spanish loans.

**San José El Paraíso** [VAN HAITSMA and VAN HAITSMA 1976]

(12C, 6V+6L+6EL)

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels: Short</th>
<th>Long</th>
<th>Extra long</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c k ?</td>
<td>i i u</td>
<td>i· i· u·</td>
<td>i: i: u:</td>
</tr>
<tr>
<td>š h</td>
<td>e o e: o:</td>
<td>e: o:</td>
<td></td>
</tr>
<tr>
<td>m n ŋ</td>
<td>a a:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>w y</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

/b d g j/ 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/. 

/φ β δ r/ appear in Spanish loans.
Native Middle American Languages

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

Consonants: Vowels:
- p t c k ?
- s š h
- m n i r
- w y
- e a o e: a: o:
- i: u: a: e:
- e: o:

Totontepec1 [SCHOENHALS and SCHOENHALS 1982; SCHOENHALS 1979]
(16C, 9V+9L)

Consonants: Vowels:
- p t c č k ?
- d g
- v s š h
- m n ŋ
- e a o e: a: o:
- i: u: a: e:
- e: o:

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

Totontepec2 [CRAWFORD 1963] (15C, 9V+9L)

Consonants: Vowels:
- p t c č k ?
- d g
- v s š h
- ź
- m n y
- e a o e: a: o:
- i: u: a: e:

Huastec [48]

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

Consonants: Vowels:
- p t c č k kʷ
- t’ c’ č’ k’ kʷ ?
- ũ
- θ š h
- m n l
- e o e: o:
- i: u:
- a: a:
- e: o:

/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: Vowels:

\begin{align*}
\text{p} & \quad \text{t} & \quad \text{c} & \quad \text{č} & \quad \text{k} & \quad \text{k}^w \\
\text{b} & \quad \text{t}^\prime & \quad \text{c}^\prime & \quad \text{č}^\prime & \quad \text{k}^\prime & \quad \text{k}^w^? \\
\theta & \quad \text{s} & \quad \text{š} & \quad \text{h} & \quad \text{a} & \quad \text{a} \\
\text{m} & \quad \text{n} & \quad \text{l} & \quad \text{r} & \quad \text{w} & \quad \text{y}
\end{align*}

All vowels may be nasalized in a limited number of onomatopoetic forms.

/p^w\ b^w\ d\ g\ g^w\ f\ f^w\ x^w\ h^w\ m^w\ n^w\ ň\ l^w\ r^w\ ř^w/ are found in Spanish loans.

/s/ is found only in Spanish loans.

Yucatec [49]

Yucatec¹ [Blair 1964] (21C, 5V)

Consonants: Vowels:

\begin{align*}
\text{p} & \quad \text{t} & \quad \text{c} & \quad \text{č} & \quad \text{k} \\
\text{p}^\prime & \quad \text{t}^\prime & \quad \text{c}^\prime & \quad \text{č}^\prime & \quad \text{k}^\prime \\
\text{b}^\prime & \quad \text{s} & \quad \text{š} & \quad \text{h} & \quad \text{a} \\
\text{m} & \quad \text{n} & \quad \text{l} & \quad \text{r} & \quad \text{w} & \quad \text{y}
\end{align*}

/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: Vowels:

\begin{align*}
\text{p} & \quad \text{t} & \quad \text{c} & \quad \text{č} & \quad \text{k} \\
\text{p}^\prime & \quad \text{t}^\prime & \quad \text{c}^\prime & \quad \text{č}^\prime & \quad \text{k}^\prime \\
\text{b}^\prime & \quad \text{s} & \quad \text{š} & \quad \text{h} & \quad \text{a} & \quad \text{a} \\
\text{m} & \quad \text{n} & \quad \text{l} & \quad \text{w} & \quad \text{y}
\end{align*}

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:  
\[\begin{array}{c}
\text{p} & \text{t} & \text{c} & \text{č} & \text{k} \\
p' & t' & c' & č' & k' \ \ ?
\end{array}\]  
\[\begin{array}{c}
b \\
s \ ̆ \ s \ ̆ \ h
\end{array}\]  
\[\begin{array}{c}
m \ n \\
l
\end{array}\]  
\[\begin{array}{c}
w \\
y
\end{array}\]  

Vowels:  
\[\begin{array}{c}
i & u & i: & u: \\
e & ů & e: & ů: \\
a & a: \\
\end{array}\]  

Itzá [51]  
※Itzá¹ [SCHUMANN 1971] (21C, 6V+5L)  
Consonants:  
\[\begin{array}{c}
\text{p} & \text{t} & \text{c} & \text{č} & \text{k} \\
p' & t' & c' & č' & k' \ \ ?
\end{array}\]  
\[\begin{array}{c}
b' \\
s \ ̆ \ s \ ̆ \ h
\end{array}\]  
\[\begin{array}{c}
m \ n \\
l
\end{array}\]  
\[\begin{array}{c}
w \\
y
\end{array}\]  

Vowels:  
\[\begin{array}{c}
i & i & u & i: & u: \\
e & o & e & o: \\
a & a: \\
\end{array}\]  

Itzá² [HOFLING 1990] (20C, 6V+5L)  
Consonants:  
\[\begin{array}{c}
\text{p} & \text{t} & \text{c} & \text{č} & \text{k} \\
p' & t' & c' & č' & k' \ \ ?
\end{array}\]  
\[\begin{array}{c}
b' \\
s \ ̆ \ s \ ̆ \ h
\end{array}\]  
\[\begin{array}{c}
m \ n \\
l
\end{array}\]  
\[\begin{array}{c}
w \\
y
\end{array}\]  

/d g f v r ř ň/ 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:  Vowels:
\[ p \ t \ c \ ʃ \ k \ ɾ \ t' \ c' \ ʃ' \ k' \ ? \]
\[ i \ i \ u \ i:\ (i:) u:\ e \ o \ e:\ o:\ a \ a:\ s \ š \ h \]
\[ m \ n \ l \ (ɾ) \ w \ y \]

/ɾ/ 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:  Vowels:
\[ p \ t' \ t \ c \ ʃ \ k \ ɾ \ t' \ t \ c' \ ʃ' \ k' \ ? \]
\[ i \ u \ e \ ø \ o \ a \ s \ š \ h \]
\[ m \ n \ ŋ \ l \ w \ y \]

/d g f r ɾ/ appear in Spanish loans. Since /ɜ/ in the original is interpreted as a mid, central vowel, it may be better to replace it with /ø/. /t t'/ are found only in a few words, while /t' t'/ occur with normal frequency.

Tila² [SCHUMANN 1973] (22C, 6V)

Consonants:  Vowels:
\[ p \ t \ c \ ʃ \ k \ ɾ \ t' \ c' \ ʃ' \ k' \ ? \]
\[ i \ i \ u \ e \ o \ a \ s \ š \ h \]
\[ m \ n \ ŋ \ l \ r \ w \ y \]

/d g/ appear in Spanish loans. /t t'/ are represented as [t' t'']. They occur in only a few words.
Chontal [54]
[Knowles 1984] (21C, 6V)

Consonants: Vowels:
  p  t  c  ċ  k  i  i  u
  p'  t'  c'  ċ'  k'  ?  e  o
  b
  s  ĭ  h
  m  n
  l
  r
  w  y
/d  g  f/ are most commonly found in Spanish loan words, but occur in a few native Chontal words in restricted environments. /f ŋ/ are only found in Spanish loan words.

Chortí (Jocotán) [55]
[Lubeck 1989] (20C, 5V)

Consonants: Vowels:
  p  t  c  ċ  k  i  u
  b'  t'  c'  ċ'  k'  ?  e  o
  )  s  ĭ  h
  m  n
  l
  r
  w  y
 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) [Alissen 1987; Haviland 1981] (21C, 5V)

Consonants: Vowels:
  p  t  c  ċ  k  i  u
  p'  t'  c'  ċ'  k'  ?  e  o
  b
  s  ĭ  h
  m  n
  l
  r
  v  y
/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].
Database 1: Phonological Systems

![Phonological Systems](image)

**Tzotzil** (Chalchihuitán) [Hopkins 1967a] (20C, 5V)

Consonants:

<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>c</th>
<th>č</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>b'</td>
<td>t'</td>
<td>c'</td>
<td>č'</td>
<td>k'</td>
</tr>
<tr>
<td>s</td>
<td>š</td>
<td>h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vowels:

<table>
<thead>
<tr>
<th>i</th>
<th>u</th>
</tr>
</thead>
<tbody>
<tr>
<td>e</td>
<td>o</td>
</tr>
<tr>
<td>a</td>
<td></td>
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</tbody>
</table>

Tzeltal [57]

Aguacatenango [Kaufman 1971], Tenejapa [Berlin 1963] (21C, 5V)

Consonants:

<table>
<thead>
<tr>
<th>p</th>
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<th>c</th>
<th>č</th>
<th>k</th>
</tr>
</thead>
<tbody>
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<td>b'</td>
<td>t'</td>
<td>c'</td>
<td>č'</td>
<td>k'</td>
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<tr>
<td>s</td>
<td>š</td>
<td>h</td>
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<tr>
<td>e</td>
<td>o</td>
</tr>
<tr>
<td>a</td>
<td></td>
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</tbody>
</table>

Tojolabal [58]

[Furbee-Losee 1976] (20C, 5V)

Consonants:

<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>c</th>
<th>č</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>b'</td>
<td>t'</td>
<td>c'</td>
<td>č'</td>
<td>k'</td>
</tr>
<tr>
<td>s</td>
<td>š</td>
<td>h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vowels:

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<tbody>
<tr>
<td>e</td>
<td>o</td>
</tr>
<tr>
<td>a</td>
<td></td>
</tr>
</tbody>
</table>

/b d g/ appear only in Spanish loan words.
Chuj [59]
[HOPKINS 1967b] (22C, 5V)

Consonants: Vowels:

\begin{itemize}
\item p t c č ĕ k
\item b' t' c' č' ĕ' k' ?
\item s š x h
\item m n ŋ
\item l
\item r
\item w y
\end{itemize}

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

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

Consonants: Vowels:

\begin{itemize}
\item p t c č ĕ k
\item b' t' c' č' ĕ' k' q' ?
\item s š š x h
\item m n ŋ
\item l
\item r
\item w y
\end{itemize}

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

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

Consonants: Vowels:

\begin{itemize}
\item p t c č ĕ k q
\item b' t' c' č' ĕ' k' q' ?
\item s š š x h-
\item m n
\item l
\item r
\item w y
\end{itemize}

/h-/ occurs only in some prefixes and some pronominals.
### Acatec [62]

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

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c č č̄ k (q)</td>
<td>i u i: u:</td>
</tr>
<tr>
<td>b’ t’ c’ č’ č̄’ k’ (q’) ?</td>
<td>e o e: o:</td>
</tr>
<tr>
<td>s š ʃ x</td>
<td>a a:</td>
</tr>
<tr>
<td>m n l r</td>
<td></td>
</tr>
<tr>
<td>w y</td>
<td></td>
</tr>
</tbody>
</table>

/b d ģ 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)

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c č č̄ k’ k q</td>
<td>i u i: u:</td>
</tr>
<tr>
<td>b’ t’ c’ č’ č̄’ k’ k’ q’ ?</td>
<td>e o e: o:</td>
</tr>
<tr>
<td>s š ʃ x</td>
<td>a a:</td>
</tr>
<tr>
<td>m n l</td>
<td></td>
</tr>
<tr>
<td>w y</td>
<td></td>
</tr>
</tbody>
</table>

/b ģ f/ occur only in Spanish loans. /d t/ 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 /t/ is found in some onomatopoetic words.

### Mam [66]

[England 1983] (26C, 5V + 5L)

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c č č̄ k’ k q</td>
<td>i u i: u:</td>
</tr>
<tr>
<td>b’ t’ c’ č’ č̄’ k’ k’ q’ ?</td>
<td>e o e: o:</td>
</tr>
<tr>
<td>s š ʃ x</td>
<td>a a:</td>
</tr>
<tr>
<td>m n l</td>
<td></td>
</tr>
<tr>
<td>w y</td>
<td></td>
</tr>
</tbody>
</table>

/b’ q’/ are implosives. /b d ģ/ are found in Spanish loans. [ɾ] occurs mostly in loans and sound imitative words.
### Aguacatec [67]

[McARTHUR and McARTHUR 1956] (27C, 5V+5L)

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c č č k’ k q</td>
<td>i u i: u:</td>
</tr>
<tr>
<td>b’ t’ c’ č ‘ č’ k’ k’ q’ ?</td>
<td>e o e: o:</td>
</tr>
<tr>
<td>s š š x</td>
<td>a a:</td>
</tr>
<tr>
<td>m n</td>
<td>l</td>
</tr>
<tr>
<td>r</td>
<td></td>
</tr>
<tr>
<td>w y</td>
<td></td>
</tr>
</tbody>
</table>

Consonants: /d g/ occur in Spanish loans. /r/ varies between [ɾ] and [ɽ]. /b’/ is implosive [ɓ].

### Ixil [68]

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

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c č č k q</td>
<td>i u i: u:</td>
</tr>
<tr>
<td>b’ t’ c’ č ‘ č’ k’ k’ q’ ?</td>
<td>e o e: o:</td>
</tr>
<tr>
<td>s š š x</td>
<td>a a:</td>
</tr>
<tr>
<td>m n</td>
<td>l</td>
</tr>
<tr>
<td>r</td>
<td></td>
</tr>
<tr>
<td>w y</td>
<td></td>
</tr>
</tbody>
</table>

Consonants: /d g/ occur in Spanish loans. In Nebaj dialect /b’/ is implosive [ɓ].

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

<table>
<thead>
<tr>
<th>Consonants:</th>
<th>Vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c č č k q</td>
<td>i u i: u:</td>
</tr>
<tr>
<td>b’ t’ c’ č ‘ č’ k’ k’ q’ ?</td>
<td>e o e: o:</td>
</tr>
<tr>
<td>s š š š h</td>
<td>a a:</td>
</tr>
<tr>
<td>m n</td>
<td>l</td>
</tr>
<tr>
<td>r</td>
<td></td>
</tr>
<tr>
<td>w y</td>
<td></td>
</tr>
</tbody>
</table>

Consonants: /d g/ occur in Spanish loans. In Chajul dialect apico-alveolo-palatals /č ‘ č’ š/ are added. /č č’ š/ are lamino-alveolo-palatals. /b’/ is implosive /ɓ/. 
Ixil³ (Cotzal) [Townsend 1986] (27C, 5V+5L)

Consonants:  

<table>
<thead>
<tr>
<th></th>
<th>i</th>
<th>u</th>
<th>i:</th>
<th>u:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c ć ç k q</td>
<td>b’ t’ c’ ć’ ç’ k’ q’ ?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vowels:  

<table>
<thead>
<tr>
<th></th>
<th>a</th>
</tr>
</thead>
<tbody>
<tr>
<td>e o e: o:</td>
<td>a?</td>
</tr>
</tbody>
</table>

/pw kW a a: a? s š ś ŋ h m n r w y /
b’/ is implosive [6]. Words are generally stressed on the penult or, if the vowel in the final syllable is either long or laryngealized, on the ultima.

Kekchi [69]

[Stewart 1980; Cuc Caal 1988] (23C, 5V+5L)

Consonants:  

<table>
<thead>
<tr>
<th></th>
<th>i</th>
<th>u</th>
<th>i:</th>
<th>u:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c ć k q</td>
<td>b’ t’ c’ ć’ k’ q’ ?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vowels:  

<table>
<thead>
<tr>
<th></th>
<th>a</th>
</tr>
</thead>
<tbody>
<tr>
<td>e o e: o:</td>
<td>a:</td>
</tr>
</tbody>
</table>

/m n r w y /
d g f v/ occur in Spanish loans.

Pocomchi [70]

Pocomchi¹ [Brown 1979] (24C, 5V+5L)

Consonants:  

<table>
<thead>
<tr>
<th></th>
<th>i</th>
<th>u</th>
<th>i:</th>
<th>u:</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t c ć k q</td>
<td>b’</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vowels:  

<table>
<thead>
<tr>
<th></th>
<th>a</th>
</tr>
</thead>
<tbody>
<tr>
<td>e o e: o:</td>
<td>a:</td>
</tr>
</tbody>
</table>

/m n r w y /
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.
Native Middle American Languages

**Pocomchi** [Ramírez and Ramírez 1983] (23C, 5V+5L)

Consonants:  
- pt c č k q  
- b' t' c' ċ k' q' ?  
- s š x h  

Vowels:  
- i  
- u  
- i:  
- u:  
- e  
- o  
- e:  
- o:  
- a  
- a:

/b d g/ occur in Spanish loans.

**Pocomam** [71]


Consonants:  
- pt c č k q  
- b' t' c' ċ k' q' ?  
- s š x h  

Vowels:  
- i  
- u  
- i:  
- u:  
- e  
- o  
- e:  
- o:  
- a  
- a:

/w/ is [gʷ].  
/b'/→[w]/ #

**Uspantec** [72]

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

Consonants:  
- pt c č k q  
- b' t' c' ċ k' q' ?  
- s š x  

Vowels:  
- i  
- u  
- i:  
- u:  
- e  
- o  
- e:  
- o:  
- a  
- a:

Long vowels are not registered in Cartilla Uspanteca [Anonymous 1980].
Quiché [73]

Quiché¹ (Totonicapán) [Fox 1973] (22C, 6V)
Consonants:  

| p | t | c | ċ | k | q | i | u |
| b’ | t’ | c’ | ċ’ | k’ | q’ | ? |
| s | š | x | a |
| m | n |
| l |
| r |
| w | y |

Vowels:  

| e | ø | o |

Quiché² (Zunil) [PYE 1983]
(Momostenango, Santa Catarina Ixtahuacan) [SUY TUM 1988] (23C, 5V+5L)
Consonants:  

| p | t | c | ċ | k | q | i | u | i: | u: |
| b’ | t’ | c’ | ċ’ | k’ | q’ | ? |
| s | š | x | h | a | a: |
| m | n |
| l |
| r |
| w | y |

/h/ occurs only in word-final position.

Quiché³ (Nahualá) [MONDLOCH 1978] (22C, 5V+5L)
Consonants:  

| p | t | c | ċ | k | q | i | u | i: | u: |
| b’ | t’ | c’ | ċ’ | k’ | q’ | ? |
| s | š | x | a | a: |
| m | n |
| l |
| r |
| w | y |

/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.
Native Middle American Languages

Sacapultec [74]

Consonants: Vowels:
- p t c ć k ć k q i u i: u:
- b' t' c' ċ' k' ć' k' q' ? e o e: o:
- s ź x a a:
- m n η
- l
- r
- w y

/ŋ/ occurs only in word-final position.

Sipacapeño [75]

Consonants: Vowels:
- p t c ć k ć k q i u i: u:
- b' t' c' ċ' k' ć' k' q' ? e o e: o:
- s ź x a a:
- m n
- l
- r
- w y

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: Vowels:
- p t c ć k q i u
- b' t' c' ċ' k' ć' k' q' ? e a o
- s ź x a
- m n
- l
- r
- v y

/r l v y/ are devoiced in word-final position.
Cakchiquel² (Comalapa) [CHACACH CUTZAL 1990] (22C, 5TV+4LV)

Consonants:  
\[ p \ t \ c \ \check{c} \ k \ q \ b' \ t' \ c' \ \check{c}' \ k' \ q' \ ? \ s \ \check{s} \ x \ m \ n \ l \ r \ w \ y \]

Vowels: Tense  Lax
\[ i \ u \ i \ U \ e \ o \ e \ o \ a \]

Tzutujil [77]

Tzutujil¹ (Santiago) [DAYLEY 1985] (22C, 5V+5L+2)

Consonants:  
\[ p \ t \ c \ \check{c} \ k \ q \ b' \ t' \ c' \ \check{c}' \ k' \ q' \ ? \ s \ \check{s} \ x \ m \ n \ l \ r \ w \ y \]

Vowels: Short  Long  Broken Long
\[ i \ u \ i: \ u: \ e \ o \ e: \ o: \ ie \ uo \ a \ a: \]

Tzutujil² (San Pedro La Laguna) [BUTLER and BUTLER 1977] (22C, 5V+5L)

Consonants:  
\[ p \ t \ c \ \check{c} \ k \ q \ b' \ d' \ c' \ \check{c}' \ k' \ q' \ ? \ s \ \check{s} \ x \ m \ n \ l \ r \ w \ y \]

Vowels:
\[ i \ u \ i: \ u: \ e \ o \ e: \ o: \ a \ a: \]

/b d g/ occur in Spanish loans. /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.
Native Middle American Languages

Xinca [78]

\*Xinca\textsuperscript{1} [Schumann 1966] (20C, 6V)

Consonants:

\begin{tabular}{cccccccc}

\textit{p} & \textit{t} & \textit{c} & \textit{ č} & \textit{k} & \textit{?} & \textit{i} & \textit{i} & \textit{u} \\
\textit{b} & \textit{g} & \textit{a} \\
\textit{s} & \textit{š} & \textit{š} & \textit{h} \\
m & n \\
l & l \\
r \\
w & y
\end{tabular}

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

Xinca\textsuperscript{2} [Campbell 1972] (17C, 6V)

Consonants:

\begin{tabular}{cccccccc}

\textit{p} & \textit{t} & \textit{k} & \textit{p’} & \textit{t’} & \textit{c’} & \textit{ k’} & \textit{?} & \textit{i} & \textit{i} & \textit{u} \\
\textit{š} & \textit{h} & \textit{a} \\
m & n \\
l & l \\
r \\
w & y
\end{tabular}

/č/ occurs only in loanwords.

\*Xinca\textsuperscript{3} [Mayers 1966: 309] (22C, 6V + 4L)

Consonants:

\begin{tabular}{cccccccc}

\textit{p} & \textit{t} & \textit{c} & \textit{ č} & \textit{k} & \textit{?} & \textit{i} & \textit{i} & \textit{u} & \textit{(i:)} & \textit{u:} \\
\textit{b} & \textit{(d)} & \textit{g} & \textit{a} & \textit{a} \\
\textit{s} & \textit{š} & \textit{š} & \textit{h} \\
\textit{m} & \textit{n} & \textit{ŋ} \\
l & r \\
w & y
\end{tabular}

/ř/ is manifested as [l] in initial and medial position, [ε] or [ɾ] in final position. /ɾ/ is manifested as [ɾ] in initial and medial position, [ɾ] 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
- w

Vowels:
- i u i u
- e o ø ø
- a

Garifuna (Black Carib) [79]

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

Consonants:
- p t c k
- ph th ch kh
- p' t' c' k' ?
- ß s h
- m n ñ
- l
- w ñ y

Vowels:
- i i u
- e o
- a

Stress is phonemic. /i/ occurs only as an infix and is interpreted as a semivowel because it is phonetically nonsyllabic. /ß/ is eliminated by Campbell, who unites /w/ and /ß/ as /w/

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

Consonants:
- p t k
- b d g
- m n ñ
- l
- w

Vowels:
- i u i: u:
- a a:

Miskitu [81]

Heath [1950] notes that there are 5 vowels (Miskitu¹), 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: Vowels:
p t k i u i: u:
bd g a a:
s h
m n ƞ
l
r
w y
Voiceless nasals and liquids are expressed as /mh nh ƞh lh rh/.

Rama [84]
[Craig 1986] (14C, 3V+3L)

Consonants: Vowels:
p t k i u i: u:
bd g a a:
s ś
m n ƞ
l
r
w y
/e o/ occur only in loanwords.

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

Consonants: Vowels:
p t č k i u i: u:
ĥ e o e: o:
š s x a a:
l l
r ř
m n ƞ
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 [u] and [i].
Boruca [86]

[ABARCA GONZÁLEZ 1988] (19C, 5V)

Consonants:
- t c č k?
- b d j g
- s š x
- r
- m n ſ 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?
- b d j
- s š h
- ſ
- r

Vowels:
- i u j ə
- e o ə ə
- a ə

Tones: high, low

/ť/ is a retroflexed trill. /tk/ is a dento-velar stop. [m n ſ] are not phonemes, but rather nasalized /b d j/. [w] and [y] are not phonemes, either. There are two tones, high and low. According to Constenla Umaña, /ť/ is lateral flap /ɭ/ and there are three tones, rising, falling and low [CONSENLA UMAÑA 1981].

Bribri [88]

Bribri1 [CONSENLA UMAÑA 1990] (14C, 7V+5N)

Consonants:
- p t c č tk k?
- b d j
- s š h
- ſ
- ř

Vowels:
- i u j ə
- e o ə ə
- a ə

[m n ſ] are nasalized /b d j/. /ř/ is lateral flap /ɭ/ and /h/ is /x/; tonemes are high, low, rising and falling in [CONSENLA UMAÑA 1981].

Bribri2 [SCHLABACH 1974] (20C, 7V+5N)

Consonants:
- p t c č tk k?
- hp ht hc ɦ ɦ?
- b d j
- s š
- l
- w y

Vowels:
- i u j ə
- e o ə ə
- a ə

/ɭ/ is a lateral vibrant. /hp ht hc ɦ/ are preaspirated obstruents. /b d j/ are nasalized and manifested as [m n ſ] before a nasalized vowel or before a voiced obstruent.
Native Middle American Languages

*Bribri* [Wilson 1974] (16C, 7V+5N)

Consonants:

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<thead>
<tr>
<th>p</th>
<th>t</th>
<th>č</th>
<th>k</th>
<th>ʔ</th>
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<tbody>
<tr>
<td>b</td>
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<td>j</td>
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<tr>
<td>s</td>
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<tr>
<td>r</td>
<td>ř</td>
<td>ř</td>
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<tr>
<td>w</td>
<td>y</td>
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Vowels:

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<tr>
<td>o</td>
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<td>ř</td>
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<td>a</td>
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</tbody>
</table>

Nasalized /b d j/ are manifested as [m n ŋ] before a nasalized vowel or in word-final position. There are two tone contrasts plus combinations of them.

*Térraba* [89]


Consonants:

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<tr>
<th>p</th>
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<th></th>
</tr>
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<tbody>
<tr>
<td>b</td>
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<td>g</td>
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</tr>
<tr>
<td>tʰ</td>
<td>kʰ</td>
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<td>φ</td>
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<td>a</td>
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<tr>
<td>z</td>
<td>ř</td>
<td>ř</td>
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Vowels:

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</table>

There is an accent phoneme /'/. Semivowels w and y are interpreted as /u/ and /i/ in the non-syllabic nucleus. /ř/ is a lateral flap /l/ in [Constenla Umaña 1981].

*Teribe* [89]

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

Consonants:

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<tr>
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<tr>
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<td>g</td>
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<tr>
<td>pʰ</td>
<td>tʰ</td>
<td>kʰ</td>
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<tr>
<td>s</td>
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<td>a</td>
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<tr>
<td>z</td>
<td>ř</td>
<td>ř</td>
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<tr>
<td>m</td>
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<td>ŋ</td>
<td>ŋ</td>
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<tr>
<td>l</td>
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<tr>
<td>w</td>
<td>y</td>
<td></td>
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</table>

Vowels:

<table>
<thead>
<tr>
<th>i</th>
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<th>ţ</th>
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<tr>
<td>ţ</td>
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<td>e</td>
<td>ř</td>
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<td>a</td>
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</table>

There are two tone contrasts. Portilla Cháves [1986] registers /kʷ gʷ ʔ/ as phonemes, but does not admit /l/.
Guaymi Movere [90]

[ABARCA GONZÁLEZ 1985] (15C, 8V+7N)

Consonants:
- t č k
- b d j g
- s x
- m n ŋ ñ
- l r

Vowels:
- i ĭ u j į ŭ
- e ė o ė ġ ŭ
- a ą ā ĭ

There are two tone contrasts.

Bocotá [91]

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

Consonants:
- t č k
- b d j g
- s x
- l r

Vowels:
- i u j ŭ
- e ė o ė ġ ŭ
- a ą ā ĭ

[m n ŋ ñ] are interpreted as nasalized /b d j 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 /j/ 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 ĭ
- 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]

<table>
<thead>
<tr>
<th></th>
<th>[SAXTON 1982: 198]</th>
<th>[ZEPEDA 1983: 117-119]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>himako</td>
<td>himako</td>
</tr>
<tr>
<td>2</td>
<td>gook</td>
<td>gook</td>
</tr>
<tr>
<td>3</td>
<td>waik</td>
<td>waik</td>
</tr>
<tr>
<td>4</td>
<td>gi'ik</td>
<td>gi'ik</td>
</tr>
<tr>
<td>5</td>
<td>hitasp</td>
<td>hitasp</td>
</tr>
<tr>
<td>6</td>
<td>ċuudp</td>
<td>ċuudp</td>
</tr>
<tr>
<td>7</td>
<td>wiwa'ak /wiwkam</td>
<td>wiwa'ak</td>
</tr>
<tr>
<td>8</td>
<td>gigi'ik</td>
<td>gigi'ik</td>
</tr>
<tr>
<td>9</td>
<td>humukt /humjcam</td>
<td>humuk</td>
</tr>
<tr>
<td>10</td>
<td>wistmaam</td>
<td>wistmaam</td>
</tr>
<tr>
<td>11</td>
<td>gamai-himako</td>
<td>10+1</td>
</tr>
<tr>
<td>12</td>
<td>gamai-gook</td>
<td>10+2</td>
</tr>
<tr>
<td>13</td>
<td>gamai-waik</td>
<td>10+3</td>
</tr>
<tr>
<td>14</td>
<td>gamai-gi'ik</td>
<td>10+4</td>
</tr>
<tr>
<td>15</td>
<td>gamai-hitasp</td>
<td>10+5</td>
</tr>
<tr>
<td>16</td>
<td>gamai-čuudp</td>
<td>10+6</td>
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<tr>
<td>17</td>
<td>gamai-wiwa'ak</td>
<td>10+7</td>
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<tr>
<td>18</td>
<td>gamai-gigi'ik</td>
<td>10+8</td>
</tr>
<tr>
<td>19</td>
<td>gamai-humuk</td>
<td>10+9</td>
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<tr>
<td>20</td>
<td>gokko-wistmaan</td>
<td>2×10</td>
</tr>
<tr>
<td>21</td>
<td>gokko-himako</td>
<td>20+1</td>
</tr>
<tr>
<td>22</td>
<td>gokko-gook</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>gokko-waik</td>
<td></td>
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<tr>
<td>24</td>
<td>gokko-gi'ik</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>gokko-humuk</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>waikko-wistmaan</td>
<td>3×10</td>
</tr>
<tr>
<td>31</td>
<td>waikko-himako</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>gi'ikko-wistmaan</td>
<td>4×10</td>
</tr>
<tr>
<td>99</td>
<td>humukko-humuk</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>siant</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>himako-siant wistmaan</td>
<td>1×100+10</td>
</tr>
<tr>
<td>1000</td>
<td>miil</td>
<td></td>
</tr>
</tbody>
</table>

Basic vocabulary:

*U = {1...7, 9, 10}*

*\(B_1 = \{10' \text{(gamai)/10 (wistmaan)}\}, B_2 = \{100 \text{(siant)}\}, B_3 = \{1000 \text{(miil)}\})*

Derivative vocabulary:

*\{2'...9'\} = \{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 wistmaan.

*\(N_{11-19} = B_1 \text{(gamai-)} + \{N_{1-9}\})*

3. Decimal system above 20.
Native Middle American Languages

$N_{20.99} = \{N_{2.9'}\} \times B^1 \text{ (wistmaan)} / \text{ round numbers}$

$= \{N_{2.9'}\} + \{N_{1.9}\} / \text{ interval numbers}$

① 100 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
9. tumbustamama
10. bustamama gamai maco 10+1
11. macobai/bustamama gamai goco 10+2
12. bust'mama vaico 10+3
13. vaico utaspo 3×5
14. maco opa 1×20
15. maco opa ovai gamai bust'ma 1×20+10
16. goc obpai 2×20
17. vaico opa /obbac 3×20
18. gamui vustama
19. guico opa 4×20

Basic vocabulary:

$U = \{1...7, 9, 10\}$

$B^1 = \{10 \text{ (bustamama)}\}, B^2 = \{20 \text{ (opa)}\}.$

Derivative vocabulary:

2' = goco, 20' = 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]**

[Bason 1982: 334]

1. imóko
2. goóka
Basic vocabulary:

- **U** = \{1...7\}
- **B\textsuperscript{1}** = \{10 (baivušt'áma)\}, **B\textsuperscript{2}** = \{20 (kóbai)\}, **B\textsuperscript{3}** = \{100 (siénto)\}

A connective: \{dan\}

1. Eight (maamákova) 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 \(/-1+10/\).

2. From 11 to 19, the numeral words are *baivušt'áma* (10) plus 1, 2, ...9 with the connective word *dan*.

3. Vigesimal above 20. Interval words are formed from rank words, a conjunction *dan* and the numbers from 1 to 19.

Tepecano [D1]

[MASON 1916: 377]

(c in the original is changed to š and · is to . Eight in the original is civ·a·'=ik which may be šiva·'=ik.)
Basic vocabulary:

\[ U = \{1 \ldots 5\} \]

\[ B^1 = \{5' (šiv)\}, B^2 = \{10 \text{ (ma´mvör)}\} \]

1 Quinary. From 6 up, 5' (šiv) + \{1 \ldots 4\}.

**Tarahumara [6]**

[MERRIFIELD 1968a: 96-98]

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<th>227</th>
<th>880</th>
<th>9999</th>
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<tbody>
<tr>
<td></td>
<td>biré</td>
<td>okua</td>
<td>bikiya</td>
<td>nawó</td>
<td>mari</td>
<td>usani</td>
<td>kiçáo</td>
<td>o-sá nawó</td>
<td>ki-maköi</td>
<td>maköi</td>
<td>maköi waminá biré</td>
<td>maköi waminá kimaköi</td>
<td>o-sá maköi</td>
<td>o-sá maköi waminá okua</td>
<td>bai-sá maköi waminá bikiya</td>
<td>náwó-sa maköi waminá mari</td>
<td>mari-sa maköi waminá usani</td>
<td>usán-sa maköi</td>
<td>kiçáo-sa maköi</td>
<td>biré siento</td>
<td>okuá siento waminá o-sá maköi waminá kiçáo</td>
<td>o-sá nawó siento waminá o-sá nawó-sa maköi</td>
<td>kimaköi mili waminá kimaköi siento waminá kimaköi-sa maköi waminá kimaköi</td>
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<td>2 x 100 + 2 x 10 + 7</td>
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**Western Tarahumara** [BURGESS 1984: 86-87]

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<td>baikiá /bakiá</td>
<td>naó</td>
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<td>o-sá nó</td>
<td>gi-makoé</td>
<td>makoé</td>
<td>makó bilé</td>
<td>bilé elía / o-sá makoé</td>
<td>makoé</td>
<td>oká elía / naó-sa makoé</td>
<td>marígi-sa makoé</td>
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</table>
Basic vocabulary:

\[ U = \{1, \ldots, 7\} \]
\[ B^1 = \{10 \text{ (makői)}\}, \quad B^2 = \{100 \text{ (siento)}\}, \quad B^3 = \{1000 \text{ (mili)}\} \]

Connectives: {-sa, waminá}

1. Eight is a combination of 2 and 4, which is expressed in this study as /2×4/. 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 inter-
tested in the formation, that is, /2×4/.

\[ N_{1,9} = \{1\ldots7, \ 2×4, \ -1+10\} \]

2. From 11 to 19, the numbers 1 to 9 are added to 10 connected by waminá. The
numbers from 20 up are decimal.

\[ N_{10,99} = \{\#\ldots9\} \times U^1 \text{ (makői)} \pm \text{ waminá} \pm \{N_{1,9}\} \]

3. The next rank is 100 and the third rank is 1000. These words are borrowed from
Spanish.

\[ N_{100} = \{1\ldots9\} \times B^2 \pm \{N_{1,99}\} \]

**Eudeve (Heve, Eudeva, Dohema) [D4]**

[Pennington 1981] (original transcription)

| 1  | sei   |
| 2  | godūm |
| 3  | vedūm |
| 4  | nāvoi |
| 5  | márqui |
| 6  | visani |
| 7  | seniovusāni | 1+6 |
| 8  | gos nāvoi | \((2 \times 4)\) |
| 9  | vesmācoi | "casi diez" |
| 10 | mācoi |
| 11 | mācoi se beguam | 10+1 above |
| 12 | mācoita goc beguam |
| 14 | mācoita nāguoc beguam |
| 20 | sei dōhme | "one person" |
| 30 | sei dōhme mācoita beguām |
| 40 | goc dōhme | 2×20 |
| 80 | nāvoi dōhme | 4×20 |
| 100| márqui dōhme | 5×20 |

Basic vocabulary:

\[ U = \{1\ldots6\} \], \[ B^1 = \{10 \text{ (mācoi)}\}, \quad B^2 = \{20 \text{ (dōhme)}\} \]

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. In-
stead of godúm and návoi, goc and naguoc are used for the 2 and 4 of 12 and 14.
\[ N_{10-19} = B^1 (mácoi) \pm ta \pm \{N_{1,9}\} \pm \text{beguam} \]
③ From 20 up the system is vigesimal and the coefficients occur before the base 20. The
coefficient 2 is 2' (goc).
\[ N_{20,} = \{N_{1,9}\} \times B^2 (dóhme) \pm \{N_{1,19}\} \]

Yaqui [8]
[Johnson 1962: 30-31]

<table>
<thead>
<tr>
<th></th>
<th>seenu / séenu</th>
<th>wóí</th>
<th>báhi</th>
<th>náiki</th>
<th>mámni</th>
<th>búsani</th>
<th>wóbusani</th>
<th>wóhnaiki</th>
<th>bátani</th>
<th>wohmámni</th>
<th>wohmámni 'áma wépulai</th>
<th>senu taká</th>
<th>senu taká 'áma wépulai</th>
<th>mámni taká</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>seeenu</td>
<td>wóí</td>
<td>báhi</td>
<td>náiki</td>
<td>mámni</td>
<td>búsani</td>
<td>2 × 6</td>
<td>2 × 4</td>
<td>2 × 5</td>
<td>10 + 1</td>
<td>10 + 1</td>
<td>5 × 20</td>
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Mayo [9]

<table>
<thead>
<tr>
<th></th>
<th>seeenu</th>
<th>guooyi</th>
<th>báhi</th>
<th>náiki</th>
<th>mámni</th>
<th>búsani</th>
<th>guoibúsani</th>
<th>guohnaiki</th>
<th>bátani</th>
<th>guohmámni</th>
<th>guohmámnama huépu'ulai</th>
<th>guohmámnama guooyi</th>
<th>guohmámnama báhi</th>
<th>guohmámnama náiki</th>
<th>guohmámnama mámni</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>seeenu</td>
<td>guooyi</td>
<td>báhi</td>
<td>náiki</td>
<td>mámni</td>
<td>búsani</td>
<td>guoibúsani</td>
<td>guohnaiki</td>
<td>bátani</td>
<td>guohmámni</td>
<td>guohmámnama huépu'ulai</td>
<td>guohmámnama guooyi</td>
<td>guohmámnama báhi</td>
<td>guohmámnama náiki</td>
<td>guohmámnama mámni</td>
</tr>
<tr>
<td>2</td>
<td>2 × 6</td>
<td>2 × 4</td>
<td>2 × 5</td>
<td>10 + 1</td>
<td>10 + 2</td>
<td>10 + 3</td>
<td>10 + 4</td>
<td>10 + 5</td>
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</tbody>
</table>
Database 2: Numeral Systems

16 guohmámnama búsaní 10 + 6
17 guohmámnama guoi búsaní 10 + 7
18 guohmámnama guohnaiki 10 + 8
19 guohmámnama bátani 10 + 9
20 senú taká senú taká
21 senú taká ama huépu’ulai 20 + 1
30 senú taká ama guohmánni 20 + 10
40 guoi taká wóí taká 2 × 20
60 bái taká 3 × 20
80 naiki taká 4 × 20
100 mamni taká 5 × 20

Basic vocabulary:
U = {1...6, 9}
B¹ = {10 (wohman)}, B² = {20 (taka)}

Derivative vocabulary:
I' = wépulai

A connective: {ama}

1 The formation of 7 is uncommon. Seven is wo-busani = 2 × 6. Eight is 2 × 4 and 10 is
2 × 5, both of which are formed by double counting.
N₁₀₀ = {1...6, 2–6, 2 × 4, 9, 2 × 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.
N₁₁–₁₉ = B¹ (wohman)-ama + {1', 2...9}

3 Vigesimal beyond 20.
Nₒ₀ = {N₁} × B² (taka) ± ama ± {N₁₋₁₀}

Cora [10]
[CASAD 1984: 267-269]

1 saítí
2 wá’ap*a
3 wáika
4 m*ák*a
5 anšívi
6 aráhsevi (ha-ra “in the face of/ there outside-facing frontwards” + 1)
7 aráawa’ap*a ha-ra + 2
8 aráawaalika ha-ra + 3
9 arám*ak*a ha-ra + 4
10 tam*áam*ata’a
15 tam*áam*ata’a hap*án anšívi 10 above 5
16 tam*áam*ata’a hap*án haráhsevi 10 above 5 + 1
20 satté
25 wá’ap*a hece 2 hece
35 satté hap*án tam*áam*ata’a hap*án anšívi 20 + 10 + 5
40 wá’ap*at’e 2 × 20
50 m*ák*a hece 4 hece
60 wáikat’e 3 × 20
80 m*ák*at’e 4 × 20
100 anšité 5 × 20
Native Middle American Languages

1000 sei-vi'ira'a  
2000 wa'ap*a-vi'ira'a

Basic vocabulary:

\[ U = \{1, \ldots, 5\} \]

\[ B^1 = \{5' \text{ (ara)}\}, \quad B^2 = \{10 \text{ (tamWaamWata'a)}\}, \quad B^3 = \{20 \text{ (tye)}\}, \{\text{hece}\}, \]

\[ B^4 = \{1000 \text{ (vi'ira'a)}\} \]

Derivative vocabulary:

1' = sevi

A connective: \{hapwán\}

1. The numbers from 6 to 9 are quinary, being formed from 5' (ara) and \{1' \ldots 4\}.

\[ N_{1:5} = \{1 \ldots 5\} \]

\[ N_{6:9} = B^1 \text{ (ara)} + \{1' \ldots 4\} \]

2. The numerals from 10 to 19 are formed from 10 plus the numbers from 1 to 9 by means of a connective, hapwán.

\[ N_{10:19} = B^2 \text{ (tamWaamWata'a)} \cdot \text{hapwan} \cdot \{\text{Ni-g}\} \]

3. Vigesimal above 20, but 25 and 50 follow a different formation.

\[ N_{20} = \{1 \ldots 4\} \times B^2 \text{ (tye)} \cdot \text{hapwan} \cdot \{\text{Ni.lg}\} \]

4. From 1000 up, the base is vi'ira'a.

\[ N_{1000} = \{1 \ldots \} \times B^4 \text{ (vi'ira'a)} \cdot \text{hapwan} \cdot \{N,999\} \]

**Huichol [11]**

<table>
<thead>
<tr>
<th>[GRIMES 1964: 39, 41]</th>
<th>[PALAFOX VARGAS 1978: 41-42]</th>
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<tbody>
<tr>
<td>1 zewi / zee</td>
<td>zebi</td>
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<td>2 huuta</td>
<td>huta</td>
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<td>3 haika</td>
<td>haika</td>
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<tr>
<td>4 nauka</td>
<td>nauka</td>
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<tr>
<td>5 auzíwi</td>
<td>auzubi</td>
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<tr>
<td>6 ataa + zewi</td>
<td>ata zebi</td>
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<tr>
<td>7 ataa + húuta</td>
<td>ata huta</td>
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<tr>
<td>8 ataa + haika</td>
<td>ata haika</td>
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<td>9 ataa + nauka</td>
<td>ata nauka</td>
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<td>10 tamámata</td>
<td>tamámata</td>
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<td>11</td>
<td>taamámate zebi</td>
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<td>12 tamámata heimana húuta</td>
<td>taamámate huta</td>
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<td>13 tamámata haika</td>
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<td>14 tamámata nauka</td>
<td>10 + 4</td>
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<tr>
<td>15 tamámata auzubi</td>
<td>10 + 5</td>
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<td>16 tamámata ata zebi</td>
<td>10 + 5 + 1</td>
</tr>
<tr>
<td>17 tamámata ata huta</td>
<td>10 + 5 + 2</td>
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<td>18 tamámata ata haika</td>
<td>10 + 5 + 3</td>
</tr>
<tr>
<td>19 tamámata ata nauka</td>
<td>10 + 5 + 4</td>
</tr>
<tr>
<td>20 téwi + yari (person-one)</td>
<td>rei tebiyarí</td>
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<tr>
<td>71 haika téwiyari heimana tamámata heimana zewi</td>
<td>3 \times 20 + 10 + 1</td>
</tr>
<tr>
<td>399 haika sientú yaari heimana nauka téwí yari heimana tamámata</td>
<td>3 \times 100 + 4 \times 20 + 10 + 5 + 4</td>
</tr>
</tbody>
</table>
Basic vocabulary:

\[ U = \{1...5\} \]

\[ B^1 = \{5' (ata)\}, B^2 = \{10 (tamámata)\}, B^3 = \{20 (téwiyari)\} \]

A connective: \{heimana\}

1. The numerals from 6 to 9 are quinary.

\[ N_{6..9} = B^1 (ata) + \{1...4\} \]

2. The numbers from 11 to 19 are formed from 10 plus the numbers from 1 to 9 by means of a connective, \textit{heimana}, but in some cases the connective is not necessary.

\[ N_{10..19} = B^2 (tamámata) \pm \text{heimana} \pm \{N_{1..9}\} \]


\[ N_{20..} = \{1?/ 2...\} \times B^3 (téwiyari) \pm \text{heimana} \pm \{N_{1..9}\} \]

\textbf{Nahuatl [12]}

\textbf{Classical Nahuatl [SULLIVAN 1983: 189-195] (original transcription)}

\begin{align*}
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 \times 20 \\
21 & cempoalli once & 1 \times 20+1 \\
22 & cempoalli omome & 1 \times 20+2 \\
23 & cempoalli omei & 1 \times 20+3 \\
24 & cempoalli onnahui & 1 \times 20+4 \\
25 & cempoalli ommacuilli & 1 \times 20+5 \\
26 & cempoalli onchicuace & 1 \times 20+5+1 \\
27 & cempoalli onchicome & 1 \times 20+5+2 \\
28 & cempoalli onchicuei & 1 \times 20+5+3 \\
29 & cempoalli onchiconahui & 1 \times 20+5+4 \\
30 & cempoalli ommatlactli & 1+20+10 \\
31 & cempoalli ommatlactli once & 1 \times 20+10+1 \\
32 & cempoalli ommatlactli omome & 1 \times 20+10+2 \\
33 & cempoalli ommatlactli omei & 1 \times 20+10+3 \\
34 & cempoalli ommatlactli onnahui & 1 \times 20+10+4 
\end{align*}
Native Middle American Languages

Basic vocabulary:

\[ U = \{1...5\} \]

\[ B_1 = \{5^* \text{ (chicu-)}\}, B_2 = \{10 \text{ (matlactli)}\}, B_3 = \{15 \text{ (caxtolli)}\}, \]

\[ B_4 = \{20 \text{ (poalli)}\}, B_5 = \{400 \text{ (tzontli)}\}, B_6 = \{8000 \text{ (xiquipilli)}\} \]

Connectives: \{on/ om\}

\( N_{1,5} = \{1...5\}, \)
\[ N_{6.9} = B^1 (\text{chicu}) + \{N_{1.4}\} \]

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.
\[ N_{20.399} = \{N_{1.19}\} \times B^4 (\text{poalli}) + \{N_{1.4}\} \]

4. New words for 400, 8000 are introduced.

**Modern Nahuan [12-14]**

**Tetelcingo Nahuatl** [TUGGY 1979: 72]

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<td>ume/ unte</td>
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<td>nowi</td>
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<td>čikume</td>
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<td>čiknowi</td>
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<td>mahak*ki</td>
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<td>mahak*ki wansie</td>
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<td>mahak*ki wanume</td>
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<td>17</td>
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<td>kaštuli wa yeyi</td>
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<td>kaštuli wa nowi</td>
</tr>
<tr>
<td>20</td>
<td>sempoaši</td>
</tr>
<tr>
<td>40</td>
<td>uhpoali</td>
</tr>
</tbody>
</table>

Usually Spanish loans are used above 10.

**North Puebla Nahuatl** [BROCKWAY 1979: 165]

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
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</tr>
<tr>
<td>3</td>
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</tr>
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<td>4</td>
<td>nawe</td>
</tr>
<tr>
<td>5</td>
<td>mak*ili</td>
</tr>
<tr>
<td>6</td>
<td>čik*ašin</td>
</tr>
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<td>7</td>
<td>čikome</td>
</tr>
<tr>
<td>8</td>
<td>čik*eiyi</td>
</tr>
<tr>
<td>9</td>
<td>čiknawe</td>
</tr>
<tr>
<td>10</td>
<td>mahak*li</td>
</tr>
<tr>
<td>11</td>
<td>mahak*li wan seya</td>
</tr>
<tr>
<td>12</td>
<td>mahak*li wan ome</td>
</tr>
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<td>13</td>
<td>mahak*li wan yiyi</td>
</tr>
<tr>
<td>14</td>
<td>mahak*li wan nawe</td>
</tr>
</tbody>
</table>
Native Middle American Languages

252

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*ili 1 × 20 + 5
30 sempowali wan ma'akλi 1 × 20 + 10
33 sempowali wan ma'akλi 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*ili
6 čikwaseh 5 + 1
7 čikome 5 + 2
8 čikweyi 5 + 3
9 čiknawi 5 + 4
10 ma:kwili
11 ma:kwili 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*ili
6 čik*ase 5 + 1
7 čikome 5 + 2
8 čik*e 5 + 3
9 čiknawi 5 + 4
10 mahlakli

Sierra Nahuat [Robinson 1966: 159]

1 se:
2 ome
3 e:yi
4 nawi
5 mak*k*il
Database 2: Numeral Systems

<p>| | | | | | | | | |</p>
<table>
<thead>
<tr>
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<td>čikome</td>
<td>čik`e:yi</td>
<td>čiknawi</td>
<td>mahtakti</td>
<td>mahtaktionse:</td>
<td>mahtaktiomome</td>
<td>mahtaktiome:yi</td>
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<td>10 + 3</td>
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<td>20 + 2</td>
<td>20 + 3</td>
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<td>25 + 3</td>
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</tr>
<tr>
<td>11</td>
<td>35</td>
<td>35 + 1</td>
<td>35 + 2</td>
<td>35 + 3</td>
<td>35 + 4</td>
<td>3 × 20</td>
<td>3 × 20 + 1</td>
<td>3 × 20 + 2</td>
</tr>
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<td>40 + 3</td>
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<td>4 × 20 + 1</td>
<td>4 × 20 + 2</td>
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<td>13</td>
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<td>80 + 2</td>
<td>80 + 3</td>
<td>80 + 4</td>
<td>8 × 20</td>
<td>8 × 20 + 1</td>
<td>8 × 20 + 2</td>
</tr>
<tr>
<td>15</td>
<td>100</td>
<td>100 + 1</td>
<td>100 + 2</td>
<td>100 + 3</td>
<td>100 + 4</td>
<td>10 × 20</td>
<td>10 × 20 + 1</td>
<td>10 × 20 + 2</td>
</tr>
<tr>
<td>16</td>
<td>153</td>
<td>153 + 1</td>
<td>153 + 2</td>
<td>153 + 3</td>
<td>153 + 4</td>
<td>100 + 2 × 20 + 10 + 3</td>
<td>100 + 2 × 20 + 10 + 4</td>
<td>100 + 2 × 20 + 10 + 5</td>
</tr>
</tbody>
</table>

Mecayapan Nahuat [Wolgemuth 1981: 60]

1 se:
2 ô: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)

<table>
<thead>
<tr>
<th></th>
<th>ti'i /ti'wili</th>
<th>tahuaj</th>
<th>kalí/ti ka'li'hta</th>
<th>kalí/ti / kalí'hta</th>
<th>pāta</th>
<th>puhlalíta</th>
<th>puwáti / puwáta</th>
<th>dașița</th>
<th>wișiți / wișița</th>
<th>puhúalíta (&lt;puwa ti+ihta ti=5+mitad)</th>
<th>nití / nití</th>
<th>šiți / ciți</th>
<th>pili</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>10 + 1</td>
</tr>
</tbody>
</table>
Native Middle American Languages

12 méti
20 kitméti (<šiti + méti = 10 + 20)
30 40 50 60 70 80 90 100... puhmé (<puwa ti + méti = 5 × 20)
1000

[McQuown 1940]
1 tawal
100 tawal puhmé

Basic vocabulary:
U = {1...10}
B = {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.
N_{1,10} = {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.
N_{11,19} = 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.
N_{30,} = {3...9} × 10'' (chonli)
4 100 and 1000 may be decimal.

Notes: The contrasts t: l and tch: ch in pujila lijpuxla (8) and pujilaijpujuxla-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/ tióhoŋ
2 kóokh /káhkoŋ
3 kápxa /pxáa'ŋ
4 kšoóškw/ šóxkoŋ
5 kóitoŋ /k*áitoŋ
6 isnáapkášoh/ nápškh
7 tooxkók*.i'/ káowk*.i
8 kšóoxoótkag/ pšóowk*.i
9 ksoi'ánt/ kšóox'ánt ~ 1 + 10
10 k'ánt/ xó'nál
11 t'ánt tášo kk*ii'
20 i'ánt kóokh
21 i'ánt tokh tášo kk*ii'

aguilcaxta
tahuelmé
calichonli
paxlachonli
puaxlachonli
daschichonli
huistlaichonli
pujilaijpxlachonli
noxtaichonli
puajchonli
chonslapuajchonli
Database 2: Numeral Systems

<table>
<thead>
<tr>
<th>50</th>
<th>i'ant k'itoŋ</th>
<th>10 × 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>i'ant k'ant</td>
<td>10 × 10</td>
</tr>
<tr>
<td>1000</td>
<td>i'ant i'ant k'ant</td>
<td>10 × 10 × 10</td>
</tr>
</tbody>
</table>

Basic vocabulary:

U = {1...10}

B1 = {10' (t'ant)}, B2 = {100}

A connective: {taso}

1. Decimal. However, since the morphemes representing 2 and 3 are found in the second alternatives for 7 and 8, and the same morpheme wkwí follows them, the formation seems to be 2 + 5, 3 + 5, respectively. The word for 9 has k'ant, which represents 10, so 9 seems to be formed by back-counting.

N19 = {1...6, 2' + 5', 3' + 5', -1' + 10, 10}

2. The numbers from 11 to 19 are formed from t'ant (10) and 1...9 through the connective taso.

N11-19 = B1 (t'ant) + taso + {N19}

3. The numbers from 20 up are also decimal. The coefficients follow the base.

N20-99 = 10' (i'ant) × {N19} + taso + {N19}

Tarasco [21]

[Foster 1969: 157] [Nansen Díaz 1985]

<table>
<thead>
<tr>
<th>1</th>
<th>má</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>cima = ni</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>tani = mu</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>t'a = mu</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>yu = mu</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>k'wí = mu</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>yu = mu ci-ma = ni</td>
<td>yúm cimánina</td>
</tr>
<tr>
<td>8</td>
<td>yu = mu tani = mu</td>
<td>yúm tanímu</td>
</tr>
<tr>
<td>9</td>
<td>yu = mu t'a = mu</td>
<td>yúm t'amu</td>
</tr>
<tr>
<td>10</td>
<td>te = mpe-ni</td>
<td>témpeini</td>
</tr>
<tr>
<td>11</td>
<td>témpeini ká má</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>témpeini ká yúmu t'ámu</td>
<td>10 + 5 + 4</td>
</tr>
<tr>
<td>20</td>
<td>e-k*a = ce</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>má e-k*a = ce</td>
<td>1 + 20</td>
</tr>
<tr>
<td>22</td>
<td>ci-ma = ni e-k*a = ce</td>
<td>2 + 20</td>
</tr>
<tr>
<td>23</td>
<td>tani = mu e-k*a = ce</td>
<td>3 + 20</td>
</tr>
<tr>
<td>30</td>
<td>te = mpe-ni e-k*a = ce</td>
<td>10 + 20</td>
</tr>
<tr>
<td>100</td>
<td>yúm ek*a'aci</td>
<td>5 × 20</td>
</tr>
</tbody>
</table>

mu is "mouth, edge," and ce is "down, ground."

Classical Tarasco

[Basalenque 1886 (1714): XXXI-XXXII] [Gilberti 1898 (1558): 283-285]

<table>
<thead>
<tr>
<th>1</th>
<th>ma</th>
<th>ma</th>
<th>ma-ro</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>tiziman</td>
<td>tzim-an</td>
<td>tzimoro</td>
</tr>
<tr>
<td>3</td>
<td>tanimu</td>
<td>tani-mu</td>
<td>tani-poro</td>
</tr>
<tr>
<td>4</td>
<td>tamu</td>
<td>tha-mu</td>
<td>tha-poro</td>
</tr>
<tr>
<td>5</td>
<td>yumu</td>
<td>yu-mu</td>
<td>yu-poro</td>
</tr>
</tbody>
</table>
Basic vocabulary:

\[ U = \{1 \ldots 6\} \]
\[ B^1 = \{5' (yun)\}, B^2 = \{10 (tembe/temben)\}, B^3 = \{20 (ekwace)\} \]

1 Quinary except 6.
\[ N_{1,6} = \{1 \ldots 6\} \]
\[ N_{7,9} = B^1 + \{2, 3, 4\} \]

2 Decimal.
\[ N_{10,19} = B^2 (tembe/temben) (± ka) ± \{1 \ldots 9\} \]

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.
\[ N_{20,} = ± \{1 \ldots \} + \{\#, 2 \ldots\} \times B^3 (ekwace) \]

However, in Classical Tarasco, the base precedes smaller units. This formation is common in Middle America.
\[ N_{20,} = \{1 \ldots \} \times 20 (ekwace) ± ca ± \{N_{1,19}\} \]

Notes: Numeral classifiers are used in Classical Tarasco as cited by Gilberti.

**Totonac [22]**

[Hernández García 1982: 112-3]
<table>
<thead>
<tr>
<th>Numeral</th>
<th>Translation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>kaw</td>
<td>10+1</td>
</tr>
<tr>
<td>11</td>
<td>kawitu'</td>
<td>10+2</td>
</tr>
<tr>
<td>12</td>
<td>kut'uy</td>
<td>10+3</td>
</tr>
<tr>
<td>13</td>
<td>kut'ut'u</td>
<td>10+4</td>
</tr>
<tr>
<td>14</td>
<td>kut'at'i</td>
<td>10+5</td>
</tr>
<tr>
<td>15</td>
<td>kukícis</td>
<td>10+6</td>
</tr>
<tr>
<td>16</td>
<td>kučašán</td>
<td>10+7</td>
</tr>
<tr>
<td>17</td>
<td>kutuhún</td>
<td>10+8</td>
</tr>
<tr>
<td>18</td>
<td>kucayán</td>
<td>10+9</td>
</tr>
<tr>
<td>20</td>
<td>p'ušám</td>
<td>20+1</td>
</tr>
<tr>
<td>30</td>
<td>p'ušamakaw</td>
<td>20+10</td>
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<tr>
<td>40</td>
<td>tip'ušám</td>
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<td>tutump'ušám</td>
<td>3×20</td>
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<tr>
<td>80</td>
<td>t'at'ip'ušám</td>
<td>4×20</td>
</tr>
<tr>
<td>100</td>
<td>kicisp'ušám</td>
<td>5×20</td>
</tr>
<tr>
<td>1000</td>
<td>kawkicisp'ušám</td>
<td>10×5×20</td>
</tr>
</tbody>
</table>

**Tepehua [23]**

[Bower 1948]

<table>
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<th>Translation</th>
<th>Value</th>
</tr>
</thead>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>t'uy</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>t'utu</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>t'at't'i:</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>ki:s</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>čašán</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>tuhun</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>cahin</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>naha:c</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>ka:w</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>ka:wt'am</td>
<td>10+1</td>
</tr>
<tr>
<td>12</td>
<td>ka:wt'uy</td>
<td>10+2</td>
</tr>
<tr>
<td>13</td>
<td>ka:wt'ut'u</td>
<td>10+3</td>
</tr>
<tr>
<td>14</td>
<td>ka:wt'av't'i:</td>
<td>10+4</td>
</tr>
<tr>
<td>15</td>
<td>ka:wk'i:s</td>
<td>10+5</td>
</tr>
<tr>
<td>16</td>
<td>ka:wačašan</td>
<td>10+6</td>
</tr>
<tr>
<td>17</td>
<td>ka:wtuhun</td>
<td>10+7</td>
</tr>
<tr>
<td>18</td>
<td>ka:wcahin</td>
<td>10+8</td>
</tr>
<tr>
<td>19</td>
<td>ka:wnaha:c</td>
<td>10+9</td>
</tr>
<tr>
<td>20</td>
<td>p'ušam</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>p'ušamtam</td>
<td>20+1</td>
</tr>
<tr>
<td>22</td>
<td>p'ušamt'uy</td>
<td>20+2</td>
</tr>
<tr>
<td>23</td>
<td>p'ušamt'utu</td>
<td>20+3</td>
</tr>
<tr>
<td>24</td>
<td>p'ušamt'av't'i:</td>
<td>20+4</td>
</tr>
<tr>
<td>25</td>
<td>p'ušamki:s</td>
<td>20+5</td>
</tr>
<tr>
<td>26</td>
<td>p'ušamčašan</td>
<td>20+6</td>
</tr>
<tr>
<td>27</td>
<td>p'ušamtuhan</td>
<td>20+7</td>
</tr>
<tr>
<td>28</td>
<td>p'ušamcahin</td>
<td>20+8</td>
</tr>
<tr>
<td>29</td>
<td>p'ušamnaha:c</td>
<td>20+9</td>
</tr>
</tbody>
</table>
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Native Middle American Languages

30  p'ušamkaːw  20 + 10
31  p'ušamkaːwtam  20 + 10 + 1
32  p'ušamkaːwt'uy  20 + 10 + 2
33  p'ušamkaːwt'ut'u  20 + 10 + 3
34  p'ušamkaːwt'aːt'ːiː  20 + 10 + 4
35  p'ušamkaːwkiːs  20 + 10 + 5
36  p'ušamkaːwčaːšan  20 + 10 + 6
37  p'ušamkaːwuːhun  20 + 10 + 7
38  p'ušamkaːwcahin  20 + 10 + 8
39  p'ušamkaːwnahaːc  20 + 10 + 9
40  t'up'ušam  2 × 20
50  t'up'ušamkaːw  2 × 20 + 10
60  t'utump'ušam  3 × 20
80  t'aːt'ːiːp'ušam  4 × 20
100  kiːsp'ušam  5 × 20
400  t'aːt'ːikiːsp'ušam  4 × 5 × 20
500  kiːskiːsp'ušam  5 × 5 × 20
1000  kaːw siːyentus  10 × 100

Basic vocabulary:

\[ U = \{1 \ldots 9\} \]
\[ B^1 = \{10 (kaːw)\}, B^2 = \{20 (p'ušam)\}, B^3 = \{100 = 5 \times 20\} \]

In Totonac some morphophonemic changes such as kaːw→ku, kaw-i-tu' and p'ušam-a-túm, are observed.

1 2 3  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.
\[ N_{100} = \{#, 2 \ldots 9\} \times B^3 \pm \{N_{1..99}\} \]

Chichimec [24]

[Angulo 1932: 183-184] (Original transcription) [Romero C. 1966: 530-531]

1  nánt'ːa  nánt'ːa
2  tán'ːén  tanehén'ːes
3  tín'uhun  tín'uhun
4  tipán  tipán
5  sangwáro  sangwáro
6  tákún  táku'ún
7  tsákūs  sak'úsp
8  tsásndžev  sánzep
9  nánt'ːa pámʃt "one more"  nánt'ːa pámʃp
10  rátsoró  rác'oro
11  rátsoró nánt'ːa énuːnts  rác'oro nánt'ːa enúːc'  10 + 1
12  rátsoró tán'ːen énuːntsɛs  rác'oro tanehén'ːes enúːc'ɛs  10 + 2
13  rátsoró tín'uhun égãts  rác'oro tín'uhun égãc'  10 + 3
14  rátsoró tipán égãts  rác'oro tipán égãc'  10 + 4
15  rátsoró sangwáro égãts  rác'oro sánzep égãc'  10 + 5
16  rác'oro táku'ún égãc'  10 + 6
17  rác'oro sak'úsp égãc'  10 + 7
18  rác'oro sánzep égãc'  10 + 8
Database 2: Numeral Systems

Basic vocabulary:

\[ U = \{1, \ldots, 9\} \]

\[ B^1 = \{10 \text{ (rác'aro)}\}, \quad B^2 = \{20 \text{ (up'in)}\}, \quad B^3 = \{100 \text{ (úr'í/ úr'ihi)}\}, \quad B^4 = \{1000 \text{ (úvó)}\} \]

Connectives: \{enúc'/ enúc'és/ égac'\}

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.”

\[ N_{1,9} = \{1, \ldots, 9\} \]

2. To the words from 11 to 19 are added enúc', enúc'és, and égac'. These are singular, dual and plural forms of enúc', respectively. (nunc means “to add.”)

\[ N_{10,19} = B^1 \pm \{N_{1,9}\} \pm \text{enúc'}/ \text{enúc'és}/ \text{égac'} \]

3. Vigesimal from 20 to 99. However, 50 is expressed by half-counting, that is, half-100.

\[ N_{20,99} = \{1, \ldots, 4\} \times B^2 + \{N_{1,9}\} \]

4. From 100 up, 100 and 1000 become the bases.

\[ N_{100,999} = \{1, \ldots, 9\} \times B^3 + \{N_{1,9}\} \]

Pame [25]

<table>
<thead>
<tr>
<th>Jiliapan (South)</th>
<th>Jiliapan (South)</th>
<th>Tilaco (South)</th>
<th>S. M. Acapulco (Central)</th>
<th>Alaquines (North)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Manrique C. 1967: 342]</td>
<td>[Soustelle 1937: 367]</td>
<td></td>
<td></td>
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<td>nna</td>
<td>nna</td>
<td>nda</td>
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<td>tìi</td>
<td>ti</td>
<td>tiyói</td>
<td>nùwi</td>
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<td>3</td>
<td>hnu</td>
<td>/niyù</td>
<td>tìyìa</td>
<td>kìnyì</td>
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<td>tìypìa</td>
<td>kìnyìì</td>
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<td>şpöitung</td>
<td>şputun</td>
<td>kit'ìë</td>
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<td>tìkiyënt</td>
<td>tåken</td>
<td>tìlya</td>
</tr>
<tr>
<td>7</td>
<td>tikti</td>
<td>tekìti</td>
<td>tìkiyöì</td>
<td>têlinyùhìn</td>
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<td>têñiyùn</td>
<td>këööinùn</td>
<td>dënsaw</td>
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<td>nahuwën</td>
<td>nàhë</td>
<td>tënsönta</td>
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<td>stut'u</td>
<td>štusù</td>
<td>šeškay</td>
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<td>11</td>
<td>sthutnà</td>
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10 + 1
Native Middle American Languages

Basic vocabulary:
\[ U = \{1...9\} \]
\[ B^1 = \{5' (tik)\}, B^2 = \{10 (shtml\} , B^3 = \{20 (de)\}, B^4 = \{100 (nte'e)\} \]

Derivative vocabulary:
\[ 1' = yent, 3' = nyiu \]
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.

\[ U = \{1...5\}, \]
\[ N_{6-9} = B^1 + \{1', 2, 3'\}, N_9 = \{9\} \]

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.

\[ N_{20-99} = \{1...4\} \times B^3 \pm (N_{1,19}) \]

4. 100 is a new base.

\[ N_{100} = \{1...\} \times B^4 \pm \]

Matlatzinca [26]

(Original transcription)

<table>
<thead>
<tr>
<th>Mexicalzingo</th>
<th>San Francisco</th>
<th>Oztotilpan</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Basalenque 1642]</td>
<td>[Soustelle 1937: 325]</td>
<td>[Soustelle: 325]</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>1 huera-hui</td>
<td>yndahhuy</td>
<td>indawi</td>
</tr>
<tr>
<td>2 no-hui</td>
<td>ynahuy</td>
<td>hinowi</td>
</tr>
<tr>
<td>3 inyuu/ ni</td>
<td>ynyuhu</td>
<td>hišu</td>
</tr>
<tr>
<td>4 cunno-hui</td>
<td>yncunohuy</td>
<td>ink(^k)unuwi</td>
</tr>
<tr>
<td>5 incutha</td>
<td>yncuthaa</td>
<td>ink(^k)uda</td>
</tr>
<tr>
<td>6 daha-tho-hui</td>
<td>yndahtohuy</td>
<td>indatowö</td>
</tr>
<tr>
<td>7 ne-tho-hui</td>
<td>ynthohuy</td>
<td>nětowi</td>
</tr>
<tr>
<td>8 nen-cuno-hui</td>
<td>ynencunou</td>
<td>inenk(^k)unowi</td>
</tr>
<tr>
<td>9 muratan-dahatha</td>
<td>ymurahtadahata</td>
<td>inmaratandaha</td>
</tr>
<tr>
<td>10 dahata</td>
<td>yndahatta</td>
<td>indara</td>
</tr>
<tr>
<td>11 dahatha-mus-dahuí</td>
<td>10 + 1</td>
<td></td>
</tr>
<tr>
<td>12 dahatha-mus-rohui</td>
<td>10 + 2</td>
<td></td>
</tr>
</tbody>
</table>
Basic vocabulary:
\[ U = \{1 \ldots 5\} \]
\[ B^1 = \{5' (\text{tho})\}, B^2 = \{10\}, B^3 = \{20 (\text{tha})\}, B^4 = \{400\} \]

Derivative vocabulary:
\[ 1' = \text{daha} \sim \text{dohon}, 2' = \text{ne} \sim \text{nene} \sim \text{nehen}, 3' = \text{thatha} \sim \text{nin} \]

A connective: \{\text{mus} \sim \text{mutz}\}

1. Six and 7 are analyzed as \(1+5'\), \(2+5'\). Eight is \(2 \times 4\) and 9 is \(-1+10\). \text{tho} is regarded as \(5'\), which seems to have the same origin as \text{to} in Otomi. Therefore the formation is quinary, but 8 and 9 are formed by the multiplicative and back-counting methods, respectively.

\[ N_{10} = \{1 \ldots 5, 1' + 5', 2' + 5', 2' \times 4, -1' + 10\} \]

2. From 10 up the forms seem to be described as \(10 + \text{mus} + \{U\}\), 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.

\[ N_{10, 19} = B^2 \pm \text{mus} \pm \{N_{10}\} \]

Ocuilteco [27] (original transcription)

<table>
<thead>
<tr>
<th>Schumann 1975: 535</th>
<th>Soustelle 1937: 327</th>
</tr>
</thead>
<tbody>
<tr>
<td>mbla</td>
<td>bla</td>
</tr>
<tr>
<td>mno</td>
<td>&quot;no</td>
</tr>
<tr>
<td>phyu</td>
<td>phyu</td>
</tr>
<tr>
<td>gunhno</td>
<td>gun/ ho</td>
</tr>
<tr>
<td>kwit'a</td>
<td>kwit'a</td>
</tr>
<tr>
<td>mblandoho</td>
<td>blandoho</td>
</tr>
<tr>
<td>mnyehndoho</td>
<td>nynedo</td>
</tr>
<tr>
<td>mnyehngunhno</td>
<td>mnyengunho</td>
</tr>
<tr>
<td>mbla-tylaht'a</td>
<td>&quot;blatil'at'a</td>
</tr>
<tr>
<td>mblah't'a</td>
<td>&quot;blat'a</td>
</tr>
<tr>
<td>mblaht'a muci-la</td>
<td>10 + 1</td>
</tr>
<tr>
<td>mblaht'a muci-no</td>
<td>10 + 2</td>
</tr>
<tr>
<td>mblaht'a muci-hyu</td>
<td>10 + 3</td>
</tr>
<tr>
<td>mblaht'a muci-gunhno</td>
<td>10 + 4</td>
</tr>
<tr>
<td>mblaht'a muci-kwit'a</td>
<td>10 + 5</td>
</tr>
<tr>
<td>mblaht'a muci-mblandoho</td>
<td>10 + 1 + 5</td>
</tr>
<tr>
<td>mblaht'a muci-mnyehndoho</td>
<td>10 + 2 + 5</td>
</tr>
<tr>
<td>mblaht'a muci-mnyengunhno</td>
<td>10 + 2 × 4</td>
</tr>
<tr>
<td>mblaht'a muci-mblatyulaht'a</td>
<td>10 - 1 + 10</td>
</tr>
<tr>
<td>mbloha</td>
<td></td>
</tr>
</tbody>
</table>

Basic vocabulary:
U = \{1...5\}, B^1 = \{5' (n-doho)\}, B^2 = \{10\}, B^3 = \{20\}

A connective: \{muci\}

1) Six and 7 are \(1+5/\) and \(2+5/\). Eight is \(2\times4/\) and 9 is \(-1+10/\).
\(N_{1.9} = \{1...5, 1+5', 2'+5', 2'\times4, -1+10'\}\)

2) The formation above 10 is \(10+muci+\{1...9\}\).
\(N_{10.19} = B^2±muci±\{N_{1.9}\}\)

3) The method of counting above 20 may be vigesimal, but no data is available.

Notes: The words for 10 and 20 contain \(mbia\) or \(mbl-\) (1). If \(mbia\) and \(mbl-\) are subtracted, \(aht'a\) and \(ohnda\) are obtained as the roots, but \(t'a\) and \(da\) seem to be more proper forms, if Ocuitleco is compared with the neighboring languages, Otomí and Mazahua.

**Otomí [28]**

<table>
<thead>
<tr>
<th>Sierra Otomí</th>
<th>Mezquital Otomí</th>
</tr>
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<tbody>
<tr>
<td>[ECEGOYEN GLEASON 1979: 72-76]</td>
<td>[Hess 1968: 63, 74-76]</td>
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<tr>
<td>1</td>
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</tr>
<tr>
<td>2</td>
<td>yoho</td>
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<tr>
<td>3</td>
<td>hyu</td>
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<td>4</td>
<td>goho</td>
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<tr>
<td>5</td>
<td>kit'a</td>
</tr>
<tr>
<td>6</td>
<td>'dato</td>
</tr>
<tr>
<td>7</td>
<td>yoto</td>
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<tr>
<td>8</td>
<td>hyato</td>
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<td>9</td>
<td>gito</td>
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<td>10</td>
<td>'dæt'a</td>
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<td>'dæ'mahyu</td>
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<td>'dæ'magoho</td>
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<td>15</td>
<td>'dæ'makít'a</td>
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<td>16</td>
<td>'dæ'ma'dato</td>
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<td>17</td>
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<td>'dæ'mahyato</td>
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<td>19</td>
<td>'dæ'magito</td>
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<td>20</td>
<td>'dote</td>
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<td>21</td>
<td>'dote ma 'da</td>
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<td>22</td>
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<td>'dote ma goho</td>
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<td>'dote ma kit'a</td>
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<td>30</td>
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<tr>
<td>40</td>
<td>yote</td>
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<td>50</td>
<td>yote ma 'dæt'a</td>
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<tr>
<td>60</td>
<td>hyate</td>
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<tr>
<td>70</td>
<td>hyate ma 'd æt'a</td>
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<tr>
<td>74</td>
<td>hñú'ráte ma 'rët'a ma gohó</td>
</tr>
<tr>
<td>80</td>
<td>goho'dote</td>
</tr>
<tr>
<td>90</td>
<td>goho'dote ma 'dæt'a</td>
</tr>
<tr>
<td>99</td>
<td>goho'dote ma 'dæmamagito</td>
</tr>
</tbody>
</table>
Database 2: Numeral Systems

100  n’da siento  ‘na nñebé  1 × 100
102  n’da siento nae yoho  1 × 100 + 2
111  n’da siento nae ‘daemada  1 × 100 + 11
128  n’da siento nae ‘dote ma hyato  1 × 100 + 20 + 8
140  n’da siento nae yote  1 × 100 + 2 × 20
155  n’da siento nae yote ma ‘daemakita  1 × 100 + 2 × 20 + 10 + 5
200  yo siento  2 × 100
300  hyu siento  3 × 100
400  goho siento  4 × 100
411  goho nñebé ne ‘rête ma ‘ra  4 × 100 + 10 + 1
500  kit’a siento  5 × 100
1000  n’da mahuahi  ‘na ’mó  1 × 1000
1001  ‘na ’mò nè ’nà  1 × 1000 + 1
4490  goho ’mò nè goho nñebé nè goho  ’ràtè ma ’rête’a  
     4 × 1000 + 4 × 100 + 4 × 20 + 10

"5000"  kít’a ’mó
"10000"  ‘dàet’a mahuahi

Basic vocabulary:
\[ U = \{1...5\} \]
\[ B_1 = \{5’ (to)\}, B_2 = \{10 (‘daë)\}, B_3 = \{20 (te)\}, B_4 = \{100 (siento)\}, B_5 = \{1000 (mahuahi)\} \]

Derivative vocabulary:
\[ \{1’, 2’, 3’, 4’\} = \{‘da/’do, yo, hya, gi\} \]

Connectives:\{ma, naë\}

1. Quinary.
   \[ N_{1,5} = \{1...5\} \]
   \[ N_{6,9} = \{1’...4’\} + B_1 \]
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.
   \[ N_{20,99} = \{1’...4’\} × B_3 + ma + \{N_{1,19}\} \]
4. The numbers above 100 are formed from a new base 100, but the interval numbers follow the vigesimal method.
   \[ N_{100,} = \{U’\} × B_4 ± \]
   \[ N_{1000,} = \{U’\} × B_5 ± \]

Mazahua [29]
[NÁGERA YANGUAS 1637: 6-8, 33] (Original transcription)

1  daha
2  yehe
3  elihij
4  zioho
5  zicha
6  nantto  1 + 5
7  yencho  2 + 5
8  ñincho  3 + 5
9  zincho  4 + 5
10  decha
<table>
<thead>
<tr>
<th></th>
<th>Native Middle American Languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>dechēdaha</td>
</tr>
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<td>12</td>
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<tr>
<td>320</td>
<td>dechen ñhincho enche</td>
</tr>
<tr>
<td>330</td>
<td>dechen ñhincho enche quiziyechá</td>
</tr>
<tr>
<td>340</td>
<td>dechen quinchó enche</td>
</tr>
<tr>
<td>350</td>
<td>dechen quinchó enche quiziyechá</td>
</tr>
<tr>
<td>360</td>
<td>damo</td>
</tr>
<tr>
<td>370</td>
<td>damo decha</td>
</tr>
<tr>
<td>380</td>
<td>damo dotte</td>
</tr>
<tr>
<td>390</td>
<td>damo dotten decha</td>
</tr>
<tr>
<td>400</td>
<td>damo yheche</td>
</tr>
<tr>
<td>410</td>
<td>damo yhechen decha</td>
</tr>
<tr>
<td>420</td>
<td>damo ñhiche</td>
</tr>
<tr>
<td>430</td>
<td>damo ñhichendecha</td>
</tr>
<tr>
<td>440</td>
<td>damo quiche</td>
</tr>
<tr>
<td>450</td>
<td>damo quichen decha</td>
</tr>
<tr>
<td>460</td>
<td>damo quicheche</td>
</tr>
</tbody>
</table>
700  damo dechen quicha enche  400 + 15 \times 20
800  yemo  2 \times 400
900  yemo quichiche  2 \times 400 + 5 \times 20
1000  yemo dechiche  2 \times 400 + 10 \times 20

Basic vocabulary:
U = \{1 \ldots 5\}
B^1 = \{5' (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'\} = \{nant, yen, ñin, zin, cho\}, \{20'\} = \{che\}
\{1'', 2'', 3'', 4'', 5'' \ldots\} = \{yho, yhe, ñhi, zhi, zhichi\ldots\}

Connectives: \{en, i\}

① Quinary. The numbers from 6 to 9 are \{1' \ldots 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.
\mathrm{N}_{1,5} = \{1 \ldots 5\}
\mathrm{N}_{6,9} = \{1' \ldots 4'\} + 5'

② The words from 11 to 19 are formed from 10 plus with the numbers \{1 \ldots 9\} by means of a connective, en.
\mathrm{N}_{11,19} = B^2 + \text{en} + \{N_{1,9}\}

③ Vigesimal above 20.
\mathrm{N}_{21,39} = \{N_{1,19}'\} \times B^3 \text{ (-te/-i-che/-en-che)} \pm \{N_{1,9}\}

④ Since 400 is \text{da-mo} and 800 is \text{ye-mo}, they are analyzed as \{D'\} \times \text{mo}.

Tlapanecc [30]
[SuÁErez 1983a]
1  mba¹
2  a³hma³
3  a²cu¹
4  a²kho³
5  wi²cu²
7  hu²wa³
9  mi²hna¹ gu³wa¹³ \text{(mi³hngi² = "cerca")}
10  gu³wa¹³
15  gu³wa¹³ ni¹cu²  10 + 5
17  gu³wa¹³ ni¹cu² e³hna³  10 + 5 + 2
20  mba² sk³yu¹
35  mba² sk³yu¹ gu³wa¹³ ni¹cu²  1 \times 20 + 10 + 5
40  a³hna³ sk³yu¹  2 \times 20
59  a³hna³ sk³yu¹ gu³wa¹³ ni¹cu² e³kho³  2 \times 20 + 10 + 5 + 4

(According to SuÁErez, the numeral just above is 55, but judging from its composition, it must be 59.)

"100"  mba² sye¹to¹  1 \times 100

Basic vocabulary:
U = \{1 \ldots 9\}
B^1 = \{10\}, B^2 = \{15\}, B^3 = \{20\}, B^4 = \{100\}
Native Middle American Languages

Derivative vocabulary:

\[2' = e^3hma, 4' = e^3kho\] (perhaps \(a\rightarrow e/ \# a\))

\[5' = n + wi^2cu > ni^1cu^2\]

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 \(1\pm 10\). According to Suárez, \(mi^2hna^1\) is derived from \(mi^2hngi^2\), "near."

\[N_{15,9} = \{1\ldots 9\}\]

2 The data for 11 through 19 are scanty, but the numbers above 15 are undoubtedly quinary.

\[N_{15,19} = B^2 \pm \{1\ldots 4\}\]

3 Vigesimal from 20 to 99.

\[N_{20,99} = \{1\ldots 4\} \times B^3 \pm N_{1,19}\]

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    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   | 16   | 17   | 18   | 19   | 20   | 21   | 22   | 23   | 30   | 31   | 32   | 33   | 40   | 50   |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|    | imba | apu  | asu  | acu  | hiusu/hiusu | mahu | niquinu | nuha | melnu | gua/ gua/ guxa | gua-n-imba | gua-n-apu | gua-n-asu | gua-n-axku | gua-n-isu | gua-n-mahu | gua-n-quinu | gua-(n)-nuha | gua-n-melnu | dino (dño)/imba diño/'ba diño | 'ba-diño-imba-nu | 'ba-diño-apu-nu | 'ba-diño-asu-nu | 'ba-diño-guha-nu | 'ba-diño-gua-n-imba-nu | 'ba-diño-gua-n-apu-nu | 'ba-diño-gua-n-asu-nu | apu-diño | apu-diño-guha-nu | |
|    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
Database 2: Numeral Systems

60  asu-diño  asu-diño  3 × 20
70  asu-diño-guha-nu  3 × 20 + 10
80  acu-diño
90  acu-diño-guha-nu  4 × 20 + 10
100 huisu-diño/guha-amba  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 × 5 × 20
2000 huisu-diño-amba  isu-diño-axmba  5 × 400
4000 guha-diño-amba  gua-diño-axmba  10 × 400

Basic Vocabulary:
U = {1...9}
B¹ = {10}, B² = {20}, B³ = {400}

Derivative vocabulary:
1' = 'ba, 5' = isu

Connectives: {-n-} {-nu}

1) The words from 1 to 19 follow the decimal method. A connective -n- is inserted between 10 and {1...9}.
N₁,₁₉ = ± B¹ ± n ± U

2) The numbers above 20 are vigesimal, but 1000 is 10 × 5 × 20. The formation is decimal.
N₂₀,₃₉₉ = N₁,₁₉ × B² ± (N₁,₁₉ + nu)

Ixatec [31]
[FERNÁNDEZ de MIRANDA 1961]

1  hngu²
2  yu¹hu²
3  nj¹he²
4  ñu¹hu¹ / ñu¹
5  s'q¹
6  šho³
7  ya²tu²
8  hni¹
9  nj³he²
10  u'te³
11  u'te³ hngu²  10 + 1
13  u'te³ nj¹he²  10 + 3
15  čj¹'u³  15
17  čj¹'u² yu¹hu²  15 + 2
19  čj¹'u² ñu¹hu¹  15 + 4
20  ška³  20
29  ška¹ nj³he²  20 + 9
30  ška¹ u'te³
39  ška¹ u'te³ nj³he²  20 + 10 + 9
50  ya¹ška² u'te³  2 × 20 + 10
60  ye¹ška²  3 × 20
100  sye¹ntu⁴
400  ñu¹hu¹ sye¹ntu¹  4 × 100
Basic vocabulary:

\[ U = \{1 \ldots 9\} \]

\[ B^1 = \{10 \ (u^2te^3)\}, \ B^2 = \{15 \ (gji^1u^3)\}, \ B^3 = \{20 \ (skal^1)\}, \ B^4 = \{100\} \]

Derivative vocabulary:

\[ \{2'\} = ya^1a^1, \ \{3'\} = ye^1e^1 \]

1. Decimal below 10.

\[ N_{1.9} = \{1 \ldots 9\} \]

2. Quinary from 10 to 19.

\[ N_{10.14} = B^1 \pm \{1 \ldots 4\} \]

\[ N_{15.19} = B^2 \pm \{1 \ldots 4\} \]

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]

\[
\begin{array}{ll}
1 & ngu^2 \\
2 & \check{u}^12 \\
3 & nie^12 \\
4 & niu^21 \\
5 & \check{u}^2u^1 \\
6 & \check{u}^3 \\
7 & \check{a}^2du^3 \\
8 & \check{i}^1 \\
9 & na^3 \\
10 & te^1 \\
11 & to^1 \\
12 & rxa^3 \\
13 & \check{e}^2e^1 \\
14 & rxa^3 \\
15 & rxa^3 \ ku^2 & 15 \\
16 & rxa^3 \ ku^2 \ ku^2 & 15 + 1 \\
17 & rxa^3 \ \check{u}^12 & 15 + 2 \\
18 & rxa^3 \ nie^12 & 15 + 3 \\
19 & rxa^3 \ nie^12 \ niei^2 & 15 + 4 \\
20 & ka^1 \\
21 & ka^1 \ ku^2 & 20 + 1 \\
22 & ka^1 \ \check{u}^12 & 20 + 2 \\
23 & ka^1 \ nie^12 & 20 + 3 \\
24 & ka^1 \ nie^12 \ niei^2 & 20 + 4 \\
25 & ka^1 \ \check{u}^2u^1 & 20 + 5 \\
26 & ka^1 \ \check{u}^2u^1 & 20 + 6 \\
27 & ka^1 \ \check{a}^2du^3 & 20 + 7 \\
28 & ka^1 \ \check{a}^1 & 20 + 8 \\
29 & ka^1 \ na^3 & 20 + 9 \\
30 & ka^1 \ te^1 & 20 + 10 \\
31 & ka^1 \ to^1 & 20 + 11 \\
\end{array}
\]
32  kα' rxa³ 20 + 12
33  kα' še²e³ 20 + 13
34  kα' rxo³ 20 + 14
35  kα' rxo²? 20 + 15
36  kα' rxo²? ku² 20 + 15 + 1
37  kα' rxo²? žu³ 20 + 15 + 2
38  kα' rxo²? nie² 20 + 15 + 3
39  kα' rxi²? niu² 20 + 15 + 4
40  žα²kα² 2 × 20
41  žα²k α²ku² 2 × 20 + 1
42  žα²k αžu² 2 × 20 + 2
50  žα²k a²te³ 2 × 20 + 10
55  žα²k a²rxo²? 2 × 20 + 15
56  žα²k a²rxo²? ku² 2 × 20 + 15 + 1
60  nie²kα² 3 × 20
61  nie²kα²ku² 3 × 20 + 1
70  nie²kα²te³ 3 × 20 + 10
75  nie²kα²rxo²? 3 × 20 + 15
76  nie²kα²rxo²? ku² 3 × 20 + 15 + 1
80  niu²kα² 4 × 20
81  niu²kα²ku² 4 × 20 + 1
90  niu²kα²te³ 4 × 20 + 10
95  niu²kα²rxo²? 4 × 20 + 15
100  ngu² sie²ntu²? 1 × 100

Basic vocabulary:

U = {1...15}
B¹ = {15 (rxo²?), B² = {20 (kα²)}, B³ = {100 (sie²ntu²?)}

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.

N₁₁₄ = {1...14}
N₁₅₁₉ = B¹ + {1...4}

Vigesimal from 20 to 99.
N₂₀₉₉ = {#, 2', 3', 4'} × B² + {N₁₁₄}

The word for 100 is a Spanish loan.
N₁₀₀ = U × B³ +

Mazatec [34]

Chiquihuitlán Mazatec (ü = ú, ã = a)

[JAMIESON 1988: 67-68] [THOMAS 1897-8: 888-890]

1  ngu  gu
2  ho  ho
3  hya  ha
4  ūhu  ūhu
5  'ũu  ū
6  hyu  hu
7  yatu  yi-tu
8  hyi  hi-i
9  ūha  ū-ha
<table>
<thead>
<tr>
<th></th>
<th>ta</th>
<th>te</th>
<th>te-n-gu</th>
<th>10+1</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>te-ngu</td>
<td>te-n-gu</td>
<td>10+1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>te-ho</td>
<td>te-n-ho</td>
<td>10+2</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>te-hya</td>
<td>te-n-ha</td>
<td>10+3</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>te-ñuhu</td>
<td>te-ni-hu</td>
<td>10+4</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>tyhu'u</td>
<td>te-u</td>
<td>15</td>
<td>(10+5)</td>
</tr>
<tr>
<td>16</td>
<td>tyhu'u-ngu</td>
<td>te-u-n-gu</td>
<td>15+1</td>
<td>(10+5+1)</td>
</tr>
<tr>
<td>17</td>
<td>tyhu'u-ho</td>
<td>te-u-n-ho</td>
<td>15+2</td>
<td>(10+5+2)</td>
</tr>
<tr>
<td>18</td>
<td>tyhu'u-hya</td>
<td>te-u-n-ha</td>
<td>15+3</td>
<td>(10+5+3)</td>
</tr>
<tr>
<td>19</td>
<td>tyhu'u-ñuhu</td>
<td>te-u-ni-hu</td>
<td>15+4</td>
<td>(10+5+4)</td>
</tr>
<tr>
<td>20</td>
<td>ka</td>
<td>ka</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>ka-ngu</td>
<td>ka-n-gu</td>
<td>20+1</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>ka-ho</td>
<td>ka-n-ho</td>
<td>20+2</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>ka-hya</td>
<td>ka-n-ha</td>
<td>20+3</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>ka-ñuhu</td>
<td>ka-ni-hu</td>
<td>20+4</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>ka-ñ'nu</td>
<td>ka-u</td>
<td>20+5</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>ka-hu</td>
<td>ka-u-n-gu</td>
<td>20+5+1</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>ka-yitu</td>
<td>ka-u-n-ho</td>
<td>20+5+2</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>ka-hii</td>
<td>ka-u-n-ha</td>
<td>20+5+3</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>ka-niha</td>
<td>ka-u-ni-hu</td>
<td>20+5+4</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>ka-ta</td>
<td>ka-te</td>
<td>20+10</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>ka-te-n-gu</td>
<td>ka-te-n-ho</td>
<td>20+10+1</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>ka-te-n-ho</td>
<td>ka-te-n-ha</td>
<td>20+10+2</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>ka-te-n-ha</td>
<td>20+10+3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>ka-te-ni-hu</td>
<td>20+10+4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>ka-tyhu'u</td>
<td>ka-te-u</td>
<td>20+10+5</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>ka-tyhu'u-ngu</td>
<td>ka-te-hu (ka-te-u-n-gu)</td>
<td>20+10+5+1</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>ka-te-yitu (ka-te-u-n-ho)</td>
<td>20+10+5+2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>ka-te-hii (ka-te-u-n-ha)</td>
<td>20+10+5+3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>ka-te-niha (ka-te-u-ni-hu)</td>
<td>20+10+5+4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>ya-ça</td>
<td>yi-cha</td>
<td>2×20</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>yi-cha-ngu</td>
<td>2×20+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>yi-cha-hu (yi-cha-u-ngu)</td>
<td>2×20+5+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>ya-ça-ta</td>
<td>yichite (or ichite)</td>
<td>2×20+10</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>ichite-ngu</td>
<td>2×20+10+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>ya-ça-tyu'hu</td>
<td>2×20+15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>ichite-hu (ichite-u-ngu)</td>
<td>2×20+10+5+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>hya-ça</td>
<td>ichite-koh-koh</td>
<td>3×20 (2×20+10+10)</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>ichite-koh-koh</td>
<td>3×20+10+10+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>ichite-koh-koh (ichite-koh-koh)</td>
<td>3×20+10+10+5+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>hya-ça-ta</td>
<td>ichite-koh-koh</td>
<td>3×20+10 (50+20)</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>ichite-koh-koh</td>
<td>50+20+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>ichite-koh-koh</td>
<td>50+20+5+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>ñuhu-çã</td>
<td>ichite-koh-koh-te</td>
<td>4×20 (50+20+10)</td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>ñuhu-çã</td>
<td>ichite-koh-koh-yicha</td>
<td>50+40</td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>ñuhu-çã-te</td>
<td>50+40+5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>ñuhu-çã-tyu'hu-ngu</td>
<td>4×20+15+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>ngu sientu</td>
<td>u-cha</td>
<td>1×100 (5×20)</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>u-cha-te</td>
<td>5×20+10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>ho sientu</td>
<td>ho-u-cha</td>
<td>2×100 (2×5×20)</td>
<td></td>
</tr>
</tbody>
</table>
Database 2: Numeral Systems

245  ho sientu koho ya-ča’flu  
300  ha-u-cha  
1000  te-u-cha  
2000  ho-mi (ho-te-u-cha)  
10000  te-mi  
20000  kα-mi  
30000  kate-mi  
100000  u-cha-te-u-cha  
110000  u-cha-te-te-u-cha  
130000  u-cha-kate-te-u-cha

Proto Mazatec [KIRK 1985]

1  ’hanku3i  
2  ’hau2  
3  ’ša2  
4  ’nα’hu2  
5  ’nα2  
6  ’ša4  
7  ’nα2tu43  
8  ’ši2  
9  ’nα2ha43  
10  ’te3  
15  ’tYhau3’v2  
20  ’ka43  
50  ’nα46a2te3  
100  ’nα46a3  
400  ’yuwa

Basic vocabulary:

U = {1...10}

B1 = {10' (te)} , B2 = {15 (tyh’u’u)}, B3 = {20 (kα)}, B4 = {100 (sientu/ ucha)}

The numbers 1 through 10 are decimal.

N₁,₁₀ = {1...9}

The numbers 10 through 19 are quinary.

N₁₀,₁₄ = B¹ (‘te³) ± {1...4}  
N₁₅,₁₹ = B² (t’hau³μ² < 10 + 5) ± {1...4}

Thomas’s data cited from Francisco Belmar [1905: 91-92] show more clearly than Jamieson’s that 15 is 10 + 5.

Vigesimal from 20 to 99.

N₂₀,₉₉ = { # , 2 , 3 , 4‘ } × B³ ± {N₁,₁₀}

In Jalapa de Diaz two current alternative systems exist for counting 26 through 29. One of these is formed by using 20 + 5 + {1...4}. The numbers from 50 to 99 are 50 ± {1...49}.

There are two methods for forming the numbers from 100 up. A new base 100 (B⁴) is expressed either by 5 × 20 or by the Spanish loan word for 100.

N₁₀₀ = { # , 2...9} × B⁴ (’nα46a3/ ucha) ± {N₁,₉₉}
Amuzgo [35]
[Anonymous 1954]

1     kwi
2     we
3     nde
4     nekie
5     'aum
6     nñaam
7     ntkie'
8     nña
9     ṉñe
10    ki
11    ka-nño-'kwi'  10+1
12    ka-nño-we     10+2
13    ka-nño-'nde'  10+3
14    ka-nño-nkie   10+4
15    ki-n-'aum    10+5
16    ki-n-'aum nño-'kwi'  10+5+1
17    ki-n-'aum nño-we    10+5+2
18    ki-n-'aum nño-ndε    10+5+3
19    ki-n-'aum nño-nkie   10+5+4
20    ntkyu
21    ntkyu nño-'kwi'  20+1
22    ntkyu nño-we     20+2
23    ntkyu nño-ndε    20+3
24    ntkyu nño-nkie   20+4
25    ntkyu nño-'aum'  20+5
26    ntkyu nño-'aum nño-'kwi'  20+5+1
27    ntkyu nño-'aum nño-we    20+5+2
28    ntkyu nño-'aum nño-ndε    20+5+3
29    ntkyu nño-'aum nño-nkie   20+5+4
30    ntkyu nño-ki     20+10
40    we-n'a              2×20
50    we-n'a nño-ki     2×20+10
60    nde-n'a           3×20
70    nde-n'a nño-ki    4×20+10
80    nekie-n'a        4×20
90    nekie-n'a nño-ki  4×20+10
100   kwi siento        1×100

Basic vocabulary:

U = {1...10}
B¹ = {5 ('aum)}, B² = {10 (ki)/10' (ka)}, B³ = {20 (n'a)/20' (ntkyu), B⁴ = {100 (siento)}

Connectives: {-nño-, -n-}

1  Decimal under 10,
   N₁₋₉ = {1...9}

2  Quinary from 10 to 19.
   N₁₁₋₁₄ = B² (ka) ± nño + {N₁₋₄}
\[ N_{15.19} = B^2 (k_i) \pm n \pm B^1 \pm n^0 \pm \{N_{1.4}\} \]

\( N_{20.24} = B^3 (ntkyu) \pm n^0 \pm \{N_{1.4}\} \)
\( N_{25.29} = B^3 (ntkyu) \pm n^0 \pm B^1 \pm n^0 \pm \{N_{1.4}\} \)
\( N_{40.99} = \{2, 3, 4\} \times B^3 (n^a) \pm \)

3. Vigesimal from 20 to 99.

The word for 100 is borrowed from Spanish.
\[ N_{100} = \{U\} \times B^4 \pm \]

**Mixtec [36]**

Atalahuca Mixtec [ALEXANDER 1980: 73-75] (Mixteca Alta)

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Silacayoapan Mixtec [NORTH and SHIELDS 1978: 19-22] (Mixteca Baja)

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San Juan Colorado Mixtec [STARK et al. 1986: 200-201] (Mixteca Costa)

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**Jicaltepec Mixtec** [BRADLEY 1970: 51]

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Native Middle American Languages

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Basic vocabulary:

- \( U = \{1 \ldots 9\} \)
- \( B^1 = \{10\}, \ B^2 = \{15\}, \ B^3 = \{20\} \) (oko-šiko), \( B^4 = \{100\} \)

Derivative vocabulary:

1. Decimal below 10.
   \( N_{1,9} = \{1 \ldots 9\} \)
2. Quinary from 10 to 19.
   \( N_{10,14} = B^1 \pm \{1 \ldots 4\} \)
   \( N_{15,19} = B^2 \pm \{1 \ldots 4\} \)
3. Vigesimal from 20 to 99.
   \( N_{20,39} = B^3 \pm \{N_{1,19}\} \)
   \( N_{40,99} = \{2, 3, 4\} \times 20' (šiko) \pm \{N_{1,19}\} \)
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 | u³vi³ |
| 3 | i'nu' |
| 4 | ku⁴ |
| 5 | gu³u³ |
| 6 | ga⁴ |
| 7 | ndača⁴ |
| 8 | ni³ni² |
| 9 | nu²³ |
| 10 | ndiči² |
| 11 | ndića'ma² |
| 12 | ndiću²vi² |
| 13 | ndići⁴ ku³⁴ |
| 14 | ndità³lyu³ |
| 15 | ndità³lyu³ a₂ma² |
| 16 | ndità³lyu³ u³vi³ |
| 17 | ndità³lyu³ i'nu² |
| 18 | ndità³lyu³ ku³⁴ |
| 19 | ndità³lyu³ i'nu² |
| 20 | ndità³lyu³ |
| 40 | u³vi³ ga'ku³ |
| 50 | u³vi³ ga'ku³ ndiči² |
| 70 | i'nu³ ga'ku³ ndiči² |
| 80 | ku⁴ ga'ku³ |

| \(10 + 1\) | \(10 + 2\) | \(10 + 4\) | \(15 + 1\) | \(15 + 2\) | \(15 + 3\) | \(15 + 4\) | \(2 \times 20\) | \(2 \times 20 + 10\) | \(3 \times 20 + 10\) | \(4 \times 20\) |
Basic vocabulary:

U = \{1...9\}
B^1 = \{10\}, B^2 = \{15\}, B^3 = \{20 (ndi3ku3-ga3ku3)\}, B^4 = \{100 (siento)\}

Derivative vocabulary:

20' = ga3ku3

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\}

3. Vigesimal from 20 to 99.

N_{20..39} = B^3 \pm \{N_{1..19}\}
N_{40..99} = \{2, 3, 4\} \times 20' (ga3ku3) \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'3/’ngoh'4
2. wui'3
3. wa't'ni3
4. ga'5'9
5. u'tu3
6. wat'a'3
7. ‘cih’4
8. ‘tih’4
9. ‘i’4
10. ‘ci’44
11. ‘za’5
12. ‘zuwih’4
13. ‘za’5’nih’3
14. ‘zi’5’ah’3
15. ‘zi’u’3
16. ‘zi’u’3’ya’4
17. ‘zi’u’3’wui’3
18. ‘zi’u’3’wa’t’ni’3
19. ‘zi’u’3’ga’5’q’3
20. ‘ko’4
21. ‘ko’4’ya’4
20 + 1
30. ‘ko’4’ci’44
20 + 10
40. wui’3 ‘zia’3
2 × 20
60. wa’nih’3 ‘zia’3
3 × 20
80. ga’5’ah’3 ‘zia’3
4 × 20
100. siento’3

Basic vocabulary:
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Native Middle American Languages

\[ U = \{1...9\} \]
\[ B^1 = \{10 (\ddot{z}i)\}, \ B^2 = \{15 (\ddot{z}iu')\}, \ B^3 = \{20 (k\ddot{o}z\ddot{a})\}, \ B^4 = \{100 (s\text{ientu}^3)\} \]

1. Decimal below 10.
\[ N_{1,9} = \{1...9\} \]

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.
\[ 11 = \ddot{z}i + \ddot{y}a > \ddot{z}a; \ 12 = \ddot{z}i + wui > \ddot{z}uwi; \ 13 = \ddot{z}i + w\ddot{a}ni > \ddot{z}anih; \ 14 = \ddot{z}i + g\ddot{a}a > \ddot{z}iga\ddot{a}h \]
\[ N_{10-14} = B^1 \pm \{1...4\} \]
\[ N_{15,19} = B^2 \pm \{1...4\} \]

3. Vigesimal from 20 to 99.
\[ N_{20,39} = B^3 \pm \{N_{1,19}\} \]
\[ N_{40,99} = \{2, 3, 4\} \times 20' (\ddot{z}ia) \pm \{N_{1,19}\} \]

4. The word for 100 is borrowed from Spanish.
\[ N_{100} = \{U\} \times B^4 \pm \{N_{1,90}\} \]

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  \(15 \pm 5 + 20\)
16  chino-bi-tobi  \(15 + 1\)
17  chino-bi-topa/ chino-bi-cato/ ce-chona-quizaha-calle  \(15 + 2 \pm 3 + 20\)
18  chino-bi-chona/ ce-toba-calle/ ce-toba-quizaha-calle  \(15 + 3 \pm 2 + 20\)
19  chino-bi-tapla ce-tobi-calle ce-tobi-quizaha-calle  \(15 + 4 \pm 1 + 20\)
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  \(20 + 6\)
Database 2: Numeral Systems

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-bi-chij-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/ ce-caa-toua  20+15/−5+40
36  calle-bi-chij-bi-xopa/ ce-caayo-toua-bi-tobi/ ce-tapa-caca-quizaha-chaa-toua  20+10+6/−5+40+1/−4+40
37  calle-bi-chij-bi-xopa/ ce-caayo-toua-bi-tobi/ ce-chona-caca-quizaha-chaa-toua  20+10+7/−5+40+2/−3+40
38  calle-bi-chij-bi-xono/ ce-caayo-toua-bi-chona/ ce-topa-caca-quizaha-chaa-toua  20+10+8/−5+40+3/−2+40
39  calle-bi-chij-bi-caa/ ce-caa (caayo)-toua-bi-tapa/ ce-tobi-caca-quizaha-chaa-toua  20+10+9/−5+40+4/−1+40
40  toua  2×20
41  toua-bi-tobi  2×20+1
42  toua-bi-topa  2×20+2
43  toua-bi-chona/ toua-bi-caayo  2×20+3
44  toua-bi-tapa  2×20+4
45  toua-bi-caayo  2×20+5
46  toua-bi-xopa  2×20+6
47  toua-bi-caache  2×20+7
48  toua-bi-xono  2×20+8
49  toua-bi-gaa  2×20+9
50  toua-bi-chij  2×20+10
51  toua-bi-chij-bi-tobi  2×20+10+1
52  toua-bi-chij-bi-topa  2×20+10+2
53  toua-bi-chij-bi-chona  2×20+10+3
54  toua-bi-chij-bi-tapa/ toua-bi-chij-bi-taa  2×20+10+4
55  ce-caa (caayo)-quiona (cayona)/ ce-caayo-zaa-quizaha-chaa-caca-cayona  −5+3×20
56  ce-caayo-quiona-bi-tobi/ ce-tapa-caca-quizaha-chaa-cayona  −5+3×20+1/−4+3×20
57  ce-caa (gaayo)-quiona-bi-topa/ ce-chona-caca-quizaha-chaa-cayona  −5+3×20+2/−3+3×20
58  ce-caa (gaayo)-quiona-bi-chona/ ce-topa-caca-quizaha-chaa-cayona  −5+3×20+3/−2+3×20
59  ce-gaayo (caay)-quiona-bi-topa/ ce-tobi-caca-quizaha-chaa-cayona  −5+60+4/−1+3×20
60  cayona
61  cayona-bi-tobi  3×20+1
62  cayona-bi-topa  3×20+2
63  cayona-bi-chij  3×20+10
64  cayona-bi-chij-bi-tobi  3×20+10+1
65  cayona-bi-chij-bi-topa  3×20+10+2
66  cayona-bi-chij-bi-chijn/ cayona-bi-chij-bi-chona  3×20+10+3
67  cayona-bi-chij-bi-tapa/ cayona-bi-chij-taa  3×20+10+4
68  ce-caa (caayo)-taa/ ce-caayo-caca-quezaha (quizaha)-chaa-taa  5×4×20
69  ce-gaa (caayo)-taa-bi-tobi/ ce-tapa-quizaha-chaa-caca-taa
Native Middle American Languages

Basic vocabulary:

\[ U = \{1 \ldots 9\} \]
B¹ = {10 (chij)}, B² = {15 (chino)}, B³ = {20 (calle)}, B⁴ = {400 (ela)}, B⁵ = {8000 (zoti)}

Derivative vocabulary:
20' = ua, na, a, lalle; 400' = el, ella

Connectives: {bi, ce, quizaha}

1. Decimal below 10.
   \( N_{1,9} = \{1...9\} \)

2. Quinary from 10 to 19.
   \( N_{10,14} = B¹ ± \{1...4\} \)
   \( N_{15,19} = B² ± \{1...4\} \) or \( N_{15,19} = c ± \{5...1\} + \text{quizaha} + B³ \)

3. The formation above 20 is fundamentally vigesimal.
   \( N_{20,34} = B³ ± \{N_{1,14}\} \)
   \( N_{35} = B³ + B² \) or \( ce + 5 + B³ \)
   \( N_{36,40} = B³ + bi + B¹ + bi + \{1...4\} \), or \( ce + 5 + 2 × B³ + \{1...4\} \), or \( ce + \{4...1\} + \text{caca quizaha chaah} + 2 × B³ \)
   \( N_{40,99} = \{2, 3, 4\} × 20' ± \{N_{1,19}\} \)

Three or four numbers before the ranks (20, 2 × 20, 3 × 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.

3.4 The words above 100 seem to have been vigesimal.
   \( N_{20,399} = \{N_{1,19}\} × 20 ± \{N_{1,19}\} \)
   \( N_{400,3999} = \{N_{1,19}\} × 400 ± \{N_{1,19}\} \)

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-foo
14. chy-taa 10 + 4
15. chy-no
16. chynoo-bi-tobi 15 + 1
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**Mitla Zapotec [BRIGGS 1961: 86-89]**

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### Juárez Zapotec

[NELLISS and NELLISS 1983: 469-471]

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### Yatzachi Zapotec

[Butler 1980: 211-213]

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**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 gayuua
Basic vocabulary:
- U = \{1...9\}
- B^1 = \{10\}, B^2 = \{15\}, B^3 = \{20\}, B^4 = \{100\}

Derivative vocabulary:
- 20' = a, na; 60' = yon, yoon'a'; 80' = ta', taplalX, etc.

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\}

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 Yatzachi Zapotec the words for 11, 12, and 13 are unanalyzable. Only 14 can be analyzed as \( \tilde{z}da' < \tilde{z}i + ta' \), 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 Yatzachi Zapotec is \( tg walX < to-galXa \), 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. Yatzachi and Juárez Zapotec use overcounting as far as 60, placing \{1...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}\}

4. 100 is expressed as 5 \times 20, which becomes a new base.
- N_{100} = \{U\} \times B^2 \pm \{N_{1..99}\}

Yatzachi has two alternates for 120. One is 1 \times 5 \times 20 + 20, and the other is 6 \times 20.

**Chatino [40]**

**[PRIDE and PRIDE 1970]**

1. caka
2. tuk'a
3. sná
4. hak'a
5. ka'yu
6. sk'a
7. kati
8. snú'
9. kaa
10. tii
Basic vocabulary:

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<tr>
<td>36</td>
<td>hakwu yala t'ii nga'yu</td>
</tr>
<tr>
<td>37</td>
<td>ska siento</td>
</tr>
<tr>
<td>38</td>
<td>ska siento ndukwu caka</td>
</tr>
<tr>
<td>39</td>
<td>ska siento kla'be</td>
</tr>
<tr>
<td>40</td>
<td>kala siento</td>
</tr>
</tbody>
</table>

Derivative vocabulary:

- $B^1 = \{10 (ti)\}$, $B^2 = \{15 (ti\nu)\}$, $B^3 = \{20\}$, $B^4 = \{100\}$

Connectives: $\{y\} \{ndukwu \} \{n\}$

1. Decimal below 10.

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.

3. Vigesimal from 20 to 99.

- $N_{10,19} = B^1 \pm y \pm \{1 \ldots 4\}$
- $N_{15,19} = B^2 \pm y \pm \{1 \ldots 4\}$
- $N_{20,39} = kala \pm \{N_{1,19}\}$
- $N_{40,59} = tu'ba \pm \{N_{1,19}\}$
\[ N_{60-99} = (3, 4) \times 20' \text{ (yala)} \pm (N_{1-99}) \]

4. The word for 100 is borrowed from Spanish. It forms a new base for the words above 100.

\[ N_{100} = \{1\ldots\} \times B^4 \pm (N_{1-99}) \]

### Chinantec [41]

#### San Juan Lealao Chinantec [Rupp 1980: 125]

<table>
<thead>
<tr>
<th>inanimate</th>
<th>animate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ką:3</td>
<td>häy3</td>
</tr>
<tr>
<td>2 tų4</td>
<td>á:ły4</td>
</tr>
<tr>
<td>3 ni3</td>
<td>a: y3</td>
</tr>
<tr>
<td>4 kųy3</td>
<td>kųy3</td>
</tr>
<tr>
<td>5 ŋa1</td>
<td>ŋey3</td>
</tr>
<tr>
<td>6 hňú:3</td>
<td>hňú: u3</td>
</tr>
<tr>
<td>7 gą:4</td>
<td>gę: y4</td>
</tr>
<tr>
<td>8 hňá4</td>
<td>hňey4</td>
</tr>
<tr>
<td>9 ŋũ4</td>
<td>ŋũy4</td>
</tr>
<tr>
<td>10 gą:4</td>
<td>gę: y4</td>
</tr>
<tr>
<td>11 gą:4kų:3</td>
<td>gę:4k  'ą:y3</td>
</tr>
<tr>
<td>12 gą:4tų3</td>
<td>gę:4t'/uy3</td>
</tr>
<tr>
<td>20 gą:3</td>
<td>gę: y3</td>
</tr>
<tr>
<td>21 gą:3zǐ2ką:3</td>
<td>gę: y3zǐ2hųy3</td>
</tr>
<tr>
<td>30 gą:4gą:3</td>
<td>gę:4gę:y3</td>
</tr>
<tr>
<td>40 tůľá:3</td>
<td>tůľa: y3</td>
</tr>
<tr>
<td>50 tů'ňa4gą:3</td>
<td>tů'ňa4gę:y3</td>
</tr>
<tr>
<td>100 ką:4háłá:</td>
<td>ką:4hāl ą:y4</td>
</tr>
<tr>
<td>1000 ką:3mılıl</td>
<td>ką:3mılı</td>
</tr>
</tbody>
</table>

#### Quiotepec Chinantec [Robbins 1968: 51, 76-77]

<table>
<thead>
<tr>
<th>inanimate</th>
<th>animate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 koh23</td>
<td>häji23</td>
</tr>
<tr>
<td>2 tų2</td>
<td>gai22</td>
</tr>
<tr>
<td>3 'ni3</td>
<td>gaih23</td>
</tr>
<tr>
<td>4 tų3</td>
<td>t'/ųh2</td>
</tr>
<tr>
<td>5 'ňą2</td>
<td>'ňęği2</td>
</tr>
<tr>
<td>6 hňųh2</td>
<td>hňųh2</td>
</tr>
<tr>
<td>7 d'rą2</td>
<td>d'ą22</td>
</tr>
<tr>
<td>8 hňą2</td>
<td>hňęgi2</td>
</tr>
<tr>
<td>9 ŋų2</td>
<td>ŋų22</td>
</tr>
<tr>
<td>10 d'ą2</td>
<td>d'ě22</td>
</tr>
<tr>
<td>12 d'ą4tų3</td>
<td>d'ą4t'hų3</td>
</tr>
<tr>
<td>14 d'ą4tų3</td>
<td>d'ą4t'/hų3</td>
</tr>
<tr>
<td>15 d'ą4tńą2</td>
<td>d'ą4t'ną2</td>
</tr>
<tr>
<td>18 d'ąhňą3</td>
<td>d'ą'hňęgi3</td>
</tr>
<tr>
<td>19 d'ąńų3</td>
<td>d'ąńųhų3</td>
</tr>
<tr>
<td>20 d'ąńh2</td>
<td>d'ąńh2</td>
</tr>
<tr>
<td>22 d'ąńh2</td>
<td>d'ąńh2</td>
</tr>
<tr>
<td>24 d'ąńh2tų3</td>
<td>d'ąńh2t'hų3</td>
</tr>
<tr>
<td>28 d'ąńh2hńą3</td>
<td>d'ąńh2hńęgi3</td>
</tr>
</tbody>
</table>
Palantla Chinantec [MERRIFIELD 1968: 67-68]

<table>
<thead>
<tr>
<th>inanimate</th>
<th>(abstract)</th>
<th>animate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>këw^2</td>
<td>ku^2</td>
</tr>
<tr>
<td>2</td>
<td>tó^3</td>
<td>tá^2</td>
</tr>
<tr>
<td>3</td>
<td>'niw^32</td>
<td>'náy^3</td>
</tr>
<tr>
<td>4</td>
<td>k'ú^2</td>
<td>úw^2</td>
</tr>
<tr>
<td>5</td>
<td>'nyi^2</td>
<td>'nyá^2</td>
</tr>
<tr>
<td>6</td>
<td>hnyéw^2</td>
<td>hnyó^2</td>
</tr>
<tr>
<td>7</td>
<td>g'ö^3</td>
<td>g'ow^3</td>
</tr>
<tr>
<td>8</td>
<td>hnyi^3</td>
<td>hnya^1</td>
</tr>
<tr>
<td>9</td>
<td>ñyu^3</td>
<td>ñyo^3</td>
</tr>
<tr>
<td>10</td>
<td>g'r^1</td>
<td>g'a^1</td>
</tr>
<tr>
<td>11</td>
<td>g'r^1 këw^3</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>g'r^1 ñyu^2</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>g'ëw^2</td>
<td>g'úw^2</td>
</tr>
<tr>
<td>22</td>
<td>g'ëw^2 tó^3</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>g'ëw^2 g'r^1</td>
<td>g'ëw^2 g'á^3</td>
</tr>
<tr>
<td>31</td>
<td>g'ëw^2 g'r^1 rì'zì^2 këw^2</td>
<td>20 + 10</td>
</tr>
<tr>
<td>35</td>
<td>g'ëw^2 g'r^1 rì'zì^2 'ñyi^2</td>
<td>30 + 5</td>
</tr>
<tr>
<td>40</td>
<td>tó'law^3</td>
<td>tó'law^3</td>
</tr>
<tr>
<td>50</td>
<td>tó'luw^2 g'r^2</td>
<td>tó'luw^2 g'á^2</td>
</tr>
<tr>
<td>65</td>
<td>tó'luw^2 g'r^2 rì'zì^2 g'r^3 ñyu^2</td>
<td>50 + 10 + 5</td>
</tr>
<tr>
<td>100</td>
<td>ñyu^2 lëw^2</td>
<td>ñyu^2 lëw^2</td>
</tr>
<tr>
<td>225</td>
<td>tó^3 ñyu^2 lëw^2 rì'zì^2 g'ëw^2 ñyu^2</td>
<td>2 × 100 + 20 + 5</td>
</tr>
<tr>
<td>1000</td>
<td>mey^31</td>
<td>mey^31</td>
</tr>
</tbody>
</table>

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...9\}

B^1 = \{10\}, B^2 = \{20\}

1 Decimal below 20.

N_{1..9} = ± B^1 + \{1...9\}

2 Vigesimal from 20 to 99.

N_{20..99} = B^2 ± \{N_{1..9}\}

2056 tó^3 mey^31 rì'zì^2 tó'luw^2 g'r^2 rì'zì^2 hnyéw^2| 2 × 1000 + 50 + 6 |
\(N_{40, 99} = \{2, 3, 4\} \times 20' \pm \{N_{1, 19}\}\)

In Palantla and Leala Chinantec the following connectives are used except in 10.

Connectives: \{\(\tau\iota^2\iota^2\}\} \{\(\zeta^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)

<table>
<thead>
<tr>
<th></th>
<th>tike</th>
<th>tique, ticao</th>
<th>tiché</th>
<th>tique, tiqué, tiqui, ndique, ticao</th>
<th>tiche</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ju-miji</td>
<td>hao, homo, hohmi, hohmime</td>
<td>hú-mihi</td>
<td>hao, hu-mihi</td>
<td>tū-miši</td>
</tr>
<tr>
<td>3</td>
<td>ja-miji</td>
<td>hauí, hehmí, hehmime</td>
<td>he-mihi</td>
<td>hauí, hie-mihi</td>
<td>tihé-miši</td>
</tr>
<tr>
<td>4</td>
<td>jūa-mipi</td>
<td>haha</td>
<td>ahuá-mihi</td>
<td>aha-mihi, hua-mihi</td>
<td>tūā-miši</td>
</tr>
<tr>
<td>5</td>
<td>jaó-miji</td>
<td>hao, haomo, himo</td>
<td>hau-mihi</td>
<td>ao-mihi</td>
<td>ŭā-hū-miši</td>
</tr>
<tr>
<td>6</td>
<td>hambana</td>
<td>hambá-mihi</td>
<td>hendi-mihi</td>
<td>hendi-mihi</td>
<td>tāmbá-miši</td>
</tr>
<tr>
<td>7</td>
<td>hendo</td>
<td>hendo-mihi</td>
<td>hendo-mihi</td>
<td>hendo-mihi</td>
<td>tīnd-šiši</td>
</tr>
<tr>
<td>8</td>
<td>haho</td>
<td>hahu-mihi</td>
<td>mahu-mihi</td>
<td>asú-miši</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>heli-me</td>
<td>heli-mihi</td>
<td>heli-mihi</td>
<td>tīheli-miši</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>henda, menda</td>
<td>henda</td>
<td>henda</td>
<td>tēndá</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>10+1</td>
<td>henda-mu-ndiché</td>
<td>henda-mu-ndiqué</td>
<td>tēndá-mu-ndiché</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>10+2</td>
<td>henda-cu-c-áo</td>
<td>tēndá-cu-c-áhū</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>10+3</td>
<td>henda-mu-y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>10+4</td>
<td>henda-m-ahua</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>hendamu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>15+1</td>
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<td></td>
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<tr>
<td>17</td>
<td>15+2</td>
<td>hendamu-cu-cao</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>15+3</td>
<td>hendamu-m-ahua</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>15+4</td>
<td>hendamu-hua-mihi</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>20</td>
<td>hue</td>
<td>ahué</td>
<td>ahuá, hahuá, haué, hahuys ahsúc [ahsúé]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>20+1</td>
<td>(h)ahuá-mu-ndique</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>20+2</td>
<td>ahuá-m-nhumé</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>20+3</td>
<td>ahuá-m-ahue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>20+4</td>
<td>ahuá-mihi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>20+5</td>
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<tr>
<td>26</td>
<td>20+6</td>
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<td></td>
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</tr>
<tr>
<td>27</td>
<td>20+7</td>
<td>ahuá-m-indí</td>
<td></td>
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</tr>
<tr>
<td>28</td>
<td>20+8</td>
<td>ahuá-(m)-mahu</td>
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<td></td>
</tr>
<tr>
<td>29</td>
<td>20+9</td>
<td>ahuá-[m]-heli-mihi</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>30</td>
<td>20+10</td>
<td>ahuá-mu-nda</td>
<td>ahsúé-mu-nda</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>20+10+1</td>
<td>ahuá-mu-nda-cu-tique</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>2×20</td>
<td>humu-hu</td>
<td>tēhu-mu-súc [súc]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>2×20+10</td>
<td>huhume-mu-nda</td>
<td>tū-mu-sè-mu-nda</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>3×20</td>
<td>himu-hé</td>
<td>tīhmu-súc[súe]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>3×20+1</td>
<td>himuhe-cu-tique</td>
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<td></td>
</tr>
<tr>
<td>70</td>
<td>3×20+10</td>
<td>hamuhe??</td>
<td>tīhmu-sè-mu-nda</td>
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<tr>
<td>80</td>
<td>4×20</td>
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<td>tā-mu-sé</td>
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<td></td>
</tr>
<tr>
<td>90</td>
<td>4×20+10</td>
<td></td>
<td>tā-mu-sè-mu-nda</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Basic Vocabulary:

\[ U = \{1 \ldots 9\} \]
\[ B^1 = \{10\}, \ B^2 = \{15\}, \ B^3 = \{20\} \]

Derivative vocabulary:

\[ \{1', 2', 3', 4'\} = \{ndique, cu-cao, y/ahua, ahua\} \]
\[ 20' = hu/he \]

1. Decimal below 10. The numerals from 2 up are suffixed by -\text{mihi}.

\[ N_{1,9} = \{1 \ldots 9\} \]

2. Quinary from 10 to 19.

\[ N_{10-14} = B^1 \pm \{1' \ldots 4'\} \]
\[ N_{15-19} = B^2 \pm \{1' \ldots 4'\} \]

3. Vigesimal from 20 up.

\[ N_{20-39} = B^3 \pm \{N_{1,19}\} \]
\[ N_{40} = \{2' \ldots \} \times 20 \text{ (hu/ he)} \pm \{N_{1,19}\} \]

**Mangue [D10]**

[LEHMANN 1920: 845, 848] (Original transcription)

1. teka 2. nah 3. ho 4. hahome 5. haunsmij

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 / ihiw / ihimbiw / iim / ik
3. arohpiew / areh / arohcwiw / arohmbiwiw / aroomb / er
4. pikiw
5. akokiaiw
6. anaiw
7. ayalw
8. ohpeakiw
9. ohkiyeh
10. gahpawiw / gahpawiw
11. gahpanoiw / gahpanop / gahpanoc 10+1
12. gahpik / pahpiip / gahpilc 10+2
13. gahpar 10+3
14. gahpopek 10+4
15. gahpokoik 10+5
16. gahponiy 10+6
17. gahpoyay 10+7
### Basic vocabulary:

- **U** = \{1...9\}
- **B^1** = \{10' (gahpa--)\}, **B^2** = \{20 (miow)\}, **B^3** = \{5 \times 20\}

### Derivative vocabulary:

- **U'** = \{1'...9'\}, **1''** = (ni), **3''** = (er)

#### Decimal below 20

The first digits below 20 correspond to **U\{1...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.

<table>
<thead>
<tr>
<th>Digits</th>
<th>The first digits in the 10'.</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;1&quot;</td>
<td>noik/ nop/ noc</td>
</tr>
<tr>
<td>&quot;2&quot;</td>
<td>ihkiaw/ ihpiw/ ihciw</td>
</tr>
<tr>
<td>&quot;3&quot;</td>
<td>ar-</td>
</tr>
<tr>
<td>&quot;4&quot;</td>
<td>pikiw</td>
</tr>
<tr>
<td>&quot;5&quot;</td>
<td>a-kokiaw</td>
</tr>
<tr>
<td>&quot;6&quot;</td>
<td>a-naïw</td>
</tr>
<tr>
<td>&quot;7&quot;</td>
<td>a-yaïw</td>
</tr>
<tr>
<td>&quot;8&quot;</td>
<td>oh-peak-iw</td>
</tr>
<tr>
<td>&quot;9&quot;</td>
<td>oh-kiy-eh</td>
</tr>
</tbody>
</table>

\[ N_{1,9} = U \]
\[ N_{10,19} = B^1 \pm U' \]
Vigesimal from 20 to 99. The numerals above 100 are formed from a new base, $5 \times 20$.

\[ N_{20-99} = \{1', 2', 3', 4'\} \times 20^2 + \{N_{19}\} \]

\[ N_{100-} = \{\#, 2\ldots\} \times 20^3 + \{N_{99}\} \]

**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 -či.

[WATERHOUSE 1980: 148-149] [TURNER & TURNER 1971: 360-361]

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>anuli</td>
<td>anuli</td>
</tr>
<tr>
<td>2</td>
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<td>afane' / afanci</td>
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<td>amage' / amahši</td>
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Database 2: Numeral Systems

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<tr>
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<tr>
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<tr>
<td>10000</td>
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</tr>
</tbody>
</table>

The numbers from 2 to 7 take 2 forms, animate and inanimate.

1. fiulyi
2. ukwe'/ kwešि (animate)
3. fane'/ fañçi' (animate)
4. malpu'/ moñšì' (animate)
5. mage' (<ma(ne) ge "hand this") / mañšì' (animate)
6. kañč'ùş / kam'masi' (animate)
7. kote'/ kañšì' (animate)
8. malfa < 5 + 3?
9. penla
10. mbama' 
11. mbamah fiulyi 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'ùş 10 + 6
17. mbamah kote' 10 + 7
18. mbamah malfa 10 + 8
19. mbamah penla 10 + 9
Basic vocabulary:

\[ U = \{1...9\} \]

\[ B^1 = \{10\}, \quad B^2 = \{20\}, \quad B^3 = \{100\} \]

1. 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.

\[ N_{1,19} = B^1 + U \]

2. Vigesimal from 20 through 99.

\[ N_{20,99} = \{\#, 2, 3, 4\} \times B^2 \pm \{N_{1,19}\} \]

3. The numerals from 100 up are formed on a new base, 100.

\[ N_{100} = \{\#/1,...\} + B^3 \pm \]

However, they may also be formed on the base 20.

\[ N_{100} = \{5,...\} \times B^2 \pm \]

**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  makktuma'y 10+1
12  makwistihka'y 10+2
13  makktuka'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
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<td>2000</td>
<td>mohsa’ mone’</td>
</tr>
<tr>
<td>8000</td>
<td>ips mone’</td>
</tr>
</tbody>
</table>

Rayón Zoque [Harrison and Harrison 1984]
| 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 | maksthuhtay   | 4+6 |
|10 | mahkay        |

The numerals from 11 up are Spanish.

Basic vocabulary:

\[ U = \{1...9\} \]

\[ B^1 = \{10 \text{ (mak)}\}, \quad B^2 = \{15 \text{ (yit)}\}, \quad B^3 = \{20 \text{ (ips)}\}, \quad B^4 = \{400 \text{ (mone')}\} \]

Derivative vocabulary:

\[ 2’ = \text{wis}, \quad 2'' = \text{wistihk}, \quad 3’ = \text{tuku}, \quad 4’ = \text{makstuh}, \quad 4'' = \text{maktask}, \quad 4''' = \text{maktahs} \]

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.
Database 2: Numeral Systems

\( N_{1:10} = \{1 \ldots 7, 3 + 6, 4 + 6, 10\} \)

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.
\[ N_{20:99} = \{\#', 2', 3, 4''\} \times B^1 \pm ko \pm \{N_{1:19}\} \]

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 \( \times \) 20, 10 \( \times \) 20, and 15 \( \times \) 20, respectively.
\[ N_{100:399} = \{5, 10, 15\} \times B^2 \pm ko \pm \{N_{1:19}\} \]

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.
\[ N_{400:799} = \{1 \ldots 20\} \times B^4 \pm ko \pm \{N_{1:399}\} \]

Veracruz Zoque [45]

<table>
<thead>
<tr>
<th>Texistepec Popoluca</th>
<th>Sierra Popoluca</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Original transcription)</td>
<td></td>
</tr>
</tbody>
</table>

1. tum
2. huisna
3. tuguna
4. bacsna
5. bosna
6. tujna
7. hues-tujna
8. tug-tujna
9. bacs-tujuná
10. bacsna
11. bac-tumna
12. bac'-huisna
20. ipx-ña
30. ipx-comoc
40. vuusk-ipx
100. box

Basic vocabulary:
\( U = \{1 \ldots 9\} \)
\[ B^1 = \{10 (bak)\}, B^3 = \{20 (ipś)\}, B^4 = \{100 (boś)\} \]

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.
\[ N_{1:10} = \{1 \ldots 6, 2 + 6, 3 + 6, 4 + 6, 10\} \]

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
[CLARK & CLARK 1974][LEHMANN 1920: 779]

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<td>tu'k</td>
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<tr>
<td>2</td>
<td>mečk</td>
<td>meshi/ meski</td>
</tr>
<tr>
<td>3</td>
<td>tú:gup</td>
<td>tugup/ tugeuk (tuhuek)</td>
</tr>
<tr>
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<td>mactax</td>
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<td>tu'k mun</td>
<td>tuc-mun</td>
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</table>

Basic vocabulary:

U = {1...9}
B1 = {10 (mak)}, B3 = {20 (ips)}, B4 = {100 (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.

N10 = {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]

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<td>2</td>
<td>mehck</td>
<td>mahck</td>
</tr>
<tr>
<td>3</td>
<td>to:mk</td>
<td>ták:šk</td>
</tr>
<tr>
<td>4</td>
<td>maktašk</td>
<td>maktešk</td>
</tr>
<tr>
<td>5</td>
<td>mugošk</td>
<td>makošk</td>
</tr>
<tr>
<td>6</td>
<td>toohtik</td>
<td>tutukh</td>
</tr>
<tr>
<td>7</td>
<td>vuštohtik</td>
<td>waštuhk</td>
</tr>
<tr>
<td>8</td>
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<td>tukuhtik</td>
</tr>
<tr>
<td>9</td>
<td>taohtohtik</td>
<td>tštuhk</td>
</tr>
<tr>
<td>10</td>
<td>mahk</td>
<td>mšhk</td>
</tr>
<tr>
<td>11</td>
<td>makto'k</td>
<td>10+1</td>
</tr>
<tr>
<td>12</td>
<td>maktmehck</td>
<td>10+2</td>
</tr>
</tbody>
</table>

Tlahuitoltepec [LYON 1980: 132]
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.

The numerals from 10 to 19 are based on the decimal system.

100 is a new base.

Colonial Mixe (Traditional transcription is adopted.)

[QUINTANA 1890 (1730): 139-142, YASUGI 1991 :451-452] [DE LA GRASSERIE 1898: 377]

1 tuuc
2 metzc
3 tucoc
4 mactoxc
5 mocoxc
6 tuduuc
7 tzoc
tzok
metzk
mactacxk
mokoxk
<table>
<thead>
<tr>
<th>7</th>
<th>huextuuc</th>
<th>2 + 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>tuctuuc</td>
<td>3 + 5</td>
</tr>
<tr>
<td>9</td>
<td>taxtuuc</td>
<td>4 + 5</td>
</tr>
<tr>
<td>10</td>
<td>mahc</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>mahc-tuuc</td>
<td>10 + 1</td>
</tr>
<tr>
<td>12</td>
<td>mahc-metz</td>
<td>10 + 2</td>
</tr>
<tr>
<td>13</td>
<td>mahc-tucoc</td>
<td>10 + 3</td>
</tr>
<tr>
<td>14</td>
<td>mahc-mactz</td>
<td>10 + 4</td>
</tr>
<tr>
<td>15</td>
<td>mahc-mocx</td>
<td>10 + 5</td>
</tr>
<tr>
<td>16</td>
<td>mahc-tuduuc/ mahc-mocx-tuuc</td>
<td>10 + 1 + 5/15 + 1</td>
</tr>
<tr>
<td>17</td>
<td>mahc-huextuuc/ mahc-mocx-metz</td>
<td>10 + 2 + 5/15 + 2</td>
</tr>
<tr>
<td>18</td>
<td>mahc-tuctuuc/ mahc-mocx-tucoc</td>
<td>10 + 3 + 5/15 + 3</td>
</tr>
<tr>
<td>19</td>
<td>mahc-taxtuuc/ atuuc ca ypx</td>
<td>10 + 4 + 5/-1 + 20</td>
</tr>
<tr>
<td>20</td>
<td>ypx</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>ypx-tuuc</td>
<td>20 + 1</td>
</tr>
<tr>
<td>22</td>
<td>ypx-metz</td>
<td>20 + 2</td>
</tr>
<tr>
<td>23</td>
<td>ypx-tucoc</td>
<td>20 + 3</td>
</tr>
<tr>
<td>24</td>
<td>ypx-mactz</td>
<td>20 + 4</td>
</tr>
<tr>
<td>25</td>
<td>ypx-mocox</td>
<td>20 + 5</td>
</tr>
<tr>
<td>26</td>
<td>ypx-tuduuc</td>
<td>20 + 1 + 5</td>
</tr>
<tr>
<td>27</td>
<td>ypx-huextuuc</td>
<td>20 + 2 + 5</td>
</tr>
<tr>
<td>28</td>
<td>ypx-tuctuuc</td>
<td>20 + 3 + 5</td>
</tr>
<tr>
<td>29</td>
<td>ypx-taxtuuc/ atuuc ca ypx-mahc</td>
<td>20 + 4 + 5/-1 + 20 + 10</td>
</tr>
<tr>
<td>30</td>
<td>ypx-mahc</td>
<td>20 + 10</td>
</tr>
<tr>
<td>31</td>
<td>ypx-mahctuuc</td>
<td>20 + 10 + 1</td>
</tr>
<tr>
<td>32</td>
<td>ypx-mahc-metz</td>
<td>20 + 10 + 2</td>
</tr>
<tr>
<td>33</td>
<td>ypx-mahc-tucoc</td>
<td>20 + 10 + 3</td>
</tr>
<tr>
<td>34</td>
<td>ypx-mahc-mactz</td>
<td>20 + 10 + 4</td>
</tr>
<tr>
<td>35</td>
<td>ypx-mahc-mocx</td>
<td>20 + 10 + 5</td>
</tr>
<tr>
<td>36</td>
<td>ypx-mahc-tuduuc/ ypx-mahc-mocx-tuuc</td>
<td>20 + 10 + 6/20 + 10 + 5 + 1</td>
</tr>
<tr>
<td>37</td>
<td>ypx-mahc-huextuuc/ ypx-mahc-mocx-metz</td>
<td>20 + 10 + 7/20 + 10 + 5 + 2</td>
</tr>
<tr>
<td>38</td>
<td>ypx-mahc-tuctuuc/ ypx-mahc-mocx-tucoc</td>
<td>20 + 10 + 8/20 + 10 + 5 + 3</td>
</tr>
<tr>
<td>39</td>
<td>ypx-mahc-taxtuuc/ atuuc ca huixtiex</td>
<td>20 + 10 + 9/-1 + 40</td>
</tr>
<tr>
<td>40</td>
<td>huixtiex</td>
<td>2 × 20</td>
</tr>
<tr>
<td>50</td>
<td>huixtiex-mahc</td>
<td>2 × 20 + 10</td>
</tr>
<tr>
<td>60</td>
<td>tucopx</td>
<td>3 × 20</td>
</tr>
<tr>
<td>80</td>
<td>mohctapx</td>
<td>4 × 20</td>
</tr>
<tr>
<td>100</td>
<td>mocopx</td>
<td>5 × 20</td>
</tr>
<tr>
<td>120</td>
<td>tuduupx</td>
<td>6 × 20</td>
</tr>
<tr>
<td>140</td>
<td>huextuut</td>
<td>7 × 20</td>
</tr>
<tr>
<td>160</td>
<td>tuctuut</td>
<td>8 × 20</td>
</tr>
<tr>
<td>180</td>
<td>taxtuut</td>
<td>9 × 20</td>
</tr>
<tr>
<td>200</td>
<td>maiquipx</td>
<td>10 × 20</td>
</tr>
<tr>
<td>300</td>
<td>yucmocx</td>
<td>15 × 20</td>
</tr>
<tr>
<td>400</td>
<td>tuucmoin</td>
<td>1 × 400</td>
</tr>
<tr>
<td>500</td>
<td>tuucmoin co mocopx</td>
<td>1 × 400 + 5 × 20</td>
</tr>
<tr>
<td>600</td>
<td>tuucmoin co maiquipx</td>
<td>1 × 400 + 10 × 20</td>
</tr>
<tr>
<td>700</td>
<td>tuucmoin co yucmocx</td>
<td>1 × 400 + 10 × 20</td>
</tr>
<tr>
<td>800</td>
<td>metzc moin</td>
<td>2 × 400 + 10 × 20</td>
</tr>
<tr>
<td>900</td>
<td>metzc moin co mocopx</td>
<td>2 × 400 + 10 × 20</td>
</tr>
</tbody>
</table>
Basic vocabulary:

\[ U = \{1...5\} \]
\[ B^1 = \{5'(\text{tuc}), B^2 = \{10 (\text{mahc})\}, B^3 = \{15 (\text{mahc-mocx})\}, B^4 = \{20 (\text{ypx})\}, B^5 = \{400 (\text{moifi})\} \]

Derivative vocabulary:

\[ 1' = \text{tu}, 2' = \text{huex}, 3' = \text{tuc}, 4' = \text{tax}, 5' = \text{mocx}, 4'' = \text{mactz} \]
\[ 2'' = \text{huix}, 4'' = \text{mahc}, 5'' = \text{moc}, 20' = \text{ticx}, \text{dp}x, \text{tapx}, \text{upx}, \text{tuut...} \]

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 \( \text{ypx} \) 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. \( \text{hu:}n \)
2. \( \text{ca}:b \)
3. \( \text{o}:\overset{\cdot}{\text{s}} \)
4. \( \text{ê}:\overset{'.}{\text{e}} \)
5. \( \text{bo}:\overset{'.}{\text{e}} \)
6. \( \text{ak} \)
7. \( \text{bu}:k \)
8. \( \text{wa}:\overset{\cdot}{\text{ik}} \)
9. \( \text{bele}:\overset{\cdot}{\text{hu}} \)
10. \( \text{la}:\overset{\cdot}{\text{hu}} \)
11. \( \text{la}:\overset{\cdot}{\text{hu}}:\overset{\cdot}{\text{hu}}:n \)
12. \( \text{la}:\overset{\cdot}{\text{hu}}:\overset{\cdot}{\text{ca}}:b \)
13. \( \text{la}:\overset{\cdot}{\text{hu}}:o:\overset{\cdot}{\text{s}} \)
14. \( \text{la}:\overset{\cdot}{\text{hu}}:\overset{\cdot}{\text{ê}}:\overset{'.}{\text{e}} \)
15. \( \text{la}:\overset{\cdot}{\text{hu}}:\overset{'.}{\text{bo}}:\overset{'.}{\text{e}} \)
16. \( \text{la}:\overset{\cdot}{\text{hu}}:\overset{\cdot}{\text{ak}} \)
17. \( \text{la}:\overset{\cdot}{\text{hu}}:\overset{\cdot}{\text{bu}}:k \)
18. \( \text{la}:\overset{\cdot}{\text{hu}}:\overset{\cdot}{\text{wa}}:\overset{\cdot}{\text{ik}} \)
19. \( \text{la}:\overset{\cdot}{\text{hu}}:\overset{\cdot}{\text{bele}}:\overset{\cdot}{\text{hu}} \)
20. \( \text{hu}:\overset{\cdot}{\text{n inik}} / \text{la}:\overset{\cdot}{\text{hu}} \text{la}:\overset{\cdot}{\text{hu}} \)

\( \times 20/10 + 10 \)
Classical Huastec (Original transcription)

<table>
<thead>
<tr>
<th>[TAPIR ZENTENO 1767: 18]</th>
<th>[SAPPER 1910: 315-316]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  hun</td>
<td>jun</td>
</tr>
<tr>
<td>2  tzab</td>
<td>tzab</td>
</tr>
<tr>
<td>3  ox</td>
<td>ox</td>
</tr>
<tr>
<td>4  tze</td>
<td>tze</td>
</tr>
<tr>
<td>5  bo</td>
<td>bo</td>
</tr>
<tr>
<td>6  acac</td>
<td>akak</td>
</tr>
<tr>
<td>7  buc</td>
<td>buk</td>
</tr>
<tr>
<td>8  huaxic</td>
<td>vuaxik</td>
</tr>
<tr>
<td>9  belleuh</td>
<td>belleuh</td>
</tr>
<tr>
<td>10 laju</td>
<td>lajú</td>
</tr>
<tr>
<td>11 lajujú</td>
<td>10 + 1</td>
</tr>
<tr>
<td>12 lajutzáb</td>
<td>10 + 2</td>
</tr>
<tr>
<td>13 lajúóx</td>
<td>10 + 3</td>
</tr>
<tr>
<td>14 lajutzé</td>
<td>10 + 4</td>
</tr>
<tr>
<td>15 lajubó</td>
<td>10 + 5</td>
</tr>
<tr>
<td>16 lajuakak</td>
<td>10 + 6</td>
</tr>
<tr>
<td>17 laju-buc/laju-cal-buc/laju-tin-cal-buc</td>
<td>lajubuc</td>
</tr>
<tr>
<td>18 lajujuaxik</td>
<td>10 + 8</td>
</tr>
<tr>
<td>19 laju belleuj</td>
<td>10 + 9</td>
</tr>
<tr>
<td>20 jun-inic</td>
<td>juminik</td>
</tr>
<tr>
<td>30 hum-inic-laju</td>
<td>1 × 20 + 10</td>
</tr>
<tr>
<td>40 tzab-inic</td>
<td>tzabinik</td>
</tr>
<tr>
<td>50 tzab-inic-laju</td>
<td>2 × 20 + 10</td>
</tr>
<tr>
<td>60 ox-inic</td>
<td>ox inik</td>
</tr>
<tr>
<td>70 ox-inic-al-laju</td>
<td>3 × 20 + 10</td>
</tr>
<tr>
<td>80 tze-inic</td>
<td>tze inik</td>
</tr>
<tr>
<td>90 tze-inic-laju</td>
<td>4 × 20 + 10</td>
</tr>
<tr>
<td>100 bo-inic</td>
<td>bo inik</td>
</tr>
<tr>
<td>200 tzab-bo-inic</td>
<td>2 × 5 × 20</td>
</tr>
<tr>
<td>300 ox-bo-inic</td>
<td>3 × 5 × 20</td>
</tr>
<tr>
<td>400 tze bo inik</td>
<td>4 × 5 × 20</td>
</tr>
<tr>
<td>1000 hun-xi</td>
<td>xi junxi</td>
</tr>
<tr>
<td>2000 tzab-xi</td>
<td></td>
</tr>
<tr>
<td>3000 ox-xi</td>
<td></td>
</tr>
</tbody>
</table>

Basic vocabulary:
U = {1...9}
B₁ = {10 (lahu)}, B₂ = {20 (inin)}, B₃ = {100 (bo-inik)}, B₄ = {1000 (ši')}
1.2 Decimal below 20.
\[ N_{1..9} = \pm 10 \pm U \]

3 Vigesimal from 20 to 99.
\[ N_{20..99} = \{1...4\} \times 20 \pm \{N_{1..9}\} \]

4 The base from 100 up is 5 \times 20. The interval is formed according to the vigesimal method. Ochoa Peralta, however, gives \textit{la:hu inik}, 10 \times 20, for 200.
\[ N_{100..999} = \{1...9\} \times 5 \times 20 \pm \{N_{1..9}\} \]

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
\[
\begin{array}{ccc}
\text{c} & \equiv & \text{č} \\
\text{ć} & \equiv & \text{t} \\
\end{array}
\]

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 eu
3 ox te eu
4 che te eu
5 vo te eu
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 chatee 5+10+2
20 jun inik
21 jun inik nam jün 1\times20+1
40 chaú inik 2\times20
60 ox inik 3\times20
80 che nek 4\times20
100 hoo inik 5\times20
120 hoo inik nam jun inik 5\times20+20
200 cha te ta hoo inik 2\times5\times20
300 ox te ta hoo inik 3\times5\times20
400 che te ta hoo inik 4\times5\times20

Basic vocabulary:
\[ U = \{1...9\} \]
\[ B^1 = \{10 \text{ (lau)}\}, \quad B^2 = \{15 \text{ (ola)}\}, \quad B^3 = \{20 \text{ (inik)}\}, \]
Derivative vocabulary:
5' = {hoo}, 20' = {nek}

Connectives: {i} {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.

\[ N_{1,9} = D \pm te \ eu \]

2 Quinary from 10 to 19.

\[ N_{10} = B^1 + te \ eu \]
\[ N_{11-14} = (1...4) + i + B^1 \]
\[ N_{15-19} = B^2 + te \ eu \pm nam \pm \{1...4\} \]

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.

\[ N_{20,99} = (1...4) \times B^3 \pm nam \pm \{N_{1,19}\} \]

4 100 is expressed as 5 \times 20. The system follows the decimal and vigesimal methods.

\[ N_{100} = \{\#, 2...\} - te \ ta \times B^4 \pm nam \pm \{N_{1,99}\} \]

**Yucatec [49]**

Transcription is based on Yucatec traditional orthography.

<table>
<thead>
<tr>
<th>[BELTRAN 1746]</th>
<th>[TOZZER 1921: 99-103]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 hun</td>
<td>hun</td>
</tr>
<tr>
<td>2 ca</td>
<td>ca</td>
</tr>
<tr>
<td>3 ox</td>
<td>ox</td>
</tr>
<tr>
<td>4 can</td>
<td>can</td>
</tr>
<tr>
<td>5 ho</td>
<td>ho</td>
</tr>
<tr>
<td>6 uac</td>
<td>uac</td>
</tr>
<tr>
<td>7 uuc</td>
<td>uuc</td>
</tr>
<tr>
<td>8 uaxac</td>
<td>uaxac</td>
</tr>
<tr>
<td>9 bolon</td>
<td>bolon</td>
</tr>
<tr>
<td>10 lahun</td>
<td>la hun</td>
</tr>
<tr>
<td>11 buluc</td>
<td>buluc</td>
</tr>
<tr>
<td>12 lahca</td>
<td>la ca</td>
</tr>
<tr>
<td>13 ox-lahun</td>
<td>la ox</td>
</tr>
<tr>
<td>14 can-lahun</td>
<td>la can</td>
</tr>
<tr>
<td>15 ho-lahun</td>
<td>la ho</td>
</tr>
<tr>
<td>16 uac-lahun</td>
<td>la uac</td>
</tr>
<tr>
<td>17 uuc-lahun</td>
<td>la uuc</td>
</tr>
<tr>
<td>18 uaxac-lahun</td>
<td>la uaxac</td>
</tr>
<tr>
<td>19 bolon-lahun</td>
<td>la bolon</td>
</tr>
<tr>
<td>20 hun-kal</td>
<td>hun kal</td>
</tr>
<tr>
<td>21 hun t-u-kal</td>
<td>1 &gt; 2 \times 20</td>
</tr>
<tr>
<td>22 ca t-u-kal</td>
<td>2 &gt; 2 \times 20</td>
</tr>
<tr>
<td>23 ox t-u-kal</td>
<td>3 &gt; 2 \times 20</td>
</tr>
<tr>
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<td>4 &gt; 2 \times 20</td>
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<tr>
<td>25 ho t-u-kal</td>
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</tr>
<tr>
<td>26 uac t-u-kal</td>
<td>6 &gt; 2 \times 20</td>
</tr>
<tr>
<td>27 uuc t-u-kal</td>
<td>7 &gt; 2 \times 20</td>
</tr>
<tr>
<td>28 uaxac t-u-kal</td>
<td>8 &gt; 2 \times 20</td>
</tr>
<tr>
<td>29 bolon t-u-kal</td>
<td>9 &gt; 2 \times 20</td>
</tr>
<tr>
<td>Numeral</td>
<td>Base Conversion</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
</tr>
<tr>
<td>30</td>
<td>10 &gt; 2 x 20</td>
</tr>
<tr>
<td>31</td>
<td>11 &gt; 2 x 20</td>
</tr>
<tr>
<td>32</td>
<td>12 &gt; 2 x 20</td>
</tr>
<tr>
<td>33</td>
<td>13 &gt; 2 x 20</td>
</tr>
<tr>
<td>34</td>
<td>14 &gt; 2 x 20</td>
</tr>
<tr>
<td>35</td>
<td>15 &gt; 220</td>
</tr>
<tr>
<td>36</td>
<td>16 &gt; 2 x 20</td>
</tr>
<tr>
<td>37</td>
<td>17 &gt; 2 x 20</td>
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<tr>
<td>38</td>
<td>18 &gt; 2 x 20</td>
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<tr>
<td>39</td>
<td>19 &gt; 2 x 20</td>
</tr>
<tr>
<td>40</td>
<td>3 x 20</td>
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<td>41</td>
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</table>
Native Middle American Languages

Basic vocabulary:

\[ \begin{align*}
U &= \{1, 9, 11, 12\} \\
B^1 &= \{10 (lahun)\}, B^2 = \{20 (kal)\}, B^3 = \{400 (bak)\}
\end{align*} \]

1. 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 \( la \ ca \).

\[ N_{i,19} = \{1...9\} \pm B^i, \text{ except for } \{11, 12\} = \{buluc, lahca\} \]

The numeral system given by Tozzer is as follows:

\[ N_{i,19} = \pm U^i + \{1...9\}, \text{ except for } 11 = \{buluc\} \]

2. 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]. \( t (< t) \) 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 \( kal \).

\[ N_{20,399} = \pm \{N_{i,19}\} \pm t \pm u(y) + \{N_{2,19}\} \times B^2 \]

Tozzer’s numeration is different from the above. The method is termed undercounting by Menninger. \( yete (< yetel) \) is a conjunction, corresponding to “and.”

\[ N_{20,399} = \{N_{i,19}\} \times B^2 + yete \pm \{N_{i,19}\} \]

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.

3. 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.

\begin{align*}
\text{bak} & \quad 20 \times 20 \\
\text{pic} & \quad 20 \times 20 \times 20 \\
\text{calab} & \quad 20 \times 20 \times 20 \times 20 \\
\text{kinchil} & \quad 20 \times 20 \times 20 \times 20 \times 20 \\
\text{alau} & \quad 20 \times 20 \times 20 \times 20 \times 20 \times 20
\end{align*}

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 \textit{uuckal} is changed to \textit{uuclahunkal}.)

\begin{enumerate}
\item a) \quad 18733 = \text{ca-pic catac uac-bak catac oxlahun tu uuclahunkal} \\
\hspace{1cm} 16000 = \text{ca-pic} \\
\hspace{1cm} 2400 = \text{uac-bak} \\
\hspace{1cm} 333 = 13 > 340 = \text{oxlahun tu uuclahunkal} \\
\item b) \quad 18733 = \text{uac (-bak) tu y-ox-pic catac oxlahun tu uuclahunkal} \\
\hspace{1cm} = 6 \times 400 > 3 \times 8000 \quad + \quad 13 \quad > \quad 17 \times 20
\end{enumerate}

\begin{align*}
18400 & \quad 333
\end{align*}

\textbf{Lacandón [50]}

[BROOCE 1968: 70]

1 \quad \text{hun-}

2 \quad \text{ka' -}

3 \quad \text{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.

\begin{enumerate}
\item 4 \quad \text{lah-t-a-nup’} \quad \text{“all your fingers”}
\item 5 \quad \text{hun-bu-k’-a’} \quad \text{“one hand”}
\item 6 \quad \text{taham-u-na’-k’-a’} \quad \text{“the next thumb”}
\item 10 \quad \text{ka’-bu-k’-a’} \quad \text{“two hands”}
\item 15 \quad \text{hum-buh-ok} \quad \text{“one foot”}
\item 20 \quad \text{hun-tul-winik} \quad \text{“one man”}
\item 100 \quad \text{hum-bu-k’-a’ winik} \quad \text{“five men”}
\end{enumerate}

\textbf{Chol [53]}


\begin{enumerate}
\item 1 \quad \text{hum-p’eh} \quad \text{húm-p’ehl}
\item 2 \quad \text{ča’-p’eh} \quad \text{čá’-p’ehl}
\item 3 \quad \text{uš-p’eh} \quad \text{uš-p’ehl}
\item 4 \quad \text{čim-p’ eh} \quad \text{čim-p’ehl}
\item 5 \quad \text{ho’-p’eh} \quad \text{ho’-p’ehl}
\item 6 \quad \text{wik-p’eh} \quad \text{wik-p’ehl}
\item 7 \quad \text{wuk-p’eh} \quad \text{wük-p’ehl}
\item 8 \quad \text{wašik-p’eh} \quad \text{wašik-p’ehl}
\item 9 \quad \text{bolom-p’eh} \quad \text{bolóm-p’ehl}
\item 10 \quad \text{luhum-p’eh} \quad \text{luhúm-p’ehl}
\end{enumerate}
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<thead>
<tr>
<th>#</th>
<th>Language</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>hun-luhum-p'eh</td>
<td>1+10</td>
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</tr>
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<td>12</td>
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<td>1+10</td>
<td>läh čim-p'ehl</td>
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<tr>
<td>13</td>
<td>uš-luhum-p'eh</td>
<td>3+10</td>
<td>uš luhum-p'ehl</td>
</tr>
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<td>čin-luhum-p'eh</td>
<td>4+10</td>
<td>čin luhum-p'ehl</td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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<td>hum-p'eh i ča'k'al</td>
<td>1&gt;2×20</td>
<td>hun k'äl yik'öt hüm-p'ehl</td>
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<td>uš k'äl</td>
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</tbody>
</table>
Database 2: Numeral Systems

Basic vocabulary:
\[ U = \{1...9, 12\} \]
\[ B_1 = \{10 \text{ (luhun)}\}, B_2 = \{20 \text{ (k' al)}\}, B_3 = \{400 \text{ (bahk')}\} \]
A connective: \{yik'ot\}
Decimal below 20, except for 12. The word for 12 may have been *lahča-p'ehl*, but *ča*- is replaced by *čim*, which signifies 4. *p'ehl* is one of the numeral classifiers.

\[ N_{1,19} = U \pm B^1 + p'ehl \]

The numerals from 20 to 399 are vigesimal and the method is overcounting. *i (y)* is the third person possessive.

\[ N_{21,399} = \pm \{N_{1,19}\} \mp i(y) + \{N_{2,19}\} \times B^2 \]

400 functions as a base from 400 up.

\[ N_{401} = \pm \{N_{1,19}\} \times B^2 \mp i(y) + \{N_{2,19}\} \times B^3 \]

However, 500 is *humbak' yik'o't ho'k'al*, whose formula is expressed as

\[ N_1 \times B^3 + yik'o't + N_2 \times B^2 \]

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) [Smailus 1975: 214]**

<table>
<thead>
<tr>
<th>Numeral in Chontal</th>
<th>Numerals in Classical Chontal</th>
</tr>
</thead>
<tbody>
<tr>
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<td>hun</td>
</tr>
<tr>
<td>2</td>
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<tr>
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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 Ruiz Sanchez 1978: 458-459]**

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<tr>
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</tr>
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**Zinacantan Tzotzil [Haviland 1981: 165-175]**

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### Database 2: Numeral Systems

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### Basic vocabulary:

- \( U = \{1 \ldots 9, 11, 12\} \)
- \( B^1 = \{10 \text{ (lahun)}\}, B^2 = \{20 \text{ (vinik)}\}, B^3 = \{400 \text{ (bok')}\} \)

### Derivative vocabulary:

- \( I' = \{h\}, 20' = \{\text{tob}\}, 2 = \text{čib} > \text{ča-ib} \)
- A suffix: \(-\text{eb} \sim -\text{ib} \sim -\text{ob} \sim -\text{ub}\)

1. Decimal below 20, except for 11 and 12.
   \( N_{1.19} = U + B^1 \)
   \( N_{21.399} = (+ N_{1.19} + y/ 5 + N_{2.19}) \times B^2 \)
3. 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]

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<tr>
<td>180</td>
<td>balun winik</td>
<td>9 × 20</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>lahun winik</td>
<td>10 × 20</td>
<td></td>
</tr>
<tr>
<td>220</td>
<td>buluč winik</td>
<td>11 × 20</td>
<td></td>
</tr>
<tr>
<td>240</td>
<td>lahč winik</td>
<td>12 × 20</td>
<td></td>
</tr>
<tr>
<td>260</td>
<td>ošlahun winik</td>
<td>13 × 20</td>
<td></td>
</tr>
<tr>
<td>280</td>
<td>čanlahun winik</td>
<td>14 × 20</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>ho'lahun winik</td>
<td>15 × 20</td>
<td></td>
</tr>
<tr>
<td>320</td>
<td>waklahun winik</td>
<td>16 × 20</td>
<td></td>
</tr>
<tr>
<td>340</td>
<td>huklahun winik</td>
<td>17 × 20</td>
<td></td>
</tr>
<tr>
<td>360</td>
<td>wašuklahun winik</td>
<td>18 × 20</td>
<td></td>
</tr>
<tr>
<td>380</td>
<td>balunlahun winik</td>
<td>19 × 20</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>h bahk'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>ča' bahk'</td>
<td>2 × 400</td>
<td></td>
</tr>
</tbody>
</table>

**Basic vocabulary:**

\[ U = \{1...9, 11, 12\} \]
\[ B^1 = \{10 \text{ (lahun)}\}, \ B^2 = \{20 \text{ (winik)}\}, \ B^3 = \{400 \text{ (bahk')}\} \]
Derivative vocabulary:

1' = {h}, 20' = {tab}

A suffix: {-eb}

1 Decimal below 20, except for 11 and 12.
   \[ N_{1,19} = U \pm B \]

2 Vigesimal above 20.
   \[ N_{21,399} = \pm \{N_{1,19}\} \pm y + \{N_{2,19}\} \times B \]

3 400 is a new base, but it is not clear how the interval numbers are formed.

### Tojolabal [58]

[**Furbee-Losee** 1976: 117-123] \( b' = b \)

<table>
<thead>
<tr>
<th>Number</th>
<th>Tojolabal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>hun</td>
</tr>
<tr>
<td>2</td>
<td>čahb/ čah</td>
</tr>
<tr>
<td>3</td>
<td>oš</td>
</tr>
<tr>
<td>4</td>
<td>čan</td>
</tr>
<tr>
<td>5</td>
<td>ho'</td>
</tr>
<tr>
<td>6</td>
<td>wak</td>
</tr>
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<td>huk</td>
</tr>
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<td>wašak</td>
</tr>
<tr>
<td>9</td>
<td>balun</td>
</tr>
<tr>
<td>10</td>
<td>lahun</td>
</tr>
<tr>
<td>11</td>
<td>huluč</td>
</tr>
<tr>
<td>12</td>
<td>lahčaw</td>
</tr>
<tr>
<td>13</td>
<td>oš-lahun-e'</td>
</tr>
<tr>
<td>14</td>
<td>čan-lahun-e'</td>
</tr>
<tr>
<td>15</td>
<td>ho'-lahun-e'</td>
</tr>
<tr>
<td>16</td>
<td>wak-lahun-e'</td>
</tr>
<tr>
<td>17</td>
<td>huk-lahun-e'</td>
</tr>
<tr>
<td>18</td>
<td>wašak-lahun-e'</td>
</tr>
<tr>
<td>19</td>
<td>balun-lahun-e'</td>
</tr>
<tr>
<td>20</td>
<td>tahab/ /winik/ tak'in</td>
</tr>
<tr>
<td>21</td>
<td>hun-tahab-sok-hun-e'</td>
</tr>
<tr>
<td>22</td>
<td>hun-tahab-sok-čahb-e'</td>
</tr>
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<td>23</td>
<td>hun-tahab-sok-lahun-e'</td>
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<td>24</td>
<td>hun-tahab-sok-ho-lahun-e'</td>
</tr>
<tr>
<td>25</td>
<td>hun-tahab-sok-balun-lahun-e'</td>
</tr>
<tr>
<td>26</td>
<td>čahb-tahab-e'</td>
</tr>
<tr>
<td>27</td>
<td>čahb-tahab-sok-lahun-e'</td>
</tr>
<tr>
<td>28</td>
<td>oš-tahab-e'</td>
</tr>
<tr>
<td>29</td>
<td>čan-tahab-e'</td>
</tr>
<tr>
<td>30</td>
<td>ho'-tahab-e'</td>
</tr>
<tr>
<td>31</td>
<td>wak-tahab-e'</td>
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<tr>
<td>32</td>
<td>huk-tahab-e'</td>
</tr>
<tr>
<td>33</td>
<td>wašak-tahab-e'</td>
</tr>
<tr>
<td>34</td>
<td>balun-tahab-e'</td>
</tr>
<tr>
<td>35</td>
<td>lahun-tahab-e'</td>
</tr>
<tr>
<td>36</td>
<td>huluč-tahab-e'</td>
</tr>
<tr>
<td>37</td>
<td>lahčaw-tahab-e'</td>
</tr>
<tr>
<td>38</td>
<td>oš-lahun-tahab-e'</td>
</tr>
</tbody>
</table>
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-sa'n-e' 2 × 400
800  čahb-sa'n-e'  2 × 400

Basic vocabulary:
U = {1...9, 11, 12}
B¹ = {10 (lahun)}, B² = {20 (tahab), B³ = {400 (sā'n)}
A connective: {sok}
A suffix: {-e'}
1 Decimal below 20, except for 11 and 12.
N₁₁₁₉ = U ± B¹
2 Vigesimal above 20.
N₂₁₃₉₉ = (N₁₁₁₉) × B² ± sok ± N₁₁₂
3 From 400 up 400 is used as the base, but it is not clear how the intermediate numbers are formed.

Chuj [59]

1 xun
2 ča'p'/ ča'
3 oš
4 čog/ čaŋ
5 hoy/ ho'/ hop'
6 wak'/ wak
7 hukup'/ huk
8 wašak'/ waxšak
9 p'alun
10 laxuŋ
11 hušluč'/ hušluč
12 laxčaw
13 oš-laxuŋ 3 + 10
14 čoŋ-laxuŋ 4 + 10
15 ho'-laxuŋ 5 + 10
16 wak-laxuŋ 6 + 10
17 huk-laxuŋ 7 + 10
18 wašak-laxuŋ 8 + 10
19 p'alun-laxuŋ 9 + 10
20 xunak/ xunk', winak/ wiŋk'
21 xun s-ča- wiŋk'/ winak 1 > 2 × 20
23 oše s-ča-winak 3 > 2 × 20
35 ho' laxuŋe s-ča-winak 10 > 2 × 20
36 waklaxuŋe s-ča-winak 11 > 2 × 20
40 ča'-winak 2 × 20
41 xun yoš winak 1 > 3 × 20
Basic vocabulary:

\[ U = \{1 \ldots 9, 11, 12\} \]
\[ B_1 = \{10 (\text{laxun})\}, \quad B_2 = \{20 (\text{winak})\}, \quad B_3 = \{400 (k'al)\} \]

1. Decimal below 20, except 11 and 12.

\[ N_{1,19} = D \pm B_1 \]


\[ N_{21-399} = \pm \{N_{1,19}\} \pm s-y + \{N_{2,19}\} \times U_2 \]

3. 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 \textit{xun k'al} or as \textit{xun k'al winak}. Since \textit{k'al} means 20 and \textit{winak} also means 20 (originally "man"), 400 is analyzed as \(1 \times 20\) or \(1 \times 20 \times 20\). However, \textit{k'al} is not used as 20, as it is in Jacaltec and Yucatec. It appears, therefore, that \textit{k'al} came to have the specific meaning of 400 in Chuj.

**Jacaltec [60]**

[DAY 1973: 57-59] \(b' = b\)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
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21
22
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31
32

<table>
<thead>
<tr>
<th></th>
<th>Chuj</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>hun</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>ka</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>oš</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>k'aj</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>ho</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>wax</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>hux</td>
<td>7</td>
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<tr>
<td>8</td>
<td>wašax</td>
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</tr>
<tr>
<td>9</td>
<td>baluŋ</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>lahuŋ</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>hun-la'ñéb</td>
<td>1 + 10</td>
</tr>
<tr>
<td>12</td>
<td>kab-la'ñéb</td>
<td>2 + 10</td>
</tr>
<tr>
<td>13</td>
<td>oš-la'ñéb</td>
<td>3 + 10</td>
</tr>
<tr>
<td>14</td>
<td>k'aj-la'ñéb</td>
<td>4 + 10</td>
</tr>
<tr>
<td>15</td>
<td>ho-la'ñéb</td>
<td>5 + 10</td>
</tr>
<tr>
<td>16</td>
<td>wax-la'ñéb</td>
<td>6 + 10</td>
</tr>
<tr>
<td>17</td>
<td>hux-la'ñéb</td>
<td>7 + 10</td>
</tr>
<tr>
<td>18</td>
<td>wašax-la'ñéb</td>
<td>8 + 10</td>
</tr>
<tr>
<td>19</td>
<td>baluŋ-la'ñéb</td>
<td>9 + 10</td>
</tr>
<tr>
<td>20</td>
<td>hun'k'al</td>
<td>10</td>
</tr>
<tr>
<td>21</td>
<td>hun'e's-ka-winax</td>
<td>1 + 2 + 20</td>
</tr>
<tr>
<td>22</td>
<td>kab-s-ka-winax</td>
<td>2 + 2 + 20</td>
</tr>
<tr>
<td>23</td>
<td>oš'ebs-ka-winax</td>
<td>3 + 2 + 20</td>
</tr>
<tr>
<td>24</td>
<td>lahuŋebs-ka-winax</td>
<td>10 + 2 + 20</td>
</tr>
<tr>
<td>25</td>
<td>hunla'ñebs-ka-winax</td>
<td>11 + 2 + 20</td>
</tr>
<tr>
<td>26</td>
<td>kablalæb s-ka-winax</td>
<td>12 + 2 + 20</td>
</tr>
</tbody>
</table>
Native Middle American Languages

Basic vocabulary:

U = \{1\ldots 9\}

B¹ = \{10 \text{ (lahun)}\}, B² = \{20 \text{ (winax-k' al)}\}, B³ = \{100 \text{ (siento)}\}

(1) Decimal below 20.

N_{1,19} = D \pm B¹

(2) Vigesimal from 20 to 99.

N_{21,99} = \pm \{N_{1,19}\} \pm s/\text{y-} + \{N_{2,3}\} \times B²

The word for 20 is \textit{hun-k' al}, but \textit{winax} is used as a base between 21 and 40, after which \textit{k' al} serves as a base.

(3) 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\ldots\} \times B³

Motocintlec [63]

[SAPPÉR 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 \times 20
21 junk'uté (sic)
Basic vocabulary:
\[ U = \{1...9\} \]
\[ B^1 = \{10 \text{ (lajun)}\}, B^2 = \{20 \text{ (uinak)}\}, B^3 = \{100 \text{ (ciento)}\} \]

Derivative vocabulary:
\[ 20' = \{k'ut\} \]
A suffix: \(-e\)

1. Decimal below 20.
\[ N_{1,19} = D \pm B^1 + e \]
2. Vigesimal from 20 to 99.
In the 20s the base is \(k'ut\) and thereafter \(uinak\) is used as a base.
3. 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. oś
4. kax
5. xweb'
6. (wa) qaq
7. wuq
8. waxaqaq
9. b'elixux
10. laxux
11. xun-laxux
12. ka:b'e-laxux
13. ośe-laxux
14. kaxe-laxux
15. xweb'-laxux
16. qaq-laxux
17. wuq-laxux
18. waxaqaq-laxux
19. b'elixux-laxux
20. winqi'n

Basic vocabulary:
\[ U = \{1...9\} \]
\[ B^1 = \{10 \text{ (laxux)}\}, B^2 = \{20 \text{ (winqi'n)}\} \]

Derivative vocabulary:
\[ 3' = \{ośe\}, 4' = \{kaxe\} \]

1. Decimal below 20.
\[ N_{1,19} = U \pm B^1 \]
Today there are no speakers who know the numerals above 20.

### Mam [66]

#### Ixtahuacan Mam

<table>
<thead>
<tr>
<th>[MALDNADO ANDRES, et al. 1986 b = b']</th>
<th>[THOMAS 1897-8: 862, 903] (Original transcription)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  hu:n</td>
<td>jun</td>
</tr>
<tr>
<td>2  kab</td>
<td>caye</td>
</tr>
<tr>
<td>3  o:s</td>
<td>ox</td>
</tr>
<tr>
<td>4  kya:x</td>
<td>quiáje (as)</td>
</tr>
<tr>
<td>5  xwe'</td>
<td>jóvue</td>
</tr>
<tr>
<td>6  qaq</td>
<td>vuák</td>
</tr>
<tr>
<td>7  wu:q</td>
<td>uk</td>
</tr>
<tr>
<td>8  waxsaq</td>
<td>vuacxák</td>
</tr>
<tr>
<td>9  belax</td>
<td>belejuń</td>
</tr>
<tr>
<td>10 la:x</td>
<td>lajṳ́</td>
</tr>
<tr>
<td>11 xun-la:x</td>
<td>hum-lahuh (as 1 + 10)</td>
</tr>
<tr>
<td>12 kab-la:x</td>
<td>kab-lahuh (as 2 + 10)</td>
</tr>
<tr>
<td>13 o:s-la:x</td>
<td>ox-lahuh (as 3 + 10)</td>
</tr>
<tr>
<td>14 kya-x-la:x</td>
<td>kiah-lahuh (as 4 + 10)</td>
</tr>
<tr>
<td>15 o-la:x</td>
<td>oo-lahuh (as 5 + 10)</td>
</tr>
<tr>
<td>16 qaq-la:x</td>
<td>vuak-lahuh</td>
</tr>
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<td>17 wu:q-la:x</td>
<td>vuk-lahuh</td>
</tr>
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<td>18 waxsaq-la:x</td>
<td>vuahxak-lahuh</td>
</tr>
<tr>
<td>19 belax-la:x</td>
<td>belhuh-lahuh</td>
</tr>
<tr>
<td>20 winqn</td>
<td>vuinkim/ huin</td>
</tr>
<tr>
<td>21 winqn xu:n</td>
<td>20 + 1</td>
</tr>
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<td>22 winqn kab</td>
<td>20 + 2</td>
</tr>
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<td>30 winaq la:x</td>
<td>20 + 10</td>
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<td>40 kya'-wnaq</td>
<td>ka-vaínk (as 2 × 20)</td>
</tr>
<tr>
<td>41 xun-la:x</td>
<td>hum-t-oxkal-im (as 1 &gt; 3 × 20)</td>
</tr>
<tr>
<td>42 kab-la:x</td>
<td>kabe-t-oxkal-im (as 2 &gt; 3 × 20)</td>
</tr>
<tr>
<td>43 o:s-la:x</td>
<td>oxe-t-oxkal-im (as 3 &gt; 3 × 20)</td>
</tr>
<tr>
<td>44 kya-x-la:x</td>
<td>kiah-t-oxkal-im (as 4 &gt; 3 × 20)</td>
</tr>
<tr>
<td>45 o-la:x</td>
<td>hoe-t-oxkal-im (as 5 &gt; 3 × 20)</td>
</tr>
<tr>
<td>46 qaq-la:x</td>
<td>vuak-t-oxkal-im (as 6 &gt; 3 × 20)</td>
</tr>
<tr>
<td>47 wu:q-la:x</td>
<td>vuk-t-oxkal-im (as 7 &gt; 3 × 20)</td>
</tr>
<tr>
<td>48 waxsaq-la:x</td>
<td>vuaxhak-t-oxkal-im (as 8 &gt; 3 × 20)</td>
</tr>
<tr>
<td>49 belax-la:x</td>
<td>belhuh-t-oxkal-im (as 9 &gt; 3 × 20)</td>
</tr>
<tr>
<td>50 winqn</td>
<td>lahuh-t-oxkal-im (as 10 &gt; 3 × 20)</td>
</tr>
<tr>
<td>60 o:s-k'a:l</td>
<td>lahuh-tu-hu-much-im (as 3 × 20)</td>
</tr>
<tr>
<td>70 xun-muː'</td>
<td>lahuh-t-oxkal-im (as 10 &gt; 5 × 20)</td>
</tr>
<tr>
<td>80 xun-muː'</td>
<td>hum-mux</td>
</tr>
<tr>
<td>90 o-la:x</td>
<td>5 × 20</td>
</tr>
<tr>
<td>100 o-kal</td>
<td>5 × 40</td>
</tr>
<tr>
<td>200 o-chuk</td>
<td>5 × 40</td>
</tr>
<tr>
<td>300 oloth-kal</td>
<td>15 × 20</td>
</tr>
<tr>
<td>400 o-mux</td>
<td>5 × 80</td>
</tr>
<tr>
<td>500 o-mux-o-kal</td>
<td>5 × 80 + 5 × 20</td>
</tr>
<tr>
<td>600 o-mux-o-chuk</td>
<td>5 × 80 + 5 × 40</td>
</tr>
<tr>
<td>700 o-mux-oloh-kal</td>
<td>5 × 80 + 15 × 20</td>
</tr>
</tbody>
</table>
Basic vocabulary:
\[ U = \{1 \ldots 9\} \]
\[ B^1 = \{10 (la:x)\}, \quad B^2 = \{20 (winaq \sim k'a:l)\} \]

Derivative vocabulary:
\[ 1' = \{xun, xu:n\}, \quad 20' = \{wi:nqan \sim wnaq\} \]

1. Decimal below 20.
\[ N_{1.19} = D \pm B^1 \]

2. 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]

<table>
<thead>
<tr>
<th>Chajul</th>
<th>Nebaj</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in-wa'l</td>
<td>u-ma'l</td>
</tr>
<tr>
<td>2 ka:-wa'l</td>
<td>ka' -wa'l</td>
</tr>
<tr>
<td>3 oš-wa'l</td>
<td>oš-wa'l</td>
</tr>
<tr>
<td>4 kax-wa'l</td>
<td>kax-wa'l</td>
</tr>
<tr>
<td>5 o'-wa'l</td>
<td>o'-wa'l</td>
</tr>
<tr>
<td>6 wahqil</td>
<td>wa:xil</td>
</tr>
<tr>
<td>7 huq-wa'l</td>
<td>wux-wa'l</td>
</tr>
<tr>
<td>8 wahšaqil</td>
<td>wa:ši:l/ wa:šaxil</td>
</tr>
<tr>
<td>9 bel-wal</td>
<td>belu-wal</td>
</tr>
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<td>la-wal</td>
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<tr>
<td>12 kab-lawal</td>
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<tr>
<td>13 oš-lawal</td>
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<tr>
<td>14 ka:-lawal</td>
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</tr>
<tr>
<td>15 o'-lawal</td>
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<tr>
<td>16 waq-lawal</td>
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<tr>
<td>17 huq-lawal</td>
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<td>wa:šax-lawal/ wa:ša-lawal</td>
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</tr>
<tr>
<td>20 wi:nqil</td>
<td>wi:nqil</td>
</tr>
<tr>
<td>21 winaq xunul</td>
<td>winax xunul/ winax w-ma'l</td>
</tr>
<tr>
<td>22 winaq ka:bil</td>
<td>winax kabil/ winax ka'-wa'l</td>
</tr>
<tr>
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</tr>
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<td>24 winaq kaal</td>
<td>winax kaal/ winax kax-wa'l</td>
</tr>
<tr>
<td>25 winaq o'1</td>
<td>winax o'1/ winax o'-wa'l</td>
</tr>
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<td>winax wuxul/ winax wux-wa'l</td>
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<td>winax wa:ši:l</td>
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<td>u-ma'l t-oš-k'al</td>
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<td>oš-k' al</td>
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<td></td>
<td>in-wa'li-muč'</td>
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<tr>
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<td>220</td>
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<td>400</td>
<td>wi:nqil-k'atal</td>
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[THOMAS 1897-8: 862, 904-905]

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<td>cáj-vual</td>
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<td>ó-vual</td>
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<td>7</td>
<td>vúj-vual</td>
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<tr>
<td>11</td>
<td>hun-lavual</td>
<td>1 + 10</td>
</tr>
<tr>
<td>12</td>
<td>cab-lavual</td>
<td>2 + 10</td>
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<tr>
<td>13</td>
<td>ox-lavual</td>
<td>3 + 10</td>
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<td>14</td>
<td>ca-lavual</td>
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<td>15</td>
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<td>vuinah-unul</td>
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<td>22</td>
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<td>23</td>
<td>vuinah-oxol</td>
<td>20 + 4</td>
</tr>
<tr>
<td>24</td>
<td>vuinah-caal</td>
<td>20 + 5</td>
</tr>
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<td>25</td>
<td>vuinah-ool</td>
<td>20 + 6</td>
</tr>
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<td>26</td>
<td>vuinah-vuahil</td>
<td>20 + 7</td>
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<td>27</td>
<td>vuinah-vuhul</td>
<td>20 + 8</td>
</tr>
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<td>28</td>
<td>vuinah-vuaxahil</td>
<td>20 + 9</td>
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<td>29</td>
<td>vuinah-behu-vual</td>
<td>20 + 10</td>
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<tr>
<td>30</td>
<td>vuinal-lavual</td>
<td>20 × 20</td>
</tr>
<tr>
<td>40</td>
<td>ca-vuinkil</td>
<td>2 × 20</td>
</tr>
<tr>
<td>60</td>
<td>ox-c'al-al</td>
<td>3 × 20</td>
</tr>
<tr>
<td>70</td>
<td>lavual-i-much-ul</td>
<td>10 &gt; 80</td>
</tr>
<tr>
<td>80</td>
<td>ung-much-ul</td>
<td>1 × 80</td>
</tr>
<tr>
<td>90</td>
<td>lavual-t-o-c'al</td>
<td>10 &gt; 5 × 20</td>
</tr>
<tr>
<td>100</td>
<td>o-c'al-al</td>
<td>5 × 20</td>
</tr>
</tbody>
</table>
Database 2: Numeral Systems

101  o-c'alal-tuc-ungvual  $5 \times 20 + 1$
110  lavual-i-vuh-c'al  $10 > 6 \times 20$
120  vuah-c'alal  $6 \times 20$
130  lavual-i-vuh-c'al  $10 > 7 \times 20$
140  vuh-c'alal  $7 \times 20$
150  lavual-i-vuaxah-c'al  $10 > 7 \times 20$
160  vuaxah-c'alal  $8 \times 20$
170  lavual-i-bele-c'al  $10 > 9 \times 20$
180  bele-c'alal  $9 \times 20$
380  belela-n-c'alal  $19 \times 20$
400  vuinkil-an-c'alal  $20 \times 20$
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:

$U = \{1...9\}$

$B^1 = \{10 \text{ (la)}\}$, $B^2 = \{20 \text{ (winaq-k' al)}\}$

Derivative vocabulary:

$1^* = \{\text{xun}\}$, $4^* = \{\text{ka:}\}$, $6^* = \{\text{waq}\}$, $20^* = \{\text{wi:nq}\}$

Suffixes: \{-wa'1, -wal, -Vl\}

Decimal below 20.

$N_{1,19} = U \pm B^1 + -wa'1/-wal/-il$

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.

$N_{20,40} = \{\#, 2\} \times 20' \text{ (wi: nq)} + \text{il}$

$N_{21,39} = B^2 (\text{winaq}) + \{N_{1,19}\} + \text{Vl}$

$N_{41,39} = \pm \{N_{1,19}\} \pm i/t-\{3...\} \times B^2 \text{ (k'al)} \text{ (except for } N_{61,80})$

$N_{61,79} = \{N_{1,19}\} + i + \text{mu'c}$

$N_{80} = \{\text{mu'c'ul}\}$

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.

400 is $\text{wi:nqil k'alal}$, whose formation is $20 \times 20$. $\text{wi:nqil}$ is derived from $\text{winaq "man} and a suffix -il$.

Kekchi [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 kwaqšaqib
9 bele:b
Basic vocabulary:

\[ U = \{1 \ldots 9\} \]
Database 2: Numeral Systems

B¹ = {10 (laxu)}, B² = {20 (k’a:l)}, B³ = {400 (oq’ob)}

Derivative vocabulary:
10' = laxe:b > laxu-e:b

A suffix: {-Vl}

1) Decimal below 20.

N₁₁₉ = U ± B¹ ± -V₁

2) Vigesimal from 20 to 399.

N₂₁₋₃₉₉ = ± (N₁₁₉) ± ŧ-/r- + (2...19) × U²

Although 200 in the list above is laxe-k’a:l (10 × 20), Thomas gives ho-tuc (5 × 40) [Thomas 1897-8: 902].

3) The numerals from 400 above are formed from 400, but as is seen in 600 (= 200 > 2 × 400) and 1000 (= 200 > 3 × 400), 200 is expressed as 5 × 40. The numerals beyond 100 in the Kekchi system are being lost. The Kekchi 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 ošíb š-ka’-k’a:l 100 and 3 × 20

Pocomchi [70]

[BROWN 1979: 62-68]

<table>
<thead>
<tr>
<th>Bound form</th>
<th>Free form</th>
<th>[THOMAS 1897-8: 862, 901]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 xun-</td>
<td>xunax/nax</td>
<td>jenaj</td>
</tr>
<tr>
<td>2 kab’/-ka’</td>
<td>k:i:b’</td>
<td>quiib</td>
</tr>
<tr>
<td>3 oš-</td>
<td>š:i:b’</td>
<td>ixib</td>
</tr>
<tr>
<td>4 kax-</td>
<td>kix-eb'/ kex-eb’</td>
<td>quiib</td>
</tr>
<tr>
<td>5 ho’-</td>
<td>ho’-o:b’</td>
<td>joób</td>
</tr>
<tr>
<td>6 waq-</td>
<td>waq-i:b’</td>
<td>vuakib</td>
</tr>
<tr>
<td>7 wuq-</td>
<td>wuq-u:b’</td>
<td>vukúb</td>
</tr>
<tr>
<td>8 wahšaq-</td>
<td>wahšaq-i:b’</td>
<td>vuaxakib</td>
</tr>
<tr>
<td>9 b’elex-</td>
<td>b’elex-e:b’</td>
<td>belejé</td>
</tr>
<tr>
<td>10 lax-</td>
<td>lax-e:b’</td>
<td>lajéék</td>
</tr>
<tr>
<td>11 xun-lax</td>
<td></td>
<td>1+10</td>
</tr>
<tr>
<td>12 kab’-lax</td>
<td></td>
<td>2+10</td>
</tr>
<tr>
<td>13 oš-lax</td>
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<td>3+10</td>
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<tr>
<td>14 kax-lax</td>
<td></td>
<td>4+10</td>
</tr>
<tr>
<td>15 ho’-lax</td>
<td></td>
<td>5+10</td>
</tr>
<tr>
<td>16 waq-lax</td>
<td></td>
<td>6+10</td>
</tr>
<tr>
<td>17 wuq-lax</td>
<td></td>
<td>7+10</td>
</tr>
<tr>
<td>18 wahšaq-lax</td>
<td></td>
<td>8+10</td>
</tr>
<tr>
<td>19 b’elex-lax</td>
<td></td>
<td>9+10</td>
</tr>
<tr>
<td>20 xun-inaq</td>
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<td>1×20</td>
</tr>
<tr>
<td>21 nax ri-ka’-winaq</td>
<td></td>
<td>henah ru-ca-vuinak</td>
</tr>
<tr>
<td>22 kib’ ri-ka’-winaq</td>
<td></td>
<td>quib ru-ca-vuinak</td>
</tr>
<tr>
<td>23 šib’ ri-ka’-winaq</td>
<td></td>
<td>3×2×20</td>
</tr>
<tr>
<td>30 laheb-ru-ca-vuinak</td>
<td></td>
<td>10×2×20</td>
</tr>
<tr>
<td>38 wahšaq-lax ri-ka’-winaq</td>
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<td>18×2×20</td>
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<td>39 b’elex-lax ri-ka’-winaq</td>
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<td>19×2×20</td>
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<tr>
<td>40 ka’-winaq</td>
<td></td>
<td>2×20</td>
</tr>
<tr>
<td>41 nax r-oš-k’ahl</td>
<td></td>
<td>1×3×20</td>
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</tbody>
</table>
In the above examples from modern Pokomchi 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:**

\[ U = \{1...9\}, \]
\[ B^1 = \{10 (lax)\}, \quad B^2 = \{20 (winaq \sim k'aahl)\}, \quad B^3 = \{100 (ho'k'aahl = 5 \times 20)\} \]

A suffix: \(-V:b\)

1. **Decimal below 20.**
   \[ N_{1,19} = U \pm B^1 \]

2. **Vigesimal from 20 up.**
   \[ N_{21,99} = \pm (N_{1,19}) \pm r/k - (2...5) \times B^2 \]

3. The numerals above 100 are formed by undercounting, using 5 \times 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 \times 40 for 200.

**Quiché [73]**

<table>
<thead>
<tr>
<th>Number</th>
<th>Pokomchi (Fox 1973: 30,57)</th>
<th>Mayan (Brasseur de Bourbourg 1961 (1862): 167-172)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>xun</td>
<td>hun</td>
</tr>
<tr>
<td>2</td>
<td>kieb'</td>
<td>cab/ caib</td>
</tr>
<tr>
<td>3</td>
<td>ošib'</td>
<td>ox-ib</td>
</tr>
<tr>
<td>4</td>
<td>kiexeb'</td>
<td>cah/ cah-ib</td>
</tr>
<tr>
<td>5</td>
<td>xob'</td>
<td>oo/oob</td>
</tr>
<tr>
<td>6</td>
<td>waqib'</td>
<td>vaka-kib (vakib?)</td>
</tr>
<tr>
<td>7</td>
<td>wuqub'</td>
<td>vuk-ub</td>
</tr>
<tr>
<td>8</td>
<td>waxšaqib'</td>
<td>vahxak-ib</td>
</tr>
<tr>
<td>9</td>
<td>b'elexeb'</td>
<td>beleh/beleheb</td>
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<td>laxux</td>
<td>lauhu</td>
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<td>11</td>
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<td>hu-lahue</td>
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<td>cab-lahu</td>
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<td>ox-lahuh</td>
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<td>o-laxux</td>
<td>o-lahuh</td>
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<td>beleh-lahue</td>
</tr>
<tr>
<td>20</td>
<td>xu-winaq</td>
<td>hu-vinaq</td>
</tr>
</tbody>
</table>

10 \times 3 = 30

3 \times 20 = 60

1 \times 3 = 3

1 \times 4 = 4

5 \times 20 = 100

5 \times 20 + 1 = 101

5 \times 20 + 2 = 102

5 \times 40 = 200
<table>
<thead>
<tr>
<th>Numeral</th>
<th>Translation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>hu-vinak-hun</td>
<td>$1 \times 20 + 1$</td>
</tr>
<tr>
<td>22</td>
<td>hu-vinak-cab</td>
<td>$1 \times 20 + 2$</td>
</tr>
<tr>
<td>30</td>
<td>xu-winaq laxux</td>
<td>$1 \times 20 + 10$</td>
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<tr>
<td>40</td>
<td>ka-winaq</td>
<td>$2 \times 20$</td>
</tr>
<tr>
<td>41</td>
<td>hun-r-ox-qal</td>
<td>$1 &gt; 3 \times 20$</td>
</tr>
<tr>
<td>42</td>
<td>cab-r-ox-qal</td>
<td>$2 &gt; 3 \times 20$</td>
</tr>
<tr>
<td>43</td>
<td>oxib-r-ox-qal</td>
<td>$3 &gt; 3 \times 20$</td>
</tr>
<tr>
<td>50</td>
<td>nik'iax siento</td>
<td>half 100</td>
</tr>
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<td>cab-ri-humuch</td>
<td>$2 \times 1 \times 80$</td>
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</tr>
<tr>
<td>80</td>
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<td>hu-much</td>
</tr>
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<td>hu-ri-vvak-qal</td>
<td>$1 \times 80$</td>
</tr>
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<td>cab-ri-vvak-qal</td>
<td>$2 \times 80$</td>
</tr>
<tr>
<td>83</td>
<td>oxib-ri-vvak-qal</td>
<td>$3 \times 80$</td>
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<tr>
<td>90</td>
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<td>xun siento</td>
<td>o-qal</td>
</tr>
<tr>
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<td>hun-ri-vvak-qal</td>
<td>$1 \times 6 \times 20$</td>
</tr>
<tr>
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<td>cab-ri-vvak-qal</td>
<td>$2 \times 6 \times 20$</td>
</tr>
<tr>
<td>103</td>
<td>oxib-ri-vvak-qal</td>
<td>$3 \times 6 \times 20$</td>
</tr>
<tr>
<td>120</td>
<td>vak-qal</td>
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<td>hun-ri-vvak-qal</td>
<td>$1 \times 7 \times 20$</td>
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<td>122</td>
<td>cab-ri-vvak-qal</td>
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<td>oxib-ri-vvak-qal</td>
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<td>140</td>
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<td>hun-ri-vahxak-qal</td>
<td>$1 \times 8 \times 20$</td>
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<td>$2 \times 8 \times 20$</td>
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<td>hun-ri-beleh-qal</td>
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<td>beleh-qal</td>
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<td>hun-ri-cablah</td>
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<td>hun-ri-cahlahu-qal</td>
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<td>hun-r-vuklahuh-qal</td>
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<td>$17 \times 20$</td>
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<tr>
<td>341</td>
<td>hun-r-vahxaklahuh-qal</td>
<td>$1 \times 18 \times 20$</td>
</tr>
</tbody>
</table>
Native Middle American Languages

360  vahxaklahuh-qal  18 x 20
361  hun-ri-beleh-lahuh-qal  1 > 19 x 20
360  belehlahuh-qal  19 x 20
381  hun-ri-o-much  1 > 5 x 80
400  o-much  5 x 80
401  o-much-hun  5 x 80 + 1
500  o-much-o-qal  5 x 80 + 5 x 20
500  o-much-o-tuk  5 x 80 + 5 x 40
700  o-much-o-lah/ o-much-o-lahuh-qal  5 x 80 + 15 x 20
720  o-much-vaklahuh-qal  5 x 80 + 16 x 20
780  o-much-belehlahuh-qal  5 x 80 + 19 x 20
781  hun-ri-ca-go  1 > 2 x 400
782  cab-ri-ca-go  2 > 2 x 400
800  ca-go  2 x 400
801  hun-r-oxo-go  1 > 3 x 400
840  cavinak-r-oxo-go  2 x 20 > 3 x 400
860  ox-qal-r-oxo-go  3 x 20 > 3 x 400
880  humuch-r-oxo-go  80 > 3 x 400
900  o-qal-r-oxo-go  5 x 20 > 3 x 400
920  vak-qal-r-oxo-go  6 x 20 > 3 x 400
940  vuk-qal-r-oxo-go  7 x 20 > 3 x 400
960  vahxak-qal-r-oxo-go  8 x 20 > 3 x 400
980  beleh-qal-r-oxo-go  9 x 20 > 3 x 400
1000  o-tuk-r-oxo-go  5 x 40 > 3 x 400
1200  r-oxo-go  3 x 400
1600  cah-go  4 x 400
2000  r-oo-go/ r-o-go  5 x 400
2400  vaka-go  6 x 400
2800  vuku-go  7 x 400
3000  o-tuk-vahxak-go  5 x 40 > 8 x 400
3200  vahxa-go  8 x 400
3600  beleh-go  9 x 400
4000  lahu-ho  10 x 400
4400  hulahuh-go  11 x 400
4800  cablahuh-go  12 x 400
5000  o-tuk-oxlahuh-go  5 x 40 > 13 x 400
5200  oxlahuh-go  13 x 400
5600  cahlahuh-go  14 x 400
6000  r-oohlahuh-go  15 x 400
6400  vaklahuh-go  16 x 400
6800  vuklahuh-go  17 x 400
7000  o-tuk-vahxaklahuh-go  5 x 40 > 18 x 400
7200  vahxaklahuh-go  18 x 400
7600  belelahuh-go  19 x 400
7601  hun-ri-hu-chuvy  1 > 8000
7602  cab-ri-hu-chuvy  2 > 8000
8000  hu-chuvy  1 x 8000
16000  ca-chuvy  2 x 8000
24000  ox-chuvy  3 x 8000
80000  lahu-chuvy  10 x 8000
Basic vocabulary:

- **U** = \{1...9\}
  - **B^1** = \{10 (lahuh), 20 (winaq), 30, ..., 90\}
  - **B^2** = \{100 (siento)\}
  - A suffix: \{-V: b\}

1. Decimal below 20.
   - \(N_{1-19} = U \pm B^1\)

2. The numerals from 20 to 99 are basically vigesimal, but 50 is expressed as half of 100, and 80 is **muc**.
   - \(N_{20-49} = \{1, 2\} \times B^2 (winaq) \pm \{N_{1-19}\}\)
   - \(N_{50} = nik'ax siento\)

3. 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**.
   - \(N_{40-37} = + \{N_{1-19}\} + r (i) + \{3'...19\} \times B^2 (qal)\)
   - \(N_{61-80} = + \{N_{1-19}\} + ri + humuch (80)\)
   - \(N_{181-200} = + \{N_{1-19}\} + r + otuk (80)\)

4. 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**.
   - \(N_{20-49} = \{1, 2\} \times B^2 (winaq) \pm \{N_{1-19}\}\)
   - \(N_{40-37} = + \{N_{1-19}\} + r (i) + \{3'...19\} \times B^2 (qal)\)
   - \(N_{61-80} = + \{N_{1-19}\} + ri + humuch (80)\)
   - \(N_{181-200} = + \{N_{1-19}\} + r + otuk (80)\)

5. 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.
   - \(N_{381-399} = \pm \{N_{1-19}\} + r + B^1 (omuch)\)
   - \(N_{400-780} = B^3 \pm \{N_{1-380}\}\)
   - \(N_{781-800} = \pm \{N_{1-19}\} + r (i) + \{2'' (ca)\} \times B^4 (go)\)
   - \(N_{801-7600} = \pm \{N_{1-399}\} + r (i) + \{3''...\} \times B^4 (go)\)
   - \(N_{7601-40000} = \pm \{N_{1-399}\} + ri + 1' (hu) \times B^5 (chuvy)\)
### Cakchiquel [76]

<table>
<thead>
<tr>
<th>Classical</th>
<th>Modern</th>
</tr>
</thead>
<tbody>
<tr>
<td>[BRINTON: 408]</td>
<td>[HERBRUGER et al. 324-326][BLAIR et al. 478-479]</td>
</tr>
<tr>
<td>1 xun</td>
<td>xun</td>
</tr>
<tr>
<td>2 kay</td>
<td>ka'</td>
</tr>
<tr>
<td>3 oši</td>
<td>oši</td>
</tr>
<tr>
<td>4 kaxi</td>
<td>kaxi'</td>
</tr>
<tr>
<td>5 voo</td>
<td>vo'o</td>
</tr>
<tr>
<td>6 vaq'q'i</td>
<td>vaq'q'i</td>
</tr>
<tr>
<td>7 vuq'</td>
<td>vuq'</td>
</tr>
<tr>
<td>8 vq'q'it</td>
<td>vq'q'it</td>
</tr>
<tr>
<td>9 belexe</td>
<td>belexé</td>
</tr>
<tr>
<td>10 laxux</td>
<td>laxux</td>
</tr>
<tr>
<td>11 xu(laxux)</td>
<td>xu(laxux)</td>
</tr>
<tr>
<td>12 kab-laxux</td>
<td>kab-laxux</td>
</tr>
<tr>
<td>13 oš-laxux</td>
<td>oš-laxux</td>
</tr>
<tr>
<td>14 kax-laxux</td>
<td>kax-laxux</td>
</tr>
<tr>
<td>15 voo-laxux</td>
<td>voo-laxux</td>
</tr>
<tr>
<td>16 vaq-laxux</td>
<td>vaq-laxux</td>
</tr>
<tr>
<td>17 vuq-laxux</td>
<td>vuq-laxux</td>
</tr>
<tr>
<td>18 vq'q'aq-laxux</td>
<td>vq'q'aq-laxux</td>
</tr>
<tr>
<td>19 belex-laxux</td>
<td>belex-laxux</td>
</tr>
<tr>
<td>20 xu-vinaq</td>
<td>xu-vinaq</td>
</tr>
<tr>
<td>21 xu-vinaq xun</td>
<td>xu-vinaq xun</td>
</tr>
<tr>
<td>30 vaq'q'aq-laxux</td>
<td>vaq'q'aq-laxux</td>
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<td>40 ka-vinaq</td>
<td>ka-vinaq</td>
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<tr>
<td>41 xun-r-oš-k'al</td>
<td>ka-vinaq k'ai</td>
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<td>50 ka-vinaq laxux</td>
<td>ka-vinaq laxux</td>
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<tr>
<td>60 oš-k'al</td>
<td>oš-k'al</td>
</tr>
<tr>
<td>61 xun ru-xu-muč</td>
<td>oš-k'al xun</td>
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<tr>
<td>80 xu-muč'</td>
<td>xu-muč'</td>
</tr>
<tr>
<td>90 xu-muč' laxux</td>
<td>xu-muč' laxux</td>
</tr>
<tr>
<td>100 o-k' al</td>
<td>vq'k' al</td>
</tr>
<tr>
<td>101 xun ru-vaq-k' al</td>
<td>xun siento rik'i xun</td>
</tr>
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<td>120 vq-k' al</td>
<td>xun siento rik'i xu-vinaq</td>
</tr>
<tr>
<td>121 xun ru-vaq-k' al</td>
<td>xun siento rik'i xu-vinaq xun</td>
</tr>
<tr>
<td>140 vuq-k' al</td>
<td>xun siento rik'i xun-vinaq</td>
</tr>
<tr>
<td>151 xun siento rik'i ka-vinaq xuwi-laxux</td>
<td>100 + 2 + 20 x 10 + 10</td>
</tr>
<tr>
<td>160 vaq'q'aq-k' al</td>
<td>xun siento rik'i o š-k'al</td>
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<tr>
<td>180 belex-k' al</td>
<td>xun siento rik'i xu-muč'</td>
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<tr>
<td>200 o-tuk</td>
<td>5 x 40</td>
</tr>
<tr>
<td>300 vo-laxux-k'al</td>
<td>15 x 20/ 3 x 100</td>
</tr>
<tr>
<td>500 o-muč' o-k'al</td>
<td>5 x 80/ 5 x 20/ 5 x 100</td>
</tr>
</tbody>
</table>

Native Middle American Languages
Basic vocabulary:

U = \{1 \ldots 9\}  
B^1 = \{10 \text{(laxux)}\}, B^2 = \{20 \text{(winaq-k'\al)}\}, B^3 = \{100 \text{(siento)}\}

A connective: \{rik'i\}

A suffix: \{-V:i\}

1. Decimal below 20.

N_{1,19} = U \pm B^1

2. 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_{1,9}\}

N_{50,99} = nik'ax \text{ 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 \text{ 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_{41,99} = \{N_{1,19}\} + ru-/r-\{3\ldots\} \times B^2 \text{(k'\al)}

3. The word for 100 is borrowed from Spanish, but the coefficients are Cakchiquel.

N_{100,1,19} = \{1 \ldots 9\} \times B^3 \pm \text{rik'i} \pm N_{1,9}

Classical Cakchiquel follows the vigesimal system, but 200 is 5 \times \text{tuk}, and 400 is 5 \times muč'. It appears that \text{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-os-\text{q'o}, and moreover, the word for 400 in Kekchi is osq'ob. Thus 400 should be osq'ob, and 800 is analyzed as ka-osq'o > kaq'o. 900 should not be os-k'al- but o-k'al-; this may be an error.

**Tzutujil [77]**

[DAYLEY 1985: 161-164]
<table>
<thead>
<tr>
<th>Page 332</th>
<th>Native Middle American Languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>oš-laxu:x</td>
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<td>waq-laxu:x</td>
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<td>22</td>
<td>xu-winaq ka'i'</td>
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<td>xu-winaq kab'-laxu:x</td>
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<td>33</td>
<td>xu-winaq oš-laxu:x</td>
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<td>34</td>
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<td>xu-winaq xo'-laxu:x</td>
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<td>36</td>
<td>xu-winaq wxaq-laxu:x</td>
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<td>xu-winaq wuq-laxu:x</td>
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<td>38</td>
<td>xu-winaq waxšaq-laxu:x</td>
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<td>39</td>
<td>xu-winaq b'elex-laxu:x</td>
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<td>40</td>
<td>ka'-winaq</td>
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<td>ka'-winaq xun:n</td>
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<td>ka'-winaq ka'i'</td>
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<td>43</td>
<td>ka'-winaq oši'</td>
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<td>ka'-winaq laxu:x/ nik'ax sye:nta</td>
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<td>51</td>
<td>ka'-winaq xu'-laxu:x/ nik'ax sye:nta xun:n</td>
</tr>
<tr>
<td>52</td>
<td>ka'-winaq kab'-laxu:x/ nik'ax sye:nta ka'i'</td>
</tr>
<tr>
<td>53</td>
<td>ka'-winaq oš-laxu:x/ nik'ax sye:nta oši'</td>
</tr>
<tr>
<td>60</td>
<td>oš-k'axl</td>
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<td>61</td>
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<tr>
<td>80</td>
<td>xumuč'</td>
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<td>81</td>
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<td>100</td>
<td>xun sye:nta</td>
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<td>200</td>
<td>ka'i' sye:nta</td>
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<td>300</td>
<td>oš-i' sye:nta</td>
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<td>400</td>
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<td>500</td>
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<td>800</td>
<td>waxšaq-i': sye:nta</td>
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<td>b'elex-e': sye:nta</td>
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<tr>
<td>1000</td>
<td>xun mi:l</td>
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<tr>
<td>2000</td>
<td>ka'i' mi:l</td>
</tr>
</tbody>
</table>
Basic vocabulary:

\[ U = \{1 \ldots 9\} \]

\[ B^1 = \{10 \text{ (laxu:x)}\}, \quad B^2 = \{20 \text{ (winaq \sim k\'axl)}\}, \quad B^3 = \{100 \text{ (sienta)}\} \]

A suffix: \{-V:\}'

1. The numerals from 20 to 99 are fundamentally vigesimal, but 50 may be formed by half-counting, and 80 is muč'.

\[ N_{50,59} = \{1,2\} \times B^2 (\text{winaq}) \pm \{N_{1.19}\} \]

\[ N_{50,59} = \text{nik\'ax sienta} \pm \{N_{1.9}\} \]

\[ N_{50,59} = 3 \times B^2 (k\'axl) \pm \{N_{1.19}\} \]

\[ N_{80,99} = \text{xumuč} \pm \{N_{1.19}\} \]

The numbers from 50 to 59 may be expressed by \text{nik\'ax sienta} \pm N_{1.9} or by ka-winaq \pm N_{10.19}.

2. 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.

\[ N_{100} = \{1 \ldots 9\} \times B^3 \pm \]

**Xinca [78]**

[Lehmann 1920: 67,734,747] (The original transcription is retained.)

<table>
<thead>
<tr>
<th>Chiquimulilla</th>
<th>Sinacatan</th>
<th>Yupiltepec</th>
<th>Jutiapa</th>
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<tr>
<td>1</td>
<td>ica</td>
<td>ica</td>
<td>ical</td>
</tr>
<tr>
<td>2</td>
<td>pi-ar/ pi</td>
<td>ti</td>
<td>piar/ bial</td>
</tr>
<tr>
<td>3</td>
<td>hual-ar/ cvuá</td>
<td>uala</td>
<td>(h)ualar/ vůalal</td>
</tr>
<tr>
<td>4</td>
<td>iri-ar/ iria</td>
<td>jiria</td>
<td>iriar/ iriahim</td>
</tr>
<tr>
<td>5</td>
<td>püj/ puj ō</td>
<td>puj</td>
<td>püj/ pijar/ piji</td>
</tr>
<tr>
<td>6</td>
<td>tacá/ taca</td>
<td>tacal</td>
<td>tacá/ tácal</td>
</tr>
<tr>
<td>7</td>
<td>puljna</td>
<td>puljuá</td>
<td>puljar/ pulja</td>
</tr>
<tr>
<td>8</td>
<td>jüörte</td>
<td>tapoc/tapuc</td>
<td>apuj</td>
</tr>
<tr>
<td>9</td>
<td>uxtú</td>
<td></td>
<td>gerjar</td>
</tr>
<tr>
<td>10</td>
<td>pakil</td>
<td></td>
<td>paquilar</td>
</tr>
<tr>
<td>11</td>
<td>pakin-cal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>pakin-pi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>pakin-hual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>pakin-irián</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>pakin-püj</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>pakin-tacá</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>pakin-puljna</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>pakin-jüörte</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Basic vocabulary:

\[ U = \{1 \ldots 9\} \]
\[ B^1 = \{10 \text{ (pakin)}\} \]

1. The system seems to be decimal.

\[ N_{1.19} = \pm U^1 + \{N_{1.9}\} \]

**Lenca [D14]**

(Lehmann 1920: 670) (Original transcription)

\[
\begin{array}{ll}
\{\text{Guajuero 1853}\} & \{\text{Similaton}\} \\
1 & \text{ita} \\
2 & \text{naa; (pa)} \\
3 & \text{lagua} \\
4 & \text{aria} \\
5 & \text{ saiha} \\
6 & \text{huie} \\
7 & \text{huisca} \\
8 & \text{teefca} \\
9 & \text{kalapa} \\
10 & \text{isis} \\
11 & \text{isis-l-ita} \\
12 & \text{isis-la-pe} \\
13 & \text{isis-lagua} \\
20 & \text{guamasta} \\
21 & \text{guamasta-l-ita} \\
30 & \text{guamasta-la-isis} \\
40 & \text{cu-eta} \\
50 & \text{cu-eta-la-isis} \\
60 & \text{cu-eta-guamasta} \\
70 & \text{cu-eta-guamasta-isis} \\
\end{array}
\]

Basic vocabulary:

\[ U = \{1...9\} \]

\[ B^1 = \{10 \text{ (isis)}\}, B^2 = \{20 \text{ (guamasta)}\}, B^3 = \{40 \text{ (cueta)}\} \]

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.)

\[
\begin{array}{llll}
\{\text{Conzemus 1921-3}\} & \{\text{von Hagen 1943: 94}\} & \{\text{Lehmann 1920: 67}\} \\
1 & \text{ pani} & \text{ pani} & \text{ pani} \\
2 & \text{ mata} & \text{ mata} & \text{ matiaa} \\
3 & \text{ kont} & \text{ kont} & \text{ contias} \\
4 & \text{ yurupana} & \text{ urupan} & \text{ abrucerua} \\
5 & \text{ komasopani} & \text{ komasopani} & \text{ urubana} \\
6 & \text{ kusi} & \text{ kuspi} & \text{ peve-bane} \\
\end{array}
\]
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.

**Miskitu [81]**

[CONZEUMIS 1929: 81-82]

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>kumi/ kum</td>
</tr>
<tr>
<td>2</td>
<td>wal</td>
</tr>
<tr>
<td>3</td>
<td>yumpa</td>
</tr>
<tr>
<td>4</td>
<td>walwal</td>
</tr>
<tr>
<td>5</td>
<td>matsip/ matasip</td>
</tr>
<tr>
<td>6</td>
<td>matlalkahbi: /matlalka:bi:</td>
</tr>
<tr>
<td>7</td>
<td>matlalkahbi: pu:ra kumi</td>
</tr>
<tr>
<td>8</td>
<td>matlalkahbi: pu:ra wal</td>
</tr>
<tr>
<td>9</td>
<td>matlalkahbi: pu:ra yumpa</td>
</tr>
<tr>
<td>10</td>
<td>matawalsip/matwalsip</td>
</tr>
<tr>
<td>11</td>
<td>matawalsip pu:ra kumi</td>
</tr>
<tr>
<td>12</td>
<td>matawalsip pu:ra wal</td>
</tr>
<tr>
<td>17</td>
<td>matawalsip pu:ra matlalkahbi: pu:ra kumi</td>
</tr>
<tr>
<td>20</td>
<td>ya:wanayska/ ya:wanayska kumi</td>
</tr>
<tr>
<td>21</td>
<td>ya:wanayska pu:ra kumi</td>
</tr>
<tr>
<td>30</td>
<td>ya:wanayska pu:ra matawalsip</td>
</tr>
<tr>
<td>40</td>
<td>ya:wanayska wal</td>
</tr>
<tr>
<td>50</td>
<td>ya:wanayska wal pu:ra matawalsip</td>
</tr>
<tr>
<td>80</td>
<td>ya:wanayska walwal</td>
</tr>
<tr>
<td>99</td>
<td>ya:wanayska walwal pu:ra matawalsip pu:ra matlalkahbi: pu:ra yumpa</td>
</tr>
<tr>
<td>100</td>
<td>ya:wanayska matsip/ andat/ andat kumi</td>
</tr>
<tr>
<td>200</td>
<td>andat wal</td>
</tr>
<tr>
<td>1000</td>
<td>tawsin/ tawsin kumi</td>
</tr>
</tbody>
</table>

Basic vocabulary:

\[ U = \{1, 2, 3, 5\} \]
\[ B^1 = \{6 (matlalkahbi:)\}, B^2 = \{10 (matawalsip)\}, B^3 = \{20 (ya:wanayska)\}, B^4 = \{100 (andat)\} \]

A connective: \{pu:ra\}
The numerals up to 20 are basically vigesimal, but the words for 4, and 6 to 10 are compounds. They are analyzed into roots.

\[6 = \text{mat-lal-kahbi} = \text{hand} + \text{head} + \text{lay upon}, \quad 10 = \text{mata-wal-sip} = 5 \times 2 + \text{sip}\]

\[N_{1,5} = \{1, 2, 3, 4, 5\}\]

\[N_{6,9} = B^1 \pm \text{pu:ra} \pm \{1, 2, 3\}\]

\[N_{10,19} = B^2 \pm \text{pu:ra} \pm \{N_{1,9}\}\]

The numerals from 20 to 99 are vigesimal.

\[N_{20,99} = B^3 \times \{\#, 2, 3, 4, 5\} \pm \{N_{1,9}\}\]

The numerals from 100 up seem to be formed on a new base, \textit{andat}, which seems to be borrowed from English "hundred."

\[N_{100,\infty} = B^4 \times \{1\ldots\} \pm\]

**Sumu [82]**

[CONZEMIUS 1929: 81-82]

<table>
<thead>
<tr>
<th>Ulwa</th>
<th>Panamaka, Twahaka</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>asla/ as</td>
</tr>
<tr>
<td>2</td>
<td>bo / bu</td>
</tr>
<tr>
<td>3</td>
<td>bas</td>
</tr>
<tr>
<td>4</td>
<td>arončka/ arunka</td>
</tr>
<tr>
<td>5</td>
<td>sinčka</td>
</tr>
<tr>
<td>6</td>
<td>tiŋ as kaw as</td>
</tr>
<tr>
<td>7</td>
<td>tiŋ as kaw bo</td>
</tr>
<tr>
<td>8</td>
<td>tiŋ as kaw bas</td>
</tr>
<tr>
<td>9</td>
<td>tiŋ as kaw 'roŋka</td>
</tr>
<tr>
<td>10</td>
<td>salap</td>
</tr>
<tr>
<td>11</td>
<td>salap takat as</td>
</tr>
<tr>
<td>12</td>
<td>salap takat bo</td>
</tr>
<tr>
<td>17</td>
<td>salap takat tiŋ as kaw bo</td>
</tr>
<tr>
<td>20</td>
<td>moyh as loyh</td>
</tr>
<tr>
<td>21</td>
<td>moyh as loyh takat as</td>
</tr>
<tr>
<td>30</td>
<td>moyh as loyh takat salap</td>
</tr>
<tr>
<td>40</td>
<td>moyh as loyh bo/</td>
</tr>
<tr>
<td>50</td>
<td>moyh bo loyh takat salap</td>
</tr>
<tr>
<td>80</td>
<td>moyh as loyh arončka/ moyh arončka loyh</td>
</tr>
<tr>
<td>99</td>
<td>moyh as loyh arončka takat salap takat tiŋ as kaw 'roŋka</td>
</tr>
<tr>
<td>100</td>
<td>moyh as loyh sinčka/ andat as/ andat asla</td>
</tr>
<tr>
<td>200</td>
<td>andat bo</td>
</tr>
<tr>
<td>1000</td>
<td>tawsin as/ tawsin asla</td>
</tr>
</tbody>
</table>

Basic vocabulary:

\[U = \{1, 2, 3, 4, 5\}\]

\[B^1 = \{5' (tiŋ)\}, \quad B^2 = \{10 (salap)\}, \quad B^3 = \{20 (moyh-as-loyh)\}, \]

\[B^4 = \{100 (andat)\}, \quad B^5 = \{1000 (tawsin)\}\]

Connectives: \{kaw\} \{takat, minitkaw\} \{loyh\}
The numerals from 20 to 99 are vigesimal.

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.

100 is expressed either by 20 × 5 or by an English loan, andat.

Cacaopera [D17]

<table>
<thead>
<tr>
<th>[CAMPBELL 1975: 151]</th>
<th>[Brinton 1895: 408] (Original transcription)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 timisa</td>
<td>tibas</td>
</tr>
<tr>
<td>2 búfu</td>
<td>burro</td>
</tr>
<tr>
<td>3 wasba</td>
<td>guabá</td>
</tr>
<tr>
<td>4 botáfo</td>
<td>botarro</td>
</tr>
<tr>
<td>5</td>
<td>panacas</td>
</tr>
</tbody>
</table>

Payá [83]

<table>
<thead>
<tr>
<th>[Lehmann 1920: 653, 651] (Original transcription)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 as</td>
</tr>
<tr>
<td>2 poc</td>
</tr>
<tr>
<td>3 mai/ maig</td>
</tr>
<tr>
<td>4 caa/ ca</td>
</tr>
<tr>
<td>5 aúñqui/ aunquí</td>
</tr>
<tr>
<td>6 séra/ será</td>
</tr>
<tr>
<td>7 tavuá/ taoag</td>
</tr>
<tr>
<td>8 óva/ oguag</td>
</tr>
<tr>
<td>9 tax/ tais</td>
</tr>
<tr>
<td>10 úca/ ucá</td>
</tr>
<tr>
<td>11 uca-r-as</td>
</tr>
<tr>
<td>12 uca-ra-poc</td>
</tr>
<tr>
<td>20 vua-ucá/ wa-ucá</td>
</tr>
<tr>
<td>21 vua-ucá-r-as</td>
</tr>
<tr>
<td>22 vua-ucá-ra-poc</td>
</tr>
<tr>
<td>30 mai-tup</td>
</tr>
<tr>
<td>40 ísca</td>
</tr>
<tr>
<td>41 ísca-r-as</td>
</tr>
<tr>
<td>50 ísca-r-ucá</td>
</tr>
<tr>
<td>60 ísca-r-vuauca</td>
</tr>
<tr>
<td>70 ísca-r-mai-tup</td>
</tr>
<tr>
<td>80 íscar-tapac-poc</td>
</tr>
<tr>
<td>90 ísca-poc-ar-ucá</td>
</tr>
<tr>
<td>100 íspoc</td>
</tr>
<tr>
<td>1000 arcapi-s-as</td>
</tr>
</tbody>
</table>
Basic vocabulary:
U = {1, 2, 3, 4, 5}
B^1 = {5 (kwikwistar), B^2 = {5' (kwik)}, B^3 = {20 (mutkülí)}

Connectives: \{su\} \{atkulin\}

1, 2 The numerals up to 20 are quinary. The words for 10 and 15 are multiples of the base 5, 5' \times 2 + atkulin for 10 and 5' \times 3 + atkulin for 15.
N_{15} = U
N_{10, 15} = B^1 + su + \{N_{15}\}

3 The numerals from 20 up are vigesimal.
N_{20.} = B^2 \times \{1\ldots\} \pm su \pm \{N_{19}\}
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 Bribri, 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."

**Cabécar [87]**

-[LEHMANN 1920: 245, 260-263, 327-328] (Original transcription)

<table>
<thead>
<tr>
<th>Cabécar</th>
<th>Cabécar</th>
<th>Estrella</th>
<th>Chiripó</th>
</tr>
</thead>
<tbody>
<tr>
<td>estaba</td>
<td>ecra</td>
<td>ecra</td>
<td>átkå</td>
</tr>
<tr>
<td>boceteá</td>
<td>bur</td>
<td>bor</td>
<td>bótke</td>
</tr>
<tr>
<td>mañáleui</td>
<td>mañôr</td>
<td>mñor</td>
<td>mañåtk</td>
</tr>
<tr>
<td>queto</td>
<td>quéire</td>
<td>quir</td>
<td>'kítk</td>
</tr>
<tr>
<td>exquetegu</td>
<td>s'quinre</td>
<td>s’quéngr</td>
<td>skár</td>
</tr>
<tr>
<td>sehen</td>
<td>qui-ecra</td>
<td>terlu</td>
<td>skär-ki-átkka</td>
</tr>
<tr>
<td>curo</td>
<td>qui-bur</td>
<td>cur</td>
<td>skär-ki-bótke</td>
</tr>
<tr>
<td>mañor</td>
<td>qui-quir</td>
<td>pagrij</td>
<td>skär-ki-mañåtk</td>
</tr>
<tr>
<td>queire</td>
<td>queire</td>
<td>tenércüh</td>
<td>skär-ki-'kítk</td>
</tr>
<tr>
<td>dose</td>
<td>dobob</td>
<td>d'bom</td>
<td>sårulå-bóbölå</td>
</tr>
<tr>
<td>yanste</td>
<td>sükåe-bóbölå/ sábå ågela</td>
<td></td>
<td></td>
</tr>
<tr>
<td>saáák-bór</td>
<td>bo-ñkålá-móska</td>
<td></td>
<td></td>
</tr>
<tr>
<td>saáák-bôr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>saáák-mañár</td>
<td>bo-ñkålá-móska</td>
<td></td>
<td></td>
</tr>
<tr>
<td>saáák-mañår</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>saáák-ki'ri</td>
<td>bo-ñkålá-móska</td>
<td></td>
<td></td>
</tr>
<tr>
<td>saáák-kiåri</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>saáák-ñkîl</td>
<td>bo-ñkålá-móska</td>
<td></td>
<td></td>
</tr>
<tr>
<td>saáák-ñkålå</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 Bribri, 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."

**Bribri [88]**

-[LEHMANN 1920: 174, 260-262, 327-328] (Original transcription)

<table>
<thead>
<tr>
<th>Bribri</th>
<th>Bribri</th>
<th>Bribri</th>
<th>Bribri</th>
</tr>
</thead>
<tbody>
<tr>
<td>àtôk/á'k</td>
<td>et</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bótôk /bô'k</td>
<td>bur/ bul</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mañåt/ mañåt</td>
<td>m'not/mañår</td>
<td></td>
<td></td>
</tr>
<tr>
<td>kêt/ kêt</td>
<td>quel/ quéire/ quénca</td>
<td></td>
<td></td>
</tr>
<tr>
<td>skêt/ skêt</td>
<td>s'cång</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tådûl/ tådûl</td>
<td>terl/ teri</td>
<td></td>
<td></td>
</tr>
<tr>
<td>kûl/ kûl</td>
<td>cuål/ cuåg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pàkûl/ pàkûl</td>
<td>pagle/ paî/ pa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sùñîto/ sùñîto</td>
<td>sùñito</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dábôp/ dábôp</td>
<td>d'bôb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dábôp-ki-átk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10x2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dábôp-bôdûk / dábôp-bô-diûk</td>
<td>d'bôb-bû-chuc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10x3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dábôp-mañå-diûk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10x4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dábôp-kê-diûk / dábôp-kê-diûk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10x5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dábôp-skê-diûk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10x6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dábôp-dêr-diûk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10x7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The formation is decimal, coefficients following the base, 10.

**Teribe [89]**

*Lerhmann 1920: 174,269* (Original transcription)

<table>
<thead>
<tr>
<th>Teribi</th>
<th>Térraba</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 krará</td>
<td>/kra-rá</td>
</tr>
<tr>
<td>2 púg-da</td>
<td>krá-bu</td>
</tr>
<tr>
<td>3 myá-re</td>
<td>krá-miá</td>
</tr>
<tr>
<td>4 pkégn-de</td>
<td>kra-búking</td>
</tr>
<tr>
<td>5 shkégn-de</td>
<td>/kro-shkin</td>
</tr>
<tr>
<td>6 tér-de</td>
<td>/kro-terre</td>
</tr>
<tr>
<td>7 kógü-de</td>
<td>krá-kók</td>
</tr>
<tr>
<td>8 kwógü-de</td>
<td>/kro-kwong</td>
</tr>
<tr>
<td>9 shkówú-de</td>
<td>/kro-shkap</td>
</tr>
<tr>
<td>10 dwówú-de</td>
<td>/kro-rubób</td>
</tr>
<tr>
<td>11 kingshu-krá</td>
<td>kingsho-krára</td>
</tr>
</tbody>
</table>

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*

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
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<td>1</td>
<td>ti</td>
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<td>2</td>
<td>bu</td>
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<tr>
<td>3</td>
<td>mo</td>
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<td>4</td>
<td>buko</td>
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<tr>
<td>5</td>
<td>rigié</td>
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<td>6</td>
<td>ti</td>
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<tr>
<td>7</td>
<td>kugu</td>
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<td>8</td>
<td>kuo</td>
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<td>9</td>
<td>honkon</td>
</tr>
<tr>
<td>10</td>
<td>hoto</td>
</tr>
<tr>
<td>11</td>
<td>hoto biti ba-ti</td>
</tr>
<tr>
<td>12</td>
<td>hoto biti bo-bu</td>
</tr>
<tr>
<td>13</td>
<td>hoto biti bo-mo</td>
</tr>
<tr>
<td>20</td>
<td>gre</td>
</tr>
<tr>
<td>30</td>
<td>gre biti kro-hoto</td>
</tr>
<tr>
<td>40</td>
<td>gre kete-bu</td>
</tr>
<tr>
<td>50</td>
<td>gre kete-bu biti kuo-hoto</td>
</tr>
<tr>
<td>60</td>
<td>gre keta-mo</td>
</tr>
<tr>
<td>80</td>
<td>gre keta-buko</td>
</tr>
<tr>
<td>100</td>
<td>gre keta-rigíé</td>
</tr>
</tbody>
</table>
Numerals classifiers occur before the numerals. Since there is some morphological change between the forms, all of them are given below.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
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</tr>
</thead>
<tbody>
<tr>
<td>ba-ti</td>
<td>bo-bu</td>
<td>bo-mon</td>
<td>bó-boko</td>
<td>bo-rigied</td>
</tr>
<tr>
<td>da-ti</td>
<td>do-bu</td>
<td>do-mon</td>
<td>dó-boko</td>
<td>do-rigied</td>
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<tr>
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<td>ni-bu</td>
<td>ni-mon</td>
<td>ni-buko</td>
<td>ni-rigied</td>
</tr>
<tr>
<td>ka-ti</td>
<td>ko-bu</td>
<td>ko-mon</td>
<td>kó-boko</td>
<td>ko-rigied</td>
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<tr>
<td>kra-ti</td>
<td>kro-bu</td>
<td>kro-mon</td>
<td>kro-bogo</td>
<td>kro-rigied</td>
</tr>
<tr>
<td>kuo-ti</td>
<td>ku-bu</td>
<td>ko-mon</td>
<td>kó-bogwo</td>
<td>kuo-rigied</td>
</tr>
<tr>
<td>kun-ti</td>
<td>kun-mun</td>
<td>kun-mon</td>
<td>kun-buko</td>
<td>kun-rigied</td>
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<tr>
<td>menani</td>
<td>mena-mu</td>
<td>mena-mo</td>
<td>menam-buko</td>
<td>mena-rigied</td>
</tr>
<tr>
<td>oto-ki-ti</td>
<td>oto-bu</td>
<td>ota-mon</td>
<td>otá-buko</td>
<td>ota-rigied</td>
</tr>
<tr>
<td>kete-ti</td>
<td>kete-bu</td>
<td>keta-mon</td>
<td>keta-buko</td>
<td>keta-rigied</td>
</tr>
<tr>
<td>kobo-ti</td>
<td>kobo-bu</td>
<td>kobo-mon</td>
<td>kobo-buko</td>
<td>kobo-rigied</td>
</tr>
<tr>
<td>kude-ti</td>
<td>kudé-bu</td>
<td>kudé-mon</td>
<td>kudé-buko</td>
<td>kudé-rigied</td>
</tr>
<tr>
<td>tai-ti</td>
<td>ta-bu</td>
<td>ta-mon</td>
<td>tá-buku</td>
<td>ta-rigied</td>
</tr>
<tr>
<td>ungrai-ti</td>
<td>ungra-bu</td>
<td>ungra-mon</td>
<td>ungrá-buko</td>
<td>ungrá-rigied</td>
</tr>
</tbody>
</table>

Basic vocabulary:

\[ U = \{1 \ldots 9\} \]
\[ B_1 = \{10 \text{ (hoto)}\}, B_2 = \{20 \text{ (gre)}\} \]
Interactive 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.
   \[ N_{20,100} = B_2 \times \text{(kete)} \times \{#,2\ldots5\} \pm \text{biti} \pm \text{NUCL} \pm \{N_{1,19}\} \]

### Cuna [92]

[LEHMANN 1920: 175] (Original transcription)  
[Holmer 1946: 189]

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>cu-énchique</td>
<td>1</td>
<td>K-ena</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pócua</td>
<td>2</td>
<td>po(o)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>págua</td>
<td>3</td>
<td>pa(a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>paguégua</td>
<td>4</td>
<td>pakke</td>
<td></td>
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</tr>
<tr>
<td>atále</td>
<td>5</td>
<td>attale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nércua/nerícua</td>
<td>6</td>
<td>nerke*ed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cublégue</td>
<td>7</td>
<td>kulle</td>
<td></td>
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</tr>
<tr>
<td>pabáca</td>
<td>8</td>
<td>paapakka</td>
<td></td>
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<tr>
<td>paquébague</td>
<td>9</td>
<td>pakkepakka</td>
<td></td>
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</tr>
<tr>
<td>ambégui</td>
<td>10</td>
<td>ampeki</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>tulábuena</td>
<td>20 × 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>tulá-pocua</td>
<td>20 × 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>tulá-atále</td>
<td>20 × 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

```
ni = withijid / 'ali withijid [Zepeda 1983: 37, 38]
my = for / child for
“for me” “for the child”
```

```
am iḍa g kii / am kii-č iḍa
LOC in ART house /LOC house-ABS in
“in the house”
```

(3-i) GN-(ga)

```
čioj kotoñ / husi jiwi-ga / husi wiñag [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)j G
NG may occur when a possessed noun is marked by the genitive -(i)j.

```
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 [Saxton 1982: 185]
   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

```
ni = 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

```
hai g gi’igid čioj [Saxton 1982: 199]
some ART big men
“some big men”
```
Nevome (Pima Bajo) [3]

(1) SOV
uburhi vusi hunu kupurhu’-t’-igi suri
wind all corn flat-PERF-IRREALIS do
“The wind flattened all the corn.”

(2) Po
ikama saidukama bumatu
these Spaniards with
“with these Spaniards”

(3) GN (-di)
Pedro honiga-di / Francisco gaga
Pedro wife-POSS / Francisco field
“Pedro’s wife” “Francisco’s field”

(4) AN
pa-parh wipuidag-kama
bad (PL-DUPLICATION) heart-one
“bad hearts”

(5) PN
ni-kuna
my-husband
“my husband”

(6) DN
ika nuoki
this speech/word
“this speech/word”

(7) QN
ikama goko gagto
these two bows
“these two bows”

Northern Tepehuan [4]

(1) VSO
takávo savili piid’úru iímádu ándiriśi múi iikoli áán im-viltari
yesterday bought Pedro with Andrew many orange me me-for
gi-tumifíśi-ga-kidi
their-money-POSSD-with
“Yesterday Peter and Andrew bought many oranges for me with their own money.”

(2) Po
váaki ibigi / giá-ibigi
house behind / my behind
“behind the house” “behind me”

(3) GN-3
dulíansa kii-d’í-ri
Lencho house-his-at
“at Lencho’s house”
(4) AN
kavá vásoi
hard grass
“hard grass”

(5) PN; however, note that in the 3rd person singular the order is NP
ğii-kii / dii-di
my house / mother-his
“my house” “his mother”

(6) DN
go-toóšii
the rabbit
“the rabbit”

(7) QN
mǘdrů kuukúdagi
many lights
“many lights”

Tarahumara [6]

(1) SOV
huáni hoso ča'pi-le
Juan José grab-PAST
“Juan grabbed José.”

(2) Po
gali-mópa
house-on top
“on top of the house”

(3) GN-la
alué kantelario upí-la
that Candelario wife-POSS
“Candelario’s wife”

(4) AN
u’tá rió
small man
“small man”

(5) PN
mué si’púča-la
you dress-POSS
“your dress”

(6) DN
alué rió
that man
“that man”

(7) QN
we’ká rió
many man
“many men”

[Bascom 1982: 340]
[Bascom 1982: 312]
[Bascom 1982: 279]
[Bascom 1982: 332]
[Burgess 1984: 9]
[Burgess 1984: 64]
[Burgess 1984: 61]
[Burgess 1984: 54]
[Burgess 1984: 27]
[Burgess 1984: 9]
[Burgess 1984: 85]
Yaqui [8]

(1) SOV
inepo em misi-ta biča-k
I your cat-DEP see-REALIZED
"I saw your cat."

(2) Po
in usi-ta bečibo
my child-DEP for
"for my child"

(3) G-ta N
itom pare-ta kari
our priest-DEP house
"our priest’s house"

(4) AN
hu b’e’u kari
this big house
"this big house"

(5) PN
bem kari
their house
"their house"

(6) DN
ini-me misi-m
this-PL cat-PL
"these cats"

(7) QN
si’ime usi-m / naiki oow-im
all child-PL / four man-PL
"all children" "four men"

Mayo [9]

(1) SOV
Dios em ċanía
God you help
"God help you."

(2) Po
kanásta-po
basket-in
"in the basket"

(3) G-ta N
huan-ta huubi
Juan-of wife
"Juan’s wife"
(4) AN
sawali wikit
yellow bird
"yellow bird"

(5) PN
in sąayo
my enemy
"my enemy"

(6) DN
hikä’a báihewa
this mist
"this mist"

(7) QN
wohi-bahi palabra-m
two-three word-PL
"two or three words"

Cora [10]

(1) VSO
ra-a-hë’ika ifidel i t’āška
DISTR:SG-COMP-kill ART Fidel ART scorpion
"Fidel killed the scorpion."

(2) Po
káuhna-ri kime’e
rope-ABS with
"with a rope"

(3) GN / N-(a)ra’an G / N-ra G
sáantos i p’āh / hinya-ra’ara’an i dioniisia
Santos chair / spindle-ABS-NONREFL POSS ART Dionisia
"Santo’s chair" “Dionisia’s spindle”
i nana-ra i pari
ART mother-NONREFL POSS (his) ART boy
"the boy’s mother"

(4) AN

(5) PN
n’e-siiku’u / karí-ra’an
my-shirt / bone-NONREFL POSS (its)
"my shirt" "its bone"

(6) DN
i t’aakú
ART toad
"the toad"

(7) QN
anśh n’íñe’ira’a cahta’a
five year within
"within five years"
Huichol [11]

(1) SVO
ne tei pu ica hiyame
"my mother AUX weave band"
"My mother weaves bands."

(2) Po
ne ki-e heima
"my house on"
"on my house"

(3) GN-ya
ne macika hiyame-ya
"my brother band-GEN"
"my brother's band"

(4) NA
rupureru mihekʷa
"hat new"
"new hat"

(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"

(6) DN
miki ciki
"the dog"

(7) QN
uume tumi:ni
"two bits"
"two bits (money)"

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 aλ i-itik
"in the water" "into the water"

[STEELE 1976: 34, 37]

water-in / the water its-into

[STEELE 1976: 34, 37]

no-yaka-pan / i-pan no-yak
my-nose-in its-in my-nose
"in my nose"

[SULLIVAN 1976: 139]
(3) 3-NG /G 3-N

i-pe\l / in i-teokal \lak [SULLIVAN 1976: 52, 65]
its-mat grandmother / the its temple Tlaloc
"grandmother's mat" "the Tlaloc temple"
in siwa\l i-yomio / in tonatiw i-nan [STEEL 1976: 37]
the woman her-bones / the sun his-mother
"the woman's bone" "the sun's mother"

(4) AN/NA

kana:wak k*e:i\l / k*e:i\l kana:wak [ANDREWS 1975: 269]
thin skirt / skirt thin
"thin skirts / skirts are thin"

(5) PN

no-kal [SULLIVAN 1976: 46]
my-house
"my house"

(6) DN

in in siwa\l [SULLIVAN 1976: 65]
this woman
"this woman"

(7) QN

na:w-\iwi\l [ANDREWS 1975: 185]
4-year
"four years"

Tezcoco Nahuatl (San Jerónimo) [12]

(1) SVO

n \swan o\lacacak* n pwerta [LASTRA DE SUÁREZ 1980: 99]
ART Juan shut ART door
"Juan shut the door."

(2) Po/Pr

mesa-pa / te\c i n te:pe [LASTRA DE SUÁREZ 1980: 19, 30]
table on / in ART mountain
"on the table" "in the mountain"

(3) 3-NG/ N de (n) G

i-ten in komalli / in kabayo den \swan [LASTRA DE SUÁREZ 1980: 106]
his edge ART comal / ART horse of Juan
"the edge of the comal" "Juan's horse"

(4) NA

k\awti k*a k\awtike [LASTRA DE SUÁREZ 1980: 18]
tree tall
"tall tree"

(5) PN

no-kone-w [LASTRA DE SUÁREZ 1980: 13]
my-son-POSS
"my son"
Native Middle American Languages

(6) DN
n te\'l
ART stone
"the stone"

(7) QN
miyake pipiltoton
many children
"many children"

Tetelcingo Nahuatl [12]

(1) SVO
sente \l\oka\l\ #-ki-pya-ya sente puro
one man SUBJ-OBJ-have-IMPERF one donkey
"A man had a donkey."

(2) Po/Pr
i-htek no-ksi / \l\il-pa
its-inside my-foot / earth-on
"in my foot" “on the ground"

(3) 3-NG
i-n\omin mali
his-husband Maria
"Maria’s husband"

(4) NA
i-m\oc wohk\.i
his-hand dry
"his withered hand"

(5) PN
no-\l\ol
my-land
"my land"

(6) DN
inu \l\oka\l
that man
"that man"

(7) QN
meyak hiente
much people
"lots of people"

North Puebla Nahuatl (Tlaxpanaloya) [12]

(1) SVO/VOS
Entonses E. okiki\'sti in sigaro
then E. took out the cigarette
"Then E. took out a cigarette."

(2) Po/Pr
mil-ten-ko / i-ten-\l\a in a\l
field-edge-to / its-edge-at the water
"border of field" “at the edge of the water"
Database 3: Word Order Typology

(3) 3-NG
i-wik i-telpoč in pančo
his-hoe his-boy the Pancho
"Pancho's boy's hoe"

(4) AN
in weyi kali
the big house
"the big house"

(5) PN
no kal
my house
"my house"

(6) DN
inon čiči
that dog
"that dog"

(7) QN
nočin in kafen
all the coffee
"all of the coffee"

Huasteca Nahuatl (Huautla) [12]

(1) VSO/SVO/VOS
ki-ita-k yahaya i-čiči
it-see-PAST he his-dog
"he saw his own dog."

(2) Po/Pr
i-pan no-mila / no-kal-teno
its-place my-field / my-house-outside
"in my field" "outside my house"

(3) 3-NG
ne i-kone wan
the his-child Juan
"Juan's child"

(4) AN
sch weyi mačete
one big machete
"one big machete"

(5) PN
no siwa
my wife
"my wife"

(6) DN
nopa amal
that paper
"that paper"

(7) QN
miak tomin
much money
“much money”

Nahual (Pómaro, Michoacan) [13]

(1) SVO
tewal ti-k-cayana-s k*awil
you you-it-split-FUT wood
“You will split wood”

(2) Po/Pr
šali-pan / pan kostales
sand-on / in bags
“on the sand” “in bags”

(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”

(4) NA
se kali k*ali wan k*ahti-k
a house good and tall-PERF
“a good and tall house”

(5) PN
i-siwa
his-woman
“his wife”

(6) DN
in al
the water
“the water”

(7) QN
miak al
much water
“much water”

Istmo Nahuat (Mecayapan/Pañapan) [14]

(1) SVO
wa: neh nigitak ho:n gawāh iyikpata tepes:t
and I saw that horse above mountain
“And I saw that horse on the mountain.”
Database 3: Word Order Typology

(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]

(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:1 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 iλwi'
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-ihiš ne siwa: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"

(6) DN  
ne pe:lu  
the dog  
"the dog"

(7) QN  
miyak tahta:kamet  
many men  
"many men"

*Cuitlatec [D7]*

(1) SVO  
a'xú-ťa čunwi-ťi tě'li pať'i  
husband-her catch-CMP a jaguar  
"Her husband caught a jaguar."

(2) Pr  
a'p-onó  
until there  
"until there"

(3) NG  
dudu-1-tumi  
pot-of-water  
"a pot of water"  
ťať-ahš'íi  
tree-plum  
"plum tree"

(4) AN  
ebó'li piké-la  
thick back  
"thick back"

(5) NP  
ťa-yi  
house-my  
"my house"

(6) DN  
i-mihku  
the dog  
"the dog"

Serí [20]

(1) SOV  
xuan ki' 'aXi kom i-yo:-k*  
Juan the dog the OBJ-MOOD-kill  
"Juan killed the dog."
Database 3: Word Order Typology

(2) Po
'amen ak ano
house ART in
"in the house"

(3) G 3-N
ša:' ki' i:me ak
sun ART its house ART
"the sun's house"

(4) NA
Xika kipXa
thing that are little
"little things"

(5) PN
'i-ta / mi-nai'
my-mother / your-skin
"my mother" "your skin"

(6) ND
ktam ki'
man ART
"the man"

(7) NQ
ktam šo
man a
"a man"

Tarasco [21]

(1) SVO
mariá kačükuska inté-ni k*biřípita
Maria cut the-OBJ meat
"Mary cut the meat."

(2) Po
kučiyu šimpó
knife with
"with a knife"

(3) G-ri N / N G-ri
tátu čiti-ri wiču
my father-GEN dog
"my father's dog"
waci ačati-eri
son man-GEN
"the man's son"

(4) NA
wiču t*aréti-iča
dog old-PL
"old dogs"
(5) PN/NP
šučí táti / táti šučí-ti
my papa / papa my
“my father”

(6) DN
inté cùnsu
this pot
“this pot”

(7) QN
ta'mičukwa škũrũiča
three leaves
“three leaves”

Totonac [22]

(1) SVO
hose máqnil lúwa’
José killed snake
“José killed the snake.”

(2) Pr
nak čik'i
in house
“in the house”

(3) 3-NG / N šla G
iš puskat hose
his woman José
“José’s wife”
liq̕a'tawaq'a šla lik'ũč'u
book 3sg.PRONOUN medicine
“the book of medicine”

(4) AN
st'iriki' taqnu'
round hat
“a round hat”

(5) PN
kin čičí'
my dog
“my dog”

(6) DN
he'ẽ čiwiš
this stone
“this stone”

(7) QN
lúwa' lackleumahān
many children
“many children”
Chichimec [24]

(1) SOV
péló injó énu‘u
Pedro he he-sees
“Pedro sees him.”

(2) Po
málpá súnga
their-fire edge
“around the fire”

(3) GN
cúcé kánthe
José hair
“José’s hair”

(4) NA
narhé nánde’
knife big
“big knife”

(5) Noun paradigm for inflection of possessive for “house”

<table>
<thead>
<tr>
<th>Person</th>
<th>Singlar</th>
<th>Dual</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>ko´ós</td>
<td>ko´ós-um’ (excl.)</td>
<td>ko´ós-hu’ (excl.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ko´ós-és (incl.)</td>
<td>ko´ós-in (incl.)</td>
</tr>
<tr>
<td>2nd</td>
<td>ut´ós</td>
<td>ut´ós-és</td>
<td>ut´ós-in</td>
</tr>
<tr>
<td>3rd</td>
<td>ut´is</td>
<td>ut´is-és</td>
<td>ur´ós</td>
</tr>
</tbody>
</table>

(6) DUN
kíni síma’an
this dog
“this dog”

(7) QN
nt’a síma’an
one dog
“one dog”

Southern Pame [25]

(1) SVO/SOV
ka gtao’ mugu
I am cutting meat
“I am cutting meat.”

ka nci kyo’a
I pots make
“I make pots.”

(4) NA
kudú škandóa
stone white
“white stone”
Matlatzinca [26]

(1) VOS
mán-thi in-téyu the-tio
COMP-bring the-lamp my-uncle
"My uncle was bringing the lamp."

(2) Pr
pi-n-ča-wewí
in-ʔ-ear-DUAL
"in the ears"

(3) 3-NG
ni'-papá wétowá'a
his-father child
"the father of the child"

(4) AN
ni-khaná čhówi
ART-good mushroom
"good mushrooms"

(5) PN
the-tio
my-uncle
"my uncle"

(6) DN
in-téyu
ART (SG)-lamp
"the lamp"

Ocuittec [27]

(1) SVO
mtaaw wira ne-líthaa tyi-ca-hní ne-yoš
yesterday these PL-bird eat PL-worm
"Yesterday these birds ate worms."

(2) Pr
pi skueela
in school
"in the school"
(4) AN
mtuwa
"a little child"

(5) PN
p-kućala / li-tumi
my-spoon / your-money
"my spoon" "your money"

(6) DN
wira ne-lithaa
these PL-bird
"these birds"

wińya nmeša
this table
"this table"

(7) QN/NQ
mwoo šaalu / kasuelu mphiuu
two jug / pot four
"two jugs" "four pots"

Otomi [28]

(1) VOS
pe'ca 'na ra ngu nu'α ra riko
he-has-it one the house that the rich-man
"That rich man has one house."

(2) Pr
xά ra tai
at the market
"at the market"

(3) 3-NG
nu rá ngu ra šuwa
that his house the Juan
"Juan's house"

(4) AN
'na ra dānga do
one the big stone
"one big stone"

(5) PN
ma ngu
my house
"my house"

(6) DN
nu'α ya ngu
those the house
"those houses"
Mazahua [29]

(1) VOS/SVO
mi ne ndehe e pihomi
PAST PROG want water ART pig
“The pig wanted water.”

(2) Pr
kha khínhni
on metate (grinding stone)
“on the metate”

(3) 3-NG
o baga e tinu
her cow ART Tina
“Tina’s cow”

(4) AN
t’ór thp
white corn
“white corn”

(5) PNP
i baga go / i baga gue / nu nana
PRON cow PRON / PRON cow PRON mother
“my cow” “your cow” “his mother”

(6) DN
k’i e ngo’o
that ART mouse
“that mouse”

(7) QN
c’i’tá burru
five donkey
“five donkeys”

Tlapanec [30]

(1) VOS/ VSO~SVO
na’kho³ šu’wi³ ja’má (O = inanimate)
eat meat boy
“The boy eats meat.”
ndi’yó:³ a’da³ a’go³ (O = animate)
saw child woman
“The woman saw the child.”
Database 3: Word Order Typology

(2) Pr
na:¹ me³jo³

to village
"to the village"

(3) N-3 G
šti:j:² ša³bo³ cu¹kho⁴

his hat person that
"that person's hat"

(4) NA
ši:j:¹² mi²ša¹

clothes white
"white clothes"

(5) NP

my hat / your hat / his hat
"my hat" "your hat" "his hat"

(6) ND
šwa²he e³ri³ge³

village this
"this village"

(7) QN
mba²ªa² i³štu²

many basket
"many baskets"

**Ixcatec [31]**

(I) VSO
ci³ka¹ na²mi³cye²e² šku² lo³na¹

seized grandfather point canvas
"The grandfather seized the point of the canvas."

(2) Pr
k’a¹ ya³a¹

among tree
"among the trees"

(3) N-3 G
ške¹ ya³a

its-leaf tree
"the leaf of the tree"

(4) NA
nja² nda³dj:³j:

house old
"old house"

(5) NP
nje³ye³-ña³na³

grandson-my
"my grandson"
(6) ND
\[mi^2'a^2-ra^2\]
woman-that
"that woman"

(7) QN
\['u^2'ca^1 \, \tilde{\text{k}}^\text{'ka}^3\]
many grass
"many grasses"

**Popoloc [32]**

(1) VSO
\[khoi^e'el^na^2 \, s^j^i \, ni'nko^2\]
built they church
"They built the church."

(2) Pr
\[\tilde{s}^e'h^e^2 \, ni'nko^2\]
inside church
"inside the church"

(3) NG
\[\tilde{s}^e'h^e^2 \, valensio\]
child Valencio
"Valencio's child"

(4) NA
\[\tilde{c}^o'h^ni^2 \, hi'n^a^2\]
person good
"a good person"

(5) NP
\[\tilde{s}^e'h^e^2 \, \theta^a^3\]
child her
"her child"

(6) DND
\[t^i^i \, \tilde{\text{s}}^h^a^3 \, a^3\]
that children that
"those children"

(7) QN
\[\tilde{\text{p}}^\text{che}^1 \, \tilde{\text{c}}^o'h^ni^2\]
many people
"many people"

**Chocho [33]**

(1) SVO[vso]
\[sa^1 \, \tilde{\text{z}}^u^3 \, ndoa^3 \, ndu^1 \, ku'n^i'^ri^3 \, sa^1 \, u^2 \, nia^2\]
the NCL man ? killed-he the NCL dog
"The man killed the dog."

\[\tilde{\text{b}}^i'\tilde{\text{k}}^o^3-a^1-mi^3\]
saw-I-you
"I saw you."
(2) Pr
ko² nča³
inside house
"inside the house"

(3) N-3 G
ndiu²-e²² u² ku³-ša¹
meat-his NCL armadillo
"meat of the armadillo"

(4) NA
u² nia²¹ tie²¹ me¹²
NCL dog black that
"that black dog"

(5) NP
u² nia²¹ ni¹ / u² ni³ nga³ / ndaša dijə¹
NCL dog our (INC) / NCL dog-your
"our dog" "your dog"

(6) DND/DN/ND
sa¹ nča³ dij¹² / sa¹ ni³ nga³ / ndaša dijə¹
the house this / the church / basket that
"this house" "the church" "that basket"

(7) QN
niu²¹ nia³ / ka² tiə² na³ ša³
four tortilla / many sarape
"four tortillas" "many woolen ponchos"

Mazatec [34]

(1) SVO
eduardo ka³ va³ ce³ na³ hno⁴
Eduardo bought tobacco
"Eduardo bought tobacco."

(2) Pr
ya³ ni² ti⁴²
in road
"in the road"

(3) NG
nt'ia³ la³ hao⁴
house stone
"stone house"

(4) NA
na³ šo¹ ni³³
flower red
"red flower"

(5) NP
ško³ / škô³ / škô⁴
my-eye / your-eye / his-eye
"my eye" "your eye" "his eye"
(6) DND
   hez ñiA-vi4
   these children-here
   "these children"

(7) QN
   nkhi2 coA'hami23
   many thing
   "many things"

Amuzgo [35]

(1) VSO
   ha4 hndæ14 ya3 cma3 cha'm he3
   go sell I cotton town now
   "I go to town to sell cotton now."

(2) Pr
   se14 c'a'm
   back tree
   "behind the tree"

(3) NG
   cua3 tai'na'mca3
   clump pineapple
   "a clump of pineapples"

(4) NA
   ka'so4 cho1 cma3ti2
   horse little your animate possession
   "your little horse"

(5) NP
   ka'so4 cma3t'a1
   horse my animate possession
   "my horse"

(6) ND
   n'a4'm ñko2 ma13
   word new this
   "this new word"

(7) QN
   kwj2 w'a'hnde4 cho1
   one airplane little
   "a little airplane"

Mixtec (Atatlahuca) [36]

(1) VSO
   ñiA'ko4 ña'a2 u2 tili'k'p'i3 nu'u3 maestro
   sell woman the potato to teacher
   "The woman sells potatoes to the teacher."
(2) Pr

\[ i'ni^2 \text{ ve'e}^2 \]

in house

"in the house"

(3) NG

\[ l'e'lu^1 \text{ huan} \]

hat Juan

"Juan's hat"

(4) NA

\[ yu'\text{nu}^2 \text{ ka'nu}^2 \]

tree big

"a big tree"

(5) NP

\[ ti^3 \text{ ki'ti}^2 \text{ yo}^1 \]

the animal our

"our animal"

(6) ND

\[ \text{fi'a}^2 \text{ yu'k*a}^3 \]

woman that

"that woman"

(7) QN

\[ k*e'he^3 \text{ ti'k*pti}^1 \]

many potato

"many potatoes"

**Cuicatec [37]**

(1) SVO

\[ \text{huan}^{14} \text{ ne}^1 \text{ e'i'ni'\text{u}^4 \text{ s}a^2 \text{ ku'\text{c}i}^1 \text{ ye'^e}^4 \text{ s}a^2 \text{ mm'a'ti'a}^1} \]

Juan CONJ killed he pig of he in this morning

"Juan killed his pig this morning."

(2) Pr

\[ nd'u'k*a^4 \text{ pre'si'de'nte}^4 \]

with president

"with the president"

(3) NG (N ye'^e^4 G)

\[ tu^{14} \text{ ka'ka}^1 \]

stone lime

"limestone"

\[ \text{mo'li'ho}^4 \text{ ye'^e}^4 \text{ y'u'ne}^{24} \]

mill of wind

"wind mill"

(4) NA

\[ y\text{ra}^{24} \text{ nd'a}^{12} \]

villages good

"good villages"

[ALExANDER 1980: 79]

[ALExANDER 1980: 52]

[ALExANDER 1980: 69]

[ALExANDER 1980: 57]

[ALExANDER 1980: 69]

[ALExANDER 1980: 76]
Trique (Chicahuaxtla) [38]

(1) VSO
gida’a34 zuwe1 ’ngo4 žato3
caught dog one rabbit
“The dog caught a rabbit.”

(2) Pr
ria’h34 we93e
on wall
“on the wall”

(3) NG
ku1 ro’o’2
bone our-hand
“the bone of our hand”

(4) NA
sa93 lih3
thing little
“little thing”

(5) NP
dukua2 zo’5
house your
“your house”

(6) ND
nawi3 nāh3
hat this
“This hat”

(7) QN
ga’i5 žuh3
many animal
“many animals”

[Anderson & Concepción Roque 1983: 56]
[Anderson & Concepción Roque 1983: 75]
[Anderson & Concepción Roque 1983: 103]
[Anderson & Concepción Roque 1983: 39]
[Anderson & Concepción Roque 1983: 112]
[Anderson & Concepción Roque 1983: 73]
[Anderson & Concepción Roque 1983: 268]
[Anderson & Concepción Roque 1983: 259]

Native Middle American Languages

[Good 1979: 56]
[Good 1979: 75]
[Good 1979: 103]
[Good 1979: 39]
[Good 1979: 112]
[Good 1979: 73]
[Good 1979: 21]
Zapotec (Yatzachi) [39]

(1) VSO

če'eX  kabeyon'  nis  
horse is drinking water
“The horse is drinking water.”

(2) Pr

len  mšet  
with machete
“with the machete”

(3) NG

ža  no’olon’  
clothes woman
“woman’s clothes”

(4) NA

de’e  kobo  
thing new
“new thing”

(5) NP

yičX-a’  
head-my
“my head”

(6) ND

yo’o-n(o’)  
house the
“the house”

(7) QN/(NQ)

tag  go’on  /  zan  libr  /  libr  zan  
four ox  /  many book  /  book many
“four oxen”  “many books”

Chatino [40]

(1) VSO

nd’ata  ngu’  kičj  re  kiča’  
plant people village this chilli
“People of this village plant chilli.”

(2) Pr

loo  mesa  
on table
“on the table”

(3) NG

ste’  št’a’a  
clothes his mother
“his mother’s clothes”
Native Middle American Languages

(4) NA
ská ni’i t’u
one house big
"a big house"

(5) NP
ni’i ’na
house my
"my house"

(6) ND
ni’i huá
house that
"that house"

(7) QN
t’u t’a na’áni
various animal
"various animals"

Chinantec [41]

(1) VSO
r’už’31 ’nú1 ’my’2 t’áh’232
wash you clothes mine
"You wash my clothes."

(2) Pr
kóh’31 páž’2
with Frank
"with Frank"

(3) N-3 G
šuíž’232 t’á’1 wó1
child his Juan
"Juan’s child"

(4) NA
cá’ñúž’3 cá’2 feiž’13
man person big
"a big man"

(5) NP
’ñúž’13 ná’2 / ’ñúž’13 hna’2
waist my / waist my
"my waist"

(6) (D)ND
’t2 šuíž’232 nó’2 [ROBBINS 1968: 117]
kaw’1 la’2
the child there
"this rock"

(7) QN
’táiž’2 niž’1 li’1
many kind flower
"many kinds of flowers"
Huave [42]

(1) SVO
   a:ga naṣey k'ām șowi’y 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-k’al maria
   his-clothes her-son Maria
   “the clothes of Maria’s son”
   [STAIRS & HOLLENBACH 1981: 293]

(4) AN
   ahkiw namb’or pet kam
   these black dog here
   “these black dogs”
   [STAIRS & HOLLENBACH 1981: 310]

(5) PN
   șe-k’al
   my-son
   “my son”
   [STAIRS & HOLLENBACH 1981: 292]

(6) DND
   a:ga nenč k’ah
   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
   t’ēxuy mango lāyw’á
   is-eating mangoes the-my-child
   “My child is eating mangoes.”
   [WATERHOUSE 1967: 360]

(2) Pr
   máx-mēxuł
   in-the-hammock
   “in the hammock”
   [WATERHOUSE 1967: 357]

(3) NG
   P’ikwáana lakwé’ / P’iṭ’āata dábíd
   the-sickness the-man / the-father David
   “the sickness of the man” “David’s father”
   [WATERHOUSE 1967: 359]
Native Middle American Languages

(4) AN
láz'ya awáata
the-little girl
"the little girl"

(5) PN
I-a-y-mí³'ya
the-my-dog
"my dog"

(6) DN
lán-mul'í'
the-boys
"the boys"

(7) QN
nü³' läkán'ó' / kán'c'úš múu³'t'ya
one woman / six month
"one woman" "six months"

Zoque (Copainalá) [44]

(1) VOS
ti³'k čihku suñipi pokskuy is nda³'s
Yesterday made pretty chair I my-papa-ERG
"Yesterday my father made a pretty chair."

(2) Po
tuwi-hí'ŋ
dog-with
"with the dog"

(3) G-'is 3-N
tei³' pi³'ni³'s tyik
the man-ERG his house
"the man's house"

(4) AN
hometambi pokskuy
new chair
"new chairs"

(5) PN
mis n-dik
you your-house
"your house"

(6) DN
tei³' tuwi-ta³'m
the dog-PL
"the dogs"

(7) QN
sone pin
various man
"various men"
Zoque (Francisco León) [44]

(1) SVO
  yomo'is tyjivitu'yahpa ane
  woman-ERG turn over tortilla
  "The women turn over tortillas"

(2) Po
  ndik-mi
  my house to
  "to my house"

(3) G-'is 3-N
  une'-is kyi'
  child-ERG his hand
  "the child's hand"

(4) AN/NA
  vihpi kuy / kuy vihpi
  good tree / tree good
  "a good tree"

(5) PN
  ndik
  my house
  "my house"

(6) DN
  yiŋ tuku
  this clothes
  "these clothes"

(7) QN/NQ
  viti pin
  many people
  "many people"
  tuyi meckuy / meckuy tuyi
  dog two / two dog
  "two dogs"

Sierra Popoluca [45]

(1) SVO
  iŋ-yo:mo i-me'c-pa kawah
  your-wife she-seek-INCOMP horse
  "Your wife is looking for the horse."

(2) Po/Pr
  ká:m-ho:m
  milpa-in
  "in the milpa"
  kon šiwan
  with Juan
  "with Juan"

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”
šiwan i-kawah
Juan his-horse
“Juan’s horse”

[Marlett 1986: 375]

(4) AN
woyó tik
round house
“a round house”

[Elson 1960: 24]

(5) PN
an-tik
my house
“my house”

[Elson 1960: 32]

(6) DN
yip kawah
this horse
“this horse”

[Marlett 1986: 380]

(7) QN
tun koŋkoy
one chair
“one chair”

[Marlett 1986: 373]

Sayula Popoluca [46]

(1) Free

(2) Po/Pr
tin-tik-m
my-house-at
“at my house”
mit tin-ci’hat
with my-aunt
“with my aunt”

[Clark 1962: 186]

(3) G 3-N / 3-NG
ki’cwáy 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]

(4) NA/AN
tu’k tiendana’ mih
one store big
“one big store”
máhat káhau / míhwae káhau
big jaguar / big jaguar
“big jaguar”

[Clark 1961: 48, 49]
Database 3: Word Order Typology

(5) PN

tin-ma:m

“my mother”

[Clark 1962: 186]

(6) DN

ayi:h to’say

“this woman”

[Clark 1962: 187]

(7) QN

may hayahwat

“many men”

[Clark 1962: 187]

Oluta Popoluca [46]

(1) SVO

hamah piyu itho:vom:pe i-avo’tik

that hen is-pecking-at her-young-chick

“That hen is pecking at her young chick.”

[Clark 1981: 11]

(2) Po/Pr

me:sa-pa’tpi

table-under

“under the table”

mi:t hamah pi:yi

with that sugarcane

“with that sugarcane”

[Clark 1981: 17]

[Clark 1981: 51]

(3) G 3-N

cu’ci i-e:me

meat its-hide

“the hide of the meat”

[Clark 1981: 10]

(4) AN

po:po’ pu’i

white sand

“white sand”

[Clark 1981: 73]

(5) PN

tin-tiki

my-house

“my house”

[Clark 1981: 144]

(6) DN

hamah kuyi

that tree

“that tree”

[Clark 1981: 59]

(7) QN

seme ca:ci

many fly

“many flies”

[Clark 1981: 60]
Mixe (Coatlán) [47]

(1) VSO > SVO / SOV Cf. [CAMPBELL & KAUFMAN & SMITH-STARK 1986: 548]

Mixe (San José El Paraíso) [47]

(2) Po/Pr

me:s-pa‘t
“under the table”

mid mi:da+š inga:b’ me:n’
“with fifty centavos money”

[NAITZMA & NAITZMA 1976: 50]
(3) G 3-N
 tu'g  tve:dy  tu:ht  
one  his-father  his-gun
 "his father's gun"

(4) AN
 tu'g  ma'  po:b  'uk
 a  big  white  dog
 "a big white dog"

(5) PN
 n-bahk
 my-bone
 "my bone"

(6) DN
 he  man
 the  son
 "the son"

(7) QN
 may  ha'yu
 many  people
 "many people"

Mixe (Tlahuitoltepec) [47]

(1) VSO > SVO / SOV (a marked, non-basic order used with tA "already" [CAMPBELL & KAUFMAN & SMITH-STARK 1986: 547])
yik'awo:hc  kwon  tahk  
opened  Juan  house
 "Juan opened the house."
yA  ho'y  tA  tyik'o:ky  yA  uk
that  person  already  killed  that  dog
 "That person already killed that dog."
tA  ac  ho'osy  nyikho'oty
already  I  firewood  brought
 "I already brought firewood."

(2) Po/Pr
 n-tahk-hotpy
 my  house  in
 "in my house"
mat  mah:oy  mane:r
with  Mr.  Manuel
 "with Mr. Manuel"

(3) G 3-N
 wekshy  po:'
 comal  its  edge
 "comal's edge"

(4) AN
 ooy  ho':y
 good  person
 "a good person"
(5) PN
(mec) n-tahk
I my-house
"my house"

(6) DN
yo'ot tahk
this house
"this house"

(7) QN
namay yo'ot uco'hk
many this child
"these many children"

Huastec [48]

(1) VSO (S=O)/VOS (S>O)
in k*a'a' an u'sum an inik
SUBJ hit the woman the man
"The woman hit the man."
in k'ohow o':s 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"

(3) 3-NG
in k*e-ci i te'
its branch the tree
"the branch of the tree"

(4) AN
at'aš u'sum
bad woman
"a bad woman"

(5) PN
nu k'ima:
my house
"my house"

(6) DN
nuwa' te'
that tree
"that tree"

(7) QN
ya:n i pik'o
many the dog
"many dogs"
Yucatec [49]

(1) SVO / VOS
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
with rope
"with a rope"

(3) 3-NG
u p'o:č-il il huan
his hat-POSS Juan
"Juan's hat"

(4) AN
sak nok'
white clothes
"white clothes"

(5) PN
a suku'un
your brother
"your brother"

(6) DN (D)
le winik-a'
the man-here
"this man"

(7) QN
hač y'a:b tunič
very many stone
"lots of stones"

Lacandón [50]

(1) VOS / SVO

t-u-kins-a balum k'ak'
PAST-SUBJ-kill-COMP jaguar Kak
"Kak killed a jaguar"

hačakyum t-u-ment-ah hač winik
Hachakyum PAST-SUBJ-make-COMP true man
"Hachakyum created Lacandons (true men)."

(2) Pr

y-etel ten
its-with me
"with me"
(3) 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-en t-u y-o-tōč 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”  

(7) QN  
hun-tul winik  
one-NUCL man  
“one man”  

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.”  

(2) Pr  
ić konol  
in store  
“in the store”  

(3) 3-NG  
u kal a pek’  
his neck the dog  
“the neck of the dog”  

(4) AN  
ah c’i’ šidal  
MASC little child  
“the little child”  

(5) PN  
u y-oṭć  
his-house  
“his house”  

(6) DN  
a nah  
the house  
“the house”  

(7) QN  
yaːb a nah  
many the house  
“many houses”  

Chol [53]  

(1) SVO  
ti’ miñi išim hini winik  
COMP buy corn the man  
“The man bought maize.”  

(2) Pr  
y-ik’ot huan  
his-with Juan  
“with Juan”
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Native Middle American Languages

(3) 3-NG
i y-ışm-al čolel / i y-ışım 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)
Database 3: Word Order Typology

(7) QN
mih k'en wah
very much tortilla
"lots of tortillas"

Chortí [55]

(1) SVO
e winik u-k'uši e pa'
the man SUBJ-eat the tortilla
"The man eats the tortilla."

(2) Pr
ta činam
in town
"in the town"

(3) 3-NG
u we'r-ir e wakaš
his meat-POSS the cow
"the cow’s meat"

(4) AN (NA emphasizes a condition)
e čuču' mis / e mis čuču'
the little cat / the cat little
"the young cat" "the little cat"

(5) PN
iw-ihe'ok-tak
your-daughter-PL
"your daughters"

(6) DN/DND
e winik-op / e winik-op yaha'
the man-PL / the man-PL there
"the men" "those men"

(7) QN
inte' winik / tuno'or hente
one man / all people
"one man" "all people"

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."

(2) Pr
ta be
on path
"on the path"

(3) 3-NG
s-tot li šun-e
his-father the Xun-CL
"Xun’s father"
Native Middle American Languages

(4) AN
sonso kričano / li k'osh kremo-tik-e
foolish person / the little boy-PL-CL
"an ignorant person" "the little boy"

(5) PN
h-moč
my-basket
"my basket"

(6) DN
ti tak'in
the money
"the money"

(7) QN
ep kremo-tik
many boy-PL
"many boys"

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."
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"

(3) 3-NG
y-ok'el an mut
his-song bird
"the song of birds"

(4) AN
sakwa išim
white maize
"white maize"

(5) PN
s-hol
his-head
"his head"

(6) DN/DND
te baka [DAYLEY 1981: 43] ha’me winik ine
the cow the man that
"the cow" "that man"

[Slocum & Gerdel 1971: 27]
[Slocum & Gerdel 1971: 69]
[Slocum & Gerdel 1971: 29]
[Slocum & Gerdel 1971: 54]
[DAyLEY 1981: 43]
[DAyLEY 1981: 43]
[DAyLEY 1981: 43]
[DAyLEY 1981: 139]
(7) QN
bayel tak’in
much money
“much money

Tojolabal [58]

(1) VOS
s-mak’a hwan manwel
he-hit Juan Manuel
“Manuel hit Juan.”

(2) Pr
b’a’ s-nah
to his-house
“to his house”

(3) 3-NG
s-b’ak'(e)-il čitam
its-meat-REL pig
“pork”

(4) AN
tohol winik
honest man
“an honest man”

(5) PN
h-nah
my-house
“my house”

(6) DND
ha winik-ih
the man-here
“this man”

(7) QN
čahb’-wane’ winik
two-NUCL man
“two men”
hel ha ton-i
many the stone-here
“these many stones”

Chuj [59]

(1) VOS
iš-#-s-mak’ wax šun iš malin
COMP-OBJ-SUBJ-hit MASC Juan FEM Maria
“Maria hit Juan.”

(2) Pr
t’ah pingkah
in/to/from plantations
“in, to, or from the plantations”
(3) 3-NG
y-uk'tak s-mam wiŋ
his-brother his-father MALE ANIMATE
"his father's brother"

[HOPKINS 1967: 148]  

(4) AN
 tul kamiš
 short shirt
"short shirt"

[HOPKINS 1967: 104]  

(5) PN
 hin-xolom
 my-head
"my head"

[HOPKINS 1967: 133]  

(6) DN(D)
 wiŋ či’ / ha’ wiŋ či’
 man there / the man there
"that man" "that man there"

[HOPKINS 1967: 152, 162]  

(7) QN
 xantak animah
 many people
"many people"

[HOPKINS 1967: 152]  

Jacaltec [60]

(1) VSO
š-#-y-il nax s čeh
COMP-it-he-see he his horse
"He saw his horse"

[DAY 1973: 65]  

(2) Pr
 yul te’ ñah
 in the house
"inside the house"

[CRAIG 1977: 9]  

(3) 3-NG
s čeh hin mam
his horse my father
"my father's horse"

[DAY 1973: 67]  

(4) NA/AN
 hune’ no’ čeh sax’iŋ / hune’ te’ niman saxla šila
 one animal horse white / one the big white chair
"one (a) white horse" "one (a) big white chair"

[CRAIG 1977: 10]  

(5) PN
 ha melyu
 your money
"your money"

[CRAIG 1977: 15]
(6) DN
te' hum
the book
"the book"

(7) QN
c'ihal no' ceh
many animal horse
"many horses"

Acatec [62]

(1) VOS
či-#-s-3a' nax šunik nax luin
INCOMP-OBJ-SUBJ-hit NCL Juan NCL Pedro
"Pedro hits Juan."

(2) Pr
y-ib' an čem
its-on chair
"on the chair"

(3) 3-NG
nax y-uštax nax kuin
NCL his-brother NCL Pascual
"Pascual's brother"

(4) AN
xeb' nax wač' maštol
PL NCL good teacher
"the good teachers"

(5) PN
xa-tumin
your-money
"your money"

(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"

(7) QN
maasanil wan (x)in-mis ti'
all PL my-cat this
"all these cats of mine"

Tectitec [65]

(1) VOS
pwest ayax 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't'i c'u:c'
   its-with hoe
   "with a hoe"

(3) 3-NG
   §-ć'o:e' a šu'x-el
   her-clay your wife-POSS
   "your wife's clay"

(4) AN
   q'an ce:'
   yellow tree
   "yellow tree"

(5) PN
   q-ta:t
   our-father
   "our father"

(6) DN
   te xa alagun-ni / te šxal
   the this lake-REF / the man
   "this lake" "the man"

(7) QN
   xun šxal
   one man
   "one man"

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"

(2) Pr
   t-i:b' pwe:nt
   its-over bridge
   "above the bridge"

(3) 3-NG
   ky-wic šxal
   his-head person
   "the people's heads"

(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"

(5) PN
   n-xa:-ya
   my-house-CL
   "my house"
(6) DN
  ax ši:naq [ENGLAND 1983: 150]
  the man
  "the man"

(7) QN
  naq xu:'nqa šxa:l [ENGLAND 1983: 149]
  that all person
  "all those people"

Aguacatec [67] (ä is short)

(1) VSO
  xa "i-ç'ax šna'n b'u'y [LARSEN 1981: 137]
  PROX PAST it-she-wash woman rag
  "The woman washed the rag."

(2) Pr
  ta'x čex [MCArthur & MCArthur 1966: 161]
  on horse
  "on the horse"

(3) 3-NG
  t-ahb'il qä-tah [MCArthur & MCArthur 1980: 63]
  his-desire our-father
  "the desire of our father"

(4) AN
  xun b'u'y šwoq' [MCArthur & MCArthur 1966: 164]
  one old jug
  "an old jug"

(5) PN
  it-aq'wil [MCArthur & MCArthur 1966: 156]
  your (PL)-rope
  "your rope"

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 [MCArthur & MCArthur 1966: 162]
  the spirit-DEMONSTRATIVE ENCLITIC
  "the spirit"

(7) QN
  kob' čaqum [MCArthur & MCArthur 1966: 161]
  two messenger
  "two messengers"

Ixil [68]

(1) VSO
  kat tečb'u nax šun u le: [AYRES 1980: 279]
  COMP eat man Juan the tortilla
  "Juan ate the tortilla."
(2) Pr
wi’u me:ša
on the table
“on the table”

(3) 3-NG
i-ya:b’il naq ŋun (Chajul dialect)
his-sick man Juan
“Juan’s sick”

(4) AN
ča’si kami’si
green shirt
“a green shirt”

(5) PN
i ka:šo
his box
“his box”

(6) DN
u či’i
the dog
“the dog”

(7) QN
lawal čo:
ten animal
“ten animals”

Kekchi [69]

(1) VOS
š-#-(₃)-sak’li c’i’li k*i:nq
COMP-OBJ-SUBJ-hit the dog the man
“The man hit the dog.”

(2) Pr
sa’be
in path
“in the path”

(3) 3-NG
š-ninq’e l-in ko’
her-birthday the-my daughter
“my daughter’s birthday”

(4) AN
raši hu
blue/green book
“a green book”

(5) PN
in-c’i’
my-dog
“my dog”
(6) DN/DND
li išq / li hu a'ín
the woman / the book this
"the woman" "this book"

(7) QN
nabal li bič
many the song
"many songs"

**Pocomchi [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"

(2) Pr
wač meša
on table
"on the table"

(3) 3-NG
r-ehk'έ:n la:s
his-wife Francisco
"Francisco's wife"

(4) AN / (NA)
nax moma' če:' / nax ni-weš ak'
a big tree / a my-pants new
"a big tree" "my new pants"

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"

(6) DN/DND
i yuq' / re' pa:t wili
the hill / DEF house DEM
"the hill" "this house"

(7) QN
k'ih taqe r-il'i:b'
a lot PL his-niece
"a lot of nieces"

**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 Pocomchi 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."
Uspantec [72]

(1) SVO
xun xox š-tix ox
one raven COMP-eat avocado
"A raven ate an avocado."

(2) Pr
pach xun x-q’un
with one his-brother
"with his brother"

(3) 3-NG
x-ka’ Talin
her-metate stone Catarina
"Catarina’s metate (milling stone)"

(4) AN
xun reš pera’x
one green shawl
"a green shawl"

(5) PN
x-tun
his/her-cat
"her cat"
(6) DN
man kūk
the squirrel
"the squirrel"

(7) QN
xun tun
one cat
"one cat"

Quiché (Totonicapán) [73]

(1) SVO / VSO
ri ači š-u-loq' xun kamiša / š-u-loq' ri ači xun kamiša
the man COMP-SUBJ-buy one shirt
"The man bought a shirt."

(2) Pr
pa ri be
on the road
"on the road"

(3) 3-NG
ki palat ri pamilia
their dish the family
"the dishes of the family"

(4) AN
saq ulew
white land
"white land"

(5) PN
a tat
your father
"your father"

(6) DN
ri kamiša
the shirt
"the shirt"

(7) QN
xun kamiša / k'ia ri kamiša
one shirt / many the shirt
"one shirt" "many shirts"

Quiché (Nahualá-Ixtahuacan) [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."
š-#.u::kunax ri: ači ri: išoq
COMP-OBJ-SUBJ-cure the man the woman
"The man cured the woman./The woman cured the man."
Native Middle American Languages

(2) Pr
pa tinamit / r-uma:l le: aêi
“to town” “by the man”
[to town "by the man"

(3) 3-NG
u c’i’ le: ala
“the boy’s dog”

(4) AN
saqa taq xa
“white PL house”

(5) PN
a c’i:
“your dog”

(6) DN
le: xa
“that house”

(7) QN
r-onoxe:l winaq
every person
“every person”

Cakchiquel [76]

(1) SVO
ri mes š-n-u-tix ri ç’oy
“the cat COMP-OBJ-SUBJ-eat the mouse”

(2) Pr
pa tinamit
“to the town”

(3) 3-NG
ru-po’t ri štan
“the girl’s huipil”

(4) AN
ri nim xay
“the big house”

(5) PN
nu-c’i’
“my dog”

[MONDELHOCH 1978a: 27, 30]

[MONDELHOCH 1978a: 24]

[MONDELHOCH 1978a: 17]

[MONDELHOCH 1978a: 22]

[MONDELHOCH 1978a: 11]

[MONDELHOCH 1978a: 50]

[ISCAYA’ TALA & CHOIXIN YUCUTE 1983: 55]

[ISCAYA’ TALA & CHOIXIN YUCUTE 1983: 5]

[ISCAYA’ TALA & CHOIXIN YUCUTE 1983: 37]

[BLAIR et al.1981: 447]

[BLAIR et al.1981: 428]
(6) DN
ri aq
"the pig"
(7) QN
k'iy abax
"many stones"

**Tzutujil [77]**

(1) VOS
š-#-u-č'ey xun išoq xar ači
COMP-OBJ-SUB-hit a woman the man
"The man hit a woman."
(2) Pr
r-ma:l xar ači
his-by the man
"by the man"
(3) 3-NG
xun r-wač ršahab' r-k'axo:l n-b'esino
one its-strap his-shoe his-son my-neighbor
"a strap of my neighbor's son's shoe"
(4) AN
reš ki:naq / reš n-ki:naq
green beans / green my-beans
"green beans" "my green beans"
(5) PN
nu-ć'i:'
my-dog
"my dog"
(6) DN
xar išoq
the woman
"the woman"
(7) QN
noxe:l xa naqu:n
all the thing
"all the things"

**Xinca [78]**

(1) VOS
powoy ahuaru na pari
shine all the sun
"The sun shines on all."
c'opohi nen nah urumuwi
bit me the snake
"The snake bit me."
396 Native Middle American Languages

(2) Pr
   ti pu / ra maku
   with hand / in house
   "with the hand" "in the house"

[LEHMANN 1920: 746]

(3) NG
   uruh mihya [SCHUMANN 1966: 452]
   egg hen
   "hen's egg"

   raha maku [LEHMANN 1920: 740]
   mouth house
   "the entrance of the house"

[LEHMANN 1920: 750, 766]

(4) AN/NA
   ila uvui / ikal maku čuruku
   fresh meat / one house small
   "fresh meat" "a small house"

[LEHMANN 1920: 750, 766]

(5) NP
   pu* / puk / puh
   my hand / your hand / his hand
   "my hand" "your hand" "his hand"

[LEHMANN 1920: 761, 753]

(6) DN(D)
   nah mihya / nahna frak na
   the hen / the man this
   "the hen" "this man"

[LEHMANN 1920: 766]

(7) QN
   taha suyi
   many times
   "many times"

Garifuna (Black Carib) [79]

(1) VSO
   l-adógo-ba-u t-úmari ába yamádi wáu
   SUBJ-make-INCOMP-OBJ her-husband a basket for-us
   "Her husband will make us a basket."

[TAYLOR 1956: 6]

(2) Po / Pr
   óma-da / ába ugúnei h-ábu muláduñu
   road-in / one boat his-with mulattoes
   "in the road" "a boat with (carrying) mulattoes"

[TAYLOR 1977: 57-58]

(3) 3-NG
   t-ebénari l-uba wáguči (wa-uguči)
   its-door his-house our-father
   "the door of our father's house"

[TAYLOR 1977: 57]

(4) AN / NA
   iséri uruéi / ába áufuri uribatu
   new king / one aunt bad
   "the new king" "a bad aunt"

[TAYLOR 1977: 63-64]

(5) PN
   n-aróna
   my-arm
   "my arm"

[TAYLOR 1977: 55]
Database 3: Word Order Typology

(6) ND
kátai lira / kátuŋ túra
thing that-MASC / thing that-FEM
"that thing"        "that thing"

(7) QN
órrowa guríara túra
tree canoe that
"those three canoes"

*Lenca [D14]*

(1) SOV
guagaš ta kori-n-lana
cattle milpa eat-PERF-they
"The cattle ate the milpa."

(2)Po
sela ap
hammock in
"in the hammock"

(3) GN
ke kural
stone enclosure
"stone's enclosure"

(4) NA
u-şaygi poriana
my-brother-in-law little
"my little brother-in-law"

(5) PN
u-familia
my-family
"my family"

(6) ND
kin-ne
road-the
"the road"

(7) NQ
tumin huissiw / lassu eta
money much / cord one
"much money"  "one cord"

Tol [80]

(1) SOV
miste ve lyaha
cat tamal eat
"The cat eats tamales."
Native Middle American Languages

(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]

Miskitu [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/Infixed
kwa:l-ki: / kwa:l-kam / ay-kwa:l-ka  
cloth-my / cloth-your / his-cloth-his  
"my cloth" "your cloth" "his cloth"  
[CONZEMIUS 1929: 77]

su-k-lu / su-m-lu  
"my dog" "your dog"  
[CONZEMIUS 1929: 78]

(6) ND
li: kawhla ba  
water cold the  
"the cold water"  
[CONZEMIUS 1929: 75]
Database 3: Word Order Typology

(7) NQ
   waykna wal
   man two
   “two men”

Sumu [82]

(1) SOV
   ma:mah ya baka-ka kau wispai
   mother the child-her ACC (at)? whip
   “The mother whips her child.”

(2) Po
   a:kusah karak
   needle with
   “with the needle”

(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”

(4) NA
   u: sikka as
   house big one
   “a big house”

(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”

(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”

(7) NQ
   u: ba:s
   house three
   “three houses”
Rama [84]

(1) SOV
ma ingest a child hit
your brother my child hit-COMP
"Your brother hit my child."

(2) Po
si-ki: / ğu:-aik
water-in / house-to
"in the water" "to the house"

(3) GN
ku:ma: ain ğu:
woman her house
"woman's house"

(4) NA
su:li tara
animal big
"a big animal"

(5) PN
na:iŋ ta:ta
my father
"my father"

(6) ND
ka:t ki
tree the
"the tree"

(7) NQ
ka:t saimiq
tree one
"one (a) tree"

Guatuso [85] (Examples from Lehmann are in original transcription without superscripts.)

(1) SOV
ni arápcáo i-ri-tóikitaikíŋ maxiókaxuíso
the child him-he-love teacher
"The child loves the teacher."

tón ti i-lajéuje kórikuru
I ERG it-eat orange
"I eat oranges."

(2) Po
ná ko / ní ju
me to / he with
"to me" "with him"
Database 3: Word Order Typology

(3) GN
caju-curu / coqui-<i>pu</i>  
cacao-<i>ear</i> / tortoise-egg  
"cacao pod" "tortoise's egg"

(4) AN/NA
<i>tizaja kuejak</i> / <i>chocpa kuejak</i>  
dry firewood / wet firewood  
"dry firewood" "wet firewood"  
<i>ikasani u</i> / <i>tiageaari u</i>  
big house / little house  
"a big house" "a little house"  
<i>cora puru</i> / <i>yu ora</i>  
tree big / road little  
"a big tree" "a little road"

(5) PN
<|i-pů:ru</i> / na-kúri  
his-body / my-w<|i>-wife"  
"his body" "my wife"  

(6) DN
<|i-ni jú</i> / <i>ni arápçao</i>  
the road / the child  
"the road" "the child"

(7) NQ
pintoto ozog<|e|ente  
bird many  
"many birds"

**Boruca [86]**

(1) SOV
<|i-ba jó'kua ki ba' wi'ra</i>  
your friend AG you take  
"Your friend takes you."

(2) Po
ú <i>ta</i>  
house at  
"at the house"

(3) GN
kuasrán i turi wá' ró<|i>xk  
Cuasran his bull son PL  
"the offspring of Cuasran's bull"

(4) NA
ji krán  
fire great  
"a big fire"

(5) PN
<|i-ba sasúx</i>  
your grandmother  
"your grandmother"
Cabécar [87]

(1) SOV
jīs kāga ti tabēli bllwa
my father ERG machete hid
"My father hid the machete."

(2) Po
kal hula wa
tree arm with
"with the branch"

(3) GN
bá kāga duwa
your father brother-in-law
"your father’s brother-in-law"

(4) NA
pāīglu siunña
shirt blue
"blue shirt"

(5) PN
sā míña
our mother
"our mother"

(6) ND
jaba hi
child this
"this child"

(7) NQ
du māŋatku
bird three
"three birds"

Bribri [88]

(1) SOV
Xuan tu uhku pktwa
Juan ERG door broke
"Juan broke the door."
(2) Po
be' ु 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' ु
your house
"your house"

[DicKeman Datz 1984: 121]

(6) ND
knē  e'
work  this
"this work"

[DicKeman Datz 1984: 120]

(7) NQ
Xuana  ūrkē  ūskalo  tāuk  ēt
Juana  went  broom  buy  one
"Juana went to buy a broom."
je  kē  alā-r  kianā-dak  bul
I  EXP  child-PL  wanted-PL  two
"I wanted two children."

[DicKeman Datz 1984: 121]

[DicKeman Datz 1984: 116]

Térraba [89]

(1) SOV
e  bōr  jē
he  me  saw
"He saw me."

[Portilla Cháves 1986: 138]

(2) Po
ba  u  ūśkō
his  house  to
"to his house"

[Portilla Cháves 1986: 139]

(3) GN/NG
kōś  sēn
tree  root
"the root of tree"

[Portilla Cháves 1986: 138]

kōs  sā / mē  zbu / di  dūn
head  tapir  /  mother  god  /  water  salt
"the head of tapir"  "Virgin"  "sea"

[Portilla Cháves 1986: 138]
Native Middle American Languages

(4) NA
φίςκουο σοκσιε
"a black cat"
[Portilla Chávez 1986: 136]

(5) PN
βα ο
"his house"
"his house"
[Portilla Chávez 1986: 139]

(6) ND
θιθι ήυ
"this dog"
[Portilla Chávez 1986: 136]

(7) NQ
τθήνγ κρα-ρά
"one pot"
κλιμπρο α-τα-ρά
"one cord"
[Portilla Chávez 1986: 152]

Guaymí [90]

(1) SOV
ngobówœ ko dotebare / tiwe niara miti
"God land made / I him struck"
"God made the world." "I struck him."
[Alphonse 1956: 7, 51]

(2) Po
mø ben
"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
tì toro-e
my book-PossD
"my book"
[Alphonse 1956: 8]

(6) ND
toro ne
book this
"this book"
[Alphonse 1956: 7]
Database 3: Word Order Typology

(7) NQ
ni kabré
people many
"many people"

Bocotá [91]

(1) SOV
cá nọ i gudáble
I AG yuca eat-NON RECENT PAST PERF
"I ate yuca."

(2) Po
Francisco álĳ
Francisco for
"for Francisco"

(3) GN
cübé inuña
Chube father
"Chube's father"

(4) NA
ŋaŋ injnwa
world different
"different world"

(5) PN
cá ka
my name
"my name"

(6) ND
ŋaŋ hái
world this
"this world"

(7) NQ
gli gadá-de / kói gábá-de
tree NUCL-one / hen NUCL-one
"one tree" "one hen"

Cuna [92]

(1) SOV
tule ome , taysa
man woman saw
"The man saw the woman."

(2) Po
neka se
house to
"to the house"
(3) GN/ G 3-N
  tule talak*a / tule e-taltak*a
  man eye / man his-eye
  "a man’s eye" "a man’s eye"

(4) NA
  akk*a-lele
  stone-sacred
  "sacred stone"

(5) PN
  an(i)-pap / pe-pap
  my-father / your-father
  "my father" "your father"

(6) DN
  itti tule / ati ome
  this man / that woman
  "this man" "that woman"

(7) NQ
  tule war-k*ena
  man NUCL-one
  "one man"
Notes

Note 1) If all the data are counted, distribution in terms of number of consonants is as follows:

<table>
<thead>
<tr>
<th>Number of phonemes</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of languages</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>11</td>
<td>20</td>
<td>15</td>
<td>23</td>
<td>17</td>
<td>13</td>
<td>20</td>
<td>18</td>
<td>20</td>
<td>23</td>
</tr>
</tbody>
</table>

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 [ɪ e ə u] and the corresponding long vowels are [iː æː aː oːː].

Note 5) The comparative word list of Tol and Tequistlatec Chontal is presented below. It is difficult to find cognate sets.

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1. I napʰ</td>
<td>jya’</td>
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<tr>
<td>2. you hipʰ</td>
<td>ima’</td>
</tr>
<tr>
<td>3. we kupʰ</td>
<td>iyank’</td>
</tr>
<tr>
<td>4. this niná</td>
<td>iʔka’a</td>
</tr>
<tr>
<td>5. that noná</td>
<td>iʔkeya</td>
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<td>6. who pʰakʰ</td>
<td>nay</td>
</tr>
<tr>
<td>7. what cʰan</td>
<td>te</td>
</tr>
<tr>
<td>8. not kuvá/len’ma</td>
<td>a’i</td>
</tr>
<tr>
<td>9. all pʰi</td>
<td>tʰi/tʰaway</td>
</tr>
<tr>
<td>10. many pilik’</td>
<td>aʃpela’</td>
</tr>
<tr>
<td>11. one pʰani</td>
<td>anuli</td>
</tr>
<tr>
<td>12. two mat’e</td>
<td>oke’</td>
</tr>
<tr>
<td>13. big pine/poné (s)</td>
<td>akweka</td>
</tr>
<tr>
<td>14. small cʰikʰ</td>
<td></td>
</tr>
<tr>
<td>15. long kampa</td>
<td>itoki</td>
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<tr>
<td>16. woman kepʰ/keppán</td>
<td>ʃaka’no’</td>
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<tr>
<td>17. man yom/yomén</td>
<td>kal ʃans</td>
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<td>18. people tol/tolpán</td>
<td>lan ʃanuk’</td>
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<td>19. fish kʰul/kʰulún</td>
<td>ŋatu</td>
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<tr>
<td>20. bird cʰiyay</td>
<td>ŋaka</td>
</tr>
<tr>
<td>21. dog cʰiyó/cʰiyóš</td>
<td>kal ciki</td>
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<td>leaf</td>
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<td>root</td>
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<td>blood</td>
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<td>skin</td>
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<td>bone</td>
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<td>32.</td>
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<td>egg</td>
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<td>tail</td>
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<td>37.</td>
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<td>38.</td>
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<td>39.</td>
<td>ear</td>
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<td>eye</td>
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<td>41.</td>
<td>nose</td>
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<td>42.</td>
<td>mouth</td>
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<td>43.</td>
<td>tooth</td>
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<td>44.</td>
<td>tongue</td>
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<td>45.</td>
<td>claw</td>
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<td>46.</td>
<td>foot</td>
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<td>47.</td>
<td>knee</td>
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<td>48.</td>
<td>hand</td>
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<td>49.</td>
<td>stomach</td>
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<td>neck</td>
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<td>breast</td>
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<td>52.</td>
<td>heart</td>
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<td>53.</td>
<td>liver</td>
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<td>54.</td>
<td>drink</td>
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<td>55.</td>
<td>eat</td>
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<td>56.</td>
<td>bite</td>
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<td>57.</td>
<td>see</td>
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<td>58.</td>
<td>hear</td>
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<td>59.</td>
<td>know</td>
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<td>60.</td>
<td>sleep</td>
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<td>61.</td>
<td>die</td>
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<td>62.</td>
<td>kill</td>
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<td>63.</td>
<td>swim</td>
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<td>64.</td>
<td>fly</td>
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<td>65.</td>
<td>walk</td>
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<td>66.</td>
<td>come</td>
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<td>67.</td>
<td>lie down</td>
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<td>68.</td>
<td>sit</td>
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<td>69.</td>
<td>stand</td>
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<td>70.</td>
<td>give</td>
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<td>71.</td>
<td>say</td>
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<td>72.</td>
<td>sun</td>
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<td>73.</td>
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<td>74.</td>
<td>star</td>
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<td>75.</td>
<td>water</td>
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<tr>
<td>76.</td>
<td>rain</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Stops</th>
<th>Bilabial</th>
<th>Alveolar</th>
<th>Palatal</th>
<th>Velar</th>
<th>Uvular</th>
<th>Glottal</th>
</tr>
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Notes: /t d e e'/ are retroflexed. /tk/ appears in Cabécar and Bribri. /č/ is reported in Jesús María Cora. /č č'/ are apico-alveolo-palatal affricates reported only in Chajul Ixlil.

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Native Middle American Languages

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| Fortis | p | t | c | č | k | ŋ | ŋ | s | š | š | X | m | n | ň | l | r | w | y |
| Lenis | b | d | j | č | g | ě | ě | z | ž | ž | X | m | n | ň | l | r | w | y |

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

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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 ŧ and š, 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
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**Native Middle American Languages**

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3. Vowel Inventories of Native Middle American Languages

Where a given language has a contrast in the vowel system, it is presented as a set of lines. The first line of each language (or dialect) data is for normal length oral vowels or tense vowels (abbreviated as T). These are indicated by the phonemic symbols. Note that normal length oral vowels are normally short (S), but as is noted in Chapter 2.3, San Juan Copalá Trique long vowels constitute the simple, unmarked ones. The second line is for long (L), geminate, nasalized (N), lax (LX) vowels. If a language has additional contrasts, they are given on the third line. (EL) means extra long vowels; their presence in a language is marked by the plus sign (+). The number of vowel phonemes is given in the right column. The rightmost number indicates the total number of phonemes. In Zapotecan phonology simple, checked (glottalized), interrupted (laryngealized or low-intensity) and aspirated (high-intensity) vowels are distinguished. I have given only two examples in Cajonos and Lachixio, and the distinctions for other dialects, if reported, are given in abbreviated forms such as G (glottalized), L (laryngealized), A (aspirated) following the dialect name.

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¹: Language ¹ refers to different dialects or forms within the same language group.
²: Language ² refers to different dialects or forms within the same language group.
Native Middle American Languages

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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 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
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