HAL open science

The Popolocan languages

Evangelia Adamou

To cite this version:

Evangelia Adamou. The Popolocan languages. Soeren Wichmann. Languages and Linguistics of Mexico and Northern Central America: A Comprehensive Guide, Mouton de Gruyter, In press. halshs-03153566

HAL Id: halshs-03153566

https://shs.hal.science/halshs-03153566v1

Submitted on 26 Feb 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

The Popolocan languages

Evangelia Adamou
French National Centre for Scientific Research (CNRS)

1. Introduction

1.1. Classification

The Popolocan branch of the Otomanguean stock includes four languages, namely Chocho, Popoloc, Ixcatec, and Mazatec. This classification follows the work of Fernández de Miranda (1951, 1956), Hamp (1958), Gudschinsky (1959a) and Swadesh (1960: 83). Based on glottochronological analyses, Fernández de Miranda (1956) suggests that Mazatec was the first language to split from the other Popolocan languages 25 centuries ago. Next, 13 centuries ago, Ixcatec branched off while Chocho and Popoloc, which share the greatest number of innovations, split up 8 centuries ago. The divergence of Mazatec from the three other Popolocan languages and the proximity between Popoloc and Chocho is uncontroversial. However, the position of Ixcatec in the Popolocan branch is less clear. Fernández de Miranda (1951) states that Ixcatec is most closely related to Popoloc and more distantly related to Chocho; see Figure 1a. Hamp (1958), however, re-evaluates Fernández de Miranda's (1951) data and concludes that Chocho and Popoloc are probably sisters, cf. Figure 1b. More recently, based on an analysis of independent person pronouns, Veerman-Leichsenring (2000b: 336) suggests that Ixcatec was first in contact with Mazatec and non-Popolocan Chinantec before going back to intense contact with Chocho and Popoloc, two languages with which it shares a number of phonemic innovations; see Figure 1c.

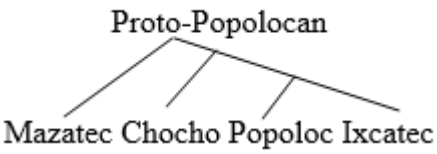

Figure 1a. The Popolocan branch according to Fernández de Miranda (1951) (adapted from Hamp 1958)

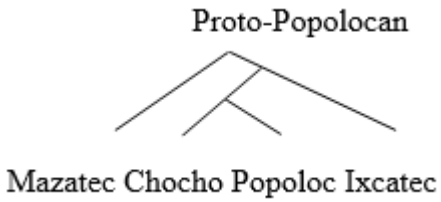

Figure 1b. The Popolocan branch according to Hamp (adapted from Hamp 1958)

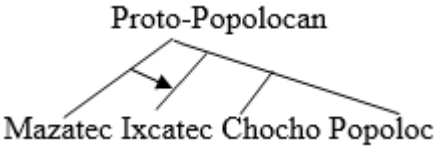

Figure 1c. The Popolocan branch according to Veerman-Leichsenring (adapted from Veerman-Leichsenring 2000b)

1.2. Localities and number of speakers

Mazatec has 185,000–250,000 speakers.[1] They live in a large number of communities in the Mazateca Mountains, including the cities of Huautla de Jimenez and Jalapa de Diaz (see Map 1 to locate some of the best studied Mazatec communities). According to Kirk (1970), the Mazatec varieties have a high degree of inter-intelligibility. The first dialect classification of Mazatec from a historical perspective distinguishes two main groups: the High and the Low Mazatec dialects (Gudschinsky 1958). More recently, based on thirty-one phonological variables with data from Kirk (1966), Mazatec has been tentatively grouped into three clusters: Northern Mazatec, Central Mazatec, and Southern Mazatec (Léonard et al. 2012: 90–91).

Popoloc is spoken by approximately 11,000–58,000 people living in a dozen localities situated around the border between the State of Puebla and the State of Oaxaca. The Popoloc varieties are grouped in three zones: the Northern, Western, and Eastern zone. According to Veerman-Leichsenring (1991: 4) intelligibility between speakers of the three zones is limited.

The most closely related language, Chocho, is severely endangered, having roughly 500–1,000 speakers, who live in four municipalities of the Mixteca Alta in the State of Oaxaca.

Lastly, contrary to official numbers, recent research has established that there are only a handful of fluent speakers of Ixcatec, most of them in their eighties. The last Ixcatec speakers reside in the municipality of Santa Maria Ixcatlan, in the Mixteca Alta in state of Oaxaca; see map in Figure 2.

Figure 2. Map of the main localities where the Popolocan languages are spoken

[1] According to estimates by the Instituto Nacional de Estadísticas y Geografía (INEGI) and the Instituto Nacional de Lenguas Indígenas (INALI), as well as by the Summer Institute of Linguistics (SIL).

1.3. Language names

The established names for the Popolocan languages are all exonyms and have fluctuated over the centuries, with a single language name covering two or more Popolocan and sometimes even non-Popolocan languages. The names for Mazatec and Ixcatec bear the suffix *-teco* based on the Nahuatl-origin[2] suffixes *-teca/-tecatl* 'inhabitant of a place (whose name ends in *-tlan* or *-lan*)'. The name Mazatec also comes from Nahuatl, where *mazatl* has the basic meaning 'deer'. The language name Chocho (or Chocholtec) probably comes from the Spanish verb *chochear*, which literally means 'to become senile', through extension to 'talk like a senile person'. In the earliest colonial documents, Ixcatec is also referred to under the name *chochon*; the first occurrences of the term *ixcateco* go back to the eighteenth century (Swanton 2008). The name Ixcatec is based on Nahuatl *ichcatl* 'cotton' to which is added the suffix *-teco*. Finally, Popoloc is based on a Nahuatl verb, *popoloca* 'to speak unintelligibly', a term which is also generally used for people of another ethnicity and language.

As commonly observed across the languages of the world, self-denominations for the Popolocan languages are based upon the expression 'our language', namely *ngigua* in Chocho, *ngiga* in Popoloc, and *x'uani* in Ixcatec. Similar self-denominations are reported for the Mazatecs, who refer to themselves as the 'people who speak our language', variably *ha xutta enima, chjotá énna, cha ndaxindí* (source http://www.sic.gob.mx/).

1.4. Existing research and language documentation

Mazatec has been the object of studies in a comparative perspective by Gudschinsky (1959a) and Kirk (1966). Studies of specific Mazatec varieties include Gudschinsky (1959b), with data from Huautla de Jimenez, Jamieson (1982, 1988) for Chiquihuitlan, Bull (1984) for San Jeronimo Tecoatl, Black and Schram (2014) for Jalapa de Diaz, and Guzmán Carrera (2011) for Mazatlan. A special focus on phonetics and phonology is found in a number of studies, such as K. Pike and E. Pike (1947), E. Pike (1956), Kirk et al. (1993), Steriade (1994), Silverman et al. (1995), Golston and Kehrein (1998), Garellek and Keating (2011), and Beal (2011). More recently, research has been carried out on morphology and dialectology by Léonard and Kihm (2012) and Léonard et al. (2012), drawing on the published data of the 1940s and 1960s.

Popoloc is relatively under-described, with the notable exception of a grammar of the Metzontla variety by Veerman-Leichsenring (1984, 1991) and a dictionary of the variety of San Juan Atzingo by Austin Krumholz et al. (1995). Studies on phonetics and phonology include Kalstrom and E. Pike (1968), Stark and Machin (1977), and more recently preliminary work by Nakamoto (2014).

Research on Chocho starts with Belmar's pioneering work (Belmar 1899), where Ixcatec, however, is also considered a Chocho variety. During the twentieth century one notes several studies on the Chocho variety of Santa Catarina Ocotlan, namely the publication of the questionnaire *Archivo de lenguas indígenas de Mexico* (ALIM) filled in for this language by Mock (1977), an article on verb morphology (Mock 1982), and a grammar (Veerman-Leichsenring 2000a).

Linguistic research on Ixcatec started in the first half of the twentieth century with the anthropologist Roberto Weitlaner, whose field notes remain unpublished. At the same time a Summer Institute of Linguistics member wrote a preliminary analysis of Ixcatec phonology (unpublished, Black 1948). The published work on Ixcatec consists of a phonological study and a dictionary by Fernández de Miranda (1959, 1961) as well as her work on possessives (Fernández de Miranda 1953). Moreover, there is the work by Veerman-Leichsenring on Ixcatec nominal phrases (Veerman-Leichsenring 2001a), and this author also discusses Ixcatec in papers on the Popolocan languages (e.g., Veerman-Leichsenring 2000b). More recently,

[2] For the Nahuatl meanings see http://whp.uoregon.edu/dictionaries/nahuatl/

work has been done on Ixcatec phonetics and phonology (Alarcón Montero 2010, DiCanio 2011, 2012), on syntax and morphology (Costaouec and Swanton 2008, Adamou and Costaouec 2013, Adamou 2014a, Costaouec 2014, Costaouec and Swanton 2015, Adamou 2017a) as well as on the expression of focus through prosodic and morphological means (Adamou, Gordon, and Gries 2018). Moreover, a major language documentation programme funded by ELDP (2010-2013) and directed by Denis Costaouec has made available 50 hours of video recordings, which can be accessed on the *Endangered Languages Archive* (ELAR).[3]

1.5. Written sources and alphabet

Despite a centuries-long writing tradition in Mesoamerica based on hieroglyphs, most written documents produced after the arrival of Spaniards are in the Latin script. However, only a small number of languages have a corpus of texts produced during colonial times, such as Zapotec and Mixtec. Among the Popolocan languages, Chocho is the only language which was extensively written from the sixteenth through to the early-nineteenth century. In the nineteenth century, some vocabularies were collected for the Popolocan languages by Mexican institutions but the orthography was not standardized (Swanton 2008).

More systematic efforts to propose an orthography were made during the twentieth century, relying on the Spanish alphabet with some additions when necessary. For Mazatec, an alphabet was first used in the works of members of the Instituto Lingüístico de Verano (ILV, the Mexican branch of the Summer Institute of Linguistics), such as Jamieson (1988), and a standardized alphabet is published in Regino (1993). For Ixcatec, an orthography was developed in the 1950s by a native Ixcatec speaker, Doroteo Jiménez, in collaboration with linguists of the ILV. It is noteworthy that the same Doroteo Jiménez, prompted by the anthropologist Roberto Weitlaner, already in 1939 had written an official letter to the Mexican President Lázaro Cárdenas, which constitutes the earliest written document in Ixcatec (Swanton 2008). Finally, Popoloc has no orthography proper, but it has been transcribed in the various studies in Latin script.

2. Phonetics, phonology, and prosody

2.1. Syllable structure

Similar to the other Otomanguean languages, roots in the Popolocan languages are typically monosyllabic. However, two monosyllabic roots may form compound words and receive a number of clitics and affixes, thus forming polysyllabic words. The most common segmental syllable structure in Metzontla Popoloc and Santa Catarina Ocotlan Chocho is (C)V(ʔ) (Veerman-Leichsenring 1991, 2000a). In Soyaltepec Mazatec the minimal and most common syllable is CV and the maximal one CCVV (Beal 2011: 127), a sequence which in Jalapa Mazatec is represented as CCGV, where G is a glide (Silverman et al. 1995: 70).

2.2. Consonants

Mazatec was described with inventories of variable size, mainly depending on the analysis of its consonant clusters. The first analysis, where glottalized and aspirated consonants are considered complex clusters of two or three segments, is proposed in K. Pike and E. Pike (1947). The second analysis, where glottalized and aspirated consonants are considered complex single segments, is presented in Steriade (1994), within the aperture theory. According to this analysis, true consonant clusters are produced within the oral cavity while the series of pre-aspirated, post-aspirated, pre-glottalized, and post-glottalized consonants are single segments associated with a number of non-oral features, laryngeal or nasal. The third analysis assumes that there are simple onsets and nuclei which can host a number of features, such as aspiration, nasalization, and glottalization. According to Golston and Kehrein (1998), while the

[3] http://elar.soas.ac.uk/deposit/0193

basic contrasts are simple, their simultaneous realization is complex. Similar analyses could probably also be applied to the other Popolocan languages. For Ixcatec, Fernández de Miranda (1959: 17) treated these combinations as groups of consonants resulting in an inventory of only 24 consonants, e.g., /th/ rather than /t^h/. For Metzontla Popoloc Veerman-Leichsenring (1991: 23-27) adopts an analysis of aspirated consonants as phonemes but treats post-glottalized consonants as groups.

Table 1 presents the Proto-Popolocan consonants based on Veerman-Leichsenring (2004: 432) who follows Gudschinsky (1959a), Hamp (1960), and Kirk (1966) and integrates the revisions suggested in Rensch (1976). We note, for example, that the retroflex consonants which exist in contemporary Chocho and Popoloc, such as the retroflex affricate /ʈʂ/, also reconstructed by Gudschinsky (1959a), are analysed as innovations in Proto-Chocho-Popoloca (Hamp 1960: 62) and are not included in the Proto-Popolocan inventory. Moreover, phonemes found in borrowed words, such as /p/, are not included in Table 1 either.

Table 1. Consonants in Proto-Popolocan (marked by a double asterisk)[4] based on Veerman-Leichsenring (2004: 432) following Rensch (1976)

	Bilabial	Dental	Alveopalatal	Palatalized	Velar	Labialized	Glottal
Stop		**t		**t^j	**k	**k^w	**ʔ
Fricative		**s	**ʃ				**h
Affricate		**ts	**tʃ				
Nasal	**m	**n		**ɲ			
Approximant				**j		**w	
Lateral approximant		**l					

2.3. Vowels

Ixcatec (Fernández de Miranda 1961: 4) and Chocho (Veerman-Leichsenring 2000a) are described as having five oral vowels /a e i o u/ as well as their nasal counterparts /ã ẽ ĩ õ ũ/, all of which are reconstructed for Proto-Popolocan (Gudschinsky 1959a); cf. Table 2. The opposition between the back vowels /o/ and /u/ is missing in Metzontla Popoloc (Veerman-Leichsenring 1991: 21). Some Mazatec varieties have an opposition between /o/ and /u/ (Jamieson 1988: 4, Silverman et al. 1995, Beal 2011: 106), while in others, such as Huautla Mazatec, there appears to be free variation between [o] and [u] (K. Pike and E. Pike 1947).

Some Mazatec varieties, such as Chiquihuitlan Mazatec, have an extra height contrast for the open front vowel /æ/, which is neutralized for its nasalized counterpart (Jamieson 1988: 4–6), while others have only the /æ/ phoneme without a contrast with /e/, i.e., Jalapa Mazatec (Silverman et al. 1995: 72). Finally, for Soyaltepec Mazatec, Beal (2011: 106) describes an /ɛ/ phoneme which is variably realized as [ɛ] and [e]. Table 2 summarizes these facts.

[4] Here and elsewhere the double asterisk is used for Proto-Popolocan reconstructions, to distinguish them from reconstructions at shallower levels, signaled by a single asterisk.

Table 2. Vowels in the Popolocan languages

	Front	Central	Back
Close	i ĩ		u ũ
Close-mid	e ẽ		(o)
Open	æ*	a ã	

*only in Mazatec

In the Popolocan languages vowel length does not appear to be distinctive although it frequently does occur phonetically. As for diphthongs, **/ai/ and **/au/ are reconstructed for Proto-Popoloc (Veerman-Leichsenring 2004: 432 following Rensch 1976), although their status in the contemporary varieties is not clear. Indeed, nine diphthongs are described for Huautla Mazatec (K. Pike and E. Pike 1948), but an alternative analysis considers "the initial vowel in a two-vowel sequence as a glide in the preceding onset" (Golston and Kehrein 1998: 323). For example, the pairs provided by K. Pike and E. Pike (1948), *čhao*^{42} 'egg' vs. *cʔoa*^{3} 'his mouth' and *nʔãĩ*^{42} 'father' vs. *ntʔia*^{34} 'house', are represented by Golston and Kehrein (1998) as *čʷo̰*^{42} 'egg' (composed by a dorsal glide and breathy phonation on the vowel) vs. *cʷa̰*^{3} 'his mouth' (composed by a labial glide and creaky phonation on the vowel) and *nʷḭ̃*^{42} 'father' (with dorsal glide and creaky phonation) vs. *nt*^{j}*a̰*^{34} 'house' (with a coronal glide and creaky phonation).

The Jalapa Mazatec variety has received attention because of its typologically interesting tripartite phonation contrast involving modal, breathy, and laryngealized (or creaky) voice (Kirk et al. 1993, Silverman et al. 1995, Golston and Kehrein 1998). Although in most Mazatec varieties phonation and tone interact, in Jalapa Mazatec the three phonations and the tones are independent (Garellek and Keating 2011), cf. Table 3. Silverman (1997) further explores the realization of the so-called 'laryngeally complex' vowels, combining contrastive phonation and contrastive tone, and argues that they are sequenced in order to maximise the perceptual distinctness of these contrasts. As tone is less salient in non-modal phonation, due to biological constraints of the articulatory and auditory systems, optimal timing patterns may render tone salient when it combines with modal phonation.

Table 3. Jalapa Mazatec: Illustration of the three phonations (Garellek and Keating 2011: 190)

	Laryngealized		Modal		Breathy	
Low tone	βa̰^{1}	'thus'	ja^{1}	'kind of ant'	^{n}dja̤^{1}	'animal horn'
Mid tone	βa̰^{2}	'carries'	hæ^{2}	'finished'	^{n}da̤^{2}	'good'
High tone	βæ̰^{3}	'hits'	ha^{3}	'men'	ndʒa̤^{3}ʃu^{3}	'chocolate drink'

According to Kirk (1966), breathiness developed in Jalapa Mazatec from disyllabic *-V.hV, where "*h* metathesized with the vowel of the first syllable, and the vowel of the second syllable coalesced with this first vowel" (Silverman et al. 1995: 71), e.g., Proto-Mazatec **ntja*^{1}*hu*^{1} 'stone' > early Jalapa Mazatec **ndjo*^{1}*ho*^{1} > present-day Jalapa Mazatec *ndjo̤*^{1}. Similarly, laryngealized (creaky) vowels resulted from disyllables, where "the *ʔ* metathesized with the first vowel of the proto-disyllabic, producing a creaky vowel with coalescence of the vowel in the second syllable" (Silverman et al. 1995: 71), e.g., Proto-Mazatec **tsu*^{4}*ʔu*^{4} 'blouse' > *tsṵ*^{3}.

We note that Jalapa Mazatec was also the object of discussion regarding the existence of a ballistic-controlled contrast. Ballisticity is understood as "a prosodic phenomenon that affects the entire syllable" (Silverman et al. 1995: 78) and is characterized by "a fortis release of syllable-initial consonants, with a surge of energy, culminating in a weakened, breathy release" (Silverman et al. 1995: 73). Silverman et al. (1995) conducted an instrumental study

designed to test the three features that relate to ballisticity: 1) Presence of fortis release of syllable-initial consonants, through measurements of onset consonant duration and voice onset time (VOT); 2) Gradual surge and rapid decay in intensity, through measurements of intensity; and 3) Presence of post-vocalic aspiration. This study showed that there is an interaction of tone and length, the ballistic syllables being shorter. According to Silverman et al. (1995: 80–81), ballisticity in Jalapa Mazatec could be related to a length contrast in morphologically simple words (ballistic syllables corresponding to short syllables). According to the authors, the phonetic correlates of ballisticity, such as pitch and intensity increase, would contribute to the salience of these short syllables.

2.4. Tones

The Popolocan languages have complex tone systems, i.e., involving more than a two-way contrast (Maddieson 2013), but they have relatively small tone inventories in comparison to other Otomanguean languages. Popoloc, Chocho, and Ixcatec have three contrastive level tones, which are present in both the lexicon and the grammar: High (H), Mid (M), and Low (L) (for Popoloc see Veerman-Leichsenring 1991, for Chocho see Veerman-Leichsenring 2000a, for Ixcatec see Fernández de Miranda 1959). The pitch tracks for two minimal pairs from Ixcatec are presented in Figures 3a, 3b and 4a, 4b where it can be see that the low tone is realized as a falling tone; we also note that the low tone is realized only utterance-finally and neutralized utterance-medially as a mid tone. Similar to Proto-Popolocan, Mazatec has a fourth level tone (K. Pike 1948: 96), as does the Popolocan variety of San Juan Atzingo. Moreover, Mazatec has phonologically contrastive contours, which are best described as sequential (K. Pike 1948: 12, 97, Beal 2011: 223). The Popolocan languages also have high tone downstep, tone sandhi, and grammatical tones.

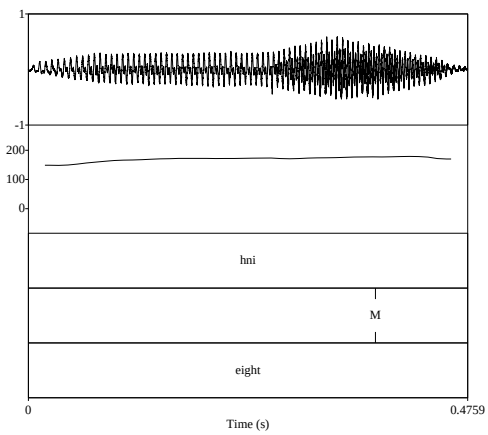

Figure 3a. Waveform and F0 contour for the word $^{h}ni^{2}$ ‘eight’ produced by a male Ixcatec speaker

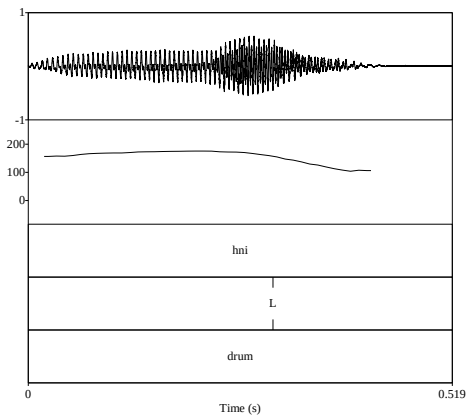

Figure 3b. Waveform and F0 contour for the word $^{h}ni^{3}$ ‘drum’ produced by a male Ixcatec speaker

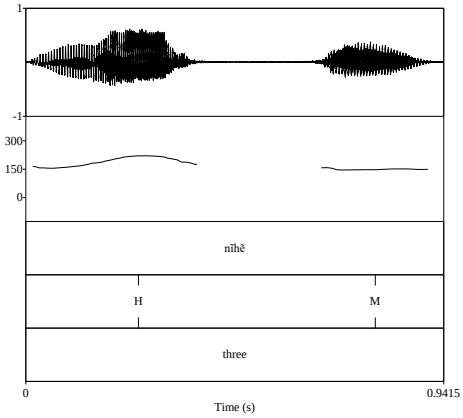

Figure 4a. Waveform and F0 contour for the word *nĩ¹hẽ²* 'three' produced by a male Ixcatec speaker

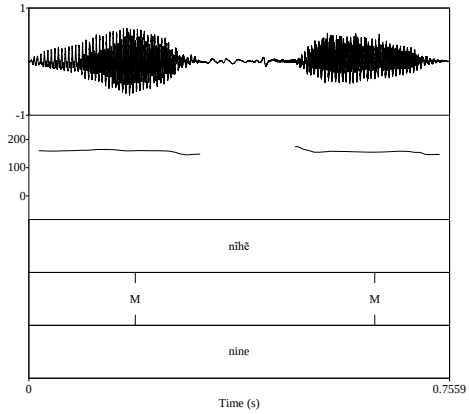

Figure 4b. Waveform and F0 contour for the word *nĩ²hẽ²* 'nine' produced by a male Ixcatec speaker

We can mention the development of Mazatec whistle speech, a form of communication which relies on prosodic features such as tone and duration. According to Meyer (2015: 43), Mazatec whistlers communicate over short and medium distances, in the mountains, the villages or even in town.

2.5. Stress

The role of stress in the Popolocan languages is currently under discussion and is of great typological interest. Although the phonetic interaction between tone and stress is wide-spread, most languages are known to have either contrastive tone or contrastive stress, but not both (de Lacy 2002). However, various researchers have drawn attention to the central role of stress in the Popolocan languages. For example, Fernández de Miranda (1961) systematically notes stress differences in Ixcatec and more recently, based on experimental data, DiCanio (2012) argues that stress in Ixcatec is contrastive. Similarly, stress as a contrastive feature is described for Metzontla Popoloc by Veerman-Leichsenring (1991: 36–38), according to whom multi-syllabic words have a (CV)CVCV pattern with stress on the penultimate vowel and also sometimes affecting the following consonant, e.g., through greater duration or preglottalization. Veerman-Leichsenring (2000b: 321–322) argues that Popoloc, Chocho, and Ixcatec also have stress in monosyllabic words, phonetically realized as vowel gemination, disyllabic realization of a diphthong or through the addition of an affix as a prothetic vowel. Lengthening of stressed syllables is described for Atzingo and Tlacoyalco Popoloc (Kalstrom and Pike E. 1968, Stark and Machin 1977: 69). In Mazatec, stress, characterized by lengthening, is fixed and falls on the final syllable (K. Pike 1948, Kirk 1966, Beal 2011). Interaction between tone and stress for Mazatec is described in Silverman et al. (1995) and Garellek and Keating (2011).

2.6. Prosodic marking of information structure

The prosodic marking of information structure is an aspect that has received little attention. Recent experimental work on Ixcatec shows that both pitch and duration are manipulated to express focus, namely through raised F0 for contrastive focus, and a variety of means, such as lengthening, for corrective focus, whereas lack of focus is associated with lowered F0 and decreased duration (Adamou, Gordon, and Gries 2018). Figure 5a illustrates the realization of the word 'three' with corrective focus; compare with Figure 4a for the realization of the same word with no focus. Moreover, the last Ixcatec speakers combine lengthening with a dedicated focus marker, *na²* (Adamou, Gordon, and Gries 2018: 73); see an example in Figure 5b.

Combination of prosody with specialized focus markers appears to be cross-linguistically rare and deserves more research (Büring 2009, Féry 2013).

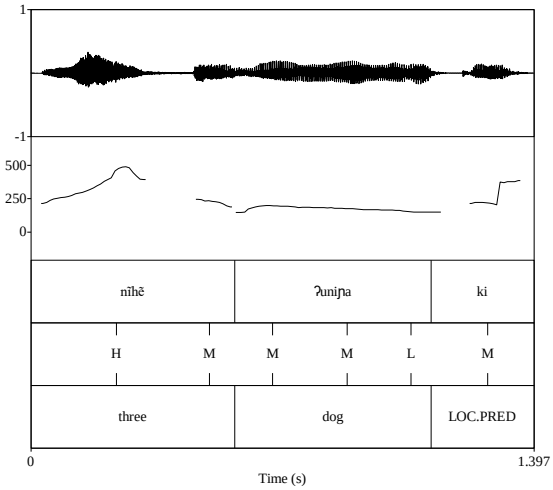

Figure 5a. Pitch track of the word ‘three’ under corrective focus (Adamou 2016: 166)

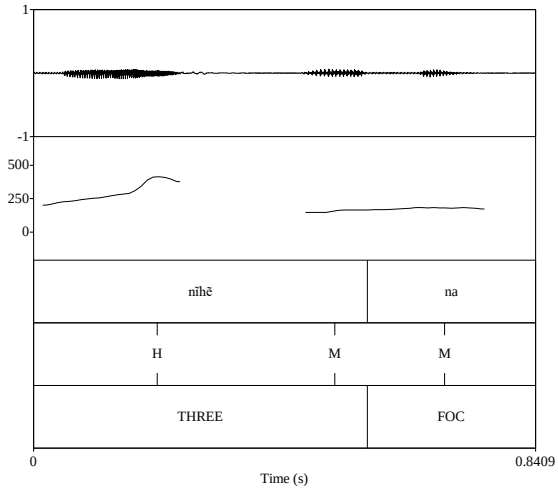

Figure 5b. Pitch track of the word ‘three’ combined with the focus particle (Adamou 2016: 171)

3. Morphology

3.1. Introduction

The rich verb morphology of the Popolocan languages has drawn the attention of typologists for illustrating a multi-level type of verb inflectional morphology, where each level behaves independently of the others (Baerman, Brown, and Corbett 2010). As shown in Table 4, for Chiquihuitlan Mazatec the verb ‘to gather’ belongs to three inflectional classes with respect to prefixal inflection, affixal inflection, and tonal inflection. Thus, the verb ‘to gather’ patterns with the verb ‘to return’ for the affixal pattern, with ‘to pull out’ for the prefixal pattern, and with ‘to take out’ for the tonal pattern. These three verbs in turn pattern with other verbs at the three levels of prefix, affix, and tone inflection. Similar complex verbal morphology can also be found in the other Popolocan languages.

Table 4. Chiquihuitlan Mazatec: Verb inflectional classes (Baerman, Brown, and Corbett 2010 based on Jamieson 1982: 152, 166–167)

	‘gather’
1SG	$\check{c}ha^{3}y\text{-}a^{1}$
2SG	$hba^{2}y\text{-}e^{2}$
3	$\check{c}ha^{3}y\text{-}a^{2}$
1INCL	$hba^{2}y\text{-}\tilde{a}^{2}$
1PL	$hba^{2}y\text{-}\tilde{\imath}^{24}$
2PL	$hba^{2}y\text{-}\tilde{u}^{2}$

	(affixal pattern) ‘return’	(prefixal pattern) ‘pull out’	(tonal pattern) ‘take out’
1SG	$bu^{1}y\text{-}a^{1}$	$\check{c}ha^{3}n\text{-}\tilde{e}^{1}$	$ba^{3}\check{s}\text{-}æ^{1}$
2SG	$bo^{3}y\text{-}e^{2}$	$hba^{3}y\text{-}e^{31}$	$n\tilde{a}^{2}\check{s}\text{-}e^{2}$
3	$bu^{3}y\text{-}a^{2}$	$\check{c}ha^{3}n\text{-}\tilde{e}^{1}$	$ba^{3}\check{s}\text{-}æ^{2}$
1INCL	$bu^{3}y\text{-}\tilde{a}^{2}$	$hba^{3}n\text{-}\tilde{e}^{31}$	$n\tilde{a}^{2}\check{s}\text{-}\tilde{e}^{2}$
1PL	$bu^{3}y\text{-}\tilde{\imath}^{24}$	$hba^{3}n\text{-}\tilde{\imath}^{14}$	$ba^{3}\check{s}\text{-}\tilde{\imath}^{24}$
2PL	$bu^{3}y\text{-}\tilde{u}^{2}$	$hba^{3}n\text{-}\tilde{u}^{1}$	$ba^{2}\check{s}\text{-}\tilde{u}^{2}$

3.1.1. Inflectional and derivational morphology

In the Popolocan languages, the distinction between inflectional and derivational morphology is not always straightforward. Indeed, these languages are characterized by an ongoing change from analytic to synthetic and from isolation to affixation. For example, Huautla Mazatec verbs are generally compounds formed with a closed class of first main stems, mainly handling verbs such as *sʔĩ*^{1} ‘makes’, *vʔa*^{3} ‘carries’, *vʔe*^{1} ‘deposits’, *va*^{1} ‘places’ (K. Pike 1948: 107, 112-116), and an open class of second main stems, which can be nouns, adjectives, verbs, or directional adverbs; e.g., *vʔe*^{1} ‘deposits’ + *nthao*^{4} > *vʔe*^{1}*nthao*^{4} ‘he fans’. But the cognates of the Huautla Mazatec main stems, which have a fixed tonal paradigm, correspond to Chiquihuitlan Mazatec stem prefixes, which belong to various tone classes (Jamieson 1982: 164); see Table 5.

Table 5. Chiquihuitlan Mazatec: Verb inflectional classes for aspect (Jamieson 1982: 149)

Set No.	3DEF or 1SG		OTHER PERSONS	
	NEUTRAL	INCOMPL	NEUTRAL	INCOMPL
1	be-	kue-	be-	kue-
2	ba-	kua-	ba-	kua-
3	bo-	sko-	čo-	čo-
4	bu-	sku-	ču-	ču-
5	hu-	sku-	čhu-	čhu-
6	hi-	ski-	čhi-	čhi-
7	hba-	khua-	hba-	khua-
8	tsi-	tsi-	nĩ-	nĩ-
9	su-	su-	nũ-	nũ-
10	bu-	ku-	bu-	ku-
11	ba-	kua-	ča-	ča-
12	ka-	ska-	ča-	ča-
13	hba-	khua-	nã-	nã-
14	ba-	kua-	nã-	nã-
15	bi-	kui-	bi-	kui-
16	bu-	sku-	ntu-	ntu-
17	hi-	si-	či-	ši-
18	hba-	khua-	čha-	čha-

Moreover, as Veerman-Leichsenring (2006: 95) points out for Popoloc, argument structure and lexical meaning cannot serve as solid criteria for defining inflexion, since inflectional suffixes may serve to change lexical meaning.

3.1.2. Clitics and affixes

Several phonological and morphosyntactic criteria are used in the literature to identify clitics: a clitic's lack of prosodic structure at the level of the prosodic word; phonological impact of the clitic on the host; internal or boundary phonology between the clitic and its host, e.g., not taking over the nasality of a host signals boundary phonology and vice versa; whether the clitic has a free variant; a clitic's high or low degree of selection of its host (see among others Zwicky 1977, Klavans 1985, Anderson 2005).

Since Pike's work (K. Pike 1948), lack of stress has been the most basic parameter for identifying clitics in Otomanguean languages: "Certain items (single morphemes or sequences of fused morphemes) follow nouns or close-knit noun phrases and depend upon them in pronunciation by being grouped with them rythmically. In addition, these dependent items have no stress, whereas every phonologically independent Mazatec item does have stress. It is precisely for this reason that the items under discussion will here be called enclitics." (K. Pike 1948: 100). Proclitics in Mazatec are also described as linked to the rythmic pronunciation of the host (K. Pike 1948: 99).

Next to the lack of prosodic structure, another phonological parameter often mentioned in the literature on cliticization has to do with the impact the clitic has on its host's stress or tone in the case of tonal languages. However, Anderson (2005) points out that whether the presence of a clitic will affect the host's prosodic structure is language specific and this is how this parameter was treated in Otomanguean studies. For example, K. Pike (1948: 89) distinguishes various types of clitics in Mixtec based on their ability to affect the host's tones and to be affected by it. For Metzontla Popoloc, Veerman-Leichsenring (1991: 38) describes clitics as morphemes that do not modify the location of stress of their host, as opposed to affixes,

which affect the location of stress of their host. The author mentions the exception of the initial verb position, where such a distinction is not possible (Veerman-Leichsenring 1991: 110). Similarly, according to Fernández de Miranda (1961), affixes in Ixcatec are those units which may modify the root.

In the general literature, internal or boundary phonology may also serve to identify and categorize clitics, i.e., as stated by Klavans (1985: 38), "clitics often do not undergo internal phonology." However, Veerman-Leichsenring (1991: 38) makes the opposite claim, namely that clitics in Metzontla Popoloc take over the nasality or orality of their host as opposed to affixes, which do not. Differently from this, K. Pike (1948: 101) observes that in Mazatec the syntactic downglide that marks the end of a noun phrase precedes the enclitics.

3.2. The verb

Following Veerman-Leichsenring (2006: 95), we may consider as inflectional the markers of person, negation, tense and aspect, which occur at the outer edges of the verb stem, while the affixes that occur in the inner structure of the verb can be considered derivational. Table 6 shows a simplified template of the Popoloc verb (Veerman-Leichsenring 2006: 95). The type of derivation depends on the semantic characteristics of the verbs, most importantly the feature [±human]. The Popoloc verb has a relatively small number of derivational affixes, namely causative, anticausative, comitative and instrumental. The Mazatec verb additionally forms compounds with a number of directional markers; for example in Chiquihuitlan Mazatec *-sy*^{1} 'on top of', *-ya*^{1} 'inside', *-koh*^{3} 'with', and *-taʔ*^{2} 'alongside' (Jamieson 1982: 144).

Table 6. Metzontla Popoloc: a simplified template of the verb (adapted from Veerman-Leichsenring 2006: 95)

-4	Tense	PRESENT PAST FUTURE (IRREALIS)
-3	Aspect	PERFECTIVE IMPERFECTIVE INCHOATIVE APPROXIMATIVE
-2	Derivational prefixes	CAUSATIVE ANTICAUSATIVE
-1	Passive or neutral tense markers	
√		
1	Derivational suffixes	COMITATIVE INSTRUMENTAL
2	Person	
3	Negation	
4	Plural and co-reference	

3.2.1. Person marking and alignment

Chocho and Popoloc have been claimed to be 'stative-active' or 'intransitive split' languages, or showing 'semantic transitivity', i.e., Chocho (Mock 1982) and Popoloc (Veerman-Leichsenring 2006). I will refer to this phenomenon here by the term 'semantic alignment', which applies to languages in which "an agentive S is encoded, through case marking, verbal agreement, or both, in the same way as A and non-agentive S in the same way as P" and "where

the agentive vs. non-agentive distinction is a pervasive feature of the grammar" (Wichmann 2008: 3).

In Chocho the unique argument of intransitive verbs (S)[5] and the agent-like argument of transitive verbs (A) are indexed on the verb through a set of suffixes shown in Table 7. Moreover, Chocho has a set of optional S/A free pronouns and a set of free pronouns which encode the P and R arguments of transitive verbs and the subjects of non-verbal predicates as well as the so-called 'medio-passive' and 'reflexive' verbs (also see Veerman-Leichsenring 2000a: 30, 35, 42–47).

Table 7. Santa Catarina Ocotlan Chocho: Person marking (based on Veerman-Leichsenring 2000a)

	S/A	**S/A**	**P/R**
1 (EXCL)	-a^{1}	xã^{1}	=ma^{1}
2SG	-a$^{1/2/3}$	xa$^{2/3}$ʔ	=mi^{3}
3SG	-Ø	sua^{1}	Ø
CO.3SG	ɾi^{1}, etc.	sua^{1}-ci^{1}/-ni^{2}/-ru^{2}	=ɾi^{1}, etc.
HON		ja^{3}	
COL	-i^{1}	xĩ^{1}	=mi^{1}
PL		+ ngu^{2}ngu^{2}	

Examples (1a) and (1b) illustrate the uses of the Chocho suffixes and the free P/R pronouns.

(1a) bi^{1}-ku^{2}-a^{1} mi^{3}
COZ ASP-see-1SG 2SG
'I saw you.' (Mock 1982: 350)[6]

(1b) bi^{1}-ku^{2}-a^{2} ma^{1}
COZ ASP-see-2SG 1SG
'You saw me.' (Mock 1982: 350)

Some intransitive Chocho verbs take the S/A suffixes; this is the case for the verbs such as 'to arrive', 'to fight', 'to sleep', 'to cry', 'to sing', 'to run', 'to stand up', 'to change', 'to dance', 'to come', 'to go' (Mock 1982: 354). Some intransitive verbs receive the P/R pronouns, such as 'to fall', 'to cough', 'to get drunk', 'to die', 'to dream', 'to tremble', 'to be lost', 'to stay quiet', 'to be (locative)', 'to burn (metaphoric)' (Mock 1982: 353). Moreover, this set of free pronouns is said to attach to some verb roots producing inactive verbs, while the S/A person suffixes attach to the same verb roots producing active verbs (Mock 1982); see Table 8. Although it is not stated explicitly by Mock or Veerman-Leichsenring, the P/R pronouns are probably specialized to human participants since they involve interlocutors (first, second, and collective).

[5] For the discussion of core arguments I use the terminology from Malchukov et al. (2010).

[6] For the sake of consistency the examples cited in this article are transcribed as follows: when tones are noted in the source cited, they are transcribed using superscript numerals, using ^{1} for a high tone, ^{2} for a mid tone, and ^{3} for a low tone. The original symbols were maintained with the exception of nasalisation which has been noted throughout the paper with a tilde above the vowel, and laryngealization, noted with a tilde below the vowel. Every example is accompanied by the three-letter ISO 639 code: COZ for Santa Catarina Ocotlan Chocho, PBE for Metzontla Popoloc, IXC for Ixcatec, and MAQ for Chiquihuitlan Mazatec.

Table 8. Santa Catarina Ocotlan Chocho: Intransitive verbs with suffixes or clitics (Mock 1982: 354)

S suffixes	**Controlled action**	**P/R clitics**	**Involuntary action**
da¹ʔxi¹-a¹	‘I get down’	da²ʔxi² ma¹	‘I’m lowered’
du²ʔngi¹-a¹	‘I wash my head’	du¹ngi¹ ma¹	‘I washed my head’
tua²ʔn̩gi¹-a¹	‘I grow (intentionally)’	tua¹ngi¹ ma¹	‘I grow up’
tẹ̃²-e¹	‘I go aside’	tẹ̃²e² ma¹	‘I’m on the side’
tu³s̱oã³-na¹	‘I get well (I recognize it, I admit it’)	tu¹s̱uẽ²ʔ ma¹	‘I get well’

In Popoloc, a set of suffixes encodes S/A arguments, prototypically [+human] (Veerman-Leichsenring 2006). Popoloc also has optional free pronouns for S/A/P/R depending on word order. Moreover, it has a series of portmanteau suffixes, encoding [+human] A>affected arguments, with verbs such as ‘to obey’, ‘to hate’, ‘to love’. The portmanteau suffixes result from fusion of segmental and tone morphemes and are similar to the possessive suffixes (Veerman-Leichsenring 2006: 100). The Popoloc portmanteau suffixes apply to a specific class of transitive verbs and to a number of labile (intransitive and transitive) verbs (Veerman-Leichsenring 2006: 102) in what can be described as a case of semantic alignment; see Table 9 for examples of labile verbs.

Veerman-Leichsenring also notes that “verbs that change their meaning significantly when marked with different inflection types can be considered separate verbs in spite of their common lexical source” (Veerman-Leichsenring 2006: 103). For example, when the verb *ši²ča³* takes a person pronoun from the intransitives (S) it means ‘to talk’, but when it takes a portmanteau pronoun (SO) it means ‘to greet a person’.

Table 9. Metzontla Popoloc: Labile verbs (Veerman-Leichsenring 2006: 102)

tha³nǯa²	(S)	‘to ask something’
	(SO)	‘to ask a specific person for something’
tʔe³ki²	(S)	‘to tell something’
	(SO)	‘to tell something to a specific person’
ti¹te²	(S³)	‘to cost something’
	(S³O)	‘to cost something (to) a specific person’

Veerman-Leichsenring distinguishes a number of verbs which take yet another set of person markers, which are enclitics. The enclitics are used with the so-called ‘reflexive’ verbs, e.g., ‘to sneeze’. For these verbs the subject and the object are identical, although the subject may be passive, e.g., ‘to suffer’, or active, e.g., ‘to move oneself’. More importantly, for these verbs “the action or state affects the subject of the predicate in a direct way” (Veerman-Leichsenring 2006: 101). The enclitics also combine with some verbs with a [+human] complement, e.g., ‘to talk’, ‘to pull’, ‘to kiss’ (Veerman-Leichsenring 1991: 168–171). Finally, the enclitics are used with nouns and adjectives that may function as predicates, such as ‘to be a woman’ or ‘to be big’ (Veerman-Leichsenring 2006: 101–102). Table 10 summarizes the different person markers and their functions.

Finally, agentless passive verbs can be derived in Metzontla Popoloc through the prefix *š-* for cases where the agent is human and known but suppressed or defocused (Veerman-Leichsenring 2006: 112); e.g., *šʔu¹ nu³a³* ‘the corn is ground’ vs. *tʔu¹ nu³a³* ‘he/she grinds the

corn'. The reciprocal pronoun *ki¹ču¹* is used to establish a symmetrical relation between agents and patients in transitive constructions (Veerman-Leichsenring 2006: 101–103).

Table 10. Metzontla Popoloc: Person marking (based on Veerman-Leichsenring 1991: 112, 128–176, 379)

	S/A	**S/A/P/R**	**[+HUM]A>affected**	**reflexive, stative predicates [+HUM]A>affected**
1SG	-a (-ua, -ia, -e)[7]	xã¹ʔa³	1>3 -ʔa³ 1>2 -ʔa¹	=na³/=na²
2SG	-a²	xa²ʔa²	2>3 -ʔe¹ 2>1 –n(ʔ)a²	=a²
3SG	Ø	xe²ʔe²	3>3 -ʔe²/-ʔe³ 3>1 –n(ʔ)a³ 3>2 -ʔa²	Ø
CO.3 F/AN		nra¹/ba²		
INCL		xe²ʔe²=ni²		=ni²
EXCL		xã¹ʔa³=na¹		(=na²)=na¹
2PL		xa²ʔa²=nda¹		(=a²)=nda¹
3PL		xe²ʔe²=na²		Ø

Ixcatec shows accusative alignment (S = A ≠ P) in indexing: the unique argument of intransitive verbs (S) and the agent-like argument of transitive verbs (A) are indexed on the verb through a set of suffixes; see (2a) and (2b). Third person singular is treated differently from all other persons and is either marked zero, see (2c), or, when appropriate, through one of the three cross-reference morphemes (see section 3.3.1). Moreover, Ixcatec has optional free pronouns for S/A/P/R depending on word order.

(2a) ɸi²-na³ li²-o²
IXC go-1SG LOC.PROX-RESTR
'I'm going just here...' (Adamou 2018, https://doi.org/10.24397/pangloss-0000358#S164)

(2b) ka²tsʰe²-na³ ʰngu² ni²ɦna² ju¹hu² ni²ɦna²
IXC bring_out-1SG one backpack two backpack
'I bring out one backpack, two backpacks…' (Adamou 2018, https://doi.org/10.24397/pangloss-0000358#S125)

(2c) ʃu²wo²-ke² tʃi¹ɲa²-ke²
IXC come-ITER again-ITER
'He comes back again.' (Adamou 2018, https://doi.org/10.24397/pangloss-0000350#S84)

[7] Veerman-Leichsenring (2006: 98–99) distinguishes two subclasses based on tonal alternations. According to the author, there are arguments that support the existence of grammatical tones (for person) which override the lexical tones.

Beside this basic alignment, a small number of Ixcatec verbs receive the possessive suffixes, e.g., emotion ‘to be upset’, ‘to be lazy’; bodily experience ‘to be sick’, ‘to bathe’, but also posture ‘to sit’; see (3) for an example.

(3) β-a²ni²nga²-ɲa¹na³ ndi²ʃe²ra² la² nda¹ ʃta¹ si¹ ma²ma²si¹ta²
IXC IPFV-upset-POSS.1SG because COMP what ugly EXS mummy
‘I’m getting upset because it’s so ugly, woman!’ (Adamou 2018, https://doi.org/10.24397/pangloss-0000358#S7)

Table 11 summarizes person marking in Ixcatec. We note the existence of an inclusive-exclusive distinction. Moreover, the third plural marker is used in impersonal constructions while a free pronoun *su¹βi²* is used in impersonal constructions with unrestricted universals and conditionals.

Table 11. Ixcatec: Person marking

	S/A	**S/A/P/R**	**Possessive suffixes**[8]
1SG	-na³	ʔi²na¹na³	- ɲa¹na³
2SG	-a²	ʔi²la³	-ʔa²
3SG	-Ø	su¹wa¹	-ʔe¹
CO.3SG M/F/AN	-da²/ -kʷa²/ -βa²	su¹wa¹-da²/-kʷa²/-βa²	
INCL	-i¹	ʔi²ni¹	-ni²
EXCL	-ri²	ʔi²na¹ri²	-ɲa³ri²
HON		ʔi²la³ri²	
3 PL	-ma²	su¹wa¹ma²	-ʔe²ma²

Chuiquihuitlan Mazatec has a complex set of S/A suffixes (Jamieson 1982, 1988). For these suffixes, the third and the first person are frequently the same. In some cases tonal changes are used to specify person number; as these changes are complex, tone is not noted in the suffixes listed in Table 12 (Jamieson 1988: 80). Moreover, Chuiquihuitlan Mazatec has a set of P/R suffixes, which are similar in form to the possessive adjectives (Jamieson 1988: 46, 49). The P/R suffixes are used with transitive verbs but also with some intransitive verbs, such as ‘to be hungry’ or ‘to be sick’, cf. (4).

(4) vojo na¹
MAQ hungry 1SG
‘I’m hungry.’ (Jamieson 1988: 77, my glosses)

Chuiquihuitlan Mazatec also has a set of free pronouns for S/A/P/R, with a short and a long form. When the two pronouns co-occur, the order is VAP, as shown in (5).

(5) vite¹xa ngahan ngaye
MAQ command 1SG 2SG
‘I ask you.’ (Jamieson 1988: 47)

[8] Fernández de Miranda (1961: 7) establishes five tonal patterns for the possessive suffixes based on the tones of the suffixes and changes of the root.

Unlike Chiquihuitlan Mazatec, Huautla Mazatec shows considerable fusion between S/A pronouns and P pronouns. Table 12 summarizes person marking in Chiquihuitlan Mazatec.

Reflexivity is expressed in Mazatec using the word *yojo* 'body' and a possessive adjective, e.g., *vaja¹ yojo naha* 'I hit my body' (Jamieson 1988: 119). Reciprocity is expressed differently, namely by the verb in plural form followed by the possessed kin term *xicjin* 'his relative' inflected for person (Jamieson 1988: 119–120).

Table 12. Chiquihuitlan Mazatec: person marking (based on Jamieson 1988: 42–47, 80; with one exception, the tones are not noted by the author, reflecting frequent tonal changes)

	S/A (example for the class in -a)	**P/R**	**S/A/P/R**
1SG	-a	-na¹	(nga)han
2SG	-e	-ri	(nga)ye
3SG	-a	-rë	
CO.3SG M/F/AN			cha/na/chu
INCL	-an	-naja	(nga)yaan
EXCL	-in	-niji	(nga)yin
2 PL/HON	-un	-nuju	(nga)yun
3 PL	-a	-rë	me

3.2.2. TMA markers

The Popolocan languages mark tense and aspect through a number of prefixes. The distinction between aspect and tense is not well established; for example Jamieson (1982) describes as aspect what is later described in her pedagogical grammar as tense (Jamieson 1988). Also, Veerman-Leichsenring (2000a: 57) explicitly mentions that what can be described as tense, i.e., past perfect, may well have a more aspectual value due to a diachronic development from tense to aspect (Veerman-Leichsenring 2006: 96). Further research is clearly needed for the entire Popolocan branch in order to obtain a more fine-grained description of the tense-mood-aspect (TMA) markers and their uses.

Table 13 summarizes the most regular forms of the TMA markers although some verb classes do not take them. For instance, in Chocho verbs starting with a vowel do not have any tense or aspect marking; Mazatec has complex marking for future depending on verb classes; in Ixcatec some TMA markers interact with person, etc. Despite complex morphology, this table shows some similarities in the TMA marking and some cognates can be gleaned. It can be seen, for example, that Ixcatec has innovated by grammaticalizing evidentiality through the prefix *tsi¹-/ts-*, which corresponds to a future in Popoloc and Chocho (Costaouec and Swanton 2008). See an example in (6).

(6) tsi¹-ɸi² tjhĩ²-na² tsi¹-βa²tsi²ʈʃe²ngi² ʔi²nda²
IXC EVD-go day-FOC EVD-pour water
'Reportedly they go by day to pour water.' (Adamou 2018, https://doi.org/10.24397/pangloss-0000360#S32)

Table 13. TMA markers in the Popolocan branch (Chocho based on Veerman-Leichsenring 2000a: 54–60, Popoloc in Veerman-Leichsenring 2006: 96–97, Ixcatec based on ongoing personal research, Chiquihuitlan Mazatec in Jamieson 1988: 107–116 and Jamieson 1982: 147–149)

	Chocho	**Popoloc**	**Ixcatec**	**Chiquihuitlan Mazatec**
Aspect				
Neutral or timeless	(k-, g-)*	(k-, kʔ-, kh, x-)*		(absence of prefix and four tone patterns)
Imperfective		kʔue^{1}-	βi^{2}- (β-)	
Incompletive				(18 stem formatives and interaction with tone)
Perfective		tsi^{1}-	ku^{1}- (k^{w}-)	
Participle (aspectual)	tsi^{1}-			
Progressive (or continuative)	di^{1}-		ti-, ki^{1}-, tu^{1}-	ti-
Consecutive	du^{1}-			
Inchoative	tsi^{2}-, tsi^{3}			
Past perfect (aspectual)	bi^{1}-			
Tense				
Present	t-, d-	t-		
Past	ku-, b-	ku- (kw-)		ka-
Anterior	=kõ^{1}		-ku^{1}	
Future	ts-, z-	ts-, tsu^{3}-	k^{w}i^{2}- (k^{w}-)	(complex morphology)
Mood and modality				
Evidential			tsi^{1}- (ts-)	
Volitional	tsu^{2}-			
Adhortative	zu^{1}-			

*These forms always appear with other TMA markers.

The Popolocan languages also have a number of auxiliaries with temporal, aspectual or modal meaning. These auxiliaries precede the main verb and inflect for person and tense. Mazatec has a number of auxiliaries which have been grammaticalized to different degrees, e.g., *fe* ‘goes’, *fehe* ‘arrives’, *fë* ‘finishes’, *nduva* ‘comes’, *vuya* ‘comes back’, *vetsihin* ‘starts’, *vijnetaha* ‘finishes’, as well as modal verbs, e.g., *meje* ‘wants’, *ma* ‘can’ (Jamieson 1988: 147–151). Also in Chocho, we find auxiliaries preceding or following the main verb, e.g., *ci*^{3} ‘to go to’ or in the past *fi*^{2}*a*^{1} ‘went to’, *ẹuã*^{1} ‘to come’, *te*^{1}*kõ*^{2} ‘to want’, *da*^{3}*si*^{3} ‘to put’ (Veerman-Leichsenring 2000a: 65–67).

3.2.3. Valency-changing devices

The Popolocan languages have a number of valency-changing devices.

3.2.3.1. Antipassive

Ixcatec is the only language of the Popolocan branch that has developed an antipassive verbal suffix, *–mi*^{2} (Adamou 2014a, 2014b). Unlike most languages with antipassive constructions

(Polinsky 2005), Ixcatec antipassive constructions target highly individuated arguments, namely humans who are also generally speech-act participants. This is due to the origin of *–mi*² which most likely developed from the Proto-Popolocan ***hmi* ‘person’ (reconstructed in Veerman-Leichsenring 2004: 433 following Gudshinsky 1959a) and is still productive in compound word formation, i.e., *mi²-nda²wa²* ‘man’, *mi²-tʃʔa²* ‘woman’, *tʃa²h-mi²* ‘people’. The Ixcatec antipassive triggers the suppression of the patient-like (P) argument—compare (7a) with (7b)—and the recipient-like (R) arguments—compare (8a) with (8b).

transitive

(7a)	hã²ã³	βi²#	βi²-ʔu²se²ʔe²	sa¹	na²-ʔa¹-ɲa¹na³	nde¹de²	ki¹i²
IXC	yes	IPFV-look		DEF	CLS-mother-POSS.1SG	what	LOC

‘Yes, she’s looking in on my mother to see how she is doing.’ (Adamou 2018, https://doi.org/10.24397/pangloss-0000360#S173)

antipassive

(7b)	βi²hi²	ʔu²se²ʔe²-mi²	tu¹=ɸi²	
IXC	arrive	look-ANTIP	PROG.PL=go	

‘She arrives to see how (we) are doing.’ (Adamou 2018, https://doi.org/10.24397/pangloss-0000360#S171)

transitive

(8a)	su¹wa¹-kʷa²	la²	β-a²ndʒi²ʔe¹-kʷa²	ni²ɲu²	ka²	sa¹	di²-ra²
IXC	3SG-F	COMP	IPFV-ask-CO.3SG.F	tortilla	all	DEF	sir-DEM.DIST

‘She’s the one asking for tortillas from all those men there.’ (Adamou 2014a: 374)

antipassive

(8b)	su¹wa¹-kʷa²	la²	β-a²ndʒi²ʔe¹-mi²-kʷa²	ni²ɲu²
IXC	3SG-F	COMP	IPFV-ask-ANTIP-CO.3SG.F	tortilla

‘She’s the one asking (us) for tortillas.’ (Adamou 2014a: 374)

There is also a special use of the antipassive suffix with stative predicates, where it indicates that the participant is affected by the state, see (9).

(9)	he²e²	na²-ʔtʃi¹-ku¹-mi²
IXC	now	CLS-grandmother-ANT-ANTIP

‘Now (we have become) already grandmothers.’

The uses of the Ixcatec antipassive highlight a connection with the semantic alignment in Chocho through the P/R pronouns in *m-*, which are probably diachronically related to the Ixcatec antipassive *-mi²* (Adamou 2014b). Within Middle America, one can also draw attention to the equivalent ‘object-suppressive’ voice in the unrelated Upper Necaxa Totonac language, a category which also occurs with states and nominal roots for atelic reading (Beck 2004).

3.2.3.2. Causative

The Popolocan languages have grammaticalized a causative suffix from the verb ‘to do, to make’. Chiquihuitlan Mazatec has a number of verbs formed with a causative, *tsi-* or *ni-* depending on person, e.g. *tsijenda* ‘to make tired’ (vs. *fenda* ‘to be tired’), as well as several lexicalized verbs (Jamieson 1988: 96). In Huautla Mazatec, the causative is also frequently encountered in the formation of compound verbs, e.g. *si¹-cho²* ‘makes + crisp’ ‘he toasts’ (K. Pike 1948: 112).

Chocho and Ixcatec each have one causative suffix, respectively *že³*- and *–tse²k–/–tse²–*. Compare (10a) and (10b) from Ixcatec, where the causative in (10b) introduces a new argument, semantically a causer and syntactically an A argument. We note that some Ixcatec verbs have been lexicalized, e.g. *tse²hi²* 'to sell' < 'to do-go'.

(10a) sa¹ di²-hua¹n la² nda¹ʃta² β-a²ɲu²ʃi²-da²
IXC DEF CLS-NP COMP a_lot IPFV-laugh-CO.3SG.M
'It's Mr. Juan who is laughing a lot.' (Adamou 2014a: 386)

(10b) sa¹ di²-hua¹n la² ku¹-tse²k-a²ɲu²ʃi²-mi²-da²
IXC DEF CLS-NP COMP PFV-CAUS-laugh-ANTIP-CO.3SG.M
'It's Mr. Juan the one that makes (me) laugh.' (Adamou 2014a: 387)

Metzontla Popoloc has two morphological causatives: the first is based on the verb 'to make' and inflects for person, i.e., *čʔe²*- for second and third person and *tʔa²*- for first person. It is used with intransitive S verbs, reflexive verbs, adjectives and some passive predicates. Compare the causal verb in (11a) and the verb phrase with similar meaning in (11b).

(11a) si²-čʔe-²ša³-ʔa²=ni²
PBE FUT-CAUS-work-NEG=INCL
'We will not work.'

(11b) si²-če²-ʔa²=ni² ša³ʔ
PBE FUT-make-NEG=INCL work
'We will not do the work.' (Veerman-Leichsenring 2006: 109–110)

The second causative, *tʔe³*-, is used with verbs that refer to the positional change of a direct object, e.g., *tʔe³-ma³ʔ* 'to hide' and *tʔe³-ndu²* 'to expose to the sun'. Moreover, in Metzontla Popoloc a periphrastic causative construction, with the verb *čʔe²* 'to make' as an auxiliary, is used when the causee has some control over the action; see example in (12).

(12) si²-ta²-ʔa³=ša¹ cʔa³ɕhe²=ša¹
PBE FUT-make-1>3=CO FUT.leave.3=CO
'I will make him (boy) leave.' (Veerman-Leichsenring 2006: 112)

3.2.3.3. Anticausative

For Metzontla Popoloc, Veerman-Leichsenring (2006: 114) describes the use of an anticausative *ti²*- prefix for a spontaneous action or process, not caused by a human being. These impersonal verbs are different from the agentless passive verbs in that the subject of the anticausative verbs is active; e.g., *ti²-thia³ngʔi¹* 'it hangs'.

3.2.3.4. Applicative-instrumental

Metzontla Popoloc has a productive instrumental suffix, *-ši²*, also realized as *-ša²* for some verbs for first and second person, which serves to add a prototypically non-human argument. In most cases it indicates that the action is realized with an instrument, see (13a), and it is only used when the argument precedes the verb, i.e., with non-canonical OV word-order. It can also be used with motion and telic verbs, indicating respectively the location, as in (13b), and the cause of the result, as in (13c) (Veerman-Leichsenring 2006: 107). In other cases the instrumental suffix has been lexicalized, e.g., *sʔe¹-ši²* 'to try', *ti³šʔi²-ši³* 'to dream', *tha³ngi¹-ši²* 'to begin' (Veerman-Leichsenring 2006: 108).

(13a) nda³ tha³te²-ši² čʔi¹-to²ma¹
PBE stick beat-INS.3 CLF-Tomas
'Mr. Tomas beats with a stick.'

(13b) ti³-ša² nda³či²na²
PBE come-INS.1 Tehuacan
'I come from Tehuacan.'

(13c) kʔuẽ¹-ši² xi³nda³
PBE PST.die-INS.3 hunger
'He/she died of hunger.' (Veerman-Leichsenring 2006: 107)

In Ixcatec, the instrumental is expressed in two ways. First, through the applicative-instrumental suffix *-ʃi²*, which attaches to verbs or experience predicates (we note some lexicalized uses). However, the applicative-instrumental no longer seems very productive in its prototypical uses, though it is still encountered in the texts of the 1950s, as illustrated in (14). Second, through the comitative-instrumental *ku²* e.g., 'talk with the microphone', 'clean with the scarf'.

(14) hngu² su²mbre¹ru¹ b-e²na²-ʃi²-mi² ʔi²na² ni¹ka² ʃkã¹ hngu² se²nta¹bo¹
IXC one hat IPFV-buy-INS-ANTIP rich just twenty one cent
'The rich buy (from us)[9] one hat for (with) hardly twenty-one cents.' (Fernández de Miranda 1961: 184, my glosses)

3.2.3.5. Applicative-comitative

In Metzontla Popoloc an applicative-comitative suffix, which inflects for person, is used to express that the agent executes the action with a human co-agent. The comitative suffix refers to the agent while the verb stem does not specify person. See examples in (15).

(15) tʔi²-ku³ 'he drinks with another person'
PBE tʔi²-kã³ 'I drink with another person'
tʔi²-kua² 'you drink with another person'
(Veerman-Leichsenring 2006: 104)

In Ixcatec, an uninflected comitative morpheme, *ka²hu²*, appears to be used as a free morpheme or in lexicalized verbs, e.g., *ɸi²ka²hu²* 'to bring' < 'to come-with', in (16).

(16) ɸi²ka²hu²-mi² di²-ni²sjo²-ri²
IXC bring-ANTIP CLS-NP-HON
'Mr. Dionisio brought (us).' (Adamou 2014a: 384)

Mazatec also has a number of compound verbs formed with *–kao⁴* 'and, with', e.g., *vʔa³kao⁴* 'he goes with someone and carries', *vha¹kao⁴* 'he talks with' (K. Pike 1948: 120–122).

[9] The Ixcatec antipassive suppresses a human P or R argument, in this example 'from us, from the Ixcatecs'; we add this in parentheses in our free translation.

3.3. The noun

3.3.1. Classifiers and word formation

Compounding is a productive process in the Popolocan languages and can be the only word formation process, e.g., in Mazatec. On the basis of an Ixcatec lexicon of 748 nouns, Costaouec (2014) identifies 54% (N=404) as compound nouns. Of these, however, 54.7% (N=221) are so called ‘classified terms’, i.e., words formed with two nouns, a noun and an adjective, or a lexical classifier and a noun. For the sake of clarity, the analysis adopted here is to consider as lexical classifiers only those morphemes that have a syntactic component, namely those that trigger cross-reference morphemes on the verb. Cross-reference morphemes are used in a non-canonical SV order as shown in (17b), and on possessed nouns, as shown in (17c). Compare these examples with the canonical VS order in (17a) and note the absence of cross-reference morpheme on the verb.

VS

(17a) ʃu²wo²-ku¹ ʰngu² kʷa²
IXC come-ANT one woman
‘One woman has come.’ (Adamou 2018, https://doi.org/10.24397/pangloss-0000352#S95)

SV

(17b) sa¹ kʷa²-ʔĩ¹ si¹si²ka²-kʷa² ki¹=tã²hũ¹ me¹sa²
IXC DEF CLF.F-little stand-CO.3SG.F PROG.3SG=on table
‘The girl stands on a table.’ (Adamou 2014a: 381)

(17c) ki¹i² kʷa² la² ʔa²ku² ndi¹-ʔe¹-kʷa²
IXC LOC woman LOC.DIST inside house-POSS.3SG-CO.F
‘…the woman is there, in her house.’ (Adamou 2018, https://doi.org/10.24397/pangloss-0000360#S24)

While the presence of lexical classifiers is peripheral in both Mazatec and Ixcatec, it is more pronounced in Popoloc and Chocho (Veerman-Leichsenring 2004). Lexical classifiers are used with animate referents (humans and animals) and inanimate referents such as plants and objects. Most classifiers are derived from nouns with a generic meaning, such as ‘person’, ‘animal’, ‘tree’, and ‘flower’. Table 14 summarizes the lexical classifiers found in the Popolocan languages together with their cross-reference counterparts.

Table 14. Lexical classifiers and their cross-reference counterparts in the Popolocan languages (adapted from Veerman-Leichsenring 2001b)

		Ixcatec		**Chocho**		**Popoloc**		**Mazatec**	
		CLF	CO	CLF	CO	CLF	CO	CLF	CO
animates	male	*di²-*	*da²*	*ři¹-*	*ri¹*	(single) *ši¹-* (married) *čʔi¹-*	(single) *ša¹* (married) *čʔa¹*	*nda⁴-* *ča-*	*ndo³* *ča*
	female	*kʷa²-*	*kʷa²*	*ci¹-*	*ci¹*	(single) *nri¹-* (married) *tha³-*	(single) *nra¹* (married) *tha³*		
	respected person				*(ni²)*	*se¹-*	*sẽ¹*		
	person, people			*řu²-*	*ri³*	*ni²-*	*na²*	*ha¹-*	*ho¹o³*
	child			*ša³-*	*šã³*	*ča³-*	*čhã³*		
	animal	*ʔu²-*	*βa²*	*u²-*	*βa²*	*ku²-*	*βa²*	*ču-*	*ču*
inanimates	tree, wood			*nda³-*	*nda³*	*nda³-*	*nda³*	*ja¹*	*jo¹o³*
	leaf, herb, vegetal			*ka²-*	*ga³*	*ka³-*	*ka³*		
	fruit, round shape			*tʸu³-*	*ru³*	*tu³-*	*tu³*		
	flower					*su³-*	*su³*		
	stone, objects made of stone					*šu³-*	*šu³*		
	earth, objects made of earth			*nče³-*		*nʒe³-*	*nʒe³*		
	liquid			*nda³-*					
	corn, tortilla			*ñu³-*		*nu³-*	*nu³*		

Table 15 shows some examples of compound nouns in Ixcatec.

Table 15. Ixcatec: Compound nouns (translated from Costaouec 2014)

chanhan + nllitsen	arm + maguey	‘maguey leaf’
chhu + ndya	mass/dough + bone	‘marrow’
chika + xhwi	iron + light	‘link’
ndya + chanha¹n	bone + chest	‘rib’
xa + ska	hair + head	‘hair’
xku + tsehe³	tip + belly	‘belly’

3.3.2. Articles

The existence of articles in the Popolocan languages is not treated in detail in existing studies and deserves some attention. For example, Mazatec is described as a language with no definite article but using the numeral *ngu* 'one' as an indefinite article (Jamieson 1988: 26-27). If true, this would be a counter-example to the cross-linguistic tendency for a language to also have a definite article if it has an indefinite article (Heine 1997: 70). The grammaticalization of a definite article in Popoloc is also unclear. Veerman-Leichsenring (1991: 355) describes the existence of a demonstrative *tĩ*^{1}, preceding the noun, which is said to have the value of a definite article. As far as Chocho is concerned, it is briefly described as having a definite article, *sa*^{2}, and as using an unaccented form of the numeral *ngu*^{2} as an indefinite article (Veerman-Leichsenring 2000a: 32).

In order to provide some more insight into definite and indefinite articles I will present some preliminary results from Ixcatec. Ixcatec has a determiner *sa*^{1} which is described as an optional demonstrative by Fernandez de Miranda (1961: 93). Analysis of the contemporary data, however, indicates that *sa*^{1} has been grammaticalized as a definite article. It is used adnominally with human, animate, and inanimate nouns and does not inflect for gender or number. It attaches only to the head of the noun phrase and is not repeated on the other constituents of the noun phrase, as shown in (18).

(18) sa¹ lĩ²-ʔĩ¹ ki¹=ʔu²te²ka¹ sa¹ mi²-nda²wa² ʃʰe²
IXC DEF CLS-little PROG.3SG=push DEF CLS-male big
'The boy is pushing the big man.' (elicited)

An analysis of 446 Ixcatec nouns found in a free-speech corpus shows that the definite article *sa*^{1} determines a noun in roughly 20% of cases (N=92). Qualitative analysis of the data shows that the Ixcatec definite article is used as a definite anaphoric, with a referent which was previously mentioned or a referent which is pragmatically identifiable, as exemplified in (19).

[Following: 'They are dancing!']
(19) a ka² sa¹ mi²-tʃʔa²
IXC EXCLM all DEF CLS-woman
'Oh, all the women!' (Adamou 2018, https://doi.org/10.24397/pangloss-0000354#S139)

The Ixcatec definite article is not used with a referent with generic meaning when it is new in discourse, as in (20a), but it can be used with a generic referent when it is given in discourse, as shown in (20b).

[+new], [+generic]
(20a) ndra² tse² ʔu²-ndʒa²ʰɲu³
IXC like_that do CLF.AN-turkey
'The turkeys do like that.' (Adamou 2018, https://doi.org/10.24397/pangloss-0000360#S116)

[+given], [+generic]
(20b) ndra² sa¹ ʔu²-ndʒa²ʰɲu³ nde¹de² ʔi¹sa¹ ʃe²ʔe² tu¹=hu²
IXC like_that DEF CLF.AN-turkey what more funny PROG.PL=be_together
'That's what the turkeys do. They are funnier.' (Adamou 2018, https://doi.org/10.24397/pangloss-0000360#S118; https://doi.org/10.24397/pangloss-0000360#S120)

Moreover, despite not being very advanced along the grammaticalization path, the Ixcatec definite article is used with human proper nouns, cf. (24a). The complete set of uses, however, has not been fully worked out.

Ixcatec *ʰngu*² 'one' is used as a numeral, but it can also be used to introduce a new participant in the beginning of a story, see (21), or in the middle, independent of whether it will become the topic of discussion. The Ixcatec *ʰngu*² 'one', however, is not fully grammaticalized as it is not used with non-referential and generic referents.

(21) ka¹ʰndu³ ki¹i² ʰngu² mi²-nda²wa²
IXC mountain LOC one CLS-male
'There is a man on a mountain.' (Adamou 2018, https://doi.org/10.24397/pangloss-0000352#S1)

3.3.3. Demonstratives

Mazatec has five demonstratives organized according to distance and relation to the world, whether real or imagined: *vihi* 'proximal' vs. *vëhë* 'distal' for physical distance, and *vi* 'proximal' vs. *vë* 'distal' for mental distance (Jamieson 1988: 27, 57). The demonstrative *jan* is an anaphoric demonstrative.

For Popoloc, Veerman-Leichsenring (1991: 355) describes a demonstrative-definite article *tĩ*¹, which may combine with two distance-related demonstratives, the proximal -*i*³ and the distal -*a*³. According to Veerman-Leichsenring (1991: 359), the demonstratives may also serve to nominalize a clause constituted by a noun, as illustrated in (22), or by an adjective.

(22) tĩ¹ sʔe¹ndu³a³ thi³xi²-a³ na³
PBE DEM sir come-DEM.DIST NA
'That sir who is coming.' (Veerman-Leichsenring 1991: 359)

Ixcatec has two demonstratives, the proximal -*ri*² and the distal -*ra*². Although these demonstratives frequently combine with the definite article *sa*¹ (15 cases out of 33 in a free-speech corpus containing 446 nouns), they cannot be described as forming part of discontinuous demonstratives as in Popoloc. The Ixcatec demonstratives are either exophoric, referring to the surrounding situation, or endophoric, referring to the discourse. The endophoric uses can be further described as anaphoric, i.e., referring to the preceding discourse, see (23a), or recognitional, i.e., referring to entities which are considered to be known by the hearer although they have not been mentioned in the preceding discourse, see (23b) in combination with the definite article.

(23a) nda² ʔu²-ra² kʷ-i²ʃku²
IXC what animal-DEM.DIST PFV-see
'I see that animal.' (Adamou 2018, https://doi.org/10.24397/pangloss-0000360#S109)

(23b) la² tu¹=tse² sa¹ # sa¹ la² sa¹ mi²-tʃʔa²-ra²
IXC COMP PROG.PL=do DEF DEF COMP DEF CLS-woman-DEM.DIST
'…that they do the… those women.' (Adamou 2018, https://doi.org/10.24397/pangloss-0000354#S181)

3.3.4. Possessive suffixes and nominal possession

Similar to other Mesoamerican languages, the Popolocan languages express nominal possession using the structure 'her/his-noun$_1$ (the) noun$_2$' where noun$_1$ is the possessed and noun$_2$ the

possessor (Campbell, Kaufman, and Smith-Stark 1986: 545). This is illustrated with examples from Ixcatec in (24a) and (24b), i.e., [possessed_noun$_1$-POSS possessor_noun$_2$] where the possessive suffix codes the person and number of the possessor.

(24a) nda²β-ʔe¹ sa¹ kʷa²-pi¹na²
IXC husband-POSS.3SG DEF CLF.F-NP
'Crespina's husband.' (Adamou 2018, https://doi.org/10.24397/pangloss-0000354#S48)

(24b) ndi¹-ʔe¹ sa¹ di²-ra² pa²dri²no²
IXC house-POSS.3SG DEF sir-DEM.DIST godfather
'At godfather's house.' (Adamou 2018, https://doi.org/10.24397/pangloss-0000354#S21)

Again, like other Mesoamerican languages, the Popolocan languages exhibit inalienable possession, also-called 'intimate possession' (Campbell, Kaufman, and Smith-Stark 1986: 549). For example, kinship terms are always possessed; see Table 16.

Table 16. Santa Catarina Ocotlan Chocho: Illustration of kinship terms (Veerman-Leichsenring 2000a: 26)

na²na¹na¹	'my mother'
na²na¹a²	'your mother'
na²ne¹e²	'his/her mother'
na²na¹ni¹	'our mother'

Moreover, body part terms bear a specific set of possessive suffixes, shown in Table 17 for Chocho. The distinction between Class A and Class B is morphological: Class A applies to the majority of nouns, including borrowings, whereas Class B is used for some of the nouns that end in a vowel with low tone, in some cases followed by a glottal stop.

Table 17. Santa Catarina Ocotlan Chocho: Possessive suffixes (Veerman-Leichsenring 2000a: 25–28)

	Class A	Class B	Body part terms
1	-na¹	-na¹	-a¹
2	-a¹a²	-a³	-a²
3	-e¹e²	-e³	
PL COLL	-ni¹	-ni¹	-i¹

In Mazatec, body part terms and some kinship terms are obligatorily possessed and have a special form, while alienable terms bear a series of possessive clitics. In addition, there is also a paradigm of independent possessive pronouns. A third construction relies on the use of two adpositions, *rë* and *tsëhë*, exemplified in (25).

(25) nahmi rë/tsëhë quihndi xihin
MAQ father of child male
'The boy's father.' (Jamieson 1988: 60)

3.3.5. Quantifiers

There are a number of quantifiers; see for example the Ixcatec universal quantifier *ka*² 'all' in (26) indicating that the predicate refers to all the members of a set.

(26) ɸu²i¹-ku¹ ka² sa¹ lĩ²-ʔĩ¹ tu¹=hu²
IXC leave-ANT all DEF CLS-little PROG.PL=be
'All the boys left. They are there.' (Adamou 2018, https://doi.org/10.24397/pangloss-0000352#S155)

4. Syntax

4.1. Verbal and non-verbal predication

The Popolocan languages make a clear distinction between nouns and verbs. A number of adjectives may also be used as predicates without the use of a copula as shown in (27) for Ixcatec.

(27) ʔu² ka¹tse³-βa²
IXC animal red-CO.3SG.AN
'The animal is red.'

Also, see Veerman-Leichsenring (1991: 368–369) for non-verbal predicates in Metzontla Popoloc. In Chiquihuitlan Mazatec, however, some adjectives function as predicates by receiving person marking (Jamieson 1988: 64–65). In order for those adjectives to receive TMA specifications, a prefix *ma-* needs to be added.

4.2. Word order

Chocho, Popoloc, and Mazatec are verb initial languages, with increasing use of SVO order (Schram and Jones 1979, Mock 1982, Veerman-Leichsenring 2001c: 74). To focus an S or A argument, Metzontla Popoloc relies on the use of a focus marker and fronting of the focused argument. In the focused construction a cross-reference morpheme follows the verb. Compare (28a) and (28b).

(28a) če²-ʔe³=ni² tha³-xua¹na¹ ni³u³
PBE give-3>3=INCL CLF-Juana tortilla
'Mrs. Juana gives us tortillas.'

(28b) tha³-xua¹na¹ na³ če²-ʔe³=ni²=tha³ ni³u³
PBE CLF-Juana FOC give-3>3=INCL=CO tortilla
'It is Mrs. Juana who gives us tortillas.' (Veerman-Leichsenring 2006: 94)

Ixcatec has an unmarked VS order, shown in (29a), but unlike the other Popolocan languages it has a rigid SVO word order, shown in (29b). The word order found in transitives seems to represent a change from the verb-initial order found in the other Popolocan languages. We further note that most transitive clauses retain a cross-reference morpheme which is reminiscent of the marked verb-initial position but which is no longer obligatory. In ditransitives, the theme-like argument (T) follows the verb, occupying the same position as the P argument of monotransitive clauses, and precedes the recipient-like argument (R), as shown in (29c).

VS

(29a) kʷ-a²nĩ¹hẽ² lĩ²-ʔĩ¹
IXC PFV-fall CLS-little
'A boy falls.' (Adamou 2018, https://doi.org/10.24397/pangloss-0000352#S103)

AVP

(29b) sa¹ kʷa²-ʔĩ¹ ki¹=ʔu²te²ka¹-kʷa² sa¹ lĩ²-ʔĩ¹
IXC DEF CLF.F-little PROG.3SG=push-CO.3SG.F DEF CLS-little
'The girl is pushing the boy.' (elicited)

AVTR

(29c) sa¹ kʷa²-ni¹ki² ku¹-tʃe¹ʔe²-kʷa² ʔi²nda² ne²ʔe¹e¹
IXC DEF CLF.F-NP PFV-give-CO.3SG.F water mother.POSS.3SG
'Niki gives water to her mother.' (elicited)

The analysis of free speech shows that S arguments are rarely expressed by an overt nominal, but when they are, the preferred word order for the intransitive clauses is VS (64%) independent of information status; see Table 18. Overtly expressed P arguments, which are inanimates in 88% of cases, follow the verb in 76% of cases (N=45) and precede it in only 24% of cases (N=14). Overt expression of A arguments is also rare in the corpus (N=14) and shows AV order in declarative clauses. Lastly, we note the absence in the spontaneous corpus of any ditransitive clauses with all nominals expressed overtly.

Table 18. Ixcatec post- and preverbal order of A, S, and P overt nominal within a single prosodic unit (for a total of 648 verbs) (adapted from Adamou 2016: 168–169)

	S		A		P	
Postverbal	48	64%			45	76%
Preverbal	27	36%	14	100%	14	24%
Total	*75*	*100%*	*14*	*100%*	*59*	*100%*

In Ixcatec, despite AVP order in affirmative clauses, PVA order is found in interrogative wh-clauses, see (30).

$P_{wh}VA_{GIVEN}$

(30) he²e² nda¹ra² tse² sa¹ ta¹ʔtʃĩ²-ra²
IXC now what do DEF old_man-DEM.DIST
'Now, what can that old man do?'
(Adamou 2018, https://doi.org/10.24397/pangloss-0005623#S120)

Ixcatec noun phrases have rigid word order, Numeral-Noun-Adjective. An example is shown in (31).

(31) ʰngu² ʔu²-ʃĩ²ku³ pi¹ntu²
IXC one CLF.AN-goat two_colour
'(It's) a two-coloured goat.' (Adamou 2018, https://doi.org/10.24397/pangloss-0000352#S51)

This word order is also encountered in the other Popolocan languages (Jamieson 1988: 55, 61, Veerman-Leichsenring 1991: 361–362, Veerman-Leichsenring 2000a: 33).

4.3. Interrogative clauses

Metzontla Popoloc uses a discontinuous interrogative particle *a¹…-rą²* in yes/no questions (Veerman-Leichsenring 1991: 66–67). Chocho has an interrogative particle, *da³*, which is used in both yes/no questions and wh-questions; see (32a) and (32b). Yes/no questions do not trigger any change to the basic word order.

(32a) ta²kõ¹ ẹi²ka³ da³
COZ want dance.2SG QUEST
'Do you want to dance?' (Veerman-Leichsenring 2000a: 71)

(32b) ṣi¹ndi³ di¹ sa¹ ta¹ da³
COZ where be.3SG DEF sir QUEST
'Where is this man?' (Veerman-Leichsenring 2000a: 72)

Ixcatec yes/no questions are introduced by an optional interrogative particle *ʔa²*. Ixcatec *wh*-words, such as *ja¹ra²* 'who', *nda¹ra²* 'what', *ndi¹ra²* 'where', always precede verbs in direct and indirect questions.

Unfortunately, there has as yet been no study of the prosodic realization of interrogative and imperative clauses for all the Popolocan languages.

4.4. Complex clauses

4.4.1. Complementizers

The Popolocan languages each have a complementizer which in all languages is used in relative and complement clauses, but which is also used in adverbial clauses in Ixcatec and in Chocho, and as a focus marker in Popoloc; see Table 19.

Table 19. Complementizers in the Popolocan languages (adapted from Adamou and Costaouec 2013: 207)

		Relative clause	**Complement clause**	**Adverbial clause**	**Focus marker**
Ixcatec (IXC)	*la*	✓	✓	✓	
Popoloc (PBE)	*na/la*	✓	✓		
Chocho (COZ)	*nì*	✓	✓	✓	✓
Mazatec (MAQ)	*xi*	✓	✓		

In Ixcatec, relative clauses are generally formed with the gap strategy and the uninflected complementizer *la²* (see Adamou 2017a for more details). This strategy allows for the relativization of any position on the Accessibility Hierarchy (Keenan and Comrie 1977): subject, illustrated in (33a), direct object, in (33b), indirect object, in (33c), and oblique, in (33d).

Subject
(33a) sa¹ a²lu¹mnu² [la² ki¹=tʃa²ʃi² ØS]
IXC DEF student COMP PROG.3SG-read
'The student that is studying.' (Adamou 2017a: 887)

Direct object

(33b) ni²ɲu² [la² ku¹=tʃe¹ʔe²-na³ ØO sa¹ kʷa²-ʃu²ngu²]
IXC tortilla COMP PFV-give-1SG DEF CLF.F-young_woman
'The tortillas that I give to the young woman.' (Adamou 2017a: 887)

Indirect object

(33c) sa¹ lĩ²-ʔĩ¹ [la² sa¹ kʷa²-ru²fi¹na² ku²=tʃe²-kʷa²
IXC DEF CLS-little COMP DEF CLF.F-NP PFV-tell-CO.3SG

ʰngu² i²sto¹ria² ØO]
one story
'The kid that Rufina tells a story to.' (Adamou 2017a: 887)

Oblique object (instrument)

(33d) sa¹ ma²tʃi¹ti² [la² kʷ-a²te²-na³ ʔi²nu² ØO]
IXC DEF machete COMP PFV-cut-1SG corn_field
'The *machete* with which I cut the corn.' (Adamou 2017a: 887)

The Ixcatec complementizer *la²* also forms complement clauses, see (34a), and adverbial clauses, see (34b). In (34a), we note the concurrent use of the complementizer (*doubly filled COMP*) with an interrogative pronoun which functions as an exclamative.

(34a) sa¹ kʷa²-e²nɸe²rme¹ra² ku²-ʈʃe²-ku¹-na³
IXC DEF CLF.F-nurse PFV-tell-ANT-1SG

la² nda² ʃta¹ si¹
COMP how ugly EXS
'I told the nurse, how ugly it is!' (Adamou and Costaouec 2013: 193)

(34b) kʷa²tu¹=βi²hi²-ʔa²-na² la² mã¹hũ¹
IXC PFV.PL-arrive-NEG-FOC SUB sweep
'Won't they come to sweep?' (Adamou and Costaouec 2013: 193)

Finally, we note that, in the contemporary Ixcatec corpus, most complement clauses have an adverb as matrix (54%), see (35a) and (35b).

(35a) me¹e¹ndi² la² hni¹ β-a²ne²
IXC this_way COMP tasty IPFV-eat
'That's how it's tasty.' (Adamou and Costaouec 2013: 203)

(35b) he²e² la² kʷ-a²sĩ²-tʲu²ʃti²
IXC now COMP PFV-come_down-rain
'Now that it rained (…everyone went to plant).' (Adamou and Costaouec 2013: 203)

4.4.2. Subordinators

The Popolocan languages have a number of subordinators which may sometimes combine with the complementizers presented in section 4.4.1. The purpose subordinator is shown in (36a) for Chocho and in (36b) for Ixcatec.

(36a)	kue¹na¹	sa¹	ka²ře¹ta²ʔ	kue¹ni¹	ni³	¢i²ko²-a²	nda³ka³
COZ	bought	DEF	cart	for	COMP	carry-2SG	firewood

‘I bought the cart for you to carry firewood.’ (Mock 1977: 153)

(36b)	nda²ʃi²	ʃʰõ³	kwe²nda²	na²hme²
IXC	because	six	for	corn

‘Because (you need) six for corn.’ (Adamou and Costaouec 2013: 204)

See Table 20 for the main subordinators in the Popolocan languages (the list is not exhaustive).

Table 20. Main subordinators in the Popolocan languages (Adamou and Costaouec 2013: 204, Jamieson 1988: 158–160, Veerman-Leichsenring 1991: 95–101, Veerman-Leichsenring 2000a: 77–78)

Ixcatec	**Chocho**	**Mazatec**	**Popoloc**	**Meaning**	**Type of clause**
la²	ti²nda¹/xi²nda¹			‘then’	temporal sequence, purpose
ndi²ʃe²ɾà, ʃe²ɾà (la²), nda²ʃi²	xa³	tsëhë (xi), ngatsë rë,ta	či²ga³	‘because’	cause
da²ndi²		peru	peru	‘but’	adversative
kwe²nda² (la²)	kuẽ¹ni²		(ngi²)ši²	‘for’	purpose
ka²la² (la²)	a²ṛa³	(sa) xi		‘if’	conditional

5. Typological features

As this review shows, from a typological perspective the Popolocan languages are of interest for their complex phonology, involving glottalized and aspirated clusters, as well as the relation between tones, contrastive phonation, and stress. The Popolocan languages are also particularly challenging for their complex verbal morphology, which combines several categories of exponent, such as tone, prefixes, and suffixes, and which also combines TMA and person marking morphology. Another fascinating issue that deserves to be further explored concerns the rise and parameters of semantic alignment and its relation to the antipassive marker for human, and thus highly individuated, arguments. From a syntactic viewpoint, the Popolocan languages are verb-initial and show related typological features, such as relative clauses following nouns, the existence of prepositions, and noun-adjective word order (Dryer 2011a, 2011b, 2011c). Popolocan languages are also interesting for their use of noun classifiers and lexical derivation. See Table 21.

As is generally the case for Mesoamerican languages, the Popolocan languages have a vigesimal numeral system, i.e., a base twenty system (Campbell, Kaufman and Smith-Stark 1986: 546). Moreover, relational terms are often based on body parts and the right-left distinction is not encoded but is introduced through contact with Spanish (Adamou 2017b, Calderón, De Pascale and Adamou 2019).

Among under-investigated topics we note prosody, the semantics of TMA markers, grammaticalization of indefinite and definite articles, the study of adverbial clauses, and spatial cognition. In addition, little is known about the effects of contact with unrelated or distantly-related languages which is likely to have had an influence on the languages of the Popolocan branch, such as contact with the Otomanguean languages Mixtec (Mixtecan), Cuicatec

(Mixtecan) and Chinantec (Chinantecan), the Uto-Aztecan Nahuatl, as well as with Indo-European Spanish.

To conclude, much work remains to be done for this branch of the Otomanguean languages which, with the exception of Mazatec, are all highly endangered.

Table 21. Main typological features of the Popolocan languages

	Chocho	**Popoloc**	**Ixcatec**	**Mazatec**
tones	yes	yes	yes	yes
nasal vowels	yes	yes	yes	yes
pre- and post-glottalized consonants	yes	yes	yes	yes
pre- and post-aspirated consonants	yes	yes	yes	yes
contrastive phonation	no	no	no	yes (in some varieties)
classifiers	yes	yes	few	few
word order	V-initial	V-initial	VS; SVO	V-initial
cross-reference morphemes	yes	yes	few	few
stative-active	yes	yes	peripheral	?
antipassive constructions	no	no	yes (for human participants)	no

Acknowledgements

I would like to extend my sincere thanks to Søren Wichmann for his insightful remarks. This chapter also benefited from the remarks of the participants at the conference “State of the Art of Mesoamerican Linguistics” held at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Dec. 6–7, 2014.

Abbreviations

Abbreviations were homogenized following the labels listed in the Leipzig Glossing Rules and expanded within the project “Designing Spoken corpora for Cross-linguistic Research” (funded by the French National Research Agency).

1, 2, 3	first, second, third person	HON	honorific
AN	animal	INCL	inclusive
ANT	anterior	INS	instrumental
ANTIP	antipassive	IPFV	imperfective
ASP	aspect	ITER	iterative
CAUS	causative	LOC	locative

CLS	class	NEG	negative
CLF	classifier	NP	proper noun
CO	cross-reference	PFV	perfective
COMP	complementizer	PL	plural
DEF	definite	POSS	possessive
DEM	demonstrative	PROG	progressive
DIST	distal	PROX	proximal
EXS	existential	PST	past
EXCL	exclusive	QUEST	interrrogative
EXCLM	exclamative	RESTR	restrictive
EVD	evidential	SG	singular
F	female	SUB	subordinator
FOC	focus		
FUT	future		

References

Adamou, Evangelia. (2018). Ixcatec corpus. Pangloss Collection, LACITO-CNRS. http://lacito.vjf.cnrs.fr/pangloss. Accessed July 17, 2018.

Adamou, Evangelia. (2017a). Subject preference in Ixcatec relative clauses. *Studies in Language* 41(4): 872-913.

Adamou, Evangelia. (2017b). Spatial language and cognition among the Ixcatec-Spanish bilinguals (Mexico). In Bellamy, Kate, Michael Child, Antje Muntendam, and Maria Carmen Parafita Couto (eds.), *Multidisciplinary Approaches to Bilingualism in the Hispanic and Lusophone World*, 175–209. Amsterdam and Philadelphia: John Benjamins.

Adamou, Evangelia. (2016). *A Corpus-Driven Approach to Language Contact. Endangered Languages in a Comparative Perspective.* Berlin and Boston: Mouton de Gruyter.

Adamou, Evangelia. (2014a). L'antipassif en ixcatèque. *Bulletin de la Société de Linguistique de Paris* 109(1): 373–396.

Adamou, Evangelia. (2014b). Ixcatec antipassive constructions and what they tell us about the semantic alignment in Chocholtec and Popoloc. Paper presented at the International Conference *State of the Art of Mesoamerican Linguistics*, Max Planck Institute for Evolutionary Anthropology, Leipzig, Dec. 6–7, 2014.

Adamou, Evangelia, Matthew Gordon, and Stefan Th. Gries. (2018). Prosodic and morphological focus marking in Ixcatec (Otomanguean). Adamou, Evangelia, Katharina Haude, and Martine Vanhove (eds), *Information Structure in Lesser-described Languages: Studies in Prosody and Syntax*, 51–83. Amsterdam and Philadelphia: Benjamins.

Adamou, Evangelia and Denis Costaouec. (2013). El complementante *la* en ixcateco: marcador de clausula relativa, completiva y adverbial. *Amerindia* 37(1): 193–210.

Alarcón Montero, Rafael. (2010). Temporalidad laríngea en las nasales y obstruyentes del ixcateco. In Herrera Zendejas, Esther (ed.), *Entre cuerdas y velo: estudios fonológicos de lenguas otomangues*, 65–84. México, D.F.: Colegio de México.

Anderson, Stephen R. (2005). *Aspects of the Theory of Clitics*. Oxford: Oxford University Press.

Austin Krumholz, Jeanne, Marjorie Kalstrom Dolson, and Miguel Hernandez Ayuso. (1995). *Diccionario popoloca de San Juan Atzingo, Puebla*. Tucson: Summer Institute of Linguistics.

Baerman, Matthew, Dunstan Brown, and Greville Corbett. (2010). Morphological complexity: A typological perspective. Manuscript, University of Surrey. Accessed March 13, 2015 at www.morphology.surrey.ac.uk.

Beal, Heather D. (2011). *The Segments and Tones of Soyaltepec Mazatec*. Ph.D. dissertation, University of Texas at Arlington.

Beck, David. (2004). *A Grammatical Sketch of Upper Necaxa Totonac*. Munich: LINCOM Europa.

Belmar, Francisco. (1899). *Idiomas indígenas del estado de Oaxaca. El Chocho*. Oaxaca.

Black, Helen. (1948). Breve descripción fonémica de la lengua ixcateca. Unpublished SIL documents. Accessed March 24, 2015, at http://www.sil.org/resources/archives/54344.

Black, Andrew H. and Judith L. Schram. (2014). Tense-aspect Formation in Mazatec of Jalapa de Díaz. Summer Institute of Linguistics, *SIL-Mexico Electronic Working Papers* 15. Accessed March 18, 2015 at http://www.sil.org/mexico/workpapers/WP015i-TenseAspect-maj.pdf

Bull, Brian. (1984). Aspect Formation of San Jeronimo Mazatec Verb. *SIL-Mexico Workpapers* 6: 93-117.

Büring, Daniel. (2009). Towards a typology of focus realization. In Zimmermann, Malte and Caroline Féry (eds.), *Information Structure*, 177–205. Oxford: Oxford University Press.

Campbell, Lyle, Terrence Kaufman, and Thomas C. Smith-Stark. (1986). Meso-America as a linguistic area. *Language* 62(3): 530–570.

Calderón, Eréndira, Stefano De Pascale, and Evangelia Adamou. (2019). How to speak 'geocentric' in an 'egocentric' language: A multimodal study among Ngigua-Spanish bilinguals and Spanish monolinguals in a rural community of Mexico. *Language Sciences* 74: 24–46.

Costaouec, Denis. (2014). Nombres complejos en ixcateco. Paper presented at the *Coloquio sobre lenguas otomangues y vecinas (COLOV 6)*, Oaxaca, Biblioteca de Investigación Juan de Córdova, April 24–27, 2014.

Costaouec, Denis and Michael Swanton. (2008). Evolución del mediativo en el ixcateco. Paper presented at the *Coloquio sobre lenguas otomangues y vecinas (COLOV-III)*, Oaxaca (México), Biblioteca Burgoa.

Costaouec, Denis and Michael Swanton. (2015). Classification nominale en ixcatèque. *La Linguistique* 51(2): 201–238.

de Lacy, Paul (2002). The interaction of tone and stress in Optimality Theory. *Phonology* 19: 1–32.

DiCanio, Christian. (2011). Laryngeal timing in Ixcatec consonants. Paper presented at the *19th Manchester Phonology Meeting*, Manchester.

DiCanio, Christian. (2012). La fonética de los tonos y del acento en ixcateco. Paper presented at the *Coloquio sobre lenguas otomangues y vecinas (COLOV-V)*, Oaxaca (México), Centro Académico y Cultural San Pablo.

Dryer, Matthew. (2011a). Relationship between the Order of Object and Verb and the Order of Adposition and Noun Phrase. In Dryer, Matthew and Martin Haspelmath (eds.), *The World Atlas of Language Structures Online*. Munich: Max Planck Digital Library, Chapter 95. Available online at http://wals.info/chapter/95. Accessed on 2012-12-06.

Dryer, Matthew. (2011b). Relationship between the Order of Object and Verb and the Order of Relative clause and Noun. In Dryer, Matthew and Martin Haspelmath (eds.), *The World Atlas of Language Structures Online*. Munich: Max Planck Digital Library, Chapter 96. Available online at http://wals.info/chapter/96. Accessed on 2012-12-06.

Dryer, Matthew. (2011c). Relationship between the Order of Object and Verb and the Order of Adjective and Noun. In Dryer, Matthew and Martin Haspelmath (eds.), *The World Atlas*

of Language Structures Online. Munich: Max Planck Digital Library, Chapter 97. Available online at http://wals.info/chapter/97. Accessed on 2012-12-06.

Fernández de Miranda, María Teresa. (1951). Reconstrucción del protopopoloca. *Revista Mexicana de Estudios Antropológicos* 12: 61–93.

Fernández de Miranda, María Teresa. (1953). Las formas posesivas del ixcateco. In *Memoria del Congreso Científico Mexicano* 12: 159–170.

Fernández de Miranda, María Teresa. (1956). *Glotocronología de la familia popoloca*. México, DF: Instituto Nacional de Antropología e Historia (INAH).

Fernández de Miranda, María Teresa. (1959). *Fonémica del Ixcateco*. México, DF: Instituto Nacional de Antropología e Historia (INAH).

Fernández de Miranda, María Teresa. (1961). *Diccionario ixcateco.* México, DF: Instituto Nacional de Antropología e Historia (INAH).

Féry, Caroline. (2013). Focus as prosodic alignment. *Natural Language and Linguistic Theory* 31: 683–734.

Garellek, Marc and Patricia Keating. (2011). The acoustic consequences of phonation and tone interactions in Jalapa Mazatec. *Journal of the International Phonetic Association* 41(2): 185–205.

Golston, Chris and Wolfgang Kehrein. (1998). Mazatec onsets and nuclei. *International Journal of American Linguistics* 64(4): 311–337.

Gudschinsky, Sarah C. (1958). Mazatec dialect history. *Language* 34: 469–481.

Gudschinsky, Sarah C. (1959a). *Proto-Popotecan. A Comparative Study of Popolocan and Mixtecan*. Bloomington, Indiana: Indiana University Publications.

Gudschinsky, Sarah C. (1959b). Mazatec kernel constructions and transformations. *International Journal of American Linguistics* 25(2): 81–89.

Guzmán Carrera, Celso. (2011). *Acercamiento gramatical a la lengua mazateca de Mazatlán Villa de Flores, Oaxaca.* México, D.F.: Instituto Nacional de Lenguas Indígenas (INALI).

Hamp, Eric P. (1958). Chocho-Popoloca innovations. *International Journal of American Linguistics* 26(1): 62.

Heine, Bernd. (1997). *Cognitive Foundations of Grammar*. Oxford: Oxford University Press.

Jamieson, Carole. (1982). Conflated subsystems marking person and aspect in Chiquihuitlán Mazatec verbs. *International Journal of American Linguistics* 48(2): 139–167.

Jamieson, Carole. (1988). *Gramática mazateca del Municipio de Chuiquihuitlan, Oaxaca*. Mexico: Instituto Lingüístico de Verano, A.C.

Kalstrom, Marjorie R. and Eunice V. Pike (1968). Stress in the phonological system of Eastern Popoloca. *Phonetica* 18: 16–30.

Klavans, Judith L. (1985). The independence of syntax and phonology in cliticization. *Language* 61(1): 95–120.

Kirk, Paul L. (1966). *Proto-Mazatec Phonology.* Ph.D. dissertation, University of Washington.

Kirk, Paul L. (1970). Dialect intelligibility testing: the Mazatec Study. *International Journal of American Linguistics* 36(3): 205–211.

Kirk, Paul L., Jenny Ladefoged, and Peter Ladefoged. (1993). Quantifying acoustic properties of modal, breathy and creaky vowels in Jalapa Mazatec. In Mattina, Anthony and Timothy Montler (eds.), *American Indian Linguistics and Ethnography in Honor of Laurence C. Thompson*, 435–440. Missoula: University of Montana.

Léonard, Jean Léo, Vittorio dell'Aquila, and Antonella Gaillard-Corvaglia. (2012). The ALMaz (*Atlas Lingüístico Mazateco*): from geolinguistic data processing to typological traits. *Language Typology and Universals* (*STUF*) 65(1): 78–94.

Léonard, Jean Léo and Alain Kihm. (2012). Classes flexionnelles du mazatec et diasystème. Empirisme critique et formalisation. *Bulletin de la Société de Linguistique de Paris* 107(1): 379–446.

Maddieson, Ian. (2013). Tone. In Dryer, Matthew and Martin Haspelmath (eds.), *The World Atlas of Language Structures Online*. Munich: Max Planck Digital Library, Chapter 13. Available online at http://wals.info/chapter/13. Accessed on 2016-01-22.

Malchukov, Andrej, Martin Haspelmath, and Bernard Comrie. (2010). Ditransitive constructions: a typological overview. In Malchukov, Andrej, Martin Haspelmath, and Bernard Comrie (eds.), *Studies in Ditransitive Constructions: A comparative handbook*, 1–64. Berlin and New York: De Gruyter.

Meyer, Julien. (2015). *Whistled languages*. Berlin and Heidelberg: Springer.

Mock, Carol. (1977). *Chocho de Santa Catarina Ocotlán*. Archivo de lenguas indígenas de México 4. México: Centro de Investigación para la Integración Social, Colegio de México and SIL.

Mock, Carol. (1982). Los casos morfosintácticos del chocho. *Anales de Antropología* 19(2): 345–378.

Nakamoto, Shun. (2014). Tres manifestaciones del saltillo subyacente en el popoloca de Temalacayuca. Paper presented at *Coloquio sobre lenguas otomangues y vecinas (COLOV 6)*, Oaxaca, Biblioteca de Investigación Juan de Córdova, April 24–27, 2014.

Pike, Eunice V. (1956). Tonally differentiated allomorphs in Soyaltepec Mazatec. *International Journal of American Linguistics* 22(1): 57–71.

Pike, Kenneth L. and Eunice V. Pike (1947). Immediate constituents of Mazatec syllables. *International Journal of American Linguistics* 13(2): 78–91.

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

Polinsky, Maria. (2005). Antipassive constructions. In Dryer, Matthew and Martin Haspelmath (eds.), *The World Atlas of Language Structures Online*. Munich: Max Planck Digital Library. Accessed March 25, 2015 at http://wals.info/chapter/108.

Regino, Juan Gregorio. (1993). *Alfabeto mazateco*. Oaxaca: Ciesas, IOC, CDCNC.

Rensch, Calvin R. (1976). *Comparative Otomanguean Phonology*. Bloomington: Indiana University Publications.

Schram, Judith and Linda Jones. (1979). Participant reference in narrative discourse in Mazatec of Jalapa de Diaz. In Jones, Linda (ed.), *Discourse Studies in Mesoamerican Languages*, 269–290. Dallas: Summer Institute of Linguistics and University of Texas at Arlington.

Silverman, Daniel. (1997). Laryngeal complexity in Otomanguean vowels. *Phonology* 14: 235–261.

Silverman, Daniel, Barbara Blankenship, Paul Kirk, and Peter Ladefoged. (1995). Phonetic structures in Jalapa Mazatec. *Anthropological Linguistics* 37: 70–88.

Stark, Sharon and Polly Machin. (1977). Stress and tone in Tlacoyalco Popoloca. In Merrifield, William R. (ed.), *Studies in Otomanguean Phonology*, 69–92. Dallas: Summer Institute of Linguistics.

Steriade, Donca. (1994). Complex onsets as single segments: the Mazateco pattern. In Cole, Jennifer and Charles Kisseberth (eds.), *Perspectives in Phonology*, 203–291. Stanford, California: CSLI Publications.

Swadesh, Morris. (1960). The Oto-Manguean Hypothesis and Macro Mixtecan. *International Journal of American Linguistics* 26: 79–111.

Swanton, Michael. (2008). La escritura indígena como “material lingüístico”. Una carta en lengua ixcateca al presidente Lázaro Cárdenas. In van Doesburg, Sebastian (ed), *Pictografia y escritura alfabetica en Oaxaca*, 353–387. Oaxaca: Instituto Estatal de Educacion Publica de Oaxaca.

Veerman-Leichsenring, Annette. (1984). El popoloca de los Reyes Metzontla. *Amerindia* 4 (special issue).

Veerman-Leichsenring, Annette. (1991). *Gramática del popoloca de Meztzontla*. Amsterdam and Atlanta: Rodopi.

Veerman-Leichsenring, Annette. (2000a). *Gramática del chocho de Santa Catarina Ocotlán, Oaxaca*. Leiden: CNWS Publications.

Veerman-Leichsenring, Annette. (2000b). Popolocan independent personal pronouns: comparison and reconstruction. *International Journal of American Linguistics* 66(3): 318–359.

Veerman-Leichsenring, Annette. (2001a). Ixcateco: La frase nominal. *Anales de Antropología* 35: 323–358.

Veerman-Leichsenring, Annette. (2001b). Coreference in the Popolocan languages. In Brinton, Laurel J. (ed.), *Historical Linguistics 1999: Selected papers from the 14th International Conference on Historical Linguistics*, Vancouver, 9–13 August 1999, 337–350. Amsterdam and Philadelphia: John Benjamins.

Veerman-Leichsenring, Annette. (2001c). Changes in Popolocan word order and clause structure. In Faarlung, Jan Terje (ed.), *Grammatical Relations in Change*, 303–322. Amsterdam and Philadelphia: John Benjamins.

Veerman-Leichsenring, Annette. (2004). Popolocan noun classifiers: A reconstruction. *International Journal of American Linguistics* 70(4): 416–451.

Veerman-Leichsenring, Annette. (2006). Valency-changing devices in Metzontla Popoloc. In Rowicka, Grazyna J. and Eithne B. Carlin (eds.), *What's in a Verb: Studies in the Verbal Morphology of the Languages of the Americas*, 93–118. Utrecht: LOT.

Wichmann, Søren. (2008). The study of semantic alignment: retrospect and state of the art. In Donohue, Mark and Søren Wichmann (eds.), *The Typology of Semantic Alignment*, 3–23. Oxford: Oxford University Press.

Zwicky, Arnold M. (1977). *On Clitics*. Bloomington: Indiana University Linguistics Club.