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CONSONANT CLUSTERS

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1. This paper presents an analysis of the consonant clusters of Miahuatlán Zapotec.¹ The composition of the clusters is here described in terms of those clusters occurring in the syllable and in terms of the ambisyllabic clusters occurring in the utterance. Of these, the clusters occurring in the syllable are the more crucial in that the further clusters occurring in the utterance are resultant on juxtaposition of syllables.

2. A syllable is a unit composed of one phonemic vowel with one phonemic tone, plus or minus length, plus or minus one to four prevocalic consonants, and plus or minus one to three postvocalic consonants. Physiologically it may consist of one chest pulse or of a primary chest pulse accompanied by

secondary chest pulse setting in somewhere about the middle of a long vowel. Minor peaks of sonority are probably present on certain consonants (e.g. nasals and semivowels) in the syllable margins. More exact physiological description of the Miahuatlán syllable must await instrumental analysis.

2.1. Five vowels occur: /i, e, a, o, u/. /i/ is high, front, close, unrounded: bis immoral, yí? ice, mbi? man, waświ to eat dinner.

/e/ has four allophones, the most common of which is mid, front, open, unrounded: šlè? fruit, mbed child, neθip path, rex lattice, mèn? people. A somewhat more close allophone occurs before /y/: mbrey? ant, mbryey it is empty, yéy? lime, ley law. A high, open, unrounded allophone occurs following /y/ and preceding /k, t, ?/ whenever the vowel bears a high tone: yéti Guixtla, yéken my head, yé? tomorrow. A high, open, unrounded, and slightly backed allophone occurs before /ʔr/: yeʔr hole, yeʔrsin? very bad.

/a/ is low, central, open, and unrounded: ba there, rlan? waist, nza ear, bál bullet, yíʔp yà axe.

/o/ is mid, back, close, and rounded: mdok dressed, mok mucus, róʔθ field of young corn, dó? cord, rope.

/u/ is high, back, close, and rounded: gu you (respectful), mbuθ funnel, ndyus drunk, punyed fist, mbup armadillo.

2.2. There are three phonemic pitch levels: high, mid, and low; high tone is indicated by acute accent, low tone by grave accent, and mid tone remains unmarked: šó? war, mdát

sleeps, šlé? fever, má? animal, yí?pbon native hoe,
mbí? man, mdat jumps, mbak dog, šot grandparent, ben
mud, šò? earthquake, šlè? fruit, ɛɪba one (of previously
identified items), kè· stone, mdàt chews.

2.3. A phoneme of length optionally occurs with vowels.
Length is indicated by raised dot after the vowel of the
syllable: yí· bamboo, dó·p maguey, dá· petate,
mbí· air, ro· grand, big, mbe· moon, mbí· oversize,
kè· nít gourd for water, bò· knot, yè· a cold.

2.4. Nineteen consonants occur: /p, t, k, ʔ, b, d, g,
ɸ, ɓ, x, s, z, š, l, r, m, n, w, y/. All of the consonants may
close a syllable and all except /ʔ/ may initiate a syllable.

There are four stops: /p, t, k, ʔ/. The first three have
aspirated allophones in utterance final. /p/ is bilabial:
pá where, napa expensive, gap up, mbup armadillo, yap
chayote. /t/ is alveolar: tad mister, mbeto? baby, nít
water, nalat is pitiful, šits pineapple. /k/ is velar:
kí· fire, neka well, good, mbak dog, míkabe? a small
singing insect, ša? ndšák he knows. /ʔ/ is glottal: má?
animal, e?š then, na?a yesterday, yí?θ will come.

There are three voiced non-sibilant fricatives: /b, d,
g/; all of these have stop allophones in clusters after nasals.
/b/ is bilabial: béw comb, bak cow, mbab itches, nába
later, mbalen I came, mbuθ funnel, šab clothing. /d/ is
alveolar: dó?wán? cargo rope, mšyad sneezed, mdok dressed,
du?r pine needles, ndšák comes to pass. /g/ is velar: gaza

seven, nagus white, ngiθ chicken, nguθ died, ngro went out, mtegad bathed (someone else), yug ox yoke.

There are three voiceless non-sibilant fricatives:

/p, θ, x/. /p/ is bilabial: pink ranch, ptyà?p orphan, palt lack of things, yí?pbon native metal hoe. /θ/ is interdental: θapa four, yèθ tortillas, naθ lézó? forgetful, bla?θ wood chip, yèθo tamale. /x/ is velar: xardin garden, xer quickly, kexad jaw bone, rex lattice.

There are three sibilants: /s, z,² š/. /s/ is voiceless alveolar: sana? hello, sè? earthenware dish, rse? supper, spins pliers, bes time. /z/ is voiced alveolar: zan tired, zye?b afraid, nálze? today, letšuz forehead. /š/ is alveopalatal and has voiced and voiceless allophones, the former occurring after /d/: šna mother, šó? war, waš many, bištil? soap, katšet flesh of cheek, ndšà? a native red bean, watš lizard.

There are two liquids and two semivowels: /l, r, w, y/.

/l/ is a lateral with voiced and voiceless allophones, the latter occurring only between voiceless consonants and silence: kišl will pay you, mbakl your dog, loš root, bél sister of a woman, lad li right side, lni fiesta, letšuz forehead. /r/ is a voiced, alveolar flap: ren blood, cur to gobble, bur burro, ye?r hole, wandren to eat breakfast, ryo?i (something) will go out.

The semivowels /w/ and /y/ are somewhat more close and tense than the corresponding vowels /u/ and /i/. /w/ is

bilabial: wats̄ lizard, wa Œuwal go, eat, wi? to see,
 b̄ew fog, nakwaw is dark, škwaw cloud. /y/ is palatal:
 ȳet water jar, ȳéy? lime, bay sash, bzyè? afternoon.

3. Prevocalic clusters are elaborated with less restriction than postvocalic clusters. For example, in regard to clusters of two consonants, there are approximately one and a half as many prevocalic clusters as postvocalic clusters in that 80 of the former have been recorded versus only 58 of the latter. Again, in clusters of three consonants the more complex elaboration of prevocalic clusters is apparent in that while 35 such prevocalic clusters have been recorded only 8 such postvocalic clusters have been found. Finally only 4 prevocalic clusters of four consonants have been recorded and no such postvocalic clusters.³

3.1. Prevocalic clusters.

3.1.1. Clusters of two consonants.

Clusters with stop /p, t, k/ as first member. In such clusters /l, r, w, y/ may follow any stop; in addition /š, t/ may follow /p/ and /t/, while /k, b, g, s/ may follow /t/:

/pl/ pló how far, /pr/ pres prisoner, /pw/ pwert door,
 /py/ pyal? fetters, /tl/ tlo to begin, /tr/ tre? here,
 /tw/ twa? there, /ty/ tya there (distant), /kl/ klas class,
 /kr/ krens belief, /kw/ kwa?n to look for, /ky/ kwalkyer whatever,
 /pš/ pšit sister-in-law of a woman,
 /pt/ pta?n sister of a man, /tš/ tšè? nude, /tt/ ttètšè? probably will loan,
 /tk/ tkà probably will take, /tb/ tberè

probably will turn around, /tg/ tgàn lézó probably will doubt, /ts/ tsero probably will return.

Clusters with fricative as first member. In such clusters, /r, w, y/ may follow /b, d/; /d, g, k, l/ may follow /b/; /r/ may follow /g, p/; /t, k, θ, s, š, w/ may follow /p/; in addition, /y/ may follow /θ/, and /w/ may follow /x/: /br/ bronk stubborn, /bw/ bwelt around, /by/ byàz plum, /dr/ dren breakfast, /dw/ dwend elf, /dy/ dyab devil, /bd/ bdeb massage (imperative), /bg/ bgad bathè (imperative), /bk/ bkeʔš scab, /bl/ blaʔθ wood chip, /gr/ groser vulgar, /pr/ pras phrase, /pt/ ptelaʔba boil it (imperative), /pk/ pkeyà take, receive (imperative), /pθ/ pθoʔi sell it (imperative), /ps/ psinʔ foam, /pš/ pšey rough, /pw/ pwer outside, /θy/ θyoʔs Tamasulapan, /xw/ xwebs Thursday.

In clusters with sibilant or liquid as first member. In such clusters /t, k, w, y/ may follow /s/ or /š/; /y/ may follow /l/ or /r/; /n/ may follow /š/ or /l/; /l/ may follow /š/ or /r/; /b, g/ may follow /š/; in addition /p/ may follow /s/, /w/ may follow /l/, and /s/ may follow /r/: /st/ amistaʔ friend, /sk/ skaler ladder, /sw/ swaʔ to guard, /sy/ syalʔ to meet, /št/ štaw middle, /šk/ škal shade, /šw/ šwanʔ tail, /šy/ šyanʔ anger, /ly/ lyaʔ will be left behind, /ry/ ryes dangerous, /šn/ šnan my mother, /ln/ lni fiesta, /šl/ šlèʔ fruit, /rl/ rlanʔ waist, /šb/ šbab an itching, /šg/ šgab a thought, /sp/ spex mirror, /lw/ lweg right away, /rs/ rseʔ day.

Clusters with nasal as first member. In such clusters /t, k, d, g, θ, s, z, š, y/ may follow /m/ or /n/; in addition /b, n/ may follow /m/, while /w/ may follow /n/:

/mt/ mteʔθ learned, /mk/ mbèd mkuts hornets that build round nests, /md/ mbèl mdi lightning, /mg/ mgèn lézó was in a hurry, /mθ/ mθoʔ sold, /ms/ mseʔ louse, /mz/ mza girl, /mš/ mšeʔ demon, /my/ myerk Wednesday, /nt/ coʔ ntal where, /nk/ nko leaning, /nd/ nda is going, /ng/ ngutš pig, /nθ/ nθoʔ sells, /ns/ nse changes, /nz/ nza ear, /nš/ nšub crushes by rubbing, /ny/ nyaʔ field, /mb/ mbab itches, /mn/ mneyla enough, /nw/ nwes nut.

3.1.2. Clusters of three consonants.

Prevovalic clusters with stop as first member include only /pts, prw, tts, tkw, kry/: /ptš/ ptšorò finger nail, /prw/ prweb trial, test, /ttš/ ttšeʔ probably will cut, /tkw/ tkwaʔn probably will look for, /kry/ kryoy domestic, sickly.

Prevovalic clusters with non-sibilant fricative as first member include only /bly, bzy, gry, pty, pθy/: /bly/ blyàn jack rabbit, /bzy/ bzyèʔ afternoon, /gry/ gryeg Greek, /pty/ ptyàʔp orphan, /pθy/ pθyoʔ maggot.

Prevovalic clusters with sibilant as first member include only /str, skr, škw/: /str/ listren to make, do, or use something new, /skr/ skrib scribe, /škw/ škwaw cloud.

Prevocalic clusters with nasal as first member. With /m/ as first member such clusters have /b, d, θ, z, š/ as second member with /y/ as third member. In addition /m/ may be followed by /k, b/ as second member with /w/ as third member. Further clusters with /m/ as first member are /mts, mtl, mbr, mbl/. With /n/ as first member, such clusters have /d, g, θ, z, š/ as second member and /y/ as third member. In addition /n/ is followed by /t, d/ as second member and /š/ or /l/ as third member. Two further clusters occur, /ndr, ngw/: /mby/ mbyak healed, /mdy/ mdyól cricket, /mθy/ mθyon was ashamed, /mzy/ mzyal? met, /mšy/ mšyad sneezed, /mkw/ mkwa?n looked for, /mbw/ mbwà?s was hit, /mts/ mtšed out, tore, /mtl/ mtlo began, /mbr/ mbréy? ant, /mbl/ mbló? put out, /ndy/ ndya is gone, /ngy/ ngyaθ ndac is better after an illness, /nθy/ nθyon is ashamed, /nzy/ nzyal? meets, /nšy/ nšyad sneezes, /nts/ ntšed cuts, tears, /ntl/ ntlo begins, /ndš/ ndšab said, /ndl/ ndlab counts, reads, /ndr/ ndrì?θ passes, /ngw/ ngwa went.

3.1.3. Clusters of four consonants.

Clusters of four consonants are very restricted. Only four clusters of four consonants have been recorded and these are prevocalic. These four clusters have a common structuring in which the first member is a nasal; the second member is a voiced bilabial or alveolar; the third member is a liquid; and the fourth member is the semivowel /y/: /mbly/ mblyátš mosquito, /mbry/ mbryey it is empty, /ndly/ ndlyà?ba

it is boiling by itself, /ndry/ ndryoʔi is brought out
or goes out customarily by itself.

3.2. Postvocalic clusters.

3.2.1. Clusters of two consonants.

Clusters with stop as first member. In such clusters /l/ may follow any stop. In addition /s, š/ may follow /t, ʔ/; /t, r/ may follow /k/; and /b, p, θ, z, n, r/ may follow /ʔ/:
/pl/ lapl your pencil, /tl/ yatl your ditch, /kl/ mbakl your dog, /ʔl/ taʔl your beans, /ts/ šits pineapple, /tš/ watš lizard, /ʔs/ yeʔs paper, /ʔš/ bkeʔš scab, /kt/ produkt product, /kr/ asukr sugar, /ʔb/ laʔb to boil, /ʔp/ ptyàʔp orphan, /ʔθ/ yiʔθ will come, /ʔz/ mblyəʔz was pried up, /ʔn/ leʔn inside of, /ʔr/ yeʔr hole.

Clusters with non-sibilant fricative or with sibilant as first member. In such clusters /l/ may follow any non-sibilant fricative or any sibilant; in addition /d, s/ may follow /b/; /t/ may follow /s/; and /r/ may follow /g/: /bl/ šbabl your itch, /dl/ ladl your body, /gl/ yugl your ox-yoke, /pl/ dó.pl your maguey, /θl/ yèθl your tortilla, /xl/ gaxl your garlic, /sl/ wesl your brother, /zl/ lizl your house, /šl/ yišl your trash, /bd/ sabd Saturday, /bs/ xwebs Thursday, /st/ apwest bet, /gr/ bisagr hinge.

Clusters with liquid, nasal, or semivowel as first member. In such clusters /l, s, ʔ/ may follow /l, r, n, w/; /t/ may follow /l, r, n/; /p, m, d/ may follow /l/; /d, b, k, n/

may follow /r/; /b, p/ may follow /m/; /ʔ/ may follow /y/;
 and /g, k, y/ may follow /n/: /ll/ béll your sister,
 /ls/ kols cabbage, /lʔ/ bélʔ meat, /rl/ mberl
your turkey, /rs/ maners manner, way, /rʔ/ larʔ cloth,
 /nl/ renl your blood, /ns/ bixilans vigilant, /nʔ/
 wanʔ robber, /wl/ škwawl your cloud, /ws/ kaws cause,
 /wʔ/ tawʔ to close, /lt/ bwelt around, /rt/ wert
light colored, /nt/ kwent story, /lp/ solp music score,
 /lm/ alm soul, /ld/ bald pail, /rd/ surd lefthanded,
 /rb/ lisirb to serve, /rk/ surk furrow, /rn/ gobyern
government, /mb/ tamb owl, /mp/ lamp lamp, /yʔ/ wayʔ
horse, /ng/ doming Sunday, /nk/ bank bench, /ny/ bany
bath.

3.2.2. Clusters of three consonants.

Postvocalic clusters of three consonants are very restricted. As first member there may occur /n, r, s, y/; as second member there may occur /t, ʔ, d, x, s, n/; as third member there may occur /t, s, š, l, r/. The actually occurring clusters are: /ndr/ almendr almond, /nts/ ants before, /rns/ byerns Friday, /yst/ mayst teacher, /str/ rastr tracks, /yʔr/ xayʔr Jairus, /ntš/ šantš grasshopper, /nxl/ anxl angel.

4. Intermediate between the syllable and the utterance there is a unit of stress placement which may be termed the word. Word stress falls on the last syllable of the stem but the stem may be followed by a stressless enclitic:⁴
 li'zen my house, letšu'zen my forehead. However, in

relation to ambisyllabic clusters within the utterance, the word, as such, is of little pertinence in that such clusters occurring in the word are no more restricted in type than those occurring in utterances. Clusters occurring in the utterance consist, then, simply of any occurring postvocalic single consonant or cluster followed by any occurring prevocalic single consonant or cluster. No attempt is made here to exhaustively illustrate all such clusters; instead, a few typical examples of this sort of clusters are given.

4.1. Examples of clusters formed by postvocalic single consonant followed by prevocalic single consonant or cluster of two to four consonants: /kn/ mbak nagus white dog, /nw/ mbin wa?i bird will eat it, /lš/ bəl ša? her sister, /bšn/ ndub šnan my mother sits, /bry/ ndšab ryete ša? said all of them, /nnd/ ngon nda oxen are going, /tndš/ šagot ndšè? this woman, /?ngr/ ša? ngro he went out, /tmb1/ nít mbla?b water boiled, /kmbly/ mbak mblyušle? dog was destroyed, /tndly/ nít ndlyya?b water is boiling by itself, /bmbly/ ša? mšub mblyátš he crushed (by rubbing) mosquito.

4.2. Examples of clusters formed by postvocalic cluster of two consonants followed by prevocalic single consonant or cluster of two to four consonants: /y?n/ way? nagus white horse, /ldn/ bald nagat black pail, /tšy/ ngutš ya nába? pig will go later, /bdnd/ sabd nde Saturday comes, /l?ng/ bəl? ngosa? meat spoiled, /klmk/ mbakl mkele? your dog bit,

/ʔnskr/ šaʔ mkwaʔn skrib he looked for scribe, /tšngr/
 ngutš ngro pig went out, /mbmkw/ tamb mkwaʔn mdin
owl looked for rat, /nʔmbly/ wánʔ mblyušleʔ robber was
 destroyed, /ʔembly/ mteʔ mblyátš the mosquito learned,
 /ʔndry/ nziʔ ndryo squirrel goes out.

4.3. Examples of clusters formed by postvocalic cluster of three consonants followed by prevocalic single consonant or cluster of two to four consonants: /ntšg/ šantš gus yellow grasshopper, /ndrn/ almendr nayà bitter almond, /ysty/ mayst yiʔ teacher will come, /ystng/ mayst nguə teacher died, /ntsnd/ ants nda šaʔ before he goes, /nxlnd/ anxl nduwa angel ate, /rnsngr/ byerns ngro šaʔ Friday he went out, /ystmbw/ mayst mbwiʔ mbed teacher saw child, /yʔrngr/ xayʔr ngro Jairus went out, /strmbly/ rastr mblyušleʔ tracks were destroyed, /mbrmbly/ alambr mblyušleʔ wire was destroyed, /ntsmbry/ wa lu ants mbryey you eat before it is gone.

5. The consonant clusters of Miahuatlán Zapotec may be most readily described in relation to the syllable. The syllable nucleus consists of one of the five phonemic vowels accompanied by one of the three phonemic register tones plus or minus the phoneme of length. The 19 consonants are distributed as follows: (a) one to four consonants preceding the vowel, and (b) one to three consonants following it. The distribution of single consonants in either position is subject to the sole restriction that /ʔ/ does not appear

prevocalic. 80 clusters of two consonants occur prevocalic and 58 such clusters occur postvocalic. 35 clusters of three consonants occur prevocalic and 8 such clusters appear postvocalic. Only 4 clusters of four consonants occur, and these clusters are limited to prevocalic position. Further ambisyllabic clusters occur composed of postvocalic single consonants or clusters followed by prevocalic single consonants or clusters without restriction of any sort either in the utterance as a whole or in the interior of the phonological word.

Footnotes:

¹ Data for this discussion was gathered over a period of three and a half years during several periods of residence in the town of Cuixtla in the district of Miahuatlán about sixty-five miles south of Oaxaca City, Mexico. The material was gathered by Manis and Jane Ruesegger working in cooperation with the Summer Institute of Linguistics. The author wishes to express appreciation to Robert Longacre and William Wonderly of the Summer Institute of Linguistics for their valuable assistance in the preparation of this paper.

² Free fluctuation occurs in a few words between the phonemes /s/ and /z/: *sya?* ~ *zya?* then, *siθ* ~ *ziθ* bone.

³ It is instructive to compare the drop in the incidence of clusters with the theoretically possible incidence of clusters of varying complexity. Thus, while it is theoretically possible to have 342 prevocalic clusters of two consonants and 361 such postvocalic clusters, the actual count gives only 80 such prevocalic clusters and only 58 such postvocalic clusters. On increasing the complexity of the clusters by one more consonant, we find that while there are over 6100 theoretically possible combinations of three consonants, nevertheless, the number of actually occurring clusters of three consonants is considerably less than the number of occurring clusters of two consonants. Finally, on increasing the complexity of the clusters by one further additional consonant, we find that, of the 110,000 or more theoretically possible combinations of four consonants, only four such clusters actually occur.

4 For those who do not admit grammatical considerations in phonemic analysis, stress would be phonemic.