THE PHONOLOGY AND TONE SANDHI OF MOLINOS MIXTEC

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0. INTRODUCTION

The Molinos dialect[1] of Mixtec, like other Mixtec dialects has a two-syllable couplet as the nucleus of the phonological word (K. Pike, 1948: 79-80; Mak, 1953:87; Longacre, 1957:11). The couplet in the Molinos dialect is pertinent in the description of (1) the placement of word stress (see 1.1, Rules 2 and 4), (2) allophones of /k/, /i/, and of nasalized vowels (see 7 and 9), (3) allotones (see 5), (4) the distribution of phonemes (see 10), and (5) in the description of tone sandhi (see 11).

Because of the importance of the couplet in description, the phonological word is treated first.

1. PHONOLOGICAL WORD

1.0. The phonological word is a rhythm unit in which timing is one of the contrastive features. That is, a phonological word of several syllables tends to be said with the same length of time as one with two syllables, and a word with numerous syllables is said very fast, as in: *nda²va²* 'to jump', *ka¹nda²va²-ti³* 'the animals are jumping', *kʷi³so³* 'to boil', *si²kʷi²so¹* 'to cause to boil', *si²kʷi²so¹-są¹* 'I'll boil (it)', *si²kʷi²so¹-są¹de³* 'I'll boil the water', *hį³si²kʷi²so¹-są¹de³* 'we (exclusive) will boil the water', *nda²si²kʷi²so¹-są¹de³nsa²* 'I'll reboil the water then!'.

1.1. The nucleus of each phonological word is a couplet of two syllables. This couplet may or may not be preceded and/or followed by one, two,

[1] The San Pedro Molinos dialect of Mixtec has approximately 700 speakers. The town is located in the District of Tlaxiaco, Oaxaca, Mexico. The principal informant used was Felipe Ortiz Juárez. The data were first gathered in 1964 and 1965 by Georgia Hunter on field trips under the auspices of the Summer Institute of Linguistics. The final analysis and preparation for publication was done by both authors.

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or three syllables. In this paper when the couplet is not preceding word space, we have written a hyphen separating it from the postcouplet syllable(s). Examples[2] of contrasting placement of the couplet are: *ka*^{2}*ta*^{2}-*ži*^{2} 'the child will sing', *si*^{2}*ka*^{1}*a*^{1} 'to feed', *ka*^{1}*hi*^{2}*ta*^{2}-*ži*^{2} 'the children are singing', *kį*^{1}*ʔį*^{3}-*są*^{1}*nsa*^{2} 'I'm going then!', *hį*^{3}*nda*^{2}*ke*^{2}*te*^{2}-*ña*^{2} 'the women will launder'.

1.2. The placement of word stress is dependent upon the tone sequence and upon the position of the couplet within the word. Five rules may be used in determining the placement of stress in the phonological word. (Within this section, word stress has been marked by an acute accent.)

Rule 1: The syllable with the last tone 1 which is followed by a lower tone within the word receives stress: *ka*^{2}*ndí*^{1}*ha*^{2}-*de*^{2}*ža*^{3} 'he will obey God', *ka*^{2}*ndi*^{1}*ha*^{2}-*są*^{1}*ža*^{3} 'I will obey God', *si*^{2}*kú*^{1}*či*^{2}-*de*^{2}*ti*^{3} 'he will bathe the animal', *si*^{2}*ku*^{1}*či*^{2}-*są*^{1}*ti*^{3} 'I will bathe the animal'. If no tone 1 occurs, stress occurs on the syllable with the last tone 2 which is followed by a low tone: *k*^{w}*i*^{2}*ni*^{3}-*dé*^{2}*ti*^{3} 'he will see the animal'.

Rule 2: Stress does not occur on a precouplet syllable, even when it is followed by a tone 3: *ku*^{1}*vį*^{3}*hį*^{2}-*są*^{1} 'I am cold'.

Rule 3: If a word is composed entirely of syllables with tone 1, or entirely of syllables with tone 2, all syllables are equally stressed as in *kó*^{1}*ní*^{1}-*ní*^{1} 'your turkey hen', *žó*^{1}*ší*^{1}*ní*^{1} 'to cover one's head', and *ndá*^{2}*ké*^{2} *té*^{2} 'will wash', *ké*^{2}*té*^{2}-*dé*^{2} 'he will dig'.

Rule 4: Stress occurs on the first syllable of the couplet (1) if a word is composed entirely of syllables with tone 3, as in *ti*^{3}*ndó*^{3}*ko*^{3} 'avacado seed', *žú*^{3}*ku*^{3}-*li*^{3} 'my herbs', (2) if it is composed of a sequence in which each succeeding tone is higher than the preceding one, as in *kį*^{3}*vi*^{2}-*są*^{1} 'I will enter', (3) if it is composed of a sequence of level tones followed by a higher tone, as in *si*^{2}*ká*^{2}*sų*^{1} 'to toast', *kí*^{2}*ti*^{2}-*ni*^{1} 'your animal', *ña*^{3}*ží*^{3}*vi*^{1} 'the world'.

Rule 5: If a word contains a sequence of two level tones following a lower tone, such as 211, 322, 311, there is a unifying rhythm of the level sequence and a slight lengthening of the vowel preceding the level sequence, as in *k*^{w}*é*^{2}*le*^{1}-*ni*^{1} 'your comrade', *ñá*^{3}*ži*^{2}*vi*^{2} 'people', *tí*^{3}*ka*^{2}-*de*^{2} 'his grasshopper', *sé*^{3}*te*^{1}-*ni*^{1} 'you will shave'.

[2] The numbers represent tone: tone [1] (high), tone [2] (mid), and tone [3] (low).

2. PHONOLOGICAL PHRASE

A phonological phrase is made up of one or more phonological words. It is characterized (1) by a following pause, (2) by a downdrift of pitch, and (3) by phrase stress.

In precise speech, downdrift of pitch is slight or absent, but in relaxed speech in a sequence of several phrases, the downdrift is apparent. In the following example, although all syllables are tone 3, those at the end of the phrase are lower than those at the beginning: *ʔú³ni³ žú³ku³ ʔú³vâ³* 'three bitter herbs'.

Phrase stress is independent of word stress and rarely coincides with it, since word stress does not occur on the phrase-final syllable, whereas phrase stress usually occurs there.

Phrase stress occurs on the phrase-final syllable, except when the phrase-final word has a CVʔV or CVhV pattern, in which case phrase stress occurs on the next to the last syllable. (In this section word stress has been marked with an acute accent, and phrase stress with a circumflex accent.) *šĺ³ko²-ña² ndĺ²vî¹* 'she will sell eggs', *šĺ³ko²-ña² žâ¹ʔa¹* 'she will sell chiles', *šĺ³ko²-ña² ñû¹ha¹* 'she will sell masa', *ka²tá²-lí³* 'I will sing'.

In addition to the phrase stress which occurs on the phrase-final syllable, a word may be emphasized by means of extra loudness. In the following examples we have marked this extra loudness with a double apostrophe. Examples: *ná³va² kú¹u² ha³″kq́¹ʔą³ tú²tû³* 'what does the paper(!) say?', *nú¹ú¹ kĺ²tĺ² ″vá¹ʔa² vé²nti¹ pé²sû¹* 'if (it is) a good(!) animal (it is worth) twenty pesos'.

3. SYLLABLE

Each syllable has a nucleus which consists of one vowel and one tone. The nucleus may or may not be preceded by one, two, or three consonants, and may be followed, in restricted environments, by /ʔ/. A syllable ending in /ʔ/ occurs only couplet-medial, or at the fusion of a couplet and postcouplet, or at the fusion of two couplets (see 10.1).

Each of the following words consists of three syllables: *te³e²-a¹* 'this man', *ka²ʔvi²-sq́¹* 'I will read', *nstį́¹į́²-sq́¹* 'I glued (it)'.

Examples of various syllable patterns are: *te³e²* (CV+V) 'man', *la¹ku¹* (CV+CV) 'worm', *sta³a³* (CCV+V) 'tortilla', *nstę³ʔę³* (CCCV+CV) 'taught', *ža²ʔvi²* (CVʔ+CV) 'expensive'.

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4. TONE CONTRASTS

There are three tones: tone 1 (high), tone 2 (mid), and tone 3 (low). In two-syllable words the nine possible sequences (11, 12, 13; 21, 22, 23; 31, 32, 33) may occur in isolation but tone sequences 13 and 31 are rare. All possible sequences also occur in three-syllable words.

Examples of the tones in contrast are: *ta²ta¹-sǫ¹* 'my father', *tu²tų²-sǫ¹* 'my firewood', *tu²tu³-sǫ¹* 'my paper', *ʔu³u³* *ri¹ki²* 'two woodpeckers', *ʔu³u³* *ki²ti²* 'two animals', *ʔu³u³* *hi³ki²* 'two fists', *ka³nta³-sǫ¹* 'I will move', *ka³nta³-ña²* 'she will move', *ka³nta³-ti³* 'the animal will move'.

Examples of tone sequences in three-syllable words: *ña³ži³vi¹* 'the world', *ti³ka³ži²* 'charcoal', *ši³ndi³ki³* 'oxen'; *nu³či²žo¹* 'shoulder', *ña³ži²vi²* 'people', *ti³ka²sų³* 'dry tortillas'; *tų³ndo¹ko¹* 'zapote tree,' *ha³ža¹ʔa²* 'this'; *kʷi²ni³-sǫ¹* 'I will know', *či²ndų³hį²* 'to bury', *kʷi²so³-de³* 'the water will boil'; *ndi²ki²vi¹* 'daily', *žo²ši²ni²* 'hat', *ko²te²ku³* 'to live'; *či²kʷa¹ku¹* 'lizard', *ka²ndi¹ha²* 'to obey', *ki²ši¹-ti³* 'the animal is sleeping'; *žo¹ši¹ni¹* 'to cover one's head', *su¹kų¹-de²* 'he is tall', *ʔi¹žo¹-de³* 'there is water'; *ti¹la²-ni¹* 'your hen', *ti¹la²-ña²* 'her hen', *ti¹la²-li³* 'my hen' (familiar); *kǫ¹ʔǫ³-sǫ¹* 'I am talking', *kǫ¹ʔǫ³-ña²* 'she is talking', *kǫ¹ʔǫ³-li³* 'I am talking' (familiar).

5. TONE VARIANTS

Tone variants may be described in relations to their environment as defined (1) by contiguous tones, (2) by placement in relation to the couplet of the word, and (3) by their occurrence phrase final or nonphrase final.

There is a gradual downdrift of pitch which is perceptible in a phrase consisting of several words (see 2).

Tone 1 has a raised allotone which occurs when preceding a tone 2 or tone 3 within a word. In *ko¹ni¹-a²* 'this turkey hen', the /ni¹/ has a higher pitch than the /ko¹/. In *vi¹lu¹-ų²* 'that cat', the /lu¹/ has a higher pitch than /vi¹/.

Tone 2 has a raised allotone when preceding a tone 3 within a word. In *ka²ta²-li³* 'I will sing' (familiar), the /ta²/ has a higher pitch than /ka²/. In *ndo²kʷi²ñi³* 'to stand up', the /kʷi²/ has a higher pitch than /ndo²/.

When following tone 3 within a word, tone 2 has a lowered allotone. In *hi³to²* *hi²te¹* 'wide bridge', the syllable /to²/ has a lower allotone than /hi²/.

A tone 3 glides downward when phrase final, as in *hį³ka³šį³* 'to grind', and *žu³ku³-li³* 'my herbs' (familiar). A tone 3 has a raised allotone when following a tone 2 within a word, as in *tu²tu³-li³* 'my paper' (familiar).

6. CONSONANT CONTRASTS

There are eighteen consonant phonemes:[3] stops and affricates /p (rare, loan words only), t, č, k, kʷ, ʔ/; fricatives and spirants /v, d, s, š, ž, h/; nasals /m, n, ñ, ŋ/; lateral /l/; and trill /r (rare)/.

Bilabials /p, v/: *pa¹a³* 'bread', *va³a³* 'noisy'.

Dentals and alveopalatals /t, d, s, š, ž, č/: *ta²ka³* 'nest', *nda²ta²-de²* 'he is splitting (it)', *sa²ka²* 'to mix', *šą³ʔą²* 'grease', *ža²ka³* 'loft', *ča²ka²* 'fish'. (The sequence [ša] also contrasts with [sia] and with [šia] as in *vi³ša³* 'wet', *ki³si²-a¹* 'this jug', *ʔi²ši¹-a²* 'this hair'.)

Velars /k, kʷ, h/: *ki²ti²* 'animal', *kʷi¹ti¹* 'short', *hi²ti³* 'intestines'. The sequence /kʷV/ contrasts with the sequence /kuV/: *su³kʷa³* 'eyebrow', *žu³ku³-a¹* 'this herb'.

The glottal stop versus the absence of glottal stop: *ko³ʔo³* 'dish', *ko³o³* 'snake'.

The nasals, lateral, and vibrant /m, n, ñ, ŋ, l, r/: *mi²ʔi²* 'exactly', *ni³ʔi²* 'fast', *ñi¹ʔi³* 'mute', *ŋi²ʔi²* 'grasped', *li²ŋki¹* 'puppy', *ri²ŋki²* 'mouse', *ri¹ki²* 'woodpecker'. (These are the only two words with /r/ which are not loan words.)

7. CONSONANT VARIANTS

The stop phonemes /p, k, kʷ/ (but not /t/ or /č/) have voiced allophones when following a nasal consonant. *pa¹a³* 'bread', *mpa¹a³* [mba¹a³] 'compadre'; *ku²u²* 'to be able', *ŋku²u²* [ŋgu²u²] 'was able'; *kʷe³ʔe²* 'to injure', *ŋkʷe³ʔe²* [ŋgʷe³ʔe²] 'was injured'.

There is a lack of symmetry in that the stop phoneme /t/ and the affricate /č/ do not have voiced allophones following a nasal consonant: *te²e²* 'to write', *nte²e²* [nte²e²] 'wrote'; *ta²ka³* 'nest', *nta³ka¹* 'every, all', *či²i²* 'to become wet', *nči²i²* [ntši²i²] 'became wet'.

[3] In addition to the phonemes which occur in native words, there is a voiced fricative /g/ which occurs in Spanish loan words. It is more fortis than the allophone of /k/: *ḡa²nču¹* 'hook'.

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NANT CONTRASTS

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The fricatives /s, ž/ (but not /d/ or /š/) have affricate allophones when following a nasal consonant: *žo¹so¹* 'to be mounted', *nžo³so²* [ndžo³so²] 'was mounted'; *sa¹ʔa²* 'to do, make', *nsa³ʔa²* [ntsa³ʔa²] 'did, made'.

There is a lack of symmetry in that the fricative /d/ has a stop allophone (instead of an affricate), and fricative /š/ has a fricative allophone (instead of an affricate) when following a nasal consonant: *nda²ʔa²-de¹* [nda²ʔa²-ɗe¹] 'his hand', *ʔu³nde³* [ʔu³nde³] 'until', *ši²či¹tu¹* 'to fill', *nši²či¹tu¹* [nši²tši¹tu¹] 'to have filled', *ši²či¹i²* 'to dampen', *nši²či¹i²* [nši²tši¹i²] 'to have dampened'.

Because other Mixtec dialects do not have a contrast of voicing versus voicelessness following a nasal consonant we have given examples of the contrasts here: *nda²va²* [nda²ɓa²] 'did fly', *nta²va²* [nta²ɓa²] 'did pull up'; *nži²i²* [ndži²i²] 'became old', *nči²i²* [ntši²i²] 'became wet'.

The phoneme /k/ varies from a voiceless velar stop to a voiced velar lenis fricative when in a postcouplet syllable which is not phrase final, as in *ka²a²-ni¹ ho²o³-[k/g]a³ ndu²či²* 'eat a few more beans'.

Voiceless stop /t/ has a voiceless nasal release when preceding a nasalized vowel: *tu²tų²* [tu²tᴺų²] 'firewood'.

The siblants /š, ž/ are retroflexed when preceding /a, o, u/: *šą³ą³* [ʂą³ą³] 'very', *žo²ʔo²* [ʐo²ʔo²] 'rope'. They are not retroflexed, however, when preceding front vowels: *šį²į²* [ši²i²] 'side', *že²ʔe²* [že²ʔe²] 'outside'.

The dental nasal /n/ varies to voicelessness when phrase initial preceding a cluster of voiceless consonants, as in *[n/N]stę¹ʔę³* 'did teach'.

The velar nasal /ŋ/ is voiceless when preceding /h/: *ŋha²a²* [ŋha²a²] 'did eat'. With some speakers this alternates with the absence of the nasal consonant, as in *ŋha²a²* or *ha²a²* 'did eat'.

When preceding a consonant word medially, the glottal stop may have a voiced release with the vocoid quality of the preceding vowel, as in *ža²[ʔ/ʔᵃ]vi²* 'expensive'. This vocoid release contrasts with a sequence in which a vowel follows a glottal stop, in that the allophonic vocoid release of the /ʔ/ is shorter than a vowel in that environment, as in *ži¹ʔi¹-žu¹* [ži¹ʔi¹žu¹] 'hollow' versus *ti²ʔvi²* [ti²ʔ¹²vi²] 'to suck'.

The voiced bilabial fricative /v/ fluctuates in the degree of rounding and friction. When it is word initial, and also when contiguous to a front vowel it is usually flat and fricative: *va³ʔa²* [ɓa³ʔa²] 'good', *ndi³vi³* [ndi³ɓi³] 'egg'. When preceding /u/ and also when following /ʔ/, the rounded allophone is the more frequent: *va¹ʔvu³* [ɓa¹ʔwu³] 'coyote', *ʔu³ʔva³* [ʔu³ʔwa³] 'salty', *še³ʔva³* [šɛ³ʔwa³] 'gully'.

The trill /r/ has a flap allophone which occurs word medially: *va²ra¹* [ɓa²řa¹] 'staff', *ka²ru¹* [ka²řu¹] 'truck'.

8. VOWEL CONTRASTS

There are five oral vowels /i, e, a, o, u/ and five nasalized vowels /į, ę (rare), ą, ǫ, ų/.

Front vowels /i, į, e, ę/: *vi*^{3}*ši*^{3} 'sweet', *vi*^{3}*šį*^{3} 'warm', *ti*^{2}*i*^{2} 'tense', *tį*^{2}*į*^{2} 'to seize', *te*^{3}*e*^{2} 'man', *tę*^{3}*ę*^{3} 'forehead', *ki*^{2}*i*^{2} 'to arrive', *ke*^{2}*e*^{2} 'to leave'.

Central vowels /a, ą/: *ka*^{3}*a*^{2} 'bell, metal', *ką*^{3}*ą*^{2} 'to adjust', *ka*^{2}*a*^{2} 'to eat'.

Back vowels /o, ǫ, u, ų/: *ču*^{2}*ku*^{2} 'louse', *ču*^{2}*kų*^{2} 'fly', *ču*^{2}*ko*^{2} 'our louse', *ču*^{2}*kǫ*^{2} 'our fly'.

9. VOWEL VARIANTS

Allophonic nasalization of vowels is best described in relation to the couplet.

When the couplet-medial consonant is a nasal, the contiguous vowels are nasalized. (There is no contrast between oral and nasalized vowels in this environment.) For example: *ku*^{1}*nu*^{1} [kų^{1}nų^{1}] 'deep', *ka*^{1}*ni*^{1} [ką^{1}nį^{1}] 'long'.

When the couplet-initial consonant is a nasal, both vowels of the couplet are nasalized unless a consonant other than /ʔ/ or /h/ occurs between them. *nu*^{3}*u*^{3} [nų^{3}ų^{3}] 'face', *ña*^{2}*ʔa*^{2} [ña^{2}ʔą^{2}] 'woman', *ni*^{1}*hi*^{1} [nį^{1}hį^{1}] 'you' (polite), but *ñu*^{3}*ti*^{2} [ñų^{3}ti^{2}] 'sand'.

Preceding a postcouplet nasal, however, and also preceding a couplet-initial nasal, there is contrast between an oral and a nasalized vowel even though the oral vowel may be slightly nasalized in that environment: *tu*^{2}*tu*^{3}-*ña*^{2} 'her paper' versus *tu*^{2}*tų*^{2}-*ña*^{2} 'her firewood', *ka*^{2}*a*^{3}-*ña*^{2} 'she will say' versus *ką*^{2}*ą*^{3}-*ña*^{2} 'she will punch', *ku*^{2}*nu*^{2}*u*^{2}-*de*^{2} [ku^{2}nų^{2}ų^{2}-de^{2}] 'he will be important' versus *ku*^{1}*nu*^{1}-*de*^{3} [kų^{1}nų^{1}-de^{3}] 'the water is deep'.

There is also a contrast of an oral versus a nasalized vowel when preceding a postcouplet nasalized vowel. *ču*^{2}*ku*^{1}-*ų*^{2} 'that louse' versus *ču*^{2}*kų*^{1}-*ų*^{2} 'that fly'. Within the couplet, however, oral vowels and nasalized vowels do not occur contiguously (see 10.2).

Of all nasalized vowels /ų/ is the most heavily nasalized and /ą/ is the least nasalized: *kų*^{3}*ų*^{3} 'four', *kǫ*^{2}*ǫ*^{3} 'we will punch', *šį*^{2}*į*^{2} 'side', *ką*^{2}*ą*^{3} 'to punch'.

The vowel /ų/ varies from a vocoid to a syllabic [m̩] when contiguous to /k/ or /ʔ/, as in *kų*^{3}*ų*^{3} [kų^{3}ų^{3}]/[km̩^{3}m̩^{3}] 'four', and *ʔų*^{3}*ʔų*^{3} [ʔų^{3}ʔų^{3}]/[ʔm̩^{3}ʔm̩^{3}] 'five'.

The vowels are more heavily nasalized after /ŋ/ than after other nasal

WEL CONTRASTS

e, a, o, u/ and five nasalized vowels /i̧, ę

*ši*³ 'sweet', *vi*³*šį*³ 'warm', *ti*²*i*² 'tense', *tį*²*į*²
orehead', *ki*²*i*² 'to arrive', *ke*²*e*² 'to leave',
*a*² 'bell, metal', *ką*³*ą*² 'to adjust', *ka*²*a*²

*ku*² 'louse', *ču*²*kų*² 'fly', *ču*²*ko*² 'our louse',

OWEL VARIANTS

owels is best described in relation to the

onsonant is a nasal, the contiguous vowels
ontrast between oral and nasalized vowels
xample: *ku*¹*nu*¹ [kų¹nų¹] 'deep', *ka*¹*ni*¹

onsonant is a nasal, both vowels of the
a consonant other than /ʔ/ or /h/ occurs
'face', *ña*²ʔ*a*² [ñą²ʔą²] 'woman', *ni*¹*hi*¹
*i*² [ñų³ti²] 'sand'.
al, however, and also preceding a couplet-
between an oral and a nasalized vowel
y be slightly nasalized in that environment:
*tu*²*tų*²-*ña*² 'her firewood', *ka*²*a*³-*ña*² 'she
will punch', *ku*²*nu*²*u*²-*de*² [ku²nų²ų²-de²]
*u*¹*nu*¹-*de*³ [kų¹nų¹-de³] 'the water is deep'.
an oral versus a nasalized vowel when
ized vowel. *ču*²*ku*¹-*ų*² 'that louse' versus
the couplet, however, oral vowels and
contiguously (see 10.2).
is the most heavily nasalized and /ą/ is
our', *kǫ*²*ǫ*³ 'we will punch', *šį*²*į*² 'side',

vocoid to a syllabic [ɱ] when contiguous
ų³]/[kɱ³ɱ³] 'four', and ʔ*ų*³ʔ*ų*³ [ʔų³ʔų³]/

nasalized after /ŋ/ than after other nasal

consonants: *ŋo*²*o*³ 'we did punch' (inclusive) versus *ño*¹*o*³ 'our town' (inclusive). Nasalized vowels are more heavily nasalized when following /k/ than when following other oral consonants, as in *ką*²*ą*³ 'to punch' versus *šą*³*ą*³ 'very'.

The vowel /i/ has various allophones. (1) It may optionally be voiceless when following a voiceless consonant phrase finally: *ka*³*č*[*i*/ɪ]³ 'cotton'. (2) It varies to [i] when following /u/, as in *ha*³*vu*²*i*²*ši*¹ 'conceited'. (3) It, or its counterpart /i̧/, is especially short when occurring in the pre-couplet contiguous to a couplet-initial vowel: *vi*²*o*²ʔ*o*² 'our house' (inclusive), *čį*³*ǫ*³ʔ*ǫ*² 'our skunk' (inclusive). (4) When between /š/ and a couplet-initial vowel, it is actualized as nonretroflexion of the /š/: *šį*³*ą*³ʔ*ų*³ [šą³ʔų³] 'fifteen'.

The vowel /e/ has allophones ranging from [e] to [ɛ]. The [e] is the more frequent when a member of a geminate cluster, as in *ke*³*e*² [ke³e²] 'to sink'. The [ɛ] is the more frequent when contiguous to /ʔ/, as in *že*²ʔ*e*² [žɛ²ʔɛ²] 'outside', and when following /h/ or /k/, as in *ke*²*nta*² [kɛ²nta²] 'to leave', *he*¹*te*² [hɛ¹te²] 'digging'. (But if a geminate cluster follows /k/, the allophone [e] occurs.) There is variation, but in other environments [e] is more frequent.

The vowel /o/ varies to the open allophone [ɔ] following a nasal consonant or /k^w/, and when it is a member of the geminate cluster /oo/, as in *no*³ʔ*o*² [nɔ³ʔɔ²] 'our teeth', *su*³*k*^{w}*o*³ [su³k^{w}ɔ³] 'our eyebrows', *žo*²*o*³ [žɔ²ɔ³] 'our song'.

10. DISTRIBUTION OF PHONEMES

10.1. The distribution of consonant clusters[4] within a phonological word is best described in relation to the couplet and the morpheme. Couplet-medial consonant clusters begin with either /ʔ/, /n/ or /ŋ/, whereas couplet-initial clusters, except for the cluster /st/, begin with /n/ or /ŋ/. There are no bimorphemic clusters in a couplet-medial environment, but in a couplet-initial environment the majority are bimorphemic. Only /ns/ occurs post-couplet.

Medial in a couplet the following monomorphemic clusters occur frequently: /ʔm, ʔn, ʔñ, ʔv, ʔž, ʔl/, as in *ña*²ʔ*mi*³ 'sweet potato', *ku*²ʔ*ni*³ 'to tie up', *ši*¹ʔ*ña*¹ 'sparrowhawk', *ža*²ʔ*vi*² 'expensive', *ndi*²*ši*¹ʔ*žu*¹ 'goat',

[4] There are various clusters in Spanish loan words which do not occur in native words, as in *ve*²*rko*²*ki*¹ 'apricot', *ga*²*vri*²*e*¹*e*² 'Gabriel', *vri*²*ŋka*¹ [bři²ŋga¹] 'gringa', *ka*³*hu*¹*e*² 'coffee'.

ko^{1}*ʔlo*^{1} 'turkey'. Infrequently monomorphemic clusters /nd, nt, nč, ŋk, ʔnd/ also occur, as in *ʔu*^{3}*nde*^{3} 'until', *ka*^{3}*nta*^{3} 'to move oneself', *la*^{2}*nči*^{2} 'sheep', *mi*^{2}*ŋki*^{2} 'brains', *ko*^{3}*ʔndo*^{3} 'knee'. (No bimorphemic clusters occur couplet-medially.)

The trill /r/ never occurs couplet medially and /d/ and /ŋ/ do not occur there unless in a cluster with another consonant.

Initial in a couplet the monomorphemic clusters /nd, nt, ns, st/ may occur, as in *nda*^{2}*ʔa*^{2} 'hand', *nta*^{3}*ka*^{1} 'all, every', *nso*^{1}*o*^{2} 'to be carrying' (only example), *sta*^{3}*a*^{3} 'tortilla'.

Initial in a couplet the bimorphemic clusters /nt, ns, ŋk, ŋk^{w}, ŋh, st/ may occur. These are composed of the morpheme {n∼ŋ} meaning COMPLETED ACTION, plus the initial consonant of the couplet, as in *nte*^{2}*e*^{2}*-są*^{1} 'I wrote', *nsa*^{3}*ʔa*^{2}*-są*^{1} 'I did', *ŋke*^{3}*e*^{2}*-są*^{1} 'I sank', *ŋk*^{w}*a*^{2}*a*^{2}*-są*^{1} 'I was blind', *ŋhą*^{2}*ą*^{2}*-są*^{1} 'I bought'. The cluster /st/ is composed of the morpheme {s} meaning CAUSATIVE ACTION, plus the initial consonant of the couplet, as in *stį*^{1}*į*^{2} 'to glue (something)', ('to cause to grasp, seize').

When precouplet the only monomorphemic clusters which occur are /nd, st/, as in *nda*^{2}*ki*^{3}*ku*^{2}*-są*^{1} 'I will mend', and *sti*^{2}*ka*^{3}*a*^{2}*-są*^{1} 'my blanket'.

When precouplet the bimorphemic clusters /ns, nč, nš, nž, ŋk, st/ may occur, as in *nsi*^{3}*ka*^{1}*a*^{1}*-ña*^{1}*ti*^{1} 'she fed the animals', *nči*^{3}*tu*^{1}*u*^{1}*-są*^{1} 'I rolled (it) up', *nši*^{3}*či*^{1}*tu*^{1}*-są*^{1} 'I filled (it)', *nžo*^{3}*ni*^{2}*ni*^{2}*-są*^{1} 'I listened', *ŋka*^{3}*ha*^{2}*a*^{2}*-są*^{1} 'I ate' (plural, polite), *stą*^{1}*nda*^{2}*ʔa*^{2}*-de*^{1}*ži*^{2} 'he is marrying them'.

The trimorphemic cluster /nst/ occurs infrequently initially in a couplet or precouplet environment, and is composed of {n} COMPLETED ACTION, {s} CAUSATIVE ACTION, and the initial consonant of the couplet or the precouplet, as in *nstį*^{1}*į*^{2}*-są*^{1} 'I did glue (it)', ('I caused it to seize or grab'), and *nstą*^{1}*nda*^{2}*ʔa*^{2}*-de*^{1}*ži*^{2} 'he married them', ('he caused them to be married').

Postcouplet the only cluster which may occur is /ns/, as in *nsa*^{2} 'then!', *kį*^{1}*ʔį*^{3}*-są*^{1}*nsa*^{2} 'I'm going then!'.

When a couplet is followed by a post-couplet, bimorphemic clusters of /ʔ/ plus any consonant may sometimes[5] optionally occur as the result of loss of a vowel which contiguously follows /ʔ/, as in *ši*^{2}*žu*^{1}*ʔu*^{1}*-są*^{1}*ti*^{3}/ *ši*^{2}*žu*^{1}*ʔ-są*^{1}*ti*^{3} 'I will frighten the animals', *ndu*^{2}*va*^{3}*ʔa-ña*^{2}/*ndu*^{2}*va*^{3}*ʔ-ña*^{2} 'she will be better'.

[5] The choice of the allomorph with VʔV versus the one with Vʔ depends upon the tone sequence. If the vowel that follows the /ʔ/ is the same tone as either of the contiguous syllables, it may be lost: *si*^{2}*kį*^{1}*ʔį*^{3} 'to lose', *si*^{2}*kį*^{1}*ʔ-li*^{3} 'I will lose' (familiar). But in *si*^{2}*kį*^{1}*ʔį*^{3}*-są*^{1} 'I will lose' (polite) the /i^{3}/ must remain.

monomorphemic clusters /nd, nt, nč, ŋk,
'until', *ka³nta³* 'to move oneself', *la²nči²*
ʔndo³ 'knee'. (No bimorphemic clusters

plet medially and /d/ and /ŋ/ do not occur
nother consonant.
omorphemic clusters /nd, nt, ns, st/ may
a³ka¹ 'all, every', *nso¹o²* 'to be carrying'
.
rphemic clusters /nt, ns, ŋk, ŋkʷ, ŋh, st/
sed of the morpheme {n∼ŋ} meaning
initial consonant of the couplet, as in
¹ 'I did', *ŋke³e²-są¹* 'I sank', *ŋkʷa²a²-są¹*
ght'. The cluster /st/ is composed of the
TIVE ACTION, plus the initial consonant of
(something)', ('to cause to grasp, seize'),
monomorphemic clusters which occur
są¹ 'I will mend', and *sti²ka³a²-są¹* 'my

hemic clusters /ns, nč, nš, nž, ŋk, st/ may
ne fed the animals', *nči³tu¹u¹-są¹* 'I rolled
t)', *nžo³ni²ni²-są¹* 'I listened', *ŋka³ha²a²-*
da²ʔa²-de¹ži² 'he is marrying them'.
/ occurs infrequently initially in a couplet
l is composed of {n} COMPLETED ACTION,
initial consonant of the couplet or the
d glue (it)', ('I caused it to seize or grab'),
narried them', ('he caused them to be

which may occur is /ns/, as in *nsa²* 'then!',
.
by a post-couplet, bimorphemic clusters
sometimes[5] optionally occur as the result
uously follows /ʔ/, as in *ši²žu¹ʔu¹-są¹ti³/*
ne animals', *ndu²va³ʔa-ña²/ndu²va³ʔ-ña²*

VʔV versus the one with Vʔ depends upon the
ows the /ʔ/ is the same tone as either of the con-
į¹ʔį³ 'to lose', *si²kį¹ʔ-li³* 'I will lose' (familiar).
e) the /i³/ must remain.

Similarly, a cluster of /ʔ/ plus any consonant may (depending upon the tone sequence) optionally occur across word boundaries. The result is a fusion of the two words into one phonological word, as in *či²žu²ʔu²ña²ni³-są¹/či²žu²ʔña³ni²-są¹* 'my brother will deny (it)', *ndu²va³ʔa²ña²ni³-są¹/ndu²va³ʔña²ni³-są¹* 'my brother will be better'.

10.2. The distribution of vowel clusters is also best described in relation to the couplet and the morpheme,[6] in that vowel clusters which occur within a monomorphemic couplet are always geminate and diverse vowel clusters are always bimorphemic.

In a monomorphemic couplet, any geminate vowel cluster (with the exception of /ǫǫ/) may occur: *ži²i²* 'difficult', *tį²į²* 'to seize', or 'grasp', *te³e²* 'man', *žu²tę²ę³* 'tomorrow', *ka²a²* 'to eat', *ką²ą³* 'to punch', *ko³o³* 'snake', *tu¹u²* 'no', *tų²ų²* 'black'.

Diverse clusters of two vowels may occur when the postcouplet has no initial consonant. Such clusters are composed of (1) the final vowel of the couplet, plus a demonstrative pronoun {a} 'this/here' or {ų} 'that/there', as in *ʔi²ta³-ų²* 'that flower', *če²te²-a¹* 'this cornsilk', *ndu²či¹-a²* 'this bean', *čo²ko¹-a²* 'this ant', *ču²ku¹-a²* 'this louse', *ču²kų¹-ų²* 'that fly', (2) the first person plural inclusive morpheme {o} and the demonstrative pronoun {a} or {ų} (the second vowel of the stem is lost), as in *ʔi²ta³* 'flower' + *o* 'our' + *ų* 'that' becomes *ʔi²to³-ų¹* 'that flower of ours'; *ču²ku²* 'louse' + *o* 'our' + *a* 'this' becomes *ču²ko²-a¹* 'this louse of ours'; *ndu²či²* 'bean' + *o* 'our' + *a* 'this' becomes *ndu²čo²-a¹* 'these beans of ours'.

Clusters of three vowels may occur when a couplet with a geminate vowel cluster is followed by the first person plural inclusive morpheme {o} or a demonstrative pronoun {a} or {ų}, as in *te³e²-a¹* 'this man', *kʷi²i²-a¹* 'this grass', *kʷi²i²-ų¹* 'that grass'. When a cluster of diverse vowels occurs in the couplet, it is always part of a sequence of three vowels, and the first vowel is always /i/, as in *kʷi²o²-a¹* 'this grass of ours'; *te²e²* 'to write' + *o* 'we' + *a* 'here' becomes *ti²o²-a¹* 'we will write here'; *tį²į²* 'to seize, grasp' + *o* 'we' + *ų* 'that' becomes *tį²ǫ²-ų¹* 'we will seize, grasp that'.

Vowel clusters occasionally occur when the precouplet is followed by

[6] The distribution of vowels has been described in relation to bisyllabic sequences and morphemes in the San Miguel el Grande dialect (K. Pike, 1947: 166-69), in relation to the "microsegments" in the Jicaltepec dialect (Bradley, 1965), in relation to the couplet and morpheme in the Huajuapan dialect (E. Pike and Cowan, 1965), and in the Ayutla dialect (Pankratz and E. Pike, 1965). The details differ but in each dialect the couplet is an important matrix for the distribution of phonemes.

a couplet beginning with a vowel, as in *vi²o²ʔo²* 'our house', *to²i²ni²* 'good afternoon', *šį³a³ʔų³* 'fifteen'.

10.3. Concerning the distribution of vowels in relation to preceding consonants (1) nasalized vowels do not follow voiced consonants. (2) The high back rounded vowels /u, ų/ do not follow /k^w/; /u/ follows /m/ only in loan words, as in *mu¹li²* 'mole'; /u/ does, however, follow /v/, as in *va¹ʔvu³* 'coyote'.

11. TONE SANDHI

11.0. There is a system of tone sandhi in which some morphemes cause the tones of other morphemes to change. Certain changes take place when couplets occur in sequence. Other changes take place when a couplet is followed by a postcouplet.[7] Except for the change as described in Rules 6 and 13 the changes are progressive, i.e. from 'left' to 'right'. The chart gives the tone sequences which occur when one couplet follows another (see p. 38).

11.1. In order to predict the changes which involve a sequence of couplets[8] the following must be taken into consideration.

(1) The basic tones of the couplets involved. The basic tones are those which occur when the couplet is in isolation, or when it is following a Class A couplet with the tones 33.

(2) The class of the couplets involved. Couplets are divided into two major classes, Class A versus Class B, and one minor class, Class B′. Some couplets with the basic tones 11, 22, 32, 33 are Class A and some are Class B. Couplets with the basic tones 21, 31, 12, 13, 23 are all Class A. Only those with the basic tone sequence 32 may be B′. In this section we have indicated the various classes by adding (A), (B), or (B′) after the cited basic forms.

(3) The grammatical class of the couplets with the tone sequence 22. These couplets are divided into classes, of verb versus nonverb.

(4) Couplets with the tone sequence 23 and 33 must be divided into

[7] More study needs to be made of the tone sandhi between precouplets and also between a precouplet and a couplet.

[8] Couplets composed of the fusion of a stem and {o} 'our, we' require a different set of rules since the resulting couplet may be a combination of a Class A couplet and a Class B enclitic, as in *na²na¹* (A) 'mother' + *o* (B) 'our, we' > *na²no¹* 'our mother'. Such couplets have not been included in our description of the tone sandhi.

owel, as in *vi²o²ʔo²* 'our house', *to²i²ni²*
een'.

tion of vowels in relation to preceding
ls do not follow voiced consonants. (2)
ls /u, ų/ do not follow /kʷ/; /u/ follows
mu¹li² 'mole'; /u/ does, however, follow

TONE SANDHI

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rsus Class B, and one minor class, Class B′.
tones 11, 22, 32, 33 are Class A and some
the basic tones 21, 31, 12, 13, 23 are all
e basic tone sequence 32 may be B′. In this
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of the couplets with the tone sequence 22,
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e of the tone sandhi between precouplets and also
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plet may be a combination of a Class A couplet and
) 'mother' + *o* (B) 'our, we' > *na²no¹* 'our mother'.
uded in our description of the tone sandhi.

those with a medial consonant which is other than /ʔ/ versus couplets having a medial /ʔ/, or with no medial consonant.

(5) Couplets which are verb stems are divided between those of the completive aspect versus those which are not completive aspect.

The following rules describe (and predict) the tone sandhi between couplets.

Rule 1: Basic 11, 12, 13, and 21 retain[9] their basic forms in all environments.

Rule 2: Basic 31 becomes 11 when following any couplet of Class B (except that after 32(B′) it optionally remains 31): *ža²ʔa²* (B) 'chiles' + *ži³či¹* (A) 'dry' > *ža²ʔa² ži¹či¹* 'dry chiles', *so¹ko¹* (B) 'well, spring' + *ži³či¹* (A) > *so¹ko¹ ži¹či¹* 'dry spring', *kų³ų³* (B) 'four' + *či³ka¹* (A) 'baskets' > *kų³ų³ či¹ka¹* 'four baskets', *ñu³ti²* (B′) 'sand' + *ži³či¹* (A) > *ñu³ti² ži¹či¹* or *ñu³ti² ži³či¹* 'dry sand'.

But it retains its basic form after any Class A couplet: *žu³ku³* (A) 'herbs' + *ži³či¹* (A) > *žu³ku³ ži³či¹* 'dry herbs'.

Rule 3: When a nonverb,[10] basic 22(B) becomes 11, and basic 22(A) becomes 12 when following a Class B couplet: *si¹vi¹* (B) 'name' + *ki²ti²* (B) 'animal' > *si¹vi¹ ki¹ti¹* 'name of the animal', *ki²ti²* (B) 'animal' + *žu²ku²* (B) 'mountain' > *ki²ti² žu¹ku¹* 'animal of the mountain', *na³ma³* (B) 'soap' + *nda²va²* (B) 'hard' > *na³ma³ nda¹va¹* 'hard soap', *šų³ʔų²* (B) 'money' + *ža²ʔa²* (B) 'chiles' > *šų³ʔų² ža¹ʔa¹* 'chile money' (from or for chiles), *si¹vi¹* (B) 'name' + *ri²ŋki²* (A) 'mouse' > *si¹vi¹ ri¹ŋki²* 'the mouse's name', *ža²kʷa²* (B) 'twisted' + *žu²te²* (A) 'river' > *ža²kʷa² žu¹te²* 'the river (is) twisted'.

When a verb, basic 22(B) becomes 11, and basic 22(A) becomes 12 when following any Class B but 33(B) or 32(B′): *ko¹ni¹* (B) 'turkey hen' + *ko²kǫ²* (B) 'to swallow' > *ko¹ni¹ ko¹kǫ¹* 'the turkey will swallow (it)', *ki²ti²* (B) 'animal' + *ka²a²* (B) 'to eat' > *ki²ti² ka¹a¹* 'the animal will eat', *ki²ti²* (B) 'animal' + *ku²nu²* (A) 'to run' > *ki²ti² ku¹nu²* 'the animal will run', *su³či²* (B) 'child' + *kʷą²ą²* (A) 'to buy' > *su³či² kʷą¹ą²* 'the child will buy'.

[9] One word in our data, however, *vi²ta¹* (A) 'soft' becomes *vi¹ta¹* when following a Class B morpheme, as in *nda²ʔa²* (B) 'hand' + *vi²ta¹* (A) 'soft' > *nda²ʔa² vi¹ta¹* 'soft hand'.

[10] Certain close-knit noun phrases do not follow this rule, in that the tone sequence 33(B) + 22(B) > 33 32 (instead of 33 11); and 33(B) + 22(A) > 33 32 (instead of 33 12): *ši³ni³* (B) 'head' + *žu²tų²* (B) 'tree' > *ši³ni³ žu³tų²* 'treetop', but *kų³ų³* (B) 'four' + *žu²tų²* (B) 'tree' > *kų³ų³ žu¹tų¹* 'four trees'; *ši³ni³* (B) 'head' + *ve²ʔe²* (A) 'house' > *ši³ni³ ve³ʔe²* 'roof' but *kų³ų³* (B) 'four' + *ve²ʔe²* (A) 'house' > *kų³ų³ ve¹ʔe²* 'four houses'. Mak (1953:93-95) reports special tone sandhi in close-knit phrases in the San Esteban dialect.

A basic 22(B) verb becomes 32, and a 22(A) may optionally become either 12 or 32, when following 33(B): *ñu³ñu³* (B) 'bees' + *ndu²ku²* (B) 'to seek, look for' + *-sq¹* (A) 'I' > *ñu³ñu³ ndu³ku²-sq¹* 'I'll look for bees', *ko³o³* (B) 'snake' + *ku²nu²* (A) 'to run' > *ko³o³ ku³nu²* or *ko³o³ ku¹nu²* 'the snake will run'.

A basic 22(B) verb and a basic 22(A) verb optionally retain their basic forms, or 22(B) may become 11, and 22(A) may become 12, when following 32(B′): *čį³ʔį²* (B′) 'skunk' + *ka²a²* (B) 'to eat' > *čį³ʔį² ka²a²* or *čį³ʔį² ka¹a¹* 'the skunk will eat (it)', *ñu³ti²* (B′) 'sand' + *sa²ka²* (B) 'to mix' + *-sq¹* (A) 'I' > *ñu³ti² sa²ka²-sq¹* or *ñu³ti² sa¹ka¹-sq¹* 'I'll mix the sand', *čį³ʔį²* (B′) 'skunk' + *ku²nu²* (A) 'to run' > *čį³ʔį² ku²nu²* or *čį³ʔį² ku¹nu²* 'the skunk will run'.

But a basic 22(A) or 22(B), verb or nonverb, retains its basic form after a Class A couplet: *ʔu³ši³* (A) 'ten' + *ri²ŋki²* (A) 'mouse' > *ʔu³ši³ ri²ŋki²* 'ten mice', *ti³ka²* (A) 'grasshopper' + *ka²a²* (B) 'to eat' > *ti³ka² ka²a²* 'the grasshopper will eat (it)'.

Rule 4: Basic 32(B) becomes 11, and a basic 32(B′) and basic 32(A) become 12 after any Class B couplet: *si¹vi¹* (B) 'name' + *su³či²* (B) 'child' + *lu²li²* (B) 'little' > *si¹vi¹ su¹či¹ lu¹li¹* 'name of the little child', *si¹vi¹* (B) 'name' + *čį³ʔį²* (B′) 'skunk' > *si¹vi¹ čį¹ʔį²* 'name of the skunk', *si¹vi¹* (B) 'name' + *te³e²* (A) 'man' > *si¹vi¹ te¹e²* 'name of the man'.

Basic 32 (B), 32(B′), and 32(A) optionally retain their basic tone after a 32(B′): *hi³ki²* (B′) 'fist' + *su³či²* (B) 'child' + *lu²li²* (B) 'little' > *hi³ki² su¹či¹ lu¹li¹* or *hi³ki² su³či² lu¹li¹* 'the little child's fist', *hi³ki²* (B′) 'fist (paw)' + *čį³ʔį²* (B′) 'skunk' > *hi³ki² čį¹ʔį²* or *hi³ki² čį³ʔį²* 'the skunk's paw', *hi³ki²* (B′) 'fist' + *te³e²* (A) 'man' > *hi³ki² te¹e²* or *hi³ki² te³e²* 'the man's fist'.

But any basic 32 retains its basic form after any Class A couplet: *ʔį²į²* (A) 'one' + *su³či²* (B) 'child' + *lu²li²* (B) 'little' > *ʔį²į² su³či² lu¹li¹* 'one little child'.

Rule 5: Basic 23 and 33 CVCV (a couplet with a medial consonant other than /ʔ/) become 21, and basic 23 and 33 CVV or CVʔV (couplets with no medial consonant, or with a /ʔ/) become 13 after any Class B couplet: *si¹vi¹* (B) 'name' + *ši²ši³-sq¹* (A) 'my aunt' > *si¹vi¹ ši²ši¹-sq¹* 'my aunt's name', *ndu²te²* (B) 'water' + *ʔu³va³* (A) 'bitter' > *ndu²te² ʔu²va¹* 'bitter water', *kų³ų³* (B) 'four' + *žo³o³* (B) 'month' > *kų³ų³ žo¹o³* 'four months', *ndu²te²* (B) 'water' + *ʔu³ʔva³* (A) 'salty' > *ndu²te² ʔu¹ʔva³* 'salty water', *ki²ti²* (B) 'animal' + *ku²u³* (A) 'to die' > *ki²ti² ku¹u³* 'the animal will die', *šų³ʔų²* (B) 'money' + *sto²o³-sq¹* (A) 'my uncle' > *šų³ʔų² sto¹o³-sq¹* 'my uncle's money'.

2(B) verb becomes 32, and a 22(A) may optionally bec
32, when following 33(B): *ñu³ñu³* (B) 'bees' + *ndu²ku²*
ok for' + *-sq¹* (A) 'I' > *ñu³ñu³ ndu³ku²-sq¹* 'I'll look for b
nake' + *ku²nu²* (A) 'to run' > *ko³o³ ku³nu²* or *ko³o³ ku*
will run'.

2(B) verb and a basic 22(A) verb optionally retain their b
22(B) may become 11, and 22(A) may become 12, w
2(B'): *čį³Pį²* (B') 'skunk' + *ka²a²* (B) 'to eat' > *čį³Pį² k*
a¹a¹ 'the skunk will eat (it)', *ñu³ti²* (B') 'sand' + *sa²ka²*
-sq¹ (A) 'I' > *ñu³ti² sa²ka²-sq¹* or *ñu³ti² sa¹ka¹-sq¹* 'I'll
čį³Pį² (B') 'skunk' + *ku²nu²* (A) 'to run' > *čį³Pį² ku²nu*
u² 'the skunk will run'.

asic 22(A) or 22(B), verb or nonverb, retains its basic f
ass A couplet: *Pu³ši³* (A) 'ten' + *ri²ŋki²* (A) 'mouse
ki² 'ten mice', *ti³ka²* (A) 'grasshopper' + *ka²a²* (B) 'to eat
a² 'the grasshopper will eat (it)'.

Basic 32(B) becomes 11, and a basic 32(B') and basic 32
2 after any Class B couplet: *si¹vi¹* (B) 'name' + *su³či²*
lu²li² (B) 'little' > *si¹vi¹ su¹či¹ lu¹li¹* 'name of the little ch
name' + *čį³Pį²* (B') 'skunk' > *si¹vi¹ čį¹Pį²* 'name of the sku
'name' + *te³e²* (A) 'man' > *si¹vi¹ te¹e²* 'name of the m
2 (B), 32(B'), and 32(A) optionally retain their basic tone a
hi³ki² (B') 'fist' + *su³či²* (B) 'child' + *lu²li²* (B) 'little
či¹ lu¹li¹ or *hi³ki² su³či² lu¹li¹* 'the little child's fist', *hi*
paw)' + *čį³Pį²* (B') 'skunk' > *hi³ki² čį¹Pį²* or *hi³ki² čį*
k's paw', *hi³ki²* (B') 'fist' + *te³e²* (A) 'man' > *hi³ki² te¹e*
e² 'the man's fist'.

y basic 32 retains its basic form after any Class A cou
'one' + *su³či²* (B) 'child' + *lu²li²* (B) 'little' > *Pį²į² si*
e little child'.

: Basic 23 and 33 CVCV (a couplet with a medial conso
n /ʔ/) become 21, and basic 23 and 33 CVV or CVʔV (cou
medial consonant, or with a /ʔ/) become 13 after any Cla
si¹vi¹ (B) 'name' + *ši²ši³-sq¹* (A) 'my aunt' > *si¹vi¹ ši²ši¹*
's name', *ndu²te²* (B) 'water' + *Pu³va³* (A) 'bitter' > *ndu*
itter water', *kų³ų³* (B) 'four' + *žo³o³* (B) 'month' > *kų³ų³ ž*
nths', *ndu²te²* (B) 'water' + *Pu³Pva³* (A) 'salty' > *ndu*
'salty water', *ki²ti²* (B) 'animal' + *ku²u³* (A) 'to die' > *k*
he animal will die', *šų³Pų²* (B) 'money' + *sto²o³-sq¹* (A)
šų³Pų² sto¹o³-sq¹ 'my uncle's money'.

But any basic 23 retains its basic form after a Class A couplet: *Pu³u³* A) 'two' + *Pi²na³* (A) 'dog' > *Pu³u³ Pi²na³* 'two dogs'.

The 23 CVCV morpheme optionally retains its basic tone, and 33 VCV may optionally become 23, after 32(B'): *ñu³ti²* (B') 'sand' + *²so³* (A) 'rabbit' > *ñu³ti² Pi²so¹* or *ñu³ti² Pi²so³* 'the rabbit's sand', *³ti²* (B') 'sand' + *ši³ku³* (A) 'niece' + *-sq¹* (A) 'my' > *ñu³ti² ši²ku¹-sq¹* *ñu³ti² ši²ku³-sq¹* 'my niece's sand'.

All basic 33 couplets become 23 after a Class A couplet which ends in ne 2: *te³e²* (A) 'man' + *kq³Pq³* (A) 'to talk' > *te³e² kq²Pq³* 'the man ill talk', *ti¹la²* (A) 'hen' + *sq³hį³-sq¹* (A) 'my nephew' > *ti¹la² sq²hį³-sq¹* y nephew's hen', *nda²va²* (A) 'to fly' + *ñu³ñu³* (B) 'bees' > *nda²va²* ²ñu³ 'the bees will fly'. But a basic 33 couplet retains its basic form after her Class A couplets: *Pu³ni³* (A) 'three' + *žo³o³* (B) 'month' > *Pu³ni³* ³o³ 'three months'.

Rule 6: There is one type of regressive tone sandhi between couplets. ecifically, the last tone of a Class B couplet with tones 22, 32, or 33 comes tone 1 when preceding a completive aspect[11] verb (but not when eceding a verb of another aspect): *Pa³sį³* (B) 'tasty' + *ŋku²u²* (A) 'was' *Pa³sį¹ ŋku²u²* 'it was tasty', *Pi²ža²* (B) 'sour' + *ŋku²u²* (A) 'was' > ²ža¹ *ŋku²u²* 'it was sour', *šq³q³* (B) 'very' + *ŋha³tu³* (A) 'did hurt' > ³q¹ *ŋha³tu³* 'it really did hurt'.

The same type of regressive tone sandhi occurs when a Class B clitic with tones 3 or 2 precedes a completive aspect verb: *se³Pe²* (A) fspring' + *-lo³* (B) 'your' (familiar) + *ŋku²u²* (A) '(it) was' > *se³Pe²-* *ŋku²u²* 'it was your child'.

2. There are tone sandhi changes which sometimes occur when a uplet is followed by a postcouplet — an enclitic.[12] Also enclitics some- nes cause tone changes in the following morphemes. Rules for the anges are as follows:

Rule 7: Enclitics with basic tone 1 (*-sq¹* (A) 'I, me, my' (polite), ¹ (A) 'you, your' (polite)) retain their basic form: *ko¹ni¹* (B) 'turkey n' + *-sq¹* (A) 'my' > *ko¹ni¹-sq¹* 'my turkey hen', *ndu²či²* (B) 'eye' + ¹ (A) 'your' > *ndu²či²-ni¹* 'your eye'.

[11] In the San Miguel el Grande dialect the completive aspect is indicated by a proclitic {}. In the Molinos dialect the completive aspect is indicated by {n∼ŋ}. It seems that ough the vowel has been lost in the Molinos dialect, the effect of the tone 3 still ains. It is this tone 3 which is changed to tone 1 by the preceding Class B morpheme. t tone 1 is actualized when the Class B morpheme itself is changed from tones 3 to tone 1.

[12] Some of the less common enclitics have not been included in this description.

s 32, and a 22(A) may optionally become
ng 33(B): *ñu³ñu³* (B) 'bees' + *ndu²ku²* (B)
I' > *ñu³ñu³ ndu³ku²-sq¹* 'I'll look for bees'
) 'to run' > *ko³o³ ku³nu²* or *ko³o³ ku¹nu²*

sic 22(A) verb optionally retain their basic
11, and 22(A) may become 12, when
kunk' + *ka²a²* (B) 'to eat' > *čį³ʔį² ka²a²*
l eat (it)', *ñu³ti²* (B') 'sand' + *sa²ka²* (B)
² *sa²ka²-sq¹* or *ñu³ti² sa¹ka¹-sq¹* 'I'll mix
+ *ku²nu²* (A) 'to run' > *čį³ʔį² ku²nu²* or
un'.

, verb or nonverb, retains its basic form
ši³ (A) 'ten' + *ri²ŋki²* (A) 'mouse' >
² (A) 'grasshopper' + *ka²a²* (B) 'to eat' >
will eat (it)'.

es 11, and a basic 32(B') and basic 32(A)
couplet: *si¹vi¹* (B) 'name' + *su³či²* (B)
i¹vi¹ su¹či¹ lu¹li¹ 'name of the little child',
skunk' > *si¹vi¹ čį¹ʔį²* 'name of the skunk',
'man' > *si¹vi¹ te¹e²* 'name of the man'.
(A) optionally retain their basic tone after
su³či² (B) 'child' + *lu²li²* (B) 'little' >
su³či² lu¹li¹ 'the little child's fist', *hi³ki²*
'skunk' > *hi³ki² čį¹ʔį²* or *hi³ki² čį³ʔį²*
'fist' + *te³e²* (A) 'man' > *hi³ki² te¹e²* or

s basic form after any Class A couplet:
'child' + *lu²li²* (B) 'little' > *ʔį²į² su³či²*

VCV (a couplet with a medial consonant
l basic 23 and 33 CVV or CVʔV (couplets
with a /ʔ/) become 13 after any Class B
i²ši³-sq¹ (A) 'my aunt' > *si¹vi¹ ši²ši¹-sq¹*
) 'water' + *ʔu³va³* (A) 'bitter' > *ndu²te²*
) 'four' + *žo³o³* (B) 'month' > *kų³ų³ žo¹o³*
water' + *ʔu³ʔva³* (A) 'salty' > *ndu²te²*
B) 'animal' + *ku²u³* (A) 'to die' > *ki²ti²*
ų³ʔų² (B) 'money' + *sto²o³-sq¹* (A) 'my
y uncle's money'.

But any basic 23 retains its basic form after a Class A couplet: *ʔu³u³* (A) 'two' + *ʔi²na³* (A) 'dog' > *ʔu³u³ ʔi²na³* 'two dogs'.

The 23 CVCV morpheme optionally retains its basic tone, and 33 CVCV may optionally become 23, after 32(B'): *ñu³ti²* (B') 'sand' + *ʔį²so³* (A) 'rabbit' > *ñu³ti² ʔį²so¹* or *ñu³ti² ʔį²so³* 'the rabbit's sand', *ñu³ti²* (B') 'sand' + *ši³ku³* (A) 'niece' + *-sq¹* (A) 'my' > *ñu³ti² ši²ku¹-sq¹* or *ñu³ti² ši²ku³-sq¹* 'my niece's sand'.

All basic 33 couplets become 23 after a Class A couplet which ends in tone 2: *te³e²* (A) 'man' + *kq³ʔq³* (A) 'to talk' > *te³e² kq²ʔq³* 'the man will talk', *ti¹la²* (A) 'hen' + *sq³hį³-sq¹* (A) 'my nephew' > *ti¹la² sq²hį³-sq¹* 'my nephew's hen', *nda²va²* (A) 'to fly' + *ñu³ñu³* (B) 'bees' > *nda²va² ñu²ñu³* 'the bees will fly'. But a basic 33 couplet retains its basic form after other Class A couplets: *ʔu³ni³* (A) 'three' + *žo³o³* (B) 'month' > *ʔu³ni³ žo³o³* 'three months'.

Rule 6: There is one type of regressive tone sandhi between couplets. Specifically, the last tone of a Class B couplet with tones 22, 32, or 33 becomes tone 1 when preceding a completive aspect[11] verb (but not when preceding a verb of another aspect): *ʔa³sį³* (B) 'tasty' + *ŋku²u²* (A) 'was' > *ʔa³sį¹ ŋku²u²* 'it was tasty', *ʔi²ža²* (B) 'sour' + *ŋku²u²* (A) 'was' > *ʔi²ža¹ ŋku²u²* 'it was sour', *šq³q³* (B) 'very' + *ŋha³tu³* (A) 'did hurt' > *šq³q¹ ŋha³tu³* 'it really did hurt'.

The same type of regressive tone sandhi occurs when a Class B enclitic with tones 3 or 2 precedes a completive aspect verb: *se³ʔe²* (A) 'offspring' + *-lo³* (B) 'your' (familiar) + *ŋku²u²* (A) '(it) was' > *se³ʔe²-lo¹ ŋku²u²* 'it was your child'.

11.2. There are tone sandhi changes which sometimes occur when a couplet is followed by a postcouplet — an enclitic.[12] Also enclitics sometimes cause tone changes in the following morphemes. Rules for the changes are as follows:

Rule 7: Enclitics with basic tone 1 (*-sq¹* (A) 'I, me, my' (polite), *-ni¹* (A) 'you, your' (polite)) retain their basic form: *ko¹ni¹* (B) 'turkey hen' + *-sq¹* (A) 'my' > *ko¹ni¹-sq¹* 'my turkey hen', *ndu²či²* (B) 'eye' + *-ni¹* (A) 'your' > *ndu²či²-ni¹* 'your eye'.

[11] In the San Miguel el Grande dialect the completive aspect is indicated by a proclitic {ni³}. In the Molinos dialect the completive aspect is indicated by {n∼ŋ}. It seems that although the vowel has been lost in the Molinos dialect, the effect of the tone 3 still remains. It is this tone 3 which is changed to tone 1 by the preceding Class B morpheme. That tone 1 is actualized when the Class B morpheme itself is changed from tones 3 or 2 to tone 1.

[12] Some of the less common enclitics have not been included in this description.

Basic Tones of the Second Couplet

Basic Tones of the First Couplet	11, 12 13, 21	31	22B		22A		32B	32B′	32A	23		33	
			Non-verb	Verb	Non-verb	Verb				CVCV	CVV	CVCV	CVV
Class B 11, 22, 32	b	11	11	11	12	12	11	12	12	21	13	21	13
Class B 33	b	11	11	32	12	12/32	11	12	12	21	13	21	13
Class B′ 32	b	11/b	11	11/b	12	12/b	11/b	12/b	12/b	21/b	13	21/23	13
Class A 12, 22, 32	b	b	b	b	b	b	b	b	b	b	b	23	23
Other Class A	b	b	b	b	b	b	b	b	b	b	b	b	b

The numbers in the chart give the tones of the second couplet which actually occur in that environment. A 'b' means that the basic tones occur there.

Rule 8: All enclitics become tone 1 when following a Class B couplet with either basic or nonbasic tones 11: *ko*^{1}*ni*^{1} (B) 'turkey hen' + *-ña*^{2} (B) 'her' > *ko*^{1}*ni*^{1}*-ña*^{1} 'her turkey hen', *si*^{1}*vi*^{1} (B) 'name' + *-ži*^{2} (A) 'child' > *si*^{1}*vi*^{1}*-ži*^{1} 'child's name', *kʷą*^{2}*ą*^{2} (A) 'to buy' + *-ña*^{2} (B) 'she' + *ki*^{2}*ti*^{2} (B) 'animal' + *-lo*^{3} (B) 'your' > *kʷą*^{2}*ą*^{2}*-ña*^{2} *ki*^{1}*ti*^{1}*-lo*^{1} 'she will buy your animal'.

Rule 9: The enclitics *-de*^{2} (A) 'he, him, his', *-ži*^{2} (A) 'child, children, they', and *-li*^{3} (A) 'I, me, my' (familiar), *-ti*^{3} (B) 'animal', *-ža*^{3} (B) 'deity', become tone 1 when following any Class B couplet: *ča*^{2}*ka*^{2} (B) 'fish' + *-de*^{2} (A) 'his' > *ča*^{2}*ka*^{2}*-de*^{1} 'his fish', *ndu*^{1}*ku*^{1} (B) 'seeking' + *-ti*^{3} (B) 'animal' + *-ži*^{2} (A) 'child' > *ndu*^{1}*ku*^{1}*-ti*^{1}*ži*^{1} 'the animal is seeking the child', but *ʔi*^{2}*na*^{3} (A) 'dog' + *-li*^{3} (A) 'my' > *ʔi*^{2}*na*^{3}*-li*^{3} 'my dog', *mi*^{2}*ŋki*^{2} (A) 'brains' + *-ti*^{3} (B) 'animal' > *mi*^{2}*ŋki-ti*^{3} 'the animal's brains'.

Rule 10: The enclitic *-ña*^{2} (B) 'she, her, hers', however, becomes tone 1 only when added to a Class B couplet with tones 11, after other Class B couplets it remains tone 2: *li*^{1}*tu*^{1} (B) 'baby goat' + *-ña*^{2} (B) *'her'* > *li*^{1}*tu*^{1}*-ña*^{1} 'her baby goat', *ha*^{1}*a*^{1} (B) 'to be eating + *-ña*^{2} (B) 'she' + *sta*^{3}*a*^{3} (B) 'tortillas' > *ha*^{1}*a*^{1}*-ña*^{1} *sta*^{1}*a*^{3} 'she is eating', but *ki*^{2}*ti*^{2} (B) 'animal' + *-ña*^{2} (B) 'her' > *ki*^{2}*ti*^{2}*-ña*^{2} 'her animal'.

Rule 11: The enclitic *-lo*^{3} (B) 'you, your' (familiar), remains tone 3 after a couplet ending with tone 3 and after a Class A couplet ending with tone 1. It becomes tone 2 after a couplet ending with tone 2, and becomes tone 1 after a Class B couplet with the tones 11. The sandhi is the same when following both basic and nonbasic tones: *su*^{3}*kų*^{3} (B) 'neck' + *-lo*^{3} (B) 'your' > *su*^{3}*kų*^{3}*-lo*^{3} 'your neck', *si*^{2}*kʷi*^{2}*so*^{1} (A) 'to boil' + *-lo*^{3} (B) 'you' + *ndu*^{2}*te*^{2} (B) 'water' > *si*^{2}*kʷi*^{2}*so*^{1}*-lo*^{3} *ndu*^{1}*te*^{1} 'you will boil water', *nda*^{2}*ke*^{2}*te*^{2} (A) 'to wash' + *-lo*^{3} (B) 'you' + *sa*^{2}*ʔma*^{2} (B) 'clothes' > *nda*^{2}*ke*^{2}*te*^{2}*-lo*^{2} *sa*^{1}*ʔma*^{1} 'you will wash clothes', *si*^{1}*vi*^{1} (B) 'name' + *-lo*^{3} (B) 'your' > *si*^{1}*vi*^{1}*-lo*^{1} 'your name'.

Rule 12: A Class B enclitic causes a following couplet or enclitic to change in the same manner that a 22 (B) couplet would cause it to change: *nda*^{2}*ke*^{2}*te*^{2} (A) 'to wash' + *-lo*^{3} (B) 'you' + *sa*^{2}*ʔma*^{2} (B) 'clothes' > *nda*^{2}*ke*^{2}*te*^{2}*-lo*^{2} *sa*^{1}*ʔma*^{1} 'you will wash clothes', *si*^{2}*kʷi*^{2}*so*^{1} (A) 'to boil' + *-ña*^{2} (B) 'she' + *ndu*^{2}*te*^{2} (B) 'water' > *si*^{2}*kʷi*^{2}*so*^{1}*-ña*^{2} *ndu*^{1}*te*^{1} 'she will boil water', *ndu*^{2}*ku*^{2} (B) 'to seek' + *-ti*^{3} (B) 'animal' + *ri*^{2}*ŋki*^{2} (A) 'mouse' > *ndu*^{2}*ku*^{2}*-ti*^{1} *ri*^{1}*ŋki*^{2} 'the animal will seek the mouse', *ndu*^{2}*ku*^{2} (B) 'to seek' + *-lo*^{3} (B) 'you' + *-ti*^{3} (B) 'animal' > *ndu*^{2}*ku*^{2}*-lo*^{2}*ti*^{1} 'you will seek the animal', *či*^{2}*va*^{3}*ʔa*^{2} (A) 'to hide, store' + *-ža*^{3} (B) 'deity' + *šų*^{3}*ʔų*^{2} (B) 'money' > *či*^{2}*va*^{3}*ʔa*^{2}*-ža*^{3} *šų*^{1}*ʔų*^{1} 'the deity will store, hide the money'.

Rule 13: In our data (but further checking is needed), a nonbasic 32(A) (the basic form has tones 22) becomes 31 when preceding an enclitic with tone 2: *ma*^{3} (B) 'won't' + *ko*^{2}*ʔo*^{2} (A) 'to drink' > *ma*^{3}*ko*^{3}*ʔo*^{2} 'won't drink'; then, *ma*^{3}*ko*^{3}*ʔo*^{2} (A) 'won't drink' + *-ži*^{2} (A) 'child' > *ma*^{3}*ko*^{3}*ʔo*^{1}*-ži*^{2} 'the child won't drink (it)'. Another example, *ši*^{3}*ni*^{3} (B) 'head' + *ve*^{2}*ʔe*^{2} (A) 'house' > *ši*^{3}*ni*^{3} *ve*^{3}*ʔe*^{2} 'roof'; then, *ši*^{3}*ni*^{3} *ve*^{3}*ʔe*^{2} 'roof' + *-ña*^{2} (B) 'her' > *ši*^{3}*ni*^{3} *ve*^{3}*ʔe*^{1}*-ña*^{2} 'her roof', but *ši*^{3}*ni*^{3} *ve*^{3}*ʔe*^{2} 'roof' + *-są*^{1} (A) 'my' remains *ši*^{3}*ni*^{3} *ve*^{3}*ʔe*^{2}*-są*^{1} 'my roof'.

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