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# Diachronic developments of voiceless nasals: the case of Ersu, Lizu, and related languages

Katia Chirkova, CNRS-CRLAO, Paris  
Zev Handel, University of Washington, Seattle

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## Abstract

Ersu, Lizu and Duoxu (collectively ELD) are three closely related, little-studied Tibeto-Burman [TB] languages of Sichuan Province in China. Their position within the broader TB family is a matter of dispute. Recent analyses variously link them to other lesser-known TB languages of Sichuan (known under the term Qiangic, Sūn 2001a) or consider them more closely related to the Naish languages (Bradley 2008, 2012; Jacques & Michaud 2011). This study presents one significant new finding for the reconstruction of Proto-ELD (going beyond the conclusions of Yu 2012): the existence of voiceless nasal onsets. This finding not only illuminates the broader problem of classification of the languages of the area, it also suggests the existence of a universal pathway of sequenced changes related to the development and loss of voiceless nasals in languages of the world.

The study makes use of a significant amount of new data arising from recent fieldwork. The conclusions are based on a combination of (i) the techniques of the comparative method within the ELD cluster, (ii) external comparison with cognates elsewhere in Tibeto-Burman, and (iii) analysis of universal phonetic mechanisms and constraints.

Voiceless nasals are posited based on cognate sets like the following for ‘ripe’, showing a correspondence between a voiceless fricative in Ersu, a voiceless nasal approximant in Lizu, and a nasal stop in Duoxu:

Ersu / $(d\epsilon^{31}-)xe^{51}/$ , Lizu / $(de^{33}-)\tilde{h}e^{51}/$ , Duoxu / $me^{34}/$

The reconstruction is supported by cognate forms elsewhere in TB (for example, Written Burmese / $m\epsilon^1$ / ‘ripe’ and Written Tibetan *smyin* ‘ripe’). In combination with recent acoustic studies of voiceless nasals in several different TB languages, it is argued that ELD developments are part of a general pathway of change that can be schematized as:

\*sN > \*N̥N > \*N̥ > ħ > x

While the development of voiceless nasals within Tibeto-Burman is not uncommon, the high degree of consistency within ELD that allows for the regular reconstruction of Proto-ELD voiceless nasals in a particular subset of lexical items constitutes an innovation that suggests that the ELD cluster is a legitimate taxonomic node within TB that may not be as closely aligned with other TB languages of Sichuan as previously thought. We further suggest that the developments of nasal initials may be used as a general diagnostic tool to help sort out the relationships among lesser-known languages of Sichuan whose genetic and contact affiliations remain obscure.

More generally, the study provides further insights into the synchronic and diachronic aspects of voiceless nasals, a type of sound that remains somewhat poorly described and poorly understood due to its relative rarity in languages of the world.

## 1. Introduction

This paper examines three closely related Tibeto-Burman languages, all spoken in southwestern Sichuan Province (四川省) in the People's Republic of China. These are: (1) Ersu, (2) Lizu, and (3) Duoxu (see Map 1).<sup>1</sup>

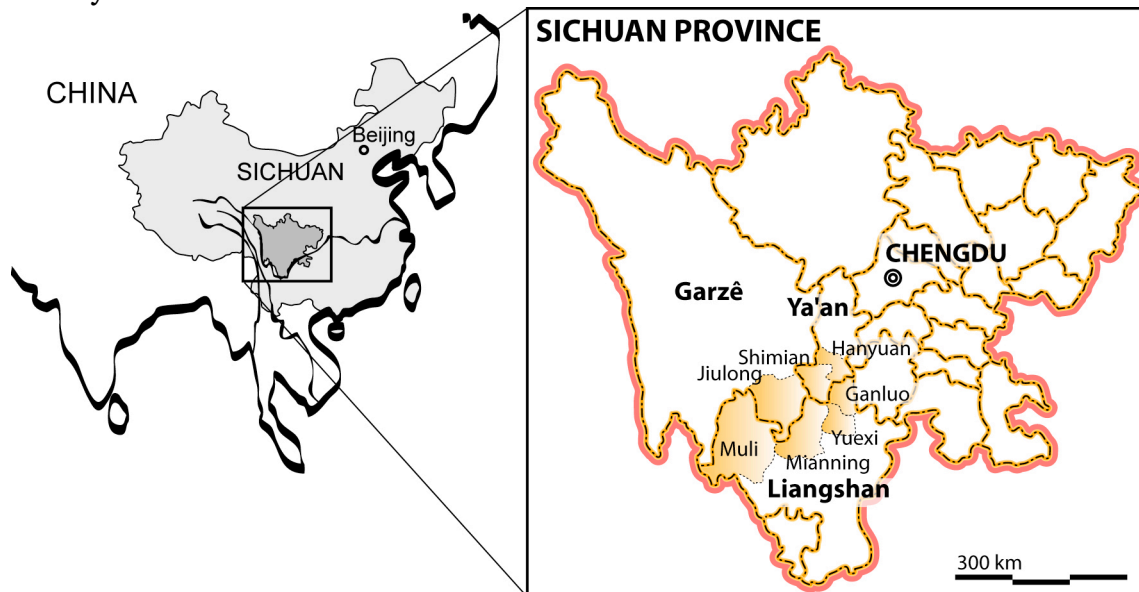
(1) The Ersu language (/<sup>HL</sup>ə-sʏ xo/, *Ĕrsū yǔ* 尔苏语) is spoken by approximately 16,800 people in the counties of (i) Gānlùò (甘洛县), (ii) Yuèxī (越西县) (both in Liángshān Yí Autonomous Prefecture 凉山彝族自治州), (iii) Shímíán (石棉县) (iv) Hànyuán (汉源县) (in Yǎ'ān Municipality 雅安市), and (iv) Jiǔlóng (九龙县, Written Tibetan, hereafter WT *brgyad zur*) (in Gānzī Tibetan Autonomous Prefecture, 甘孜州, WT *dkar mdzes*).

(2) The Lizu language (/<sup>EP</sup>li-zu hu/, *Lǐrú yǔ* 里汝语 or *Lìsū yǔ* 栗苏语) is spoken in Mùlǐ Tibetan Autonomous County 木里藏族自治县 (WT *smi li rang skyong rdzong*). It is a dialect of the Lüzu language (/<sup>EP</sup>ly-zu hu/, *Lǚsū yǔ* 吕苏语), spoken by approximately 7,000 people along the banks of the Yǎlóng (雅砻) or Nyag chu River in the counties of (i) Mùlǐ, (ii) Jiǔlóng, and (iii) Miǎnníng (冕宁县).

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<sup>1</sup> Ersu, Lizu, and Duoxu data are provided in broad phonemic transcription in the IPA. The phonemic analysis on which the transcriptions are based are outlined in Chirkova and Chen (2013) for Lizu, Chirkova et al. forthcoming for Ersu, and Chirkova (2014) for Duoxu. Earlier analyses can be found in Sūn (1982) for Ersu, Huáng and Rénzēng (1991) for Lizu, and Huáng and Yǐn (2012) for Duoxu. In transcriptions, “-” stands for morpheme boundary. In tonal notation, “H” stands for ‘high register tone’, “L” stands for ‘low register tone’, “F” stands for ‘falling tone’, “R” stands for ‘rising tone’, “EP” stands for ‘equally prominent pitch pattern’, “LP” stands for ‘left-prominent pitch pattern’, “RP” stands for ‘right-prominent pitch pattern’. Tones in Duoxu are provided in the five-scale pitch system developed by Yuen Ren Chao (1930).

(3) The Duoxu language (/do<sup>44</sup>ɕu<sup>44</sup> na<sup>32</sup>/, *Duōxù yǔ* 多续语) is a moribund language, spoken by a handful of individuals, mostly in their 70s and 80s, who live in Miǎnníng county.



Map 1. Distribution of the Ersu, Lizu, and Duoxu languages (Map by Franz Huber)

The area where the three languages are spoken is historically multi-ethnic and multi-lingual. The indigenous ethnic groups (known in Chinese historiographic sources as Xīfān 西番 ‘Western barbarians’ and Yí 夷 ‘Southern barbarians’) live here together with three exogenous ethnic groups, each with a larger area of distribution. These exogenous groups are the Tibetans (who arrived into the area in the 7<sup>th</sup> century), the Han Chinese (whose presence in the area intensified in the 18<sup>th</sup> century due to the strategic trade and military position of the region in the borderlands of the Tibetan, Sinitic and Southeast Asian realms), and the Nuosu (Yi) (who arrived into the area in the second half of the 19<sup>th</sup> century). There was a variable degree of contact between the three groups under discussion (Ersu, Lizu and Duoxu, all known historically as Xīfān people) and the Tibetans, Han Chinese, and Yi. As a result, the Lizu people and their language came under greater Tibetan influence, the Duoxu people and their language came under greater Chinese influence (specifically Southwestern Mandarin, hereafter SW Mandarin), and the Ersu are under mixed Chinese and Nuosu cultural and linguistic influences (e.g. Wū Dá 2010:3, Wáng 2010:2-6; Chirkova and Chen 2013, Chirkova et al. 2013). The Tibetan, SW Mandarin, and Yi languages have had considerable impact on the respective developments of the three languages, further contributing to the divergences among them. This is most obvious in the case of SW Mandarin influence on Duoxu, which underwent a series of drastic sound changes (such as loss of the distinction between /n/ and /l/) that currently clearly distinguish it from both Ersu and Lizu (see Chirkova 2014 for a detailed discussion).

Ersu, Lizu, and Duoxu are but little documented and described, with only five grammatical sketches to date (two of Ersu, by Sūn 1982b and Liú 2007 [1983], both

on the Gānlù; two of Lüzu, by Huáng & Rénzēng 1991 (the Mùlǐ variety) and Ikeda 2010 (the Jiǔlóng variety); and one of Duoxu by Huáng & Yǐn 2012). In addition, Sūn et al. (1991), Huáng et al. (1992), and Ikeda (2009) provide basic vocabulary lists for Ersu and for the Mùlǐ and Jiǔlóng varieties of Lüzu, respectively.

Until recently, with no fieldwork data on Duoxu to speak of, that language was known only through a vocabulary list of 740 words in the Sino-Tibetan vocabularies *Xīfān Yìyǔ* 西番译语 [Vocabularies of Western Barbarians], recorded in Chinese and Tibetan transcriptions in the Qiánlóng 乾隆 reign (1736-1796) of the Qīng 清 dynasty (Nishida 1973, Niè and Sūn 2010).

In addition to this descriptive work, an in-depth comparative-historical study of Ersu and Lizu has been conducted Dominic Yu (2012), *Proto-Ersuic*. It is based on a combination of firsthand fieldwork data (on the Miǎnníng variety of Lüzu) and secondary sources (on Ersu).

Owing to the paucity of data on Ersu, Lizu, and Duoxu as well as to the ethnic and linguistic complexity of the area where they are spoken, both the interrelationship among Ersu, Lizu, and Duoxu, and their broader affiliation within TB, are a matter of dispute.

The currently prevalent view of the three languages is that promoted by Sūn Hóngkāi 孙宏开, who argues that they are dialects of one and the same language, which he names Ersu (Sūn 1982b, 1983). In this conception, Ersu is the eastern dialect of the Ersu language, Duoxu the central dialect, and Lizu the western dialect. Sūn notes that the three languages are not mutually intelligible and share only 50% cognacy (Nishida and Sūn 1990: 15).<sup>2</sup> At the same time, Sūn stresses that salient structural similarities between the three varieties in all linguistic sub-systems leave no doubt that they stand in a dialectal relationship to each other (Sūn 1982b: 241).

In her work on the Lüzu and Duoxu languages, Huáng Bùfán 黄布凡 takes a more cautious approach to the relationship between the three languages (Huáng & Rénzēng 1991, Huáng 2009, Huáng & Yǐn 2012). More specifically, she argues for a distant relationship between Duoxu on the one hand, and Ersu and Lizu on the other hand, as well as possibly also a distant relationship between Ersu and Lizu (Huáng 2009: 205-206). In relation to the latter two languages, we note that Yu's (2012) successful reconstruction of the hypothetical parent language of Ersu and Lizu, based on regularly recurring sound correspondences in a large number of cognate sets, can be taken as strong evidence of a close relationship between these two languages. The relationship of Duoxu to Ersu and Lizu is discussed in detail in Chirkova (2014). Based on a comparison of lexical items in (i) present-day Duoxu, (ii) 18th-century Duoxu recorded in *Xīfān Yìyǔ*, (iii) Lizu, and (iv) Ersu, it is argued that the three languages are closely related and form a taxon. Duoxu's superficial differences from Ersu and Lizu can be mostly accounted for by the high degree of Chinese influence. In our work, we are therefore in agreement with Sūn about the close relationship of the three languages. However, if mutual intelligibility is taken as the main criterion, Ersu,

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<sup>2</sup> This is based on a list of basic vocabulary of ca. 1,700 words (Sūn Hóngkāi p.c., 2008).

Lizu, and Duoxu need to be seen as separate languages, and not as dialects of one Ersu language (cf. Yu 2012: 1).

In terms of the broader affiliation of the three languages within TB, the currently accepted view is again that promoted by Sūn Hóngkǎi. In this view, the Ersu language is classified as a member of the Qiangic subgroup of the Tibeto-Burman language family (Bradley 1997:36-37, Sūn 2001a), which is situated between and defined as transitional between Lolo-Burmese and Naish languages (Naxi and Mosuo) (Sūn 1983, 2001a, 2001b). The Qiangic hypothesis has increasingly come under scrutiny in recent years, as more in-depth data on these languages become available. Ongoing work on these languages suggests that features that are presently seen as probative of the membership in this subgroup are rather the result of diffusion across genetic boundaries (e.g. Chirkova 2012). Therefore, being essentially an areal grouping, the Qiangic hypothesis leaves open the issue of the genetic affiliation of its member languages. An alternative to Sūn's view is the proposal that Ersu, Lizu, and Duoxu are closely related to the Naish languages (Bradley 2008, 2012; Jacques and Michaud 2011; but see Chirkova 2012 for a differing view).

One final proposal put forward by Nishida Tatsuo (1973, 1976) relates to the Duoxu language (called by him “Tosu”), which he studied on the basis of the Duoxu vocabulary lists in *Xīfān Yìyǔ*. Nishida argues for a close link between Duoxu and Lolo-Burmese languages (most importantly, Burmese, on which his comparison is based) on the one hand, and between Duoxu and Tangut, on the other hand, leading him to propose a separate Tangut-Duoxu subgrouping within Lolo-Burmese. These competing hypotheses will be discussed below in light of newly collected data and findings.

### 1.1. Goals of the study and structure of the article

The work reported in this study is based on the first author's fieldwork since 2008 on the three languages. Fieldwork on Lizu focused on the dialect of Kālā township 卡拉乡 in Mùlǐ county. Fieldwork on Ersu focused on the dialect of Gānlùò county. Fieldwork on Duoxu consisted of interviews with the last speakers residing in and around the administrative seat of Miǎnníng county. A preliminary comparison of collected vocabulary lists (of ca. 2,000 words elicited for all three languages), sentences and texts suggests that the three languages are phonologically, lexically, and morphosyntactically closely related and that they are more closely related to each other than to any other neighboring language, thus corroborating Sūn's (e.g. 1982b, 2001a) and Yu's (2012) views. There is not only a high percentage of related words shared by Ersu, Lizu, and Duoxu, but also a high degree of regular sound correspondence that obtain among them. On the strength of this evidence, we assume that the three languages are closely related and share a recent common ancestor.

Our historical-comparative work essentially builds on Yu (2012), but it also differs from this earlier study in terms of data. We make use of firsthand fieldwork

data on Duoxu in our comparisons. Yu (2012:1) explicitly states that his Proto-Ersuic is the ancestor of Ersu, Lizu, and Duoxu (called by him “Tosu” after Nishida 1973). However, Duoxu is not among the six major language sources referenced by Yu, because of the scarcity of published Duoxu data; only forty Duoxu words collected from other sources are listed by Yu in an appendix (2012:224). While we agree with Yu’s assessment concerning the common ancestry of the three languages, we believe that bringing Duoxu data into the comparative picture has some significant ramifications for the reconstruction of that ancestor, as the present study makes clear. In view of the differences in the source material, we opt for a different name for the recent common ancestor of the three languages, to which we will hereafter refer as Proto-Ersu-Lizu-Duoxu or Proto-ELD for short. Our departure from Yu’s original term “Ersuic” as the name for the group (Yu 2012:1, ft. 1) is additionally motivated by the fact that Ersu is phonologically more innovative than Lizu and Duoxu. To take one example, while both Lizu and Duoxu share a number of cognates with the initial /l/, followed by /-j-/ or a high vowel (such as ‘wind’: Lizu /<sup>RP</sup>melje/, Duoxu /me<sup>33</sup>le<sup>44</sup>/; ‘rob, loot’: Lizu /<sup>R</sup>lju/, Duoxu /lju<sup>53</sup>/), Ersu evidences an innovative change in the initial to [ɤ] (phonologically, /lɤ/) (cf. [ʰmɛɤ] ‘wind’ and [ʰɤ] ‘rob, loot’). As the most innovative of the three languages, Ersu is not the best representative of the entire group.

By combining (i) the techniques of the comparative method within the ELD cluster, (ii) external comparison with cognates elsewhere in Tibeto-Burman, and (iii) analysis of relevant phonetic mechanisms and constraints, we aim at uncovering and reconstructing more diagnostic evidence of shared common development between the three languages (cf. Nichols 1996:48-60, Campbell 2004).

This study focuses on one such diagnostic development, the reconstruction of Proto-ELD voiceless nasals \*ṁ \*ṇ \*ṅ to account for a particular ELD onset sound correspondence. It pursues the following goals:

(1) To describe in detail the regular development of Proto-ELD voiceless nasals in a particular subset of lexical items and to argue that that development constitutes an innovation of the ELD cluster, which further corroborates its analysis as a legitimate taxonomic node within TB.

(2) To use the developments of voiceless nasals in the ELD cluster as a diagnostic tool to draw preliminary conclusions about the genetic position of that cluster within Tibeto-Burman and its relationship to other lesser-known and phylogenetically obscure languages of Sichuan, currently labeled Qiangic. We rely here on the commonly accepted notion that shared innovations are markers of a common taxonomic node (Campbell 2004). Two Qiangic languages, Pumi (普米语, a.k.a Prinmi) and Xumi (旭米语, a.k.a. Shǐxīng 史兴语), are used as reference cases to examine the issue. Our choice of these languages is motivated by their geographic proximity to Ersu, Lizu, and Duoxu, and the availability of extensive fieldwork data. All three languages (Ersu, Lizu, and Duoxu) have been in close contact with Pumi in

their history; whereas Xumi is a close neighbor of the Lizu language. Pumi is a relatively well-studied language, for which a variety of published data is available (e.g. Ding 1998, Lù 2001, Daudey forthcoming). Xumi, on the other hand, is the focus of an ongoing in-depth investigation by the first author (e.g. Chirkova 2009). In terms of family affiliation, the former language is likely to be more closely related to the Qiang language (e.g. Sūn 1962:561, 1982a, Thurgood 2003: 17), whereas Xumi is likely to be closely related to Naish languages (Guō and Hé 1994:8-9, Chirkova 2009).

(3) By combining comparative analysis with phonetic analysis, to provide further insights into the synchronic and diachronic aspects of voiceless nasals, a type of sound that remains somewhat poorly described and poorly understood due to its relative rarity in languages of the world. The present diachronic analysis put forward on the basis of ELD, Xumi, and Pumi languages, is supported by a parallel instrumental study of voiceless nasals in Burmese, Xumi, and Kham Tibetan (Basset et al. ms.), looking in detail at acoustic, aerodynamic, and perceptual differences between voiceless nasals of various degrees of devoicing. Combined data from the two studies allows us to present a detailed overview of the consecutive stages of nasal devoicing, from nasal clusters to voiceless nasals to nasalized approximants to non-nasal fricatives, to suggest a universal pathway of devoicing, which has potential applicability for diachronic analysis of languages around the world.

The remainder of the study is organized as follows. Section 2 summarizes ELD-internal evidence to propose a reconstruction of Proto-ELD \*voiceless nasals. Section 3 brings into discussion broader comparative evidence from TB bearing on the origin and developments of voiceless nasals in ELD and the neighboring languages. Section 4 proposes a phonetic explanation for the specific developments of nasal initials in ELD and beyond. The concluding section 5 sums up the essential findings, discusses their relevance to ongoing investigation of the historical relationships among lesser-known TB languages of Southwest China, and suggests perspectives for future research.

## 2. Basic correspondence patterns

A frequently-observed correspondence pattern among the three languages Ersu, Lizu and Duoxu may be notated “x/ħ/N”. That is to say, Ersu onset /x/ corresponds to Lizu onset /ħ/ corresponds to a Duoxu nasal onset.<sup>3</sup> Examples of this correspondence

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<sup>3</sup> We note one crucial difference from the earlier phonemic analysis of Lizu in Chirkova and Chen (2013a:76). That study established a voiceless glottal fricative onset /h/, which conditioned allophonic nasalization of the syllable. (/h/ also has a conditioned allophone [fi], found before /e/, /æ/, and /a/; see Chirkova and Chen 2013a:77.) That analysis further commented on an areal association between glottal fricatives and nasality, seen not only in Lizu but also attested in various Lolo-Burmese languages such as Lahu (Matisoff 1973: 20-21, 1975) and Lisu (Bradley 1989), as well as in Na languages (e.g., Yongning Na, Michaud 2006, 2008). This phenomenon is traditionally



pattern are given in Table 1a. Note that the Duoxu forms have nasals at various places of articulation.<sup>4</sup> (The right-most column contains the reference number and equivalent reconstructed form found in the “Index by Gloss” of Yu 2012.)

Gloss	Ersu	Lizu	Duoxu	Yu 2012
‘be ripe’	<sup>L</sup> xe, <sup>L</sup> dε-xe	<sup>RP</sup> de- <sup>h</sup> ie	mie <sup>34</sup>	570 *dehĩ <sup>1</sup>
‘bamboo’	<sup>L</sup> xe	<sup>H</sup> ie	mi <sup>44</sup>	22 *hĩ <sup>2</sup>
‘this year’	<sup>H</sup> ts <sup>h</sup> ε-xe	<sup>RP</sup> ts <sup>h</sup> e- <sup>h</sup> ie	tɕi <sup>33</sup> -je <sup>44</sup>	714 *tshehĩ <sup>1</sup>
‘last year’	<sup>H</sup> ja-xe	<sup>LP</sup> jæ- <sup>h</sup> ie	ja <sup>33</sup> -je <sup>44</sup>	394 *ja(ji)hĩ <sup>1</sup>
‘next year’	<sup>H</sup> so-xe	<sup>EP</sup> so- <sup>h</sup> ie	ʃəu <sup>55</sup> -je <sup>33</sup>	481 *sohĩ <sup>1</sup>
‘to borrow’	<sup>L</sup> k <sup>h</sup> ε-xe	<sup>LP</sup> (p <sup>h</sup> enggo) <sup>h</sup> ie	je <sup>44</sup>	61 *hjẽ <sup>1</sup>
‘to smell good, fragrant’ <sup>5</sup>	<sup>L</sup> xε, <sup>L</sup> dε-xε	<sup>LP</sup> de- <sup>h</sup> jo	ŋo <sup>44</sup>	279 *dehẽ <sup>1</sup>

described as secondary nasalization resulting from the acoustically similar effects of high airflow segments (such as glottal fricatives) and nasals (e.g. Matisoff 1975, but see Michaud et al. 2012: 207-208 for an alternative suggestion that nasalization of this type of segment may result from earlier clusters with nasals, \*CNV). In contrast to this received view, an ongoing acoustic, aerodynamic, and perceptual study of this type of sound in the Xumi language (Basset et al. ms.) reveals that the nasality is properly understood as an intrinsic property of the initial. More precisely, this sound is characterized by simultaneous oral and nasal airflow (with aligned velocity peaks), and with a greater peak velocity in the nasal airflow. We therefore notate the phoneme as /<sup>h</sup>i/, with inherent nasalization. In view of the general incompatibility of nasalization and oral obstruency (Ohala 1975: 300, Ohala&Ohala 1993, Ohala&Solé 2010: 61-62, see Shosted 2006 for a detailed discussion), we refrain from referring to that segment as a fricative. Furthermore, we subscribe to Laver’s (1990: 245, 304-305) view of [h] as an approximant with whispery phonation, or, more generally, a cover symbol for a whispered or breathed onset to a syllable-nuclear vocoid of any quality. Taking all of this into account, we believe it is more accurate to describe /<sup>h</sup>i/ in Lizu (as well as in Xumi) as a nasalized voiceless approximant. As will be discussed in section 4, this characterization is consistent with the historical origins of the segment.

<sup>4</sup> Note that the claim of cognacy for the words in Table 1 also depends on conformity with regular patterns of sound correspondence in the vowels and tones. Although the establishment of all these correspondences is beyond the scope of this paper, it may be noted that all of the sets above are also identified as cognates (albeit with data from slightly different dialects of Ersu and Lizu and lacking Duoxu data) by Yu (2012), who has worked out regular patterns of sound correspondence in reconstructing his Proto-Ersuic forms. We are therefore confident of the reliability of these sets and of the legitimacy of the onset correspondence pattern.

For cognate sets of the type in Tables 1a and 1b, Yu (2012:74) reconstructs the source of the onset correspondence as \*h + nasalized vowel, while noting that “PTB [Proto-Tibeto-Burman] roots suggests origins in [s-] prefixed \*nasal initials”. However, Yu notes that this observation is difficult to reconcile with a proposed development of PTB \*sN clusters to pre-aspirated stops (2012:32). In his summary of changes from PTB to Proto-Ersuic, he states (2012:202) “[PTB] \*s-prefixed nasals denasalize to fricative + stop clusters.” His listed examples of PTB \*sN clusters show inconsistent developments to Proto-Ersuic \*s, \*hC, and \*sC. All of this suggests that the Yu’s reconstruction of these sets may be in need of revision.

‘younger sister’	<sup>H</sup> xema	<sup>EP</sup> h̥imæ	na <sup>33</sup> ma <sup>53</sup>	623 *hjēmæ <sup>1</sup>
‘language’	<sup>H</sup> xo	<sup>EP</sup> h̥u-h̥u	na <sup>32</sup>	657 *hwō
‘chin, jaw’ <sup>6</sup>	<sup>L</sup> mexe	<sup>EP</sup> mehe	mie <sup>33</sup> la <sup>55</sup> < *miena	110 *mehi <sup>2</sup>
‘mushroom’	<sup>H</sup> xɿ	<sup>R</sup> h̥ɿə	mo <sup>44</sup> tɕ <sup>h</sup> i <sup>44</sup>	466 *hē <sup>1</sup>

Table 1a. The Ersu-Lizu-Duoxu correspondence pattern “x/h̥/N”

We may also include apparent examples of this correspondence pattern for which a cognate has not been identified in one of the three languages. These are listed in Table 1b.

Gloss	Ersu	Lizu	Duoxu	Yu 2012
‘to teach’	<sup>H</sup> xa-xa	--	ma <sup>33</sup> -ma <sup>53</sup>	--
‘stretch out’	<sup>H</sup> ɣɛ-xo	<sup>RP</sup> ne-h̥o	--	683 *hwō <sup>1</sup>
‘to stir up, foment; to convulse, disturb’	<sup>H</sup> da-xarɿ	<sup>RP</sup> de-h̥ɿə-h̥ɿə	--	--
‘dew’ <sup>7</sup>	<sup>H</sup> ɣuxe	<sup>EP</sup> ɣuhe	--	--
‘musk’ <sup>8</sup>	<sup>L</sup> laxa	<sup>EP</sup> le̞h̥ɿə	--	467 *lahē/lahō

Table 1b. Incomplete cognate sets illustrating the same correspondence pattern as Table 1a

<sup>5</sup> The Ersu and Lizu forms bear a superficial resemblance to Mandarin *xiāng* 香 (SW Mandarin /ɕiaŋ<sup>44</sup>/), but the correspondences are not consistent with a borrowing from Mandarin. In fact, the Ersu and Duoxu words for ‘incense’, both borrowed from *xiāng* 香, are respectively /<sup>H</sup>ɕa/ and /ɕa<sup>32</sup>[-no<sup>44</sup>]/.

<sup>6</sup> The phonemes /n/ and /l/ are in free variation in the speech of the language consultant from whom the Duoxu form was elicited. This is due to contact influence from SW Mandarin, where Middle Chinese initials l-, n- and ɲ- all merge into /n/ (Yuán et al. 2001 [1960]: 29-30). /n/ and /l/ are, however, historically distinct phonemes in Duoxu. The reconstructed form with /n/ is based on the two handwritten manuscripts with vocabulary lists recorded in Chinese characters that were discovered by Chirkova during fieldwork. They date from 2002 and 2012 and record the speech of the last fluent Duoxu speakers (all now deceased). The word for ‘chin, jaw’ is recorded in one manuscript as “[口 + 灭]那” and in the other as “灭娜”. The two characters “那” and “娜” used to transcribe the second syllable are unambiguously pronounced with onset /n/ in Mandarin.

<sup>7</sup> The second morpheme of the Duoxu word for ‘dew’, /ke<sup>33</sup>ʃo<sup>53</sup>/, is cognate to the first morpheme of the Ersu and Lizu forms; but no Duoxu cognate for the morpheme involving the sound correspondence under investigation has been found.

<sup>8</sup> The first syllable, if not the whole word, is likely a borrowing from Tibetan (cf. WT *gla* (ba’i) *nor* (bu) ‘musk’).

There are also a number of cognate sets in which the Lizu form does not perfectly conform to this pattern, having /x/ instead of /h/. Some examples are given in Table 2a. We can label this correspondence pattern “x/x/N”.

Gloss	Ersu	Lizu	Duoxu
‘bird’	<sup>H</sup> xva-je	<sup>R</sup> xwɐ	ŋo <sup>44</sup> tɕi <sup>44</sup>

Table 2a. The Ersu-Lizu-Duoxu correspondence pattern “x/x/N”

Gloss	Ersu	Lizu	Duoxu
‘to yawn’	<sup>H</sup> xa	<sup>F</sup> xwæ	--
‘to hatch, to incubate’	<sup>L</sup> k <sup>h</sup> ɛ-xɛ	<sup>RP</sup> k <sup>h</sup> e-xe	--

Table 2b. Incomplete cognate sets illustrating the same correspondence pattern as Table 2a

Note that when a Duoxu cognate form is absent and the initial of a Lizu cognate form is /x/, as is the case in some of the sets in Table 2b, there is no direct evidence for a nasal origin of the onset correspondence. However, the correspondence between the Ersu and Lizu onsets still looks quite different from those that can be confidently reconstructed with a Proto-ELD fricative, as seen in Table 3. (Note that realization of /x/ as [f] before /u/ is a strong areal feature and is observed in all three languages (cf. Chirkova and Chen 2013:78)).<sup>9</sup>

Gloss	Ersu	Lizu	Duoxu
‘tooth’	<sup>H</sup> ʃzma	<sup>RP</sup> xumæ	ɕe <sup>53</sup> ma <sup>32</sup>
‘walk’	<sup>L</sup> ʃz-ʃz	<sup>EP</sup> xu-xu	ɕe <sup>44</sup> -ɕe <sup>44</sup>
‘scallion’	<sup>H</sup> fɥby	<sup>LP</sup> xubu	fu <sup>33</sup> bu <sup>53</sup>
‘front’	<sup>H</sup> ʃo-p <sup>h</sup> ɛ	<sup>LP</sup> ʃæ-p <sup>h</sup> o	xe <sup>33</sup> -p <sup>h</sup> o <sup>53</sup>
‘long’	<sup>H</sup> ʃɛ	<sup>RP</sup> ʃe-ʃe	xe <sup>34</sup>
‘yellow’	<sup>H</sup> dɛ-ʃy	<sup>LP</sup> de-ʃu	xəɹ <sup>35</sup>

Table 3. Ersu-Lizu-Duoxu three-way fricative correspondences

While the details of three-way fricative correspondence reconstructions remain to be fully worked out, it seems likely that these derive from early \*fricatives (probably at least two different ones), while a correspondence with a Duoxu nasal initial (as in Table 2a ‘bird’) requires different treatment.<sup>10</sup> Indeed, so far in our data there are no

<sup>9</sup> In Lizu, [f] is an allophone of /x/ before /u/. In Ersu and Duoxu /x/ and /f/ are distinct phonemes, but never contrast before /u/; in these languages, [f] before /u/ can therefore also be considered an allophone of /x/.

<sup>10</sup> Yu (2012:70-71) reconstructs Proto-Ersuic \*x for some of the words in Table 3, but this is not an entirely satisfying result: Yu has Proto-Ersuic \*xui developing into Ersu (in Yu’s notation): /ɕɿ<sup>55</sup>/ (in ‘tooth’ and ‘walk’), /ɕu<sup>55</sup>/ (in ‘charcoal’), and /fu<sup>55</sup>/ (in ‘scallion’, ‘garlic’), without apparent conditioning factors.

clear-cut examples of sound correspondences where Ersu has x- and Lizu has x- or ħ-, but Duoxu has a fricative instead of a nasal.<sup>11</sup> This suggests that the Table 2b examples belong to the correspondence pattern seen in Table 2a rather than belonging to another three-way fricative correspondence like those in Table 3. As we shall see below, additional comparative evidence further supports this conclusion.

The correspondences illustrated above must be distinguished from those involving nasal initials in all three languages, as seen in Table 4.

Gloss	Ersu	Lizu	Duoxu
‘fire’	<sup>L</sup> mɛ	<sup>F</sup> me	mie <sup>32</sup>
‘monkey’	<sup>H</sup> me	<sup>F</sup> mi	mi <sup>32</sup>
‘female (animal)’	<sup>H</sup> ma	<sup>F</sup> mæ	ma <sup>44</sup>
‘cow’	<sup>L</sup> ŋva-ma	<sup>LP</sup> ŋu-mæ or <sup>RP</sup> ŋu-mæ	ju <sup>55</sup> -ma <sup>31</sup>
‘two’	<sup>H</sup> nɛ	<sup>R</sup> ne	ji <sup>53</sup>
‘rib’	<sup>H</sup> naro	<sup>EP</sup> noɾə	na <sup>33</sup> ba <sup>44</sup>
‘day’	<sup>H</sup> jo	<sup>F</sup> je	ne <sup>44</sup>
‘ache’	<sup>H</sup> je	<sup>RP</sup> de-ni	ja <sup>44</sup>

Table 4. Ersu-Lizu-Duoxu three-way nasal correspondences

Finally, an additional correspondence pattern may be relevant. The forms in Table 5 show an apparent correspondence between Ersu s- (or sVN-), Lizu t-, and a Duoxu nasal N-.

Gloss	Ersu	Lizu	Duoxu
‘heart’	<sup>H</sup> szje	<sup>RP</sup> temi	je <sup>33</sup> mi <sup>53</sup>
‘nose’	<sup>H</sup> symbɿ	<sup>LP</sup> tombu	ja <sup>33</sup> ku <sup>53</sup>
‘finger’	<sup>H</sup> lesɿ	<sup>LP</sup> letu	lo <sup>44</sup> ji <sup>44</sup> -p <sup>h</sup> a <sup>44</sup>
‘seven’	<sup>H</sup> szŋ	<sup>F</sup> tŋ	je <sup>34</sup>

Table 5. The Ersu-Lizu-Duoxu correspondence pattern “s/t/N”

The correspondences in Table 4 should be straightforwardly reconstructed as Proto-ELD \*nasals. As we have seen, the correspondences in Table 3 can be reconstructed as Proto-ELD \*fricatives. The correspondence in Table 1 requires a distinct reconstruction, for which we propose Proto-ELD \*voiceless nasals.<sup>12</sup> The synchronic and diachronic plausibility of this reconstruction is discussed presently, in

<sup>11</sup> A possible exception is the set of words for ‘lid, cover’ (in the three languages, literally, ‘pot-lid’): Ersu /ŋgua<sup>55</sup>-xa<sup>51</sup>/, Lizu /dʒə<sup>55</sup>-ħɾe<sup>51</sup>/, Duoxu /ge<sup>32</sup>-xa<sup>44</sup> pu<sup>31</sup>/ (the last syllable in the Duoxu form is a classifier). Further investigation is needed.

<sup>12</sup> Note that this reconstruction differs from the Proto-Ersuic reconstruction given in Yu (2012:74) as \*h plus nasalized vowel. Yu did not have the benefit of Duoxu data.

light of comparative evidence from Tibeto-Burman (section 3) and relevant phonetic mechanisms and constraints (section 4).

### 3. Comparative evidence from Tibeto-Burman

Many Tibeto-Burman languages are described as having distinctive series of voiceless nasals.<sup>13</sup> These languages are found across TB subgroups. Matisoff (2003:37) lists languages in the Himalayish, Qiangic, Lolo-Burmese, Nungish, Naga, and Kuki-Chin groups. The development of voiceless nasals in terms of both tonal and segmental changes is arguably best understood for the Lolo-Burmese branch, and is important for the internal subgrouping of that branch (Matisoff 1972, Bradley 1979, 1985, 1989).

Matisoff (2003:37) and Bradley (1979:144, 1985:242) reconstruct Proto-Lolo-Burmese [PLB] with three distinct series of nasals: one simple (i.e. ordinary voiced nasals) and two complex. The two complex series are \*sN clusters (possibly already changed to \*N̥ in PLB) and \*ʔN clusters.<sup>14 15</sup> These two complex series have identical consonantal reflexes in Loloish languages, but they can be distinguished in checked syllables because they engender distinct tonal developments (Matisoff 1972:25). In non-checked syllables the complex nasals cannot be distinguished with any confidence, so that one frequently sees Proto-Loloish reconstructions notated with \*s/ʔ-N.<sup>16</sup> The two complex nasal types derive from distinct Proto-Tibeto-Burman [PTB] clusters (presumed in many cases to result from two distinct types of morphological prefixation), \*s-N and \*ʔ(ə)-N. In unchecked syllables the choice of Proto-Loloish reconstruction between \*sN and \*ʔN can be informed by comparison with Burmese (which reflects voiceless nasals in the Written

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<sup>13</sup> It may be noted that voiceless nasals are also reconstructed for Old Chinese (Li 1971, Baxter 1992). Published sources on Tibeto-Burman languages frequently notate voiceless nasals with a preceding *h*, e.g. *hm*, *hn*, *hŋ* rather than as IPA *m̥*, *n̥*, *ŋ̊*. Both notations will be considered equivalent in this paper.

<sup>14</sup> Actually, Matisoff (2003:37) is inconsistent about whether clusters \*sN or voiceless nasals \*hN [N̥] are to be reconstructed for Proto-Lolo-Burmese, i.e. about whether the change PTB \*sN > PLB \*hN had taken place or not. The question of whether PLB had \*voiceless nasals or \*sN clusters that only developed into \*voiceless nasals following the ramification of the group is not directly relevant to the issues being explored in this paper, although it is related in part to the question of whether the change \*sN > N or the change \*N̥ > N is more likely to have occurred in those LB languages which have voiced nasal reflexes.

<sup>15</sup> There is some inconsistency in the literature about whether complex nasals are notated with or without a hyphen “-”. The use of the hyphen (e.g. \*s-m, \*ʔ-n) draws attention to the hypothesized morphological nature of the non-nasal element, presumed to be or derive from a prefix. Because the morphological structure is not relevant to the arguments advanced in this paper, we notate clusters without a hyphen (e.g. \*sm, \*ʔn) except when citing forms from published sources, in which case we follow that source’s notation.

<sup>16</sup> Bradley (1979:149) uses \*ʔ-N in his glossary of reconstructed forms to represent \*s/ʔ-N in such cases.

Burmese orthography dating back to the 11th century as well as in the pronunciation of modern Burmese). However, this is only possible if a reliable cognate is available.

The Lolo-Burmese nasal developments just described are illustrated in Table 6, adapted from Bradley (1979:144, 1985:242) with many details omitted.

LB Branch	Burmish	Loloish			
PLB Onset	Burmese	N. Loloish	C. Loloish	S. Loloish	Bisoid
*N	N	N	N	N	N
*sN	N̥	N̥	N	N	N̥
*ʔN	N	N̥	N	N	N̥

Table 6. Reflexes of PLB nasals in selected LB languages. Note that \*sN and \*ʔN merge in all Loloish languages, but in stopped syllables can still be distinguished by distinct tonal reflexes.<sup>17</sup>

Based on the discussion above, TB cognate forms with voiceless nasal initials and/or PLB or PTB forms with \*sN clusters constitute ancillary evidence for the reconstruction of \*voiceless nasals in Proto-ELD. Because Burmese is extensively documented, cognates are more readily found in Burmese than in other languages that have voiceless nasals. Table 7 lists cognates in Burmese, Pumi, Xumi, as well as reconstructed PTB and/or PLB forms, for a subset of the cognate sets from Tables 1 and 2.<sup>18</sup> Overall, PTB and PLB cognate evidence supports the reconstruction of voiceless nasals in Proto-ELD. Related developments in Pumi and Xumi are discussed below.

Gloss	Ersu	Lizu	Duoxu	Burmese	Pumi	Xumi	PLB / PTB
‘be ripe’	<sup>L</sup> xe, <sup>L</sup> dɛ-xe	<sup>RP</sup> de-ɦe	mie <sup>34</sup>	hmé	m̥iɛ <sup>55</sup> ti <sup>53</sup>	<sup>EP</sup> l3-mi	PLB *s/ʔ-min <sup>1</sup>

<sup>17</sup> Note that Matisoff (1972:24) differs from Bradley in proposing that \*sN and \*ʔN merge to N̥ in Burmese. He therefore reconstructs PLB \*ʔN in some roots where Bradley has \*sN, and reconstructs \*CN in some roots where Bradley has \*ʔN. See for example ‘mushroom’ in the table below. For consistency, we always cite Matisoff’s forms in the tables, and add footnotes when Bradley’s forms differ in the reconstruction of the onset.

<sup>18</sup> Burmese forms are cited from Bernot, Cramerotti and Yin Yin Myint (1997), in the transcription system by San San Hnin Tun (p.c.). Pumi forms are from the Táobā 桃巴 dialect spoken in the county of Mǔlǐ. Most forms are from Lù (2001), the remainder are from Chirkova’s fieldwork data. Xumi data are from Chirkova’s personal fieldwork (see Chirkova et al. 2013 for a phonological outline of Xumi). Reconstructed PTB and PLB forms are from Matisoff (2003) unless otherwise noted.

Absent from Table 7 are a number of forms for which no nasal-initial TB cognates are in evidence, including ‘stretch out’, ‘yawn’, ‘hatch, incubate’, ‘dew’, and ‘musk’. In general reliable Duoxu cognates have not yet been identified. It is possible that these cognate sets have a distinct origin from the Proto-ELD \*voiceless nasals we have reconstructed for the Table 6 words. This will be one object of future research.

‘bamboo’	<sup>L</sup> xe	<sup>F</sup> he	mi <sup>44</sup>	hmyi? ‘bamboo shoot’	me <sup>53</sup>	<sup>H</sup> mje	PTB *s-m(y)ik ‘bamboo sprout’
‘this year’, ‘last year’, ‘next year’	<sup>H</sup> ts <sup>h</sup> ε-xe, <sup>H</sup> ja-xe, <sup>H</sup> so-xe	<sup>RP</sup> ts <sup>h</sup> e- <sup>h</sup> ie, <sup>LP</sup> jæ- <sup>h</sup> ie, <sup>EP</sup> so- <sup>h</sup> ie	tɕ <sup>h</sup> i <sup>33</sup> - <sup>h</sup> ne <sup>44</sup> , ja <sup>33</sup> - <sup>h</sup> ne <sup>44</sup> , ʃəu <sup>55</sup> - <sup>h</sup> ne <sup>33</sup>	hni? ‘year’ -- -- --	-- -- --	-- -- --	PTB *s-niŋ; PLB *s-nik ‘year’
‘to borrow’	<sup>L</sup> k <sup>h</sup> ε-xe	<sup>LP</sup> (p <sup>h</sup> enŋ o) <sup>h</sup> ie	<sup>h</sup> ne <sup>44</sup>	hŋà	də <sup>33</sup> - <sup>h</sup> ni <sup>35</sup>	<sup>R</sup> ɲɔ	PTB *r/s-ŋ(y)a; PLB *s/?-ŋa <sup>2</sup>
‘to smell good, fragrant’	<sup>L</sup> xε, <sup>L</sup> dε-xε	<sup>LP</sup> de- <sup>h</sup> jo	ŋo <sup>44</sup>	hmwè <sup>19</sup>	--	--	--
‘younger sister’	<sup>H</sup> xema	<sup>EP</sup> himæ	na <sup>33</sup> ma <sup>53</sup>	hnə.má	ŋyi <sup>55</sup>	<sup>RP</sup> nemi	PTB *s-nam ‘daughter-in law’; PLB <sup>20</sup> *ʔəs-nam <sup>1</sup>
‘language’	<sup>H</sup> xo	<sup>EP</sup> hu- <sup>h</sup> u	na <sup>32</sup>	--	--	--	--
‘chin, jaw’	<sup>L</sup> mexe	<sup>EP</sup> me <sup>h</sup> ie	mie <sup>33</sup> la <sup>55</sup> < *miena	--	--	--	--
‘mushroom’ ,	<sup>H</sup> xɿ	<sup>R</sup> hɿə	mo <sup>44</sup> tɕ <sup>h</sup> i <sup>44</sup>	hmo	mi <sup>35</sup>	<sup>R</sup> mu	PTB *g/s-məw; PLB <sup>21</sup> *ʔ-məw <sup>1</sup>
‘to teach’	<sup>H</sup> xa-xa	--	ma <sup>33</sup> ma <sup>53</sup>	--	--	--	PLB *s/?-ma <sup>2</sup>
‘stir up, foment’	<sup>H</sup> da-xarɿ	<sup>RP</sup> de- <sup>h</sup> ɿə- <sup>h</sup> ɿə	--	hmwe.(hn au?)	--	--	PTB *ŋwal
‘bird’	<sup>H</sup> xva-je	<sup>R</sup> xwɐ	ŋo <sup>44</sup> -tɕi <sup>44</sup>	hŋe?	--	--	PTB *s-ŋak

Table 7. Cognate sets from Tables 1-2 where TB cognate evidence supports the reconstruction of a voiceless nasal initial

Table 8 lists cognate sets from Table 5, also for Pumi, Xumi, and Burmese.

Gloss	Ersu	Lizu	Duoxu	Burmese	Pumi	Xumi	PTB
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<sup>19</sup> Note that Bradley (1979:343 #512) identifies the Proto-Loloish cognate of WB hmwè as a Dai loan, borrowed into Proto-Loloish as [hɔm<sup>35</sup>]. It is possible that the WB form is not cognate to ELD, but it is nonetheless provided here for reference.

<sup>20</sup> Bradley 1979:312 #205.

<sup>21</sup> The cited form is from Matisoff (2003:183). Bradley (1979:320 #288) has Proto-Loloish \*s-mo<sup>1</sup>; the discrepancy is due to a disagreement concerning the source of WB voiceless nasals, as explained in the footnote to Table 6.

‘heart’	<sup>H</sup> szje	<sup>RP</sup> temi	je <sup>33</sup> mi <sup>53</sup>	hnə.ləun	xue <sup>53</sup>	<sup>LP</sup> j3mi	*s-niŋ
‘nose’	<sup>H</sup> symbv	<sup>LP</sup> tombu	ja <sup>33</sup> ku <sup>53</sup>	hna, hnə.k <sup>h</sup> əun	ŋə <sup>35</sup> ɣiA <sup>53</sup>	<sup>LP</sup> j3qɔ̃	*s-na
‘finger’	<sup>H</sup> lesv	<sup>LP</sup> letu	lo <sup>44</sup> ji <sup>44</sup> -p <sup>h</sup> a <sup>44</sup>	leʔ.hjə̀	ɬA <sup>35</sup> tsə <sup>35</sup>	<sup>RP</sup> liɲi	PLB <sup>22</sup> *ʔ-nyəw <sup>2</sup>
‘seven’	<sup>H</sup> szɲ	<sup>F</sup> tɲ	je <sup>34</sup>	k <sup>h</sup> un.niʔ	ŋi <sup>35</sup>	<sup>EP</sup> sɛ-ku	*s-nis

Table 8. The Ersu-Lizu-Duoxu correspondence pattern “s/t/N” with additional cognate words

The developments in the cognate sets of Table 8 also appear to be related to voiceless nasals (as already suggested on the basis of the reflexes in Duoxu). However, in this set, original \*sN clusters in Proto-ELD appear to have developed an emergent stop between the fricative /s/ and the following alveolar nasal (the place of articulation of the original nasal can be ascertained on the basis of the place of articulation of the emergent stop).<sup>23</sup> A possible explanation of this development would be that the original \*sN clusters were preserved in these high-frequency words longer than in the rest of the lexicon, which underwent the change from PTB \*sN to Proto-ELD \*N̥. The preserved \*sN clusters then underwent a later distinct development. Additional investigation will be necessary to explore this hypothesis.

Let us now turn to the developments of PTB and PLB \*ʔN clusters, which, like \*sN, developed into voiceless nasals in some Lolo-Burmese languages. There is good reason to believe that PTB \*ʔN had a Proto-ELD reflex distinct from PTB \*sN. It is not entirely clear, however, whether PTB \*ʔN merged with simple voiced nasals in Proto-ELD, or remained distinct. The cognate sets in Tables 9a and 9b match protoforms listed in Matisoff (2003:601-606) with onset \*ʔN. In addition to ELD forms, cognates from Burmese and Zaiwa, a Burmish language, are presented as well; their significance will be discussed below. (Zaiwa forms are from Lustig 2010. Creaky forms are marked by a letter v after the initial.)

Gloss	Ersu	Lizu	Duoxu	Zaiwa	Burmese	Pumi	Xumi	PLB
‘son-in-law’	<sup>L</sup> mopa	<sup>EP</sup> mopæ	na <sup>44</sup> pu <sup>44</sup>	--	θə.mɛʔ	--	--	PL *ʔ-mak <sup>L</sup> <sup>24</sup>
‘body hair’	<sup>L</sup> maː	<sup>F</sup> mu	mu <sup>32</sup>	mau <sup>35</sup>	ʔə.hmwè	mɛ̃ <sup>35</sup>	<sup>R</sup> ŋɔ̃	*ʔ-məw <sup>L</sup> <sup>25</sup>

<sup>22</sup> The cited form is the source of the second element in the compounds. It is from Matisoff (2003:285). Bradley (1979:304 #113) has Proto-Loloish \*s-po<sup>1</sup>. See the footnote above on ‘mushroom’. The first element in the compounds is derived from PTB \*lak ‘hand’.

<sup>23</sup> These developments are consistent with the proposals of Yu (2012:202).

<sup>24</sup> Matisoff (1972:61, 2003:37,233,325.474) argues for an irregular development of PLB \*ʔ-mak from PTB \*s-mak or \*s-ma:k. Bradley (1979:314 #221) lists Proto-Loloish \*ʔmak<sup>L</sup>.



‘name’	<sup>H</sup> me	<sup>F</sup> mi	mie <sup>44</sup>	miŋ <sup>31</sup>	nan.me	mẽ <sup>55</sup>	<sup>H</sup> me	*ʔ-miŋ <sup>1/3</sup>
‘high’ <sup>26</sup>	<sup>H</sup> mbo	<sup>RP</sup> mbɿə-mbɿə	mo <sup>44</sup>	-mvyaŋ <sup>55</sup>	myín	--	--	*ʔ-mraŋ <sup>3</sup>
‘ribs’	<sup>H</sup> naro	<sup>EP</sup> noɿə	na <sup>33</sup> ba <sup>44</sup>	nam <sup>31</sup> syam <sup>11</sup> si <sup>1</sup> -wui <sup>11</sup>	nan.yò	nõ <sup>35</sup>	<sup>RP</sup> hɔki	*ʔ-nam <sup>1</sup>

Table 9a. The Ersu-Lizu-Duoxu correspondence pattern “N/N/N” for PLB \*ʔN

The examples in Table 9a all have ordinary nasals in Ersu, Lizu, and Duoxu corresponding to glottalized nasals in Proto-Lolo-Burmese. These sets support the hypothesis of a complete merger of PTB \*ʔN and \*N in Proto-ELD. Compare these with the cognates of Table 9b, in which Ersu has ʔN.

Gloss	Ersu	Lizu	Duoxu	Zaiwa	Burmese	Pumi	Xumi	PLB
‘deep’	<sup>H</sup> ʔno	<sup>F</sup> ne [ʔnne]	no <sup>34</sup>	nik <sup>1</sup>	nɛʔ	xo <sup>55</sup> mə <sup>53</sup>	<sup>RP</sup> mjɛ-ɦɔ	PL *ʔ-nak <sup>L</sup>
‘brain’	<sup>H</sup> ʔno	<sup>EP</sup> nombu [ʔ <sup>EP</sup> nnombu]	no <sup>34</sup>	u <sup>1</sup> -nvuq <sup>5</sup>	ʔù.hnauʔ	nue <sup>35</sup>	<sup>RP</sup> ɣũ-ɦu	*s-nuk <sup>H 27</sup>
‘red = gold’	<sup>H</sup> ʔne	<sup>F</sup> ni	ni <sup>44</sup>	nvyɛ <sup>31</sup> , nye <sup>31</sup>	ni	ɲɛ <sup>55</sup> mə <sup>53</sup>	<sup>RP</sup> ɦi-le-le	*ʔ-ni <sup>1</sup> ‘red’
‘ear’, as in ‘gill’, lit., ‘fish-ear’	<sup>H</sup> ʔy ʔnaku	<sup>RP</sup> nɛpi	ɲɛɿ <sup>35</sup> pu <sup>31</sup>	ne <sup>1</sup> -, ne <sup>5</sup> -	nà	ne <sup>55</sup> pe <sup>53</sup>	<sup>EP</sup> ɬɜwi	*ʔ-na <sup>2</sup>
‘copper’	<sup>L</sup> ʔno	<sup>F</sup> no	dʒi <sup>44</sup> , but also ɲo <sup>44</sup> as in ɲo <sup>44</sup> ge <sup>32</sup> ‘copper pot’	--	cè.ni	ni <sup>53</sup>	--	--
‘wild animals’	<sup>H</sup> ʔne	<sup>RP</sup> ni-ŋu	ni <sup>44</sup>	--	--	--	--	--
‘dare’	<sup>L</sup> ʔno	<sup>F</sup> no	no <sup>53</sup>	--	--	--	<sup>H</sup> ɦɔ	--
‘swallow (v.)’	<sup>H</sup> nɛ-ʔme	<sup>LP</sup> ne-mi	mie <sup>33</sup> -ko <sup>44</sup>	mvi <sup>31</sup> , mvuyi <sup>31</sup>	myo.cá	--	<sup>EP</sup> mjɛ-ũ	*myuk ~

<sup>25</sup> The form is from Matisoff (2003:100). Bradley (1979:402 note 84) has PLB \*ʔmwe<sup>3</sup> and notes that the Burmese reflex is irregular.

<sup>26</sup> The mb- onset for ‘high’ in Ersu and Lizu is likely to be the result of an emergent stop, developing out of a sequence of a nasal consonant followed immediately by a segment that has a low first formant—the formant that would be most distorted by nasalization, such as /l, w, i, u/ (see Ohala 1983: 207-208).

<sup>27</sup> The form is from Matisoff (2003:39). Bradley (1979:306 #140) has Proto-Loloish \*(C)-nok<sup>L</sup>,

								*myu w <sup>28</sup>
‘silver’	<sup>H</sup> ŋua <sup>a</sup>	<sup>R</sup> ŋu	ŋo <sup>44</sup>	ngun <sup>31</sup>	ŋwe	ɲō <sup>55</sup>	<sup>H</sup> jũ~ <sup>H</sup> flu	PL *C-ŋw e <sup>1</sup> <sup>29</sup>
‘soldier’	<sup>H</sup> ŋmɛ	<sup>F</sup> mo	mo <sup>32</sup>			--	--	*mak <sup>L</sup> 30
‘pea’	<sup>H</sup> ʃa-ɲno	<sup>LP</sup> ʃe-nu	ʃa <sup>33</sup> -nu <sup>53</sup>	nuq <sup>1</sup> /nuq <sup>5</sup> /ne <sup>1</sup> - ‘bean’		ɲo <sup>53</sup>	<sup>RP</sup> nu-ɲu	*s-nuk <sup>H</sup> ‘bean’

Table 9b. The Ersu-Lizu-Duoxu correspondence pattern “ʔN/N/N”

The forms in Table 9b differ from those in Table 9a not only in that Ersu has glottalized initials; we also note that a few Lisu forms in Table 9b have geminated nasals.<sup>31</sup> Furthermore, comparing the Zaiwa data in Tables 9a and 9b, we note that there is a greater tendency for Zaiwa forms to have a creaky vowel (notated by the letter “v” after the initial) in Table 9b, corresponding to glottalized nasal initials in Ersu (and geminated nasal initials in Lisu). At present, our best explanation for this state of affairs is that Proto-ELD did indeed distinguish \*ʔN from \*N, and that the forms in Table 9b go back to Proto-ELD \*ʔN. As for Table 9a, there are two possibilities. The first is that it too represents forms going back to Proto-ELD \*ʔN, but ongoing loss of Ersu preglottalized nasals and Lisu geminated nasals has obscured this historical origin. The second is that the forms of Table 9a go back to Proto-ELD \*N, and we surmise that Proto-ELD, unlike PLB, inherited an unprefix nasal-onset PTB root form. In the latter case, there would be a meaningful correlation between Zaiwa creakiness and Proto-ELD glottalized nasals, which needs to be further investigated.

<sup>28</sup> This form is from Matisoff (1972:58 #137), who notes that based on Inscriptional Burmese it “should really be reconstructed with medial -l- rather than -y-”. Bradley (1979:354 #636) gives Proto-Loloish \*myo(k)<sup>1/LS</sup>.

<sup>29</sup> This form is from Bradley (1979:332 #401B). There is no PLB or PL cognate listed in Matisoff 1979 or Matisoff 2003.

<sup>30</sup> This form is from Matisoff (2003:35). Bradley (1979:310 #172 has Proto-Loloish \*C-mak<sup>L</sup>.

<sup>31</sup> Preglottalized nasal initials are infrequent in Ersu and they are restricted in distribution to high frequency words. They are in process of disappearing in this language, merging with plain voiced nasals. Our principal Lisu language consultant marginally distinguishes between, according to his own analysis, a relatively shorter nasal initial (transcribed here as simple nasal initial) and a relatively longer nasal initial (transcribed here as geminated initial) in a few minimal pairs, such as /ne<sup>51</sup>/ ‘you, thou’ vs. /ne<sup>51</sup>/ [nne<sup>51</sup>] ‘deep’. This would appear to be the last stage of the imminent loss of geminated nasals in Lisu. A more systematic comparison between words with preglottalized initials in Ersu and their cognates in Lisu will be undertaken in forthcoming fieldwork to see if more geminated nasals can be discovered.

The following observations can be made in relation to the cognate sets in Tables 7-9:

(i) The Ersu-Lizu-Duoxu correspondence pattern in Tables 7 and 8 is closely associated with PLB \*sN clusters and PTB nasal-initial forms that frequently occur in a prefixed variant. It is also associated with numerous Burmese cognates with voiceless nasals. This evidence further strengthens the hypothesis that the pattern derives from a Proto-ELD voiceless nasal. Conversely, the Ersu-Lizu-Duoxu correspondence pattern in Table 9 is associated with PLB and PTB \*ʔN clusters, and it has numerous Burmese cognates with voiced nasals. There are a large number of cognate sets found across all three languages, more than are found between these languages and other languages in the Qiangic and Lolo-Burmese groups.

(ii) In relation to the two reference languages, Pumi and Xumi, we observe three types of differences from the ELD data. The first relates to the overall size of the cognate sets, which are more restricted in both Pumi and Xumi than they are in ELD (as above). The second difference relates to divergent tendencies in the inheritance of either prefixed or unprefixed variants of PTB complex nasals. We have already seen that in many Tibeto-Burman languages voiceless nasals are conditioned by prefixal elements affixed to roots with plain nasal initials. Such elements might be added or lost at various points in the history of the development of one branch or language; prefixed and un-prefixed variants might co-exist in a language, the various daughter languages idiosyncratically inheriting one or the other of the variants.<sup>32</sup> In relation to PTB complex nasal initials, as discussed presently, we observe that Xumi is in greater agreement with ELD in terms of inheritance of prefixed variants, with a clear distinction in the reflexes of both \*sN and \*ʔN clusters. Pumi, on the other hand, represents more complex developments, which appear to cross cut the PTB prefixed sets, as reflected in ELD and Xumi. More precisely, Pumi reflexes corresponding to both voiceless and glottalized nasal initials in ELD combine voiceless nasals, followed by nasalized vowels (e.g. /m̥i<sup>55</sup>ti<sup>53</sup>/ ‘be ripe’, /ŋ̃i<sup>35</sup>/ ‘seven’), voiced nasals (e.g. /me<sup>53</sup>/ ‘bamboo’, /mi<sup>35</sup>/ ‘mushroom’), and voiceless fricatives (e.g. /xo<sup>55</sup>mə<sup>53</sup>/ ‘deep’). The third difference between Pumi, Xumi and ELD cognate sets relates to their respective developments of PTB (and PLB) complex nasal initials. Unlike their development in ELD, \*sN clusters in Xumi have voiced nasal reflexes, whereas \*ʔN clusters have voiceless nasals and nasalized voiceless approximant reflexes (/h̃/). These developments in Xumi appear to be representative of Naish languages at large (as established on the basis of the comparative list of basic vocabulary in Naish languages in Jacques and Michaud 2011). The correspondence patterns also conform

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<sup>32</sup> On variational effects related to PTB prefixes and initials generally, see Matisoff (2003:16-19); for a discussion of nasal initials, see Matisoff (2003:36-40). Variation among \*N, \*sN, and \*ʔN is not uncommon in Tibeto-Burman generally or even Lolo-Burmese specifically, probably reflecting both morphological and phonological processes.

to the observation in Matisoff (2003:40) that “In Naxi (outlier Loloish), PLB \*glottalized nasals become voiceless spirants.” Finally, no unified pattern can be established for Pumi, which we tentatively ascribe to differences from both ELD and Xumi in the inheritance of prefixed and unprefixed forms of PTB complex nasal initials.

We note that Pumi and Xumi forms with voiced nasal initials, corresponding to cognates with voiceless initials in ELD, should not be taken as evidence against the reconstruction of voiceless nasals in Proto-ELD. On the contrary, they further strengthen the hypothesis that these Ersu-Lizu-Duoxu cognate sets derive from nasal-initial roots. Coupled with the high degree of agreement among Ersu, Lizu, and Duoxu as to whether inherited nasal onsets were voiced or voiceless, this strongly suggests that Ersu, Lizu and Duoxu form a closely related phylogenetic unit, on a separate node from both Pumi and Xumi. Put another way, the particular set of vocabulary words manifesting the voiceless nasal correspondence pattern is one shared innovation that can set Ersu, Lizu and Duoxu apart from other languages in the region. We will return to this point in the conclusion.

Let us now turn to a phonetic explanation of the developments of complex nasal initials, as observed in Ersu-Lizu-Duoxu, and Pumi and Xumi languages.

#### **4. Synchronic and diachronic aspects of Proto-ELD \*voiceless nasals**

The arguably best-studied and best-understood type of voiceless nasal in the languages of the world is that of modern Burmese (Ladefoged 1971: 11; Dantsuji 1984, 1986; Bhaskararao and Ladefoged 1991; Ladefoged and Maddieson 1996: 111-116). This type of voiceless nasal is in fact only partially voiceless (e.g. /m̥/ = [m̥m]). More precisely, while Burmese nasals have an open glottis for most of the articulation, they also have some voicing for the period before the stricture is broken. It has been argued that the voiceless part of nasals serves the purpose of distinguishing voiceless nasals from their voiced counterparts, whereas the voiced part provides place-of-articulation cues to distinguish one voiceless nasal from another. It has been confirmed in a study of the phonetic properties of Burmese voiceless nasals by Dantsuji (1984:7) that the spectra of the voiceless portion show no distinction across places of articulation, so that it must be the voiced portion that provides the listener with relevant place-of-articulation information.

This type of voiceless nasal has been assumed to be representative of all distinctive voiceless nasals (cf. Ohala 1975: 296, Ohala and Ohala 1993:232). In a series of publications (e.g. Ohala 1975, 1983, Ohala and Ohala 1993: 232-233), Ohala notes the following properties of such voiceless nasals, which account for their diachronic development.

(1) Auditorily, voiceless nasals are non-optimal as speech sounds. This is the reason why distinctive voiceless nasals are cross-linguistically rare and unstable. The principal point of disturbance of voiceless nasal airflow is at the nostrils, regardless

of where airflow is blocked in the oral cavity. Since it is the location of the constriction producing turbulence that creates the distinctive frequency spectrum of a fricative, all voiceless nasals will produce a nearly identical auditory effect regardless of place of oral articulation.

(2) It is impossible for speakers to significantly narrow the passageways through the nostrils, so the maximum degree of frication is necessarily limited; moreover, there is no resonating cavity beyond the point of constriction. As a result, voiceless nasal sounds are low intensity, making any slight differences in frequency spectrum that might result from the different oral blockage points extremely difficult to hear. The most effective way to allow the hearer to recover the place-of-articulation distinction in voiceless nasals is therefore to voice the latter part of its articulation, hence the canonical partially-voiced realization of voiceless nasals of the Burmese type.

(3) While ordinary voiced nasals function as sonorants, voiceless nasals share a number of phonetic properties with fricatives (Ohala and Ohala 1993:231). This is not because they have a greater degree of constriction on airflow than their voiced counterparts, but because the greater airflow associated with an open larynx (i.e. with non-vibrating vocal cords) creates a greater degree of turbulence, i.e. of frication, even with no change in the degree of constriction at the place of articulation.

(4) In historical terms, the voiceless + voiced (= fricative + sonorant) realization of voiceless nasals like those of Burmese may be understood as a continuation of the same phonetic features found in the \*sN clusters that give rise to them: a sequence of voiceless fricative + voiced sonorant (Ohala and Ohala 1993:232-233).

It has now become clear that this description of the synchronic and diachronic properties of voiceless nasals tells only part of the story. Ongoing descriptive and historical-comparative work on lesser-known TB languages has brought to light the existence of voiceless nasal phonemes that are significantly different from the Burmese type. They include:

- (i) entirely devoiced nasal stops, as recently described for the Xumi language (Chirkova et al. 2013);
- (ii) nasalized voiceless approximants (as attested in a number of TB languages of Sichuan, including Lizu, Xumi, and some Lolo-Burmese and Na languages, see footnote 3).<sup>33</sup>

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<sup>33</sup> Nasalized voiceless approximants in TB languages appear to share many characteristics with contrastive nasalized voiceless approximants in some Southern Bantu languages, such as Kwangali or Yoruba, as described in Ladefoged and Maddieson (1996:132-133).

Both types of segments are devoiced throughout their articulation, a fact confirmed by electroglottographic data. They are therefore even less optimal auditorily than the partially-voiceless nasals of Burmese.

An ongoing instrumental study of these new types of voiceless nasals (Basset et al. ms.), combined with our ELD comparative data analyzed above, allows us to present a complete, phonetically-motivated, plausible pathway of sound changes related to the development of PTB complex nasals to their ultimate reflexes in ELD, Pumi, and Xumi languages. These languages effectively represent synchronic “snapshots” of different stages in the development of \*sN clusters, with the endpoint being a voiceless fricative like /x/. We believe that the sequences of changes making up this pathway are likely universal, and therefore can serve to elucidate the histories of languages elsewhere in the world.

The specific developments seen in Ersu, Lizu and Duoxu can be outlined as follows. Because \*voiceless nasals in ELD ultimately derive from \*sN clusters, it is likely that Proto-ELD \*voiceless nasals were phonetically similar to those in modern Burmese, i.e. realized as voiced in the latter part of their articulation. This is consistent with Ohala’s proposals for the development of this kind of voiceless nasal from earlier clusters. Thus we have the following Proto-ELD segments:

(i) \*/m̥ n̥ ŋ̥/ → [m̥m n̥n ŋ̥ŋ]

Within the development of Lizu and Ersu, we must first posit that the period of voicing in the latter part of the articulation of voiceless nasals became too short to be perceptually useful, or disappeared entirely. Xumi voiceless nasal stops, which are devoiced throughout, are an example of this stage of development (Chirkova et al. 2013). As we can see from phonetic analysis of the Xumi voiceless nasals, at this stage there is barely any information in the acoustic signal indicating the place of articulation of the actual oral closure. Lacking cues to distinguish distinct places of articulation as listeners, speakers would only articulate an underspecified voiceless nasal \*N̥, accompanied by some spread of nasality onto the following vowel, thus:

(ii) \*/m̥ n̥ ŋ̥/ [m̥m n̥n ŋ̥ŋ] + V > \*N̥V

The following stage results from lenition, whereby speakers cease to make any closure during the articulation of the voiceless nasal, since it provides no useful perceptual information. The result is a voiceless nasal approximant /h̥/.

(iii) \*N̥V > h̥V

This is equivalent to a vowel articulated with a whispered or breathed onset, both with nasality. So, for example, /h̥a/ = [ã̃ã].

The changes just described account for the development of Proto-ELD voiceless nasals in Lizu, schematized as follows:

$$\text{Lizu: } *m̥ *n̥ *ŋ̥ > *N̥ > h̥$$

The diachronic development in Ersu is likely to have been identical to that in Lisu but went a step further, resulting in a fricative initial and no nasalization present in the syllable. This development is quite natural if understood in terms of an association between high airflow segments produced with an open larynx (such as approximants with whispery phonation, but also voiceless nasals, Ohala and Ohala 1993:231) and nasality. This association has been observed synchronically and diachronically in many languages (e.g. Ohala 1975, see Ohala & Busà 1995:10-14 and Shosted 2006:16 for an overview). It is hypothesized, and has been supported by phonetic experimentation, that the association is due to the fact that nasals and high-airflow segments (such as [h]) produce acoustically similar effects. The reason for the similarity is that in the production of nasals the nasal cavity is coupled with the oral cavity as a second resonator, while in segments produced with an open glottis the sub-glottal cavity is coupled with the oral cavity as a second resonator. These coupled resonators have similar effects on the sound produced, specifically a lowered amplitude and increased bandwidth of the first formant. This acoustic similarity may also be found on adjacent vowels due to assimilation, i.e. the spread of nasalization or of high airflow to the production of the adjacent edge of vowels.

In the specific case of Ersu, we propose that the primary nasalization of the initial (/h̥/) was reinterpreted as secondary (or “spontaneous”) nasalization resulting from the acoustic similarity between high-airflow segments and nasalization. As a result, listeners reinterpreted the nasalization as an unintentional effect, and ceased to produce it.

The stages of development of Proto-ELD voiceless nasals into Ersu can therefore be schematized as follows:

$$\text{Ersu: } *m̥ *n̥ *ŋ̥ > *N̥ > h̥ > x$$

In Duoxu, however, an entirely difference process occurred. The voiced portion of the Proto-ELD voiceless nasals came to occupy a greater proportion of the consonant’s duration. There are two possible explanations for this. An internal motivation would be a hyper-articulated mechanism by which speakers sought to maintain distinctive pronunciations for the three places of articulation.<sup>34</sup> An external force would be the

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<sup>34</sup> The development of voiced nasal reflexes from original \*sN clusters can be observed in the Lǐtáng (理塘) variety of Kham Tibetan (Basset et al. ms.). (Overall, symmetrical pairs of voiced and voiceless nasals at four places of articulation are a characteristic feature of Kham Tibetan dialects, e.g. Gésāng and Gésāng 2002: 74.) An instrumental investigation of modern reflexes of Written Tibetan sN initial clusters in Lǐtáng Tibetan suggests that the development may have proceeded in the following fashion: (i) lenition of s to h in the original sN clusters, (ii) voicing of the lenited element to fi, (iii) loss of fi.

contact influence of Southwest Mandarin, which does not contain voiceless nasals.<sup>35</sup> Regardless of the trigger for the change, the result was that the voiceless nasals became fully voiced, merging with their voiced nasal counterparts. The development in Duoxu can therefore be schematized as follows:

Duoxu:  $*m̥ *n̥ *ŋ̥ > m n ŋ$

Taken together, these developments neatly explain the correspondence patterns seen in Tables 1-2.

The developments in Xumi are similar to that in Lizu, but they appear to originate from a different type of complex nasal initial ( $*ʔN$ ). This language is particularly illuminating for observation of the consecutive stages of nasal devoicing, because it combines, among modern reflexes of  $*ʔN$  clusters, entirely devoiced nasal stops (as in  $/^{RP}m̥jɛ-tsũ/$  ‘tail’, cf. PLB  $*ʔ-mri^2$ ) and nasalized voiceless approximants (as in  $/^{RP}m̥jɛ-ħɔ/$  ‘deep’, cf. PLB  $*ʔnak$ ). Parallel to the retention of glottalized nasal initials on some high frequency words in Ersu, it is likely that devoiced nasal stops were preserved longer in Xumi in high frequency items, whereas the remaining lexicon underwent the change from  $N̥$  to  $ħ$ . The developmental stages of voiceless nasals in Xumi can be summarized as follows:

Xumi:  $*m̥ *n̥ *ŋ̥ > *N̥ > ħ$

These developments in Xumi appear to be representative for Naish languages at large, where voiceless nasals have been posited at a proto-stage to account for correspondences between voiceless nasal approximants and voiceless oral fricatives (Jacques and Michaud 2011:491-492; Michaud et al. 2012:209).<sup>36</sup>

The developments related to the devoicing of complex nasal initials allow us to recognize such complex initials for some cognate forms in Pumi. More specifically, forms with voiceless initials and voiceless fricatives in Table 7-8 (such as ‘be ripe’, ‘heart’, ‘nose’, ‘seven’) are likely to derive from fricative-nasal clusters.

From a broader perspective, published descriptions of diachronic change and synchronic variation in unrelated languages appear to suggest similar developments, and in turn support the universality of the mechanisms posited here. Among the examples that can be cited are Iu-Mien, a Hmong-Mien language. Bruhn (2007:4-5) notes that younger speakers are merging, or have merged,  $/n̥/$  and  $/h/$ . Another

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We note the final step of the development may have phonetic motivation and be due to a general tendency for voicing to disfavor frication (Ohala and Solé 2010: 63).

<sup>35</sup> The replacement of “marked” Duoxu pronunciations by “unmarked” Mandarin equivalents is a documented pattern that has been ongoing for several hundred years. A parallel example in this language is the replacement of voiceless lateral fricative with ordinary  $/l/$  (Chirkova 2014).

<sup>36</sup> Jacques and Michaud (2011: 491-492) also reconstruct a Proto-Naish voiceless lateral  $*ɺ$ , which merges with  $*n̥$  in Naxi but develops distinctly in the other two Naish languages Na and Laze.



example is Sui, a Tai-Kadai language. Luo (forthcoming) notes that the Sandong variety of Sui has a full set of voiceless nasal onsets /ṁ ṇ ṁ ṇ/. In the closely-related Pandong variety, these have developed into “voiceless glides and a non-segmental feature of nasalization on the following vowel,” as in Sandong /ṁa<sup>1</sup>/, Pandong /hwã<sup>1</sup>/ ‘dog’.

We have already mentioned above that Michaud et al. (2012:207-209) have argued that vocalic nasality in Naish arises from \*CNV syllables, involving a transfer of nasality from the onset to the vowel. However, as the examples listed show, this changes takes place only for a limited set of \*C consonants. They surmise that the \*CN- onsets that led to vowel nasalization all went through a /\*sN-/ stage. This is consistent with our hypothesis that the development of voiceless nasal approximants, with spread of nasality to the vowel, results specifically from articulatory features of voiceless nasals.

## 5. Conclusion

Hypothesizing a close relationship among the three languages Ersu, Lizu, and Duoxu (the “ELD” node), comparison of regular sound correspondences leads to the reconstruction of a series of voiceless nasals \*ṁ \*ṇ \*ṁ in their common ancestor, Proto-ELD. This reconstruction is supported by several different types of converging evidence. One type of evidence is external comparisons with Loloish, Burmish, and Qiangic languages, as well as established Proto-Loloish, Proto-Lolo-Burmese, and Proto-Tibeto-Burman reconstructions; these all show that the ELD correspondence pattern correlates highly with various kinds of nasals within Tibeto-Burman, most notably with \*sN clusters known to develop into voiceless nasals in some TB languages. The second type of evidence concerns the phonetic properties of the corresponding sounds in Ersu, Lizu, and Duoxu, namely voiceless fricatives in Ersu and Lizu, and voiced nasals in Duoxu. General research on the acoustic and articulatory phonetics of these types of sounds provides support for the sound changes that are implied by the reconstruction of voiceless nasals.

Obviously, a single phonological criterion, coupled with a significant overlap of lexicon, is not a sufficient basis on which to base genetic classification. The voiceless nasal pattern in ELD is highly suggestive, but it will need to be correlated with additional shared innovations before the close ELD relationship can be fully confirmed. The development of fricativized high vowels and glides looks like it may be just such a shared innovation, and is the subject of an upcoming study (Chirkova and Handel 2013).

The developments of complex nasal initials in ELD, Pumi, and Xumi languages also shed light on the complex phylogenetic relationships between lesser-known languages of Sichuan, currently labeled Qiangic.

If a greater degree of manner agreement in nasal-initial cognates between languages is taken to reflect a close historical relationship, implying a recent split from a common ancestor, then we may conclude that the ELD cluster has a closer relationship with Lolo-Burmese languages (and especially with Burmese) than with either of its alleged Qiangic sister languages examined in this study, Pumi and Xumi. This finding corroborates earlier suggestions, based on unrelated types of evidence, in Nishida (1973, 1976), Chirkova (2012), and Yu (2012:214-218) of a close relationship between ELD and Lolo-Burmese languages and warrants further investigation in that direction.

Xumi (which can here be taken as representative of Naish languages) also evidences a close relationship to Lolo-Burmese languages in terms of correspondence sets, thus conforming to the general understanding of a close relationship between Lolo-Burmese, Naish, and Qiangic languages (e.g. Bradley 1975, Bradley 1997:37, Sūn 2001b). However, in terms of developments of complex nasal initials, it represents a distinct type, both from the ELD languages and from Lolo-Burmese languages, as summarized in Table 6. Finally, Pumi evidences differences from ELD and Xumi both in its lexicon and phonological developments.

From a broader perspective, by combining comparative analysis with phonetic analysis, our study provides further insights into the synchronic and diachronic aspects of voiceless nasals, a type of sound that remains somewhat poorly described and poorly understood due to its relative rarity in languages of the world. Our data allows us to present a detailed overview of the consecutive stages of nasal devoicing, from nasal clusters to voiceless nasals to nasalized approximants to non-nasal fricatives. Although individual sound changes within this sequence are widely known (within different subgroups of TB as well as in other language families, such as Tai-Kadai or Hmong-Mien), relevant phonetic mechanisms and constraints have so far only been detailed in relation to semi-voiced nasals in Burmese (the only type of voiceless nasals which has been researched in some detail). The pathway of devoicing outlined on the basis of our data has potential applicability for diachronic analysis of languages around the world.

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