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The addition of syllable-final stops in Ganan

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Abstract

This paper discusses a secondary addition of syllable-final glottal stops in Ganan (Sino-Tibetan > Sal > Jingpho-Luish). In particular, it deals with the phenomenon where words ending with *i* or *u* in Luish languages Cak and Kadu have an additional glottal stop in Ganan. This study found that words ending with *i* or *u* can be reconstructed as either *i or *iy or *u or *uw respectively, and the secondary glottal stop is added in Ganan when the reconstructed form is *iy or *uw and does not have a high tone.

Keywords: Ganan; Kadu; Luish languages; Tibeto-Burman languages; Historical linguistics; High vowel

1. Introduction

1.1 Objectives

This paper reports a phenomenon found in Ganan (ISO 639-3 zkn), a Luish language of Tibeto-Burman (TB), which adds a syllable-final glottal stop unseen in other Luish languages, and discusses its historical development.

1.2 Ganan and the Luish languages

Ganan is a Luish language of Tibeto-Burman. The Luish languages include Cak (ISO 639-3 ckh) spoken in the Chittagong Hill Tracts in Bangladesh, Sak in tRakhine State in Burma, Chakpa in the Imphal basin in India, Kadu (ISO 639-3 zkd) in Sagaing Region of Burma, Ganan, etc.

   Of these languages, Cak and Sak are almost identical as they are mutually intelligible insofar as native words are concerned. However, this is not always the case due to the large number of loanwords in Sak that originate from Burmese and its Arakanese dialect, as well as those from Bangla in Cak. Linguistic studies of Cak have been published by Huziwara (2008) (a grammatical description), and Huziwara (2016b) (a dictionary). Additionally, Löffler (1964) dealt with Cak's relationship to the Chakma language, Bernot (1966) reported several hundred basic words, and Maggard et al. (2007) compared four dialects. As for Sak, Thun Shwe Khaing (1988) provides an ethnography with a simple grammatical sketch and a list of basic vocabulary, and Moe Sandar (2010) presents a descriptive grammar of Sak. Luce (1985 vol. II, Chart K, L) has a few hundred basic words from two dialects, Bawtala and Dodem.

Chakpa is already a dead language in terms of its daily use, and is only occasionally used in rituals. For linguistic resources on Chakpa, in addition to McCulloch (1859), which contains 423 words from the Andro and Sengmai dialects recorded in the mid-nineteenth century,[1] the language is sometimes mentioned in ethnographies on the Chakpa people (Rorendrajit 2006; Basanta 2008).

Kadu is further divided into subclasses of Setto Kadu (STK), Moteik Kadu (MTK), Molang Kadu (MLK), Mokhwang Kadu (MWK), of which STK, MTK, and MLK are similar varieties and, although each has unique characteristics, are mutually intelligible. Nevertheless, MTK is not used daily anymore and is hardly passed down to the next generation. STK and MLK, similarly, have only a few villages passing down the varieties. MWK, as mentioned in Huziwara (2015), has distinct characteristics from other Kadu varieties, and is relatively close to Ganan concerning linguistic features. However, MWK is mutually intelligible with neither Ganan nor other Kadu varieties. For studies on Kadu, Sangdong (2012) is the most detailed research with texts and a vocabulary list, and Khin Moe Moe (2004) and Huziwara (2013) deal with the phonetics of Kadu. Other than these, Brown (1920) is one of the primary studies of Kadu, and Luce (1985, vol. II, Chart K, L) contains some 300 words of MLK.

Compared to Kadu, Ganan has less dialectal difference, and speakers of Ganan varieties do not have difficulty in understanding each other. The addition of a syllable-final glottal stop discussed in this paper is found in all Ganan varieties, based on the author's data. Previous works on Ganan are Ma Myo Myo (2006), which described the grammar of the Nanzar dialect, and Huziwara (2012a) on the phonology of the Shwegyaung dialect. Luce (1985, Vol. II, Chart K, L) lists some 300 Ganan words.[2] This paper treats the Shwegyaung dialect as representative of Ganan, taking into consideration the amount of data owned by the author.

1.3 Data and abbreviations

Below is a list of the sources of data and the abbreviations used in this paper. Data is taken from STEDT unless otherwise noted.

*A	A is a reconstructed form
(A/B)	A and B are allomorphs
{A}	A is a spelled form
A	Andro, taken from McCulloch (1859).
ANDV	andative marker
C	Cak, taken from primary sources collected by the author.
CKP	Chakpa
CL	classifier
CMPL	completive marker
G	Ganan, taken from primary sources collected by the author.
H	prefix having a high tone in Proto-Luish
J	Jingpho
K	Kadu, in particular the Takotta dialect of STK unless specified; from primary sources collected by the author
Lui	Luish
MT	Moteik Kadu

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[1] Luce (1985, vol. II, Chart K, L) also lists Chakpa words, though they are all taken from McCulloch (1859).

[2] Although it is unknown which dialect the work is based on, it is possibly the Nanzar dialect spoken in the prominent habitat of Ganans.

NUM	numeral
OB	Old Burmese (taken from Nishi [1999])
PLu	Proto-Luish (taken from Huziwara [2012b], [2014], [2016b])
PKG	Proto-Kadu-Ganan
PRED	predicate marker
PTB	Proto-Tibeto-Burman, taken mainly from STEDT
S	Sak
Se	Sengmai (taken from McCulloch [1859])
STEDT	Sino-Tibetan Etymological Dictionary and Thesaurus
TB	Tibeto-Burman
WB	Written Burmese, based on the transcription rules by Duroiselle ([1916])
WT	Written Tibetan (Wylie transliteration system)

1.4 Notes on transcription

The primary source used by the author is written in simplified phonological transcription. For Kadu and Ganan, readers should pay heed to the points in (1):

(1)   a. Tones: ´ stands for a high tone (H), ` for a low tone (L), ^ for a falling tone (F). No tonal symbols are attached to unmarked mid tone (M).

        b. The low tone in Kadu and Ganan developed as a result of a tonal change of a mid tone that had followed a high tone. Words starting with a low tone show that they used to have a prefix with a high tone.

        c. The falling tone in Kadu developed as a result of a tonal change of HM or ML, and regularly occurs as MF.

2. Subclasses of the Luish languages and Ganan

Before discussing the epenthesis of the syllable-final glottal stop in Ganan, I shall note how Luish languages are treated in the Tibeto-Burman language group, and how Ganan is treated in the Luish languages. Matisoff ([2013]) claims the Jingpho-Asakian languages as a subgroup of Tibeto-Burman languages, where Asakian languages have traditionally been called Luish languages. The fact that the Luish languages belong to the Tibeto-Burman language group is evident from the comparison of their basic vocabulary, as exemplified in (2).

(2)   a. "I" WT nga, WB ngaa; PLu *ŋa; C ŋa, K ŋa, G ŋa; J ŋai[33];

        b. "pig" WT phag, WB wak; PLu *wak; C vaʔ, K waʔ, G waʔ; J waʔ[31].

The Luish languages are classed under the Sal group (Burling [1983]) as evidenced by the following special diagnostic lexicons (cited from Huziwara [2020]: 46, with some modifications), which in turn is based on Benedict ([1972]: 7, 34 fn. 108) except for Luish data).

(3)   "sun" PLu *ca-mík, C cəmíʔ, S səmíʔ, K/G səmíʔ, A/Se chameet (camit); Chairel sal; Taman pupek cf. J dźān; Namsang (Northern Naga) san, Moshang (Northern Naga) sár; Garo sal.

(4)   "fire" PLu *wal, C/S vaiN, K/G wan, A/Se wal; Chairel phal; Taman vè cf. J ʔwàn; Namsang (Northern Naga) van, Moshang (Northern Naga) var; Garo waʔl.

(5)   "foot" vs. "hand/arm"
    PLu *ta vs. *tak-, C ʔáta vs. taʔmiŋ "nail", K/G ta vs. taʔmiŋ "nail", A/Se ta- vs. tak-meng "nail"; Chairel la vs. lak; Taman — vs. la < *lak; cf. Garo dzá vs. dzák, Dimasa ya

vs. yau; Tableng ya vs. yak, Tamlu la vs. lak, Banpara tśia vs. tśak, Namsang da vs. dak, Moshang ya vs. yak.

Distinctive characteristics that separate the Luish languages from other Tibeto-Burman languages including Jingpho are: (a) the order of affixes "CL-one", while "NUM-CL" from two onward;[3] (b) a set of directional auxiliary verbs; and (c) a negative prefix a-. Examples of these features are shown in (6).

(6)   a. Order of a classifier and "one" CL-NUM
           WT No classifier, WB NUM-CL
           J CL-NUM; however, the classifier is rarely used. Lui CL- "one"; for other numbers NUM-CL.
           "CL: man-one" C hú-wa, MT/G hɔ̀-wa
           "two-CL: man" C níŋ-hú, MT kleiŋ-hú, G kɛ-hɔ́;
    b. Having an andative auxiliary verb (ANDV) *-a and a completive auxiliary verb (CMPL) *-aŋ
           WT, WB, J. No such auxiliary verbs
           "drink-ANDV=PRED" C ʔu-wa=heʔ, MT/G ʔu-wa=ma
           "drink-CMPL=PRED" C ʔu-waŋ=heʔ, MT/G ʔu-waŋ=ma;
    c. Negative prefix form; WT ma, WB ma, J ń- "negative prefix-" PLu *á-;[4] C ʔá/ʔa-, K ʔə-, G ʔə-, A/Se a-.

The Luish languages are divided into Cak and Chakpa-Kadu depending on the innovations they have undergone shown in (7)–(10), namely (A) PLu *ti > kyi;[5] (B) deletion of PLu *r; (C) PLu *khy > ʃ; (D) marked linker for borrowed verbs.

(7)   a. "sweet" PLu *ti; C kyi,[6] K ti, G ti; A/Se tī; J tui³¹;
    b. "egg" PLu *ti; C ʔákyi, K təti, G titti; J ti³¹;
    c. "penis" PLu *tí; C ʔakyí, K tí, G tí.
(8)   a. "thick" PLu *rᴴ-thay; C rəthe, K tʰɛ̀ ~ ʔətʰɛ̀, G tʰɛ̀; A/Se the; J that³¹;
    b. "cord" PLu *ri; C rɨ, K ʔi, G ʔi; J ʒi³¹;
    c. "buffalo" PLu *k-réy;[7] C krɨ́, K cɛ́, G cé; A/Se ké; J wǎ³³loi³³;
    d. "crab" PLu *a/n-har < *a/n-khar; C nəhaiŋ, K ʔəha, G ʔəha; A aha, Se niha; J tʃã̃⁵⁵khan⁵¹.
(9) "red" PLu *khyá; C ʃá, K há, G há; A/Se ha; J khje³³.
(10) "loan verb marker"[8] PLu *-(t/l)ó; C —, K -tɔ́, G -lɔ́; A/Se -to.

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[3] This characteristic might be a result of language contact with the Tai languages.

[4] Negative prefix a- is reported in some Tamangic and the Lolo-Burmese languages, as well as in OB 'a- (Yabu 2004: 75). Besides, the author's fieldwork found the form ʔə- also in Taman, reportedly related to the Luish languages (Huziwara 2016a). The Luish languages are characteristic in the fact that they all share the common form of the negative prefix.

[5] The Naikhyongchari dialect of Cak, spoken in the area bordered with Burma, has the corresponding form cyi, and Sak in the Burmese territory has ci.

[6] Although this may be cognate with PTB *kyəw (STEDT #2380), it is reasonable to assume PLu *ti by analogy from "egg" and "penis".

[7] Proto-Tai *grwaay < Siamese khwaay (GSTC #75), a regional word in Mainland Southeast Asia according to Matisoff (1985: 33).

[8] Some Tibeto-Burman languages in Nepal are known to have particles exclusively used for loan verbs. In Kiranti languages, Jero -ʌi (Opgenort 2005: 186–7), Wambule Rai -ʌi (Opgenort 2004: 361–2; 2019: 751), Yakkha -a (Schackow 2015: 265–7), and Belhare -ap (Bickel 2019: 710) are probably Nepali loans, while in Tamangic languages, Gurung -di (Glover et al. 1977: 27) and Manange ²ti (Hildebrandt 2007: 296) are of unknown origin. None of these, however, seems to be cognate with Luish ones.

The linguistic innovations dividing Chakpa, Kadu, and Ganan are: (A) PLu *-l > -n; (B) development of an infix -l-;[9] and (C) change from the two-tone system to the three-tone system.[10] Examples are shown in (11) and (12):

(11) a. "fire" PLu *wan < *wal; C vaiŋ, K wan, G wan; A/Se wal; J wan[31];
     b. "tree" PLu *phón < *phól; C (ʔapʰáŋ, púŋpʰáŋ), K pʰouŋklon, pʰón "firewood", G pʰɔ́ntòn; A phol; J phun[55].
(12) a. "fat" PLu *sáw; C ʔasá, K sʰəlɔ́, G sʰəlɔ́; A/Se sa; J sau[55].
     b. "leaf" PLu *tap; C ʔátaʔ, K təlap ∼ tətap; G təlap; A/Se tatup (tatap); J lap[31].

3. Point at issue

The issue discussed in this paper is the phenomenon in which Ganan occasionally has an additional glottal stop consonant in a position where other Luish languages do not. This point is prominent evidence for dividing Ganan and Kadu.

(13) a. "bamboo shoot" G kəmiʔ; K kəmi, C kəmɯkaiŋ;
     b. "bone" G maŋkuʔ; K maʔku, C (ʔáməra);
     c. "cat" G hánsìʔ; K hançî, C háiŋ; Se huljeek (haljik);
     d. "comb (v)" G sʰiʔ; K çi, C sɨ;
     e. "correct" G hiʔ; K cʰi, C heʔ, huʔ "copula";
     f. "elbow" G táʔsʰùʔ; K taʔkəsʰû, C (táiŋdoŋ);
     g. "faeces" G hiʔ; K cʰi, C ʃi;
     h. "horse" G sʰəpùʔ; K sʰəpù, S sapú (Hodgson 1853: 5); A/Se shoorook (shuruk);
     i. "medicine" G sʰiʔ; K çi, C sɨ;
     j. "porcupine" G kətùʔ; K kətù, C (phaiŋ); A/Se kootook (kutuk);
     k. "rat" G cùʔ; K kəyù, C kəyvu; A/Se kooyook (kuyuk);
     l. "smoke" G wann̩uʔ; K (wansʰuŋ), C vaiŋhvu; A walkhoo (walkhu), Se walhoo (walhu);
     m. "steal" G kuʔ; K ku, C kvu; A/Se kook (kuk);
     n. "vine" G yəluʔ; K yəlu, C (ʔárəkuʔ); A loohook (luhuk);
     o. "wall of a house" G címkùʔ; K cémkù, C kíŋhvu.

From the examples in (13), we find that Ganan has a glottal stop after i (13a, c, d, e, g, i) and u (13b, f, h, j, k, l, m, n, o), whereas Kadu and Cak do not. Based on this point, Hypothesis 1 (14) is established.

(14) **Hypothesis 1**. When a syllable has i or u at the syllable-final position in the Luish languages (e.g. Kadu and Cak), its corresponding form in Ganan has an additional glottal stop to it.

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[9] Infixes reported in the Tibeto-Burman languages are the secondary infix *y* deriving a transitive verb from an intransitive in Lepcha (Benedict 1943; Plaisier 2007: 50–51) and Tibetan *y used for honorific expressions (Gong 1977; Hill 2019: 14–15). However, in Kadu and Ganan, the chief function of the infix is nominalization. Among their surrounding languages, the Austroasiatic languages commonly have such an infix, particularly *-n- traced back to the Proto-Austroasiatic language (Sidwell and Rau 2014: 235).

[10] Strictly speaking, one can never tell the tonal system of Chakpa, since it is extinct; however, it is conjectured that it was a two-tonal language from the fact that (A) the Proto-Luish language was probably two-tonal and that (B) minimal pairs are observed for two tones in the ritual usage of Chakpa.

Nevertheless, there are many cases with no glottal stop after i or u, as shown in (15) and (16).[11]

(15) a. "barking deer" G ŋəhí; K ʔəcʰí, C ʔiʃí;
      b. "buy" G mí; K mí, C mərɨ́;
      c. "come" G li; K li, C (vaiŋ)
      d. "cord" G ʔi; K ʔi, C rɨ;
      e. "die" G sʰí; K çí, C sɨ́;
      f. "dog" G ci; K ci, C kvu;
      g. "egg" G titti; K təti, C ʔákyi, S wa-tí (Hodgson 1853: 8);
      h. "elephant" G ʔəcí; K ʔəcí, C ʔukvú ~ wvukvú;
      i. "four" G pí; K pí, C prɨ́;
      j. "fruit" G sʰiʔsʰi; K çəçi, C ʔásɨ;
      k. "give" G ʔi; K ʔi, C ʔi;
      l. "let out (fart)" G pʰí; K pʰí, C pʰí;
      m. "penis" G tí; K tí, C ʔakyí;
      n. "smooth" G pit; K pi, C prɨ;
      o. "sour" G hí; K cʰí, C hrɨ́;
      p. "sweet" G ti; K ti, C; kyi;
      q. "wash (clothes)" G hi; K cʰi, C hrɨ;
      r. "woman" G ʔínáʔsʰa "girl"; K ʔiçî, C ʔísa "old lady";
      s. "younger brother" G nəsʰì; K nəçì, C ʔanési.

(16) a. "bathe" G kú; K kú, C krvú;
      b. "burn" G hu; K hu, C hru;
      c. "burn/roast" G su; K su, C cu;
      d. "cut(vi)" G tu; K tu, C tvu;
      e. "emerge" G pu; K pu, C pru;
      f. "dig" G tʰu; K tʰu, C tʰu;
      g. "drink" G ʔu; K ʔu, C ʔu;
      h. "fishy" G sʰú; K sʰú, C svú;
      i. "fowl" G ʔu; K ʔu, C ʔu;
      j. "get" G lu; K lu, C lu;
      k. "grind/pound" G tʰu; K tʰu, C tʰvu ~ tʰu;
      l. "open (umbrella)" G pʰú; K pʰú, C ʔahvú;
      m. "mushroom" G kúʔmú; K kəmú, C kəmúkaiŋ;
      n. "rot" G mú; K kəpú, C ɓú;
      o. "seed" G tuttu; K tətu, C ʔátvu;
      p. "snake" G kəpʰú; K kəpʰú, C kəhvú;
      q. "watch" G yu; K yu, C yu.

However, there are cases where both Ganan and Kadu have a glottal stop after i and u, as exemplified in (17).

(17) a. "mosquito" G pəsíʔ; K pəsíʔsáuʔ, C pəcíʔ;
      b. "sun" G səmíʔ; K səmíʔ, C cəmíʔ;
      c. "belly" G púʔ; K púʔ, C ʔapíʔ.

Therefore, it is far-fetched to conclude that a lexical form ending with i or u in the Luish languages unconditionally corresponds to a form with an additional glottal stop in Ganan.

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[11] In Cak, i is realized as ɨ after r/s/c/j.

Huziwara ([2012b](), [2014]()) then assumed that a glottal stop in Ganan enumerated in (13) is a derived form originating from the Proto-Luish language, and proposed a reconstructed form *-k as in (18). Below are instances with a reconstructed PLu form.

(18) a. "bamboo shoot" PLu *k-muy-k;
    b. "comb (v)" PLu *si-k;
    c. "faeces" PLu *khyi-k;
    d. "horse" PLu *s^{H}-pu-k;
    e. "medicine" PLu *si-k;
    f. "rat" PLu *k^{H}-yuw-k;
    g. "smoke" PLu *wán-huw-k < *wál-khuw-k;
    h. "steal" PLu *kuw-k;
    i. "wall of a house" PLu *kím-(k/kh)uw-k.

However, the reconstructed form *-k is unnecessary if the syllable-final glottal stop in Ganan in (13) is predictable. This paper now goes on to discuss whether or not the secondary addition of the syllable-final stop in Ganan can be predicted.

4. Rhyme reconsidered

Supposing that the addition of syllable-final stops in Ganan is predictable, what conditions are at work?

To discuss this, it is helpful to look into similar phenomena found in neighbouring languages.[12] Burling ([1966]()) reported a phenomenon where a stop consonant is secondarily inserted in Maru,[13] one of the Burmish languages.[14] According to Burling ([1966]()), for words ending with i or u in Atsi,[15] which belongs to the same language group as Maru, their corresponding form in Maru is it or uk when they correspond to {e} or {ui} in WB.[16] A list of examples is given in (19):[17]

(19) a. "die" WB {se}, Atsi šî, Maru šit;
    b. "parrot" WB {kye:}, Atsi jì, Maru jìt;
    c. "in front" WB {hre.}, Atsi hǐ, Maru ɣ^{ʔ}ít;
    d. "horn" WB {khyui}, Atsi khyúi, Maru khyùk;

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[12] Similar phenomena are seen in languages other than Maru which is dealt with in this paper. According to Mortensen ([2004](), [2012]()), in Huishu of the Tangkhulic languages of TB, k is almost always added after *i or *u in the Proto-Tangkhulic language. Also, Sawada ([2017]()) mentions that in Gyannoʔ, a variety of Lhaovo (Maru), the sporadic addition of a stop is reported in vocabulary corresponding to {e} and {ui} of WB, and that in Lashi, which belongs to the same language group as Lhaovo, a stop consonant is added in the similar conditions with almost no exception. (Bradley ([1979](): 84) writes that this phenomenon in Lashi is reported by Benedict. However, I could not find the source.) Burling ([1966]()) and Sawada ([2017]()) are based on fieldwork in Burma, and syllable-final stop consonants in Maru are either it or uk. In contrast, Nishi ([1999](): Appendix 4), from Chinese sources, reports that the Maru syllable-final stop is only k and that there is no syllable-final stop in Lashi. This might be an areal feature, as it is a phenomenon only observed in TB languages from Northeast India to Northern Burma.

[13] Maru is an exonym. The autonym is Lhaovo, and it has begun to be a trend among researchers to refer to the language as Lhaovo.

[14] This phenomenon itself in Maru was, according to Lyovin ([1968]()), reported by Karlgren ([1931](): 56) for the first time, and later also pointed out by Benedict ([1948](): 204). The contribution of Burling ([1966]()) was that he precisely determined the conditions of the occurrence and listed a larger number of examples of such words.

[15] Atsi is an exonym. The autonym is Zaiwa, and it has begun to be a trend among researchers to refer to the language as Zaiwa.

[16] Burling ([1966]()) lists the word forms in spoken Burmese, but in this paper they are unified into WB.

[17] Both {e} and {ui} in WB are reconstructed by Benedict ([1972](): particularly 59–61) as PTB *iy and *uw, respectively, based on their OB forms. Matisoff ([2003](): particularly 178–97) reconstructs *əy and *əw, respectively.

    e. "steal" WB {khui:}, Atzi kháu, Maru khúk;
    f. "breast" WB {nui.}, Atzi nàu, Maru núk.

In Maru, there are words ending with i or u as well, and they by-and-large correspond to WB {ii} or {uu}. Below (20) shows examples from Sawada (2017):

(20)   a. "fire" WB {mii:}, Zaiwa mi^{21}, Lhaovo mji^L;
       b. "to be white" WB {phruu}, Zaiwa phyu^{41}, Lhaovo p^{h}ju^F.

Below, (21) is a list of Ganan word forms shown in (13), together with corresponding Burmese forms.

(21)   a. "faeces" G hiʔ; K c^{h}i; WB {khye:}, OB {khliy};
       b. "medicine" G s^{h}iʔ; K cɪ, C sɨ; WB {che:};
       c. "smoke" G wannu̜ʔ; K (wans^{h}uŋ), C vaiŋhvu; WB {khui:}.

From the examples in (21), all word forms correspond to either {e} or {ui} in WB, which can be reconstructed as *iy or *uiw respectively (Hill 2019). As such, I shall modify Hypothesis 1 in (14) as (22).

(22) **Hypothesis 2**. Forms corresponding to {e} or {ui} in Burmese (*iy or *uiw in the proto-language) correspond with a form with an additional syllable-final glottal stop in Ganan.

That said, as we will see in (23), there are some cases where cognate Burmese forms have {e} or {ui} even though their corresponding Ganan forms have no glottal stop. For this reason, Hypothesis 2 in (22) still seems incorrect.

(23)   a. "barking deer" G ŋəhí; WB {khye}, {gyii} (Judson 1893);
       b. "die" G s^{h}í; WB {se}, OB {siy};
       c. "four" G pí; WB {le:} PTB b-ləy;
       d. "mushroom" G kúʔmú; WB {hmui};
       e. "dog" G ci; WB {khwe:}, OB {khuy};
       f. "snake" G kəp^{h}ú; WB {pui:} "insect";
       g. "bathe" G kú; WB {khyui:}, OB {khluiw}.

From the words listed in (23), we see that all the Ganan word forms but (23e) have a high tone, while the Ganan forms with a syllable-final glottal stop in (13) have a mid or low tone. Therefore, Hypothesis 2 in (22) is revised as (24):

(24) **Hypothesis 3**. For word forms with {e} or {ui} in Written Burmese, the corresponding word forms in Ganan have an additional syllable-final glottal stop when they do not have a high tone in Ganan.[18]

Huziwara (2012b, 2014) reconstructed PLu *i and *uw for PTB *əy and *əw, namely {e} and {ui} in Written Burmese, and for words with a syllable-final stop in Ganan they assumed PLu *i-k and *uw-k, respectively. Given (24), however, it is possible to predict the addition of the syllable-final stop in Ganan by supposing, for example, *iy and *uw to PLu.

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[18] (20e) "dog" is a counter-example against this hypothesis. However, this might be an exception because it corresponds to OB -uy.

Thus, the PLu or PKG forms of the word samples in (13) can be reconstructed as (25). PLu is reconstructed if a Cak word is cognate with either Kadu or Ganan, and PKG if only Kadu and Ganan are cognate.

(25) a. "bamboo shoot" G kəmiʔ; K kəmi, C kəmukaiŋ; PLu *k-muy;[19]
      b. "bone" G maŋkuʔ; K maʔku, C (ʔáməra); PKG *má(k/ŋ)-kuw;
      c. "cat" G hánsìʔ; K hançî, C háiŋ; PLu *hán-(c/s)iy < *hál-(c/s)iy;[20]
      d. "comb (v)" G sʰiʔ; K çi, C sɨ; PLu *siy;
      e. "correct" G hiʔ; K cʰi, C (heʔ, huʔ) "copula"; PKG *khyiy;
      f. "elbow" G táʔshùʔ; K taʔkəshû, C (táiŋdoŋ); PKG *ták-suw;
      g. "faeces" G hiʔ; K cʰi, C ʃi; PLu *khyiy;
      h. "horse" G sʰəpùʔ; K sʰəpù, S sapú (Hodgson 1853: 5); PLu *sᴴ-puw;
      i. "medicine" G sʰiʔ; K çi, C sɨ; PLu *siy;
      j. "porcupine" G kətùʔ; K kətù, C pədvu; PLu *kᴴ-tuw;
      k. "rat" G cùʔ; K kəyù, C kəyvu; PLu *kᴴ-yuw;
      l. "smoke" G wanṇuʔ; K (wansʰuŋ), C vaiŋhvu; PLu *wán-khuw;
      m. "steal" G kuʔ; K ku, C kvu; PLu *kuw;
      n. "vine" G yəluʔ; K yəlu, C (ʔárəkuʔ); PKG *yəluw[21] < *yuw;
      o. "wall of a house" G címkùʔ; K cémkù, C kíŋhvu; PLu *kím-(k/kh)uw.

5. Similar phenomena in related languages

Taman,[22] reportedly closely related to Luish languages, including Chakpa, has phonological phenomena similar to Ganan.

In Chakpa (Andro and Sengmai), a stop consonant is found in cognate words ending with a secondary glottal stop in Ganan, as shown in (26).

(26) a. "cat" G hánsìʔ; K hançî, C háiŋ; Se huljeek (haljik);
      b. "medicine" G sʰiʔ; K çi, C sɨ; A/Se seek (sik) "tobacco";
      c. "porcupine" G kətùʔ; K kətù, C (phaiŋ); A/Se kootook (kutuk);
      d. "rat" G cùʔ; K kəyù, C kəyvu; A/Se kooyook (kuyuk);
      e. "steal" G kuʔ; K ku, C kvu; A/Se kook (kuk);
      f. "vine" G yəluʔ; K yəlu, C (ʔárəkuʔ); A loohook (luhuk).

Occasionally, however, Chakpa has words without an additional stop where its Ganan counterpart does have it, as in (27):

(27) "smoke" G wanṇuʔ; K (wansʰuŋ), C vaiŋhvu; A walkhoo (walkhu), Se walhoo (walhu).

Example (28) might be a case of a secondary stop insertion; however, it remains uncertain because few cognate forms can be found.

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[19] Only for this word, we cannot explain the structure of the rhyme without reconstructing PLu *uy. It remains problematic that "dog" (G ci, C kvu; PLu *kuy) also contains *uy.

[20] It is conventional that s in Ganan corresponds to *c in the Proto-Luish language, and ç(i) in Kadu to s(i) in Proto-Luish. However, it might be the case that *s in Proto-Luish changed to c [ts] when preceded by n. Phonological change from -ns to -nts is reported cross-linguistically (Zwicky 1972: 291 (English), Kurabe 2013 (the Dingga dialect of Jingpho)).

[21] The əl here is an infix.

[22] As Huziwara (2016a) argued, there has been no clear evidence to determine that Taman should be classed under Luish.

(28) "man" A tik "he/she"; G tìʔsʰa; Sema [Sumi] ti mi (cited from STEDT Database, which is based on Marrison 1967).

As for Taman, there are no words cognate with Ganan where a stop is added, but some words, as for example in (29), seemingly have a secondary stop added to the end of the syllable compared to other Tibeto-Burman languages.

(29) a. "cat" Taman mətʃ**ek**sɔ; C háiŋ, K han**çî**, G hán**sìʔ**; A hunggen (hanggen), Se hul-**jeek** (haljik).
      b. "horse" Taman tʃi**pòùk**; C (məráŋ), S sa**pù** (Hodgson 1853: 5) sʰə**pù**, G sʰə**pùʔ**; A/ Se shoorook (shuruk).

In (30), Ganan and Chakpa do not have any secondary syllable-final stop added, while Taman does in comparison with other Tibeto-Burman languages.

(30) a. "man (human being)" Taman **mek**; C (lú), Kadu tə**mì**sʰa, Ganan tìʔsʰa;
         A teeksahora (tiksahora), Se teekhora (tikhora).
      b. "write" Taman **rek**; C (rwé < Marma), K ʔəcʰìn, kʰù, G (yé < Burmese); A/Se —;
         OB **riy** (Nishi 1999: 39).

As is observed, an addition of a secondary stop after a high vowel does not consistently occur in cognate forms. This implies that this innovation did not happen in the proto-language which Ganan, Chakpa and Taman commonly share, but happened independently in each language.

6. Conclusion

This paper has discussed the phenomenon whereby Ganan has an additional syllable-final glottal stop in words whose Luish counterparts do not. As a result, it demonstrated that, by assuming *iy and *uw in PLu, such Ganan forms are mostly predictable if they do not have a high tone.[23]

There are remaining issues as in (31):

(31) a. Rhyme system of PLu: If we reconstruct *iy for words with a glottal stop at their coda position in Ganan, there is a contradiction with the form *iy reconstructed earlier in Huziwara (2012b, 2014, 2016b). Therefore, it would be necessary to change *iy to *ey, and *ey to *ay. The problem remains unsolved as to how PLu rhymes should be reconstructed.
      b. It has not been explained yet why a glottal stop is added not after *i and *u but after *iy and *uw, and also why it is not added to high-tone words.[24]

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[23] Although "cut(vi)", "grind/pound", "seed" listed in (16) have no precise cognate forms in WB and PTB, they are reconstructed with PLu *uw in Huziwara (2012b, 2014), considering C vu. However, the Ganan counterparts do not have a glottal stop. This fact tells us a possibility that the Cak rhyme vu is not a feature of the proto-language but is an innovation within Cak.

[24] It is pointed out that the addition of word-final consonant is related to glide fortition (Blust 1994), chain shift, devoicing of a vowel, and accentuation (Mortensen 2012). In Ganan, glide fortition and accentuation possibly caused the consonant addition. Examples of the relationship between high tone and glottal stop are seen in the Garo language of TB. Garo has no tonal distinctions, but it instead has a glottal stop in words which have an open syllable structure with a high tone in other Boro-Garo languages (Joseph and Burling 2006: 21–22). In addition, speakers of the Kyonbaw dialect of Western Pwo occasionally add a glottal stop to an open syllable with a falling tone (pointed out by KATO Atsuhiko).

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