

Diachronic Hierarchies of Tai Tonal Development

ลำดับชั้นเชิงมิติกาลเวลาของพัฒนาการของเสียงวรรณยุกต์ในภาษาตระกูลไท

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Abstract

This paper discusses the diachronic processes of tonal development of Tai languages. Tonogenesis is treated as the very first step of the arising of tones in proto-Tai. After tone arose, two groups of proto-initials (voiceless-voiced) conditioned primary tonal splits whereas splits conditioned by other pharyngeal features, such as aspiration and preglottalization represent stages of secondary development. Some secondary tonal split patterns result in three-way register splits. However, the bearing capacity of the tone numbers in a language often cause the third register to merge into one of the other two to make two-way register splits always be the mainstream.

Key Words: Tai, Tonogenesis, tonal category, tonal split, tonal merger

บทคัดย่อ

งานวิจัยนี้ มุ่งอภิปรายกระบวนการเชิงมิติเวลาของพัฒนาการวรรณยุกต์ในกลุ่มภาษาตระกูลไท โดยการศึกษากำเนิดวรรณยุกต์ถือเป็นขั้นแรกที่น่าไปสู่การเกิดขึ้นของวรรณยุกต์ภาษาไทดั้งเดิม เมื่อมีวรรณยุกต์เกิดขึ้น เสียงพยัญชนะต้นดั้งเดิม 2 กลุ่ม (พยัญชนะเสียงไม่ก้อง – พยัญชนะเสียงก้อง) ถือเป็นเงื่อนไขปฐมภูมิที่มีผลต่อการแยกเสียงวรรณยุกต์ โดยขั้นตอนต่อมาการแยกเสียงวรรณยุกต์เป็นผลมาจากลักษณะของเสียงในช่องคอ เช่น การพ่นลมและการนำด้วยการกักเส้นเสียงซึ่งเป็นเงื่อนไขขั้นทุติยภูมิที่มีอิทธิพลต่อกระบวนการดังกล่าว รูปแบบการแยกเสียงวรรณยุกต์ในขั้นทุติยภูมิบางรูปแบบส่งผลให้เกิดการแยกเสียงวรรณยุกต์ออกเป็น 3 ทาง อย่างไรก็ตาม ความสามารถในการรองรับวรรณยุกต์ในภาษาหนึ่งๆ มีผลทำให้เกิดการรวมเสียงวรรณยุกต์ที่สามกับหนึ่งในสองของวรรณยุกต์ที่เหลือจึงทำให้การแยกเสียงวรรณยุกต์แบบ 2 ทาง ซึ่งถือเป็นแบบหลัก

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1. Introduction: Tai languages and Tai tones

Tai speaking groups are mainly found in Southern China, Vietnam, Laos, and Thailand in Mainland Southeast Asia (MSEA), with speakers greater than 80 million (Strecker, 2009: p. 653). Tai as a language branch is grouped along with other related language branches like Kam-Sui (KS), Hlai and Kra to form a language family termed Tai-Kadai. Basically, the tripartite internal division, Southwestern Tai (SWT), Central Tai (CT), and Northern Tai (NT) suggested by Li (1977) as shown in the following Figure-1, has long been accepted as the standard one in the field of comparative Tai linguistics.

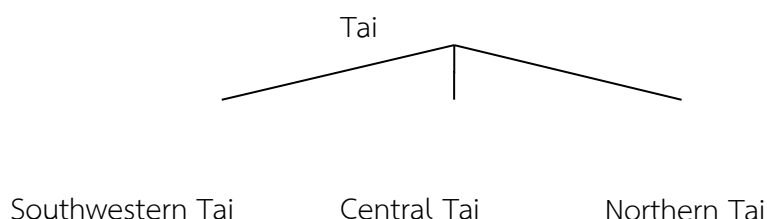


Figure 1 Tripartite Division of Tai language Branch by Li (1977)

Within the forty-two Tai varieties investigated for this paper, seven varieties are from SWT, seventeen varieties are from CT, thirteen varieties are from NT, and five varieties are of Yongnan Zhuang (YN), whose classification as CT or NT is open to debate. All these languages are labeled as L1-L41 in this paper.

As the majorities of the languages in East Asia and MSEA, all Tai languages are tonal. Tones in these languages are the use of pitch, high or low, and contour to distinguish lexical or grammatical meaning. Basically, the vast majority of Tai languages have five to six tones on live syllables ending in a continuant (vowel, semivowel, or nasal), or smooth syllables, and two to four tones on dead syllables ending with a stop (-p, -t, -k, or -ʔ), or checked syllables (Gedney, 1989[1972]: p. 192).

It is generally believed that proto-Tai (PT) had a system of three tonal categories on live syllables, and a fourth tonal category on dead syllables. These tones are designated by Li Fang-Kuei as tone *A *B *C and *D. Later these tones split into two series based on the voicing of the initial consonant, and Li designated 1 for those from a proto-voiceless initial and 2 for those from a proto-voiced initial. Furthermore *D was divided into DL for a dead syllable with a long vowel or cluster of two vowels, and DS for a dead syllable with short or simple vowel respectively, since vocalic length is

crucial to explaining the varying developments in different dialects (Li, 1977: p. 25-28). Thus, in modern Tai varieties, there are six tone categories A1, A2, B1, B2, C1, and C2 on live syllables, and four tone categories DL1, DL2, DS1, and DS2 on dead syllables. On the other hand, in the Sinitic circles scholars like Zhang, Liang & others (1999) have become accustomed to describing tones of Kam-Tai languages using the same numbering system (1-10) that they use to describe the Chinese languages. Moreover, Gedney's tone box (Gedney, 1989[1972]) is raised for using to explain the more complicated situation of tonal splits. It defines four groups of voiceless proto-initial consonants (voiceless friction, voiceless unaspirated, glottal, and voiced sounds) by their shared phonetic features conditioning possible tone splits in different Tai languages. Within these four groups of proto-initials, the former three ones amount to voiceless sounds in Li's pattern. Gedney's tone box supplemented by more lexical items has been widely used by linguists working on SWT languages. The correspondence of Tai tonal categories (with typical Tai gloss) among Li, the Sinitic circles (the Arabic numerals), and Gedney is demonstrated in Table 1.

Table 1. Tai Tonal category correspondence between the Sinitic and the Western

Circles filled in the Tai Tone box adapted from Gedney (1989[1972]: p. 202)

Proto-Tai Tones Initials at time of tonal splits	A		B		C		DL		DS	
	Voiceless friction sounds		dog		to split		five		broken	
Voiceless unaspirated stops	1	crow	5	short	3	aunt	9	mouth	7	frog
Glottal		star		to scold		village		flower		raw
voiced	2	stuck	6	river	4	horse	10	blood	8	bird

In practice, Gedney's tone box has been proved to be a good way for solving the problems of complicated tonal splits in SWT varieties. However, when applied to some varieties of CT and all NT varieties, Gedney's tone box has several shortcomings, the most noticeable being splits among his voiceless friction sounds (voiceless unaspirated stops + voiceless continuants), like *k^ha:³¹* 'foot' vs. *ma:⁵³* 'dog' in Debao (CT). Moreover, the real situation indicates the more irregular tonal correspondence among modern Tai varieties. Therefore, Tai tonal development needs a clearer frame to explain its origin in PT and its primary and secondary splits in each Tai variety,

otherwise the complexity of the correspondence among Tai tones cannot be reasonable interpreted. Therefore, this paper aims to suggest a diachronic process of tonal development of Tai languages as follows.

2. Research objectives and hypotheses

2.1 Tai tonogenesis: Tone arose in the early stage of PT due to dropping or weakening of consonantal syllable finals.

2.2 The primary tonal split: It conditioned by the loss of voicing contrast occurred in the late stage of PT.

2.3 Secondary tonal splits: In the post-PT level, they were conditioned by some specific initial features, like glottal and aspirated sounds. Secondary tonal splits result in three-way registers, or in two-way registers via a transitional three-way register pattern.

3. Literature review

Tonogenesis or the arising of tones in Tai languages is viewed as the first step of tonal development. Tonogenesis which originally suggested by Matisoff (1973) is a hypothesis proposing that tone is a secondary development induced by the decaying of the consonantal system especially syllable finals. It was applied to Vietnamese (Haudricourt, 1954) and Old Chinese (OC) (Matisoff, 1973; Norman, 1989) to indicate that a tonal language can be formed from a non-tonal language in history. Although there are disagreements on the origins of PT tones, the following points are commonly agreed with: 1) PT had a tonal system containing four tonal categories *A, *B, *C, and *D; 2) proto-tone *A was a modal tone without affiliated consonantal endings or particular voice quality; 3) proto-tone *B and *C arised by dropping some specific syllable finals or specific phonation voice; 4) proto-tone *D was on checked syllables without tonal constrast (cf. Sagart, 1988; Gedney, 1989b; Liang and Zhang, 1996; Pittayaporn, 2009).

After tone emergence, tonal splits associating with tonal mergers have been acting as a main role on the stage of tonal development. Tonal splits are usually treated as tonal registers. Taking Chinese tonal splits as an example, Norman (1988: p.

52) has pointed out that the four tonal categories of the Middle Chinese (MC) were defined as below: *píng* ‘level and non-abrupt’, *shǎng* ‘rising and non-abrupt’, *qù* ‘(probably) falling and non-abrupt’, and *rù* ‘abrupt (ending in an oral stop -p, -t, or -k)’. From MC developed to Modern Chinese dialects, when the voiceless and voiced initials became merger, basically earlier voiced initials conditioned a lower pitch and earlier voiceless initials conditioned a higher pitch. At this stage, a new eight-term tonal system was created from the tonal splits from four-term tonal categories of MC.

The common viewpoint of the primary Tai tonal split agrees on the Yin-Yang split in MC, as shown in Li’s PT tone pattern (cf. §1). For further interpreting the more complicated situation than the primary tonal splits, Gedney’s tone box based on this pattern has been widely used by linguists working on Tai languages in the Western circles (cf. §1). As a solving scheme of the aforementioned of the shortcomings of Gedney’s tone box, Liao and Shen (2012) provide above in Table 2 a revised and expanded version of the Tai tone box which can be used beyond SWT. In their chart, every box in the proto-voiceless sounds category is given a fixed name based on Li’s tone designations (A1, B1, C1, DL1, DS1, and etc.) plus a letter corresponding to the first letter of the descriptive word accompanying “voiceless” in the proto-voiceless rows. For example, A1-A would represent the tone for a word which had a voiceless initial consonant in Proto-Tai (1) and that voiceless initial consonant was Aspirated (A). Rows 2 and 1/2 are used for the proto-voiced and proposing proto-breathy sounds.

Table 2 A revised version of Gedney’s tone box (adapted from Liao & Shen, 2012; and also cf. Table 1)

Initial Groups		PT Tones				
		A	B	C	DL	DS
Proto-Voiceless Sounds	Aspirations	A1-A	B1-A	C1-A	DL1-A	DS1-A
	Continuants	A1-C	B1-C	C1-C	DL1-C	DS1-C
	Unaspirated Stops	A1-U	B1-U	C1-U	DL1-U	DS1-U
	Unaspirated Stop + *r Clusters	A1-UC	B1-UC	C1-UC	DL1-UC	DS1-UC
	Glottal Sounds	A1-G	B1-G	C1-G	DL1-G	DS1-G
Proto-Voiced	Voiced Sounds	A2	B2	C2	DL2	DS2
Proto-Breathy	Voiced Aspirations & Breathies	A1/2	B1/2	C1/2	DL1/2	DS1/2

In addition, a noticeable hypopaper suggested by Liang & Zhang (1996) and Pittayaporn (2009) that PT might not have aspirated sounds also reminds that tonal

splits conditioned by aspiration might be of secondary tonal development. Li (1977:p. 43-44), Zhang (1980), Liang & Zhang (1996), and Zhang et al. (1999) divide initials developed from earlier voiceless sounds into four groups, namely glottalized sounds, aspirated sounds, and continuants (nasals, lateral, fricative <*s-, and semivowels). The division of initial groups indicates the different effects on tonal development.

4. Methodology

This paper approaches the reconstruction of tones in PT and the diachronic developmental stages of tones in Tai languages by using a large set of tone data from forty-two Tai varieties. This section mainly presents a brief description of the theoretical basis of the methods to test the hypotheses of this paper, and falls into general comparative method, library research, and field work.

Although phonation types or voice qualities of PT tones still do not come to an agreement, linguists have provided a successful reconstruction of tonal categories in PT by applying to comparative methodology, as the discussion and the review in §1 and §2. In this paper, the comparative method is also applied to the discussion of Tai tonal development. For example, the “proto-breathy sounds” reconstructed by Liang and Zhang (1996) and further adapted by Liao and Shen (2012) is based on the so-called “voicing alternation” due to the comparison of different direction of tonal split between NT and CT/SWT varieties. These “proto-breathy” initials regularly condition a tonal split going with original low register in NT and YN, but condition a tonal split going with original high register in CT and SWT. This phenomenon leads a result of adding an extra horizontal row to the revised Tai tone box (Liao and Shen, 2012). Other similar phenomena also need further discussion to prove the causes of their formations by comparative method.

Besides the tone data of certain Tai varieties are referenced to other research materials, the tone data from the forty two Tai varieties have been mainly collected during my own fieldwork carried out in China, Thailand, and Vietnam. The tone data was collected and analyzed by using the wordlist with one hundred and ninety-five words based on Liao & Shen (2012)’s revised Tai tone box containing seven different groups of initials (cf. Table §2). The criterion for designating the wordlist is based on

certain words – normally five to seven words for one box for insuring the confidence of establishing a tonal split.

5. Results and Discussion

5.1 Tai Tonogenesis

In spite of the viewpoints commonly agreed on PT tonal categories (cf. §2), the phonetic characteristics especially the voice qualities or affiliated consonantal endings of PT tones *B and *C lack of agreements. To PT tones *B and *C, Gedney (1989b:p. 89-91) and Liang & Zhang (1996: p. 815) give syllable finals *-h* and *-ʔ* respectively, Sagart (1988:p. 89) suggests *-ʔ* and creaky voice respectively, and Pittayaporn (2009:p. 271) proposes creaky voice and final glottal constriction respectively.

Before comparing the arguments above, the following two clarifications are preferentially enumerated. First, tonogenesis should be treated as the very first step of the arising of tones in an early stage of PT due to the common proposals of Vietnamese (Haudricourt, 1954), Chinese (Matisoff, 1973; Norman, 1989), and Miao-Yao (Matisoff, 1973). This clarification rejects the treatment that tones in Tai is an inherent feature and cannot develop from non-tonal elements, or PT would be a single exception. Second, at a later period of PT the early non-tonal structure should have changed to tonal structures due to the lost or the weakening of the specific consonantal finals. We will discussed below to demonstrate that the earliest origin of tones should have been some specific consonantal finals, which we treat as the “cause” giving rise to tones, instead of those marked phonations or voice qualities, which we treat as the “effect” triggered by the cause.

On this basis, this paper agrees with Liang & Zhang (1996: p. 815) and Gedney (1989a: p. 89, p. 91) on the origin of tones in the early stage of PT, and agrees with Pittayaporn (2009: p. 271) on the phonation type of tones in the late stage of PT, but rejects to Sagart’s viewpoint because it is not able to explain the tonal correspondence between Tai and the surrounding languages. Previous studies have shown that PT tone *A, *B, *C, and *D correspond to the Chinese / Vietnamese / Miao-Yao tones *A, *C, *B, and *D respectively (cf. Pittayaporn, 2009: p. 240-241). This correspondence between tones in Chinese and those historical Chinese loans in Tai are not built on the similarity of phonetic shape of their modern tones at all since their tonal shapes are quite different. This indicates that to a certain extent, in the earlier period of PT the phonation types of the

voice qualities, the non-tonal phonetic shapes of the later tonal categories, should have been similar to their counterparts in OC and MC, namely the decaying of syllable final *-h* giving a falling tone *B, and the weakening of **-ʔ* giving a rising tone *C. Since PT *A was undisputedly speculated to be unmarked on plain syllables and *D was on checked syllables, the discussion of the voice qualities of these two PT tones will not be given unnecessary detail.

Evidence from Tai internal tonal data also supports PT *C with an accessory *-ʔ*. Li (1977: p. 11) has pointed out that the tone C2 in Lungchow (CT) is always accompanied by a glottal stop at the end of the syllable, and this is considered a special feature of the tone rather than a final consonant. Tone *C has been speculated in PT as a glottalized tone by Gedney (1989a: p. 89, 1989b: p. 209-210) by pointing out that there are a great number of CT and SWT varieties having tones developed from PT tone *C to be characterized by glottalization. Within the thirty Tai varieties recorded by myself, twenty seven of them are found to have final glottal constriction (like *ma:*^{453ʔ} ‘horse’ in Thai), or even an audible unreleased or slight released final glottal stop before pause or open juncture (like *ha:*^{24ʔ} ‘five’ and *ma:*^{213ʔ} ‘horse’ in Debao Urban). The final glottal final *-ʔ* abundantly found in the C tones normally has coarticulatory effects on the preceding vowels to give a tense gesture that extends over the whole of a syllable rhyme, and this tense gesture is called ‘final glottal constriction’ by Pittayaporn (2009: p. 277).

As for PT tone *B, modern Tai dialects do not have a consistent voice quality on the tones developing from *B like final aspiration **-h* in Vietnamese and / or Chinese tonogenesis proposed by Haudricourt (1954) and Pulleyblank (1962). Gedney (1989a: p. 91, 1989b: p. 208) speculates that it also had a final **-h* mainly based on its counterpart DL tone, and on the evidence that Thai treatment of using tone B to borrow Indic loanwords ending in *-ha*. Liang & Zhang (1996) also propose a hypopaper agreeing with Gedney’s speculation based on their own evidence from the tonal correspondence of some shared vocabularies between Tai Lue tones B and Wa syllable final *-h*. Gedney’s viewpoint has been rejected by Pittayaporn (2009). He shows that in Thai a *-ʔ* has to be inserted to an open syllable to preserve the original short vowel in the borrowing language when the source is with short vocalic nuclei in the original language, such as *pʰraʔ* ‘monk’ in Thai is actually borrowed from brah ‘honorific prefix’ in Khmer, and this is due to dropping *-h* first since Thai does not allow a final fricative (Pittayaporn, 2009:p. 253). Moreover, Pittayaporn

(2009:p. 271) provides another possible scheme that *B was a creaky tone as in some Tai varieties.

However, creakiness on B tones in some of the modern Tai varieties should be treated as the residual but not the origin of the phonetic characteristics of PT tone *B. Creakiness is known as a characteristic of low pitch in tonal languages due to the previous studies, such as Northern Chinese dialects in Shanxi, Beijing, Hebei, Henan, Shandong, and Jiangsu provinces commonly have creaky voice as the feature [+low] (Zhu and Yang, 2010). A typical example that indicates creaky voice as the feature [+low] in Qingtang Zhuang (NT) is provided by Mai (2011). In my data, creakiness also often occurs ubiquitously on the low fundamental frequency of the pitch on a syllable, no matter any tonal categories (including the A and C tones). For example, in Suogan (L36), tone A1 (51) has a strong creakiness triggered by its rapid falling contour from the highest pitch 5 to the lowest pitch 1 as in *paj*⁵¹ ‘to go’, and B2 (11) also accompanies a weak creakiness due to the lowest pitch as in *da*:¹¹ ‘river’. If we admit the method of tonogenesis, we must accept that tonal languages have developed from non-tonal proto-languages; consequently an original pattern of manifestation of the voice quality in a proto-language must not have been a fixed low pitch to automatically have coarticulatory effects to produce a creaky voice. Therefore, the treatment that the creakiness found on B tones is account for the genetic characteristics of the voice quality of PT *B tone is like to put the incidental before the fundamental. In short, creakiness may be an effect of low pitches, and should not be treated as a cause of tonogenesis. The real cause of this proposed “creakiness” on *B tone should be an original rapid falling tone, which easily gave a creakiness added to the pitch. This original falling tone typologically developed from the decaying of syllable final *-h*.

Table 3 Phonetic shapes of PT tones in the wo supposed diachronic stages

Earlier Stage of PT		plain	-h	-ʔ	-p, -t, -k
Non-tonal structures		↓	↓	↓	↓
Later Stage of PT	Tonal categories	*A	*B	*C	*D
	Voice quality	modal	creaky	glottal constriction	glottalization

To summary, as the proposed diachronic process of Tai tonogenesis in Table 3, the evidence of tonal comparison among the Tai varieties investigated in this paper suggests a result that PT tonal contrast arose by decaying of the syllable final

consonantal system, namely the weakening or dropping of **-h* and **-ʔ*. For keeping the semantic distinction from the original plain syllable (without obstruent syllable finals), the decaying of syllable final *-h* gave an original falling tone **B*, and the weakening of **-ʔ* gave an original rising tone **C*, to contrast to the least marked level tone **A* on smooth syllables. **D* was on checked syllables with oral stop finals preserved with no tonal contrasts.

5.2 Tai Primary Tonal Splits

Before the discussions of the primary Tai tonal splits, it is important to determine the different phonation types of initial consonants in PT level, since they are the conditioning factors of the subsequent tonal splits. The following four phonation types, voiceless stops, voiceless continuants, glottal sounds, and voiced sounds (including voiced stops and voiced continuants) on PT level are fewer disagreements. The most outstanding disagreement on the initial consonants in PT level is whether there were aspirated stops at that stage. Unlike the viewpoint that voiceless aspiration was a contrastive group on PT level (cf. Li, 1977: p. 43), Pittayaporn (2009) argues aspiration should be of post-PT innovation mainly developing from clusters with medial **-r-*. Liang & Zhang (1996) also suggest voiceless aspirated stops developed on post-PT level from original initial clusters, like **pr-*, **tl-*, **tr-*, **pw-*, **xp-*, **xpl-*, and **xt-*. Data from my fieldwork also show some of the same evidence as what Liang & Zhang and Pittayaporn enumerate. Therefore, this paper considers voiceless aspirated initials as of post-PT innovation.

Just as in the previous studies reviewed, after tone arose, the loss of the voicing contrast caused PT tones **ABCD* to split into two series. Series 1 or the high register was conditioned from the original voiceless initial, and Series 2 or the low register was usually conditioned by the original voiced initials. The **D* tone on checked syllables split further depending on vowel length. This scheme is treated as the primary tonal split model as discussed in §1, and formed an eight-tonal categories system, namely tones A1, A2, B1, B2, C1, C2, D1, and D2. Furthermore, tonal splits in dead syllables are also conditioned by vocalic length to result tonal categories DL1, DL2, DS1 and DS2.

However, there are some disagreements on the direct cause of the primary tonal split in some of the previous studies. The disagreement mainly lies in that the

cause was the devoicing of proto-voiced stops or the voicing of proto-voiceless continuants. Just like what L-Thongkum (1997: p. 208) points out, previous studies normally select the voiceless-voiced distinction in initial stops to illustrate the cause of tonal split, but in some specific modern Tai varieties initial consonants developing from the PT voiceless / voiced continuants present as the only cause of their primary tonal split. In Cao Bang Tho (CT) which still preserves the voiced stops, “the loss of aspiration in the sonorants” seems to be the only cause of tonal split (Haudricourt, 1972: p. 65). Dai Tho in which the voicing contrast between stops is also still preserved, the merger of voiceless sonorants with voiced sonorants from PT is suggested to be the cause of the primary tone split (L-Thongkum, 1997: p. 215). These two CT dialects are very crucial to a hypothesis that the cause of the primary tonal split in Tai languages is actually the voicing of proto-voiceless continuants, because at least they very clearly indicate that while the devoicing process of the proto-voiceless stops has not yet started, the voicing process of proto-voiceless continuants has long been completed and tonal register split has been established since the early days. It is crucial that the PT voiceless continuants tend to mostly keep their tonal behaviors as in their primary tonal splits since they have not been found to have influence on secondary tonal development as other types of initials, namely glottalization, aspiration, unaspiration do (Liang and Zhang, 1996; Zhang et al., 1999). In brief, this paper suggests the voicing of voiceless continuants which led the merger of voiceless-voiced continuants was the actual trigger of register tonal split in all Tai languages.

On the basis of the two clarifications above, we get a new structure of initial phonation types in the stage of the primary tonal split in post-PT level: voiceless unaspirated stops, glottal sounds, voiced continuants and voiced stops. The primary register split caused by the voicing of earlier voiceless continuants formed a result of the aforementioned eight-tonal categories system. In this stage, it is remarkable that phonation types of initial consonants coordinated with register split to provide a regular collocation in the process of tonal development. The merger of voiceless-voiced continuants must lead a result that the other phonation types of initials must also have to choose to be preceding syllables with either the high or the low register tones. Thus, the choice of high-low register tones for non-voiced continuants in this stage is essential to the pattern of the primary tonal split. In the previous studies, the pattern that voiceless unaspirated stops and glottal sounds went with original voiceless

frictions to condition high register tones (A1, B1, C1, DL1, and DS1), and voiced plosive went with original voiced continuant to condition low tones (A2, B2, C2, DL2, and DS2) is called straightforward tonal development. It is accessible that the proto-voiceless unaspirated stops and the proto-voiced unaspirated stops was phonetically ranged into voiceless / high register and voiced / low register. The choice that proto-glottal sounds went with the original voiceless stops /continuant to condition their syllables to have a tone going together with the original high register may also be explained as that the glottal initial stop -ʔ or the pre-glottal segment are phonetically voiceless (Li, 1977: p. 44).

The straightforward pattern seems to reflect the primary tonal split triggered by the voicing of proto-voiceless continuants, since this pattern is reflected in the majority of modern Tai varieties which do not reflect further secondary tonal developing patterns. Straightforward tonal register split pattern it is not the most common pattern in SWT varieties in Thailand, it is most commonly found in the other Tai varieties out of Thailand, such as half of the Zhuang dialects (Zhang et al., 1999: p. 245). Within the forty two Tai varieties investigated for this thesis, half of them have straightforward tonal register pattern. The straightforward pattern of register tonal split is even cross-dialects within the Kam-Tai branch above the Tai group and the KS group (Liang and Zhang, 1996: p. 817), while the non-straightforward patterns are in an irregular distribution. All these indicate that the primary tonal developing pattern in Tai languages is straightforward.

5.3 Tai Secondary Tonal Splits

Different from the unified pattern of the primary tonal split, secondary tonal splits in Tai differ from dialects to dialects or even from variety to variety within the same distinct language. This phenomenon shows that secondary tonal splits occurred after the formations of different hierarchies of languages and dialects in Tai. In fact, Gedney's scheme (cf. Table 1) and Liao & Shen's scheme (cf. Table 2) of Tai tonal categories indicate the more complex tonal development including secondary development.

As what has been pointed out in §5.2, initials developing from PT voiceless continuants tend to mostly keep their tonal behaviors as in their primary tonal split since they are of the only type that has only conditioned straightforward pattern of

register split. That is, non-straightforward tonal splits have not been found to be conditioned by initials developing from proto-voiceless continuants. Based on the reasons above, it is apparent to receive a motivation that non-straightforward tonal splits conditioned by all the other types of initials, namely glottalized sounds, aspirated stops, and unaspirated stops are all secondary in the history of Tai languages. Previous studies, like Zhang (1980), Liang & Zhang (1996), and Zhang et al. (1999) have already provided sufficient discussions to achieve this suggestion.

Secondary tonal splits in Tai are divided into four types by Zhang et al. (1999:243-245) as follows. Type 1: only glottal initials condition secondary tonal splits. Chiang Rai (L4) of SWT, Hurun (L11) and Xiangdu (L17) of CT, as well as Dongling (L32), Lizhou (L33), Gehan (L39), and Huishui Buyi (L41) of NT from my fieldwork are of this type. Type 2: Only aspiration conditions secondary tonal splits. Within the data from my fieldwork, only Dazhai (L21) and Huashan (L16) of CT are of this type. Type 3: Both aspirated stops and glottal sounds condition secondary tonal splits. Debao Dalong (L9) and Debao Luliu (L10) of CT, as well as Long'an (L27), Daqiu (L28), and Xialeng (L29) of YN from my data are of this type. Type 4: Both glottal sounds and unaspirated stops condition secondary tonal splits. This type is found in Bangkok (L1), Hat Yai (L2), and Khon Kaen (L3) of SWT, as well as Leiping (L22) and Baoxu (L23) of CT from my data.

Based upon to the presentations of the four types of non-straightforward tonal splits above, we see glottalized sounds are most common found to condition secondary tonal splits in all Tai groups (SWT, CT, NT and YN), aspirated stops are found to condition secondary tonal splits only in CT and YN, and unaspirated stops are found to condition secondary tonal splits only in SWT and CT. Both glottal and aspirated sounds can condition non-straightforward tonal splits alone (Type 1 and Type 2) or together with one another (Type 3). However, unaspirated stops have not been found to condition non-straightforward tonal splits by itself or together with aspirated stops, but only condition the splits together with glottalized sounds (Type 4) (cf. Liang and Zhang, 1996:p. 826), perhaps due to that unaspirated stops share the same features [+voiceless, -continuant, -aspirated] with the segment ʔ of glottalized sounds. This adequately indicates that at least unaspirated stops must secondarily condition the tonal split going after the split triggered by glottalized sounds. Since voiceless aspirated stops is suggested to be secondary development on post-PT level (cf. §5.2), the tonal splits on high register conditioned alone by aspirated stops have to be secondary.

Consequently, tonal splits conditioned together by aspirated stops and glottalized sounds also have to be secondary.

Moreover, non-straightforward tonal splits in some Tai varieties give a suggestion of the diachronic orders. As three-way register splits found in some Tai varieties, like Hat Yai (L2), Huashan (L16) and Baoxu (L23), they all contain a secondary split conditioned by aspirated and / or glottalized sounds (as well as unaspirated stops in some varieties). This split leads a new tone to derive from the original tonal series 1 (or the original high register) which is primarily conditioned by proto-voiceless initials. Therefore, three-way split must be considered not to be of the primary splitting pattern. However, as we have seen that most secondary tonal split patterns result two-way registers instead of three-way registers, such as the tonal patterns containing secondary splits in Bangkok (L1), Khon Kaen (L3), Chiang Rai (L4), the three Debao Yang Zhuang varieties (L8, L9, L10), Hurun (L11), Dazhai (L21), Daqiu Nung An (L28), Dongling (L32), Lizhou (L32), Gehan (L39) and Huishui Buyi (L41). However, I will speculate a diachronic sequence beginning with three-way split and ending in a two-way split due to the limited capability of the number of tones in a language. That is to say, Tai varieties with secondary splits resulting at a two-way register may have undergone a diachronic process: primary two-way register split > secondary three-way split > secondary two-way split.

The three-way register split in Huashan (CT) (shown in Table 4) provides an example for indicating the speculation on the diachronic process from three-way to two-way splits. In this dialect, the only three-way register split is found in the A column, like *p^hja:*²⁴² (A1-A) ‘stone mountain’ vs. *na:*³⁵³ (A1-C) ‘thick’ vs. *na:*²⁴² (A2) ‘rice field’. Aspirations (rows 1-A, 1-UC, and 1/2) always condition a derived tone with a lower pitch (242) than the original odd tone (353). This pitch distinction is quite slight and is easily ignored if we do not observe that the same tonal depress is also found on the same rows with aspirated initials (rows 1-A, 1-UC, and 1/2) in the DS column. Different from the slight split in tone A, the pitch-lowering in tone DS is quite clear (a mid-falling 32 vs. a high level 55). It is interesting that this dialect has undergone tonal flip-flops (cf. Matisoff, 1973) as the original low tones are all pitch-higher than the original high tone. However, the derived tone (242) splitting from the odd tone (353) is still lower than the lowered odd tone after tonal flip-flop. This suggests that tonal flip-

flop established first, and then secondary tonal split conditioned by aspiration caused a pitch-lowering derived tone.

Table 4 Basic tonal patterns in Huashan Min Zhuang (L16)

	Proto-Initial\Tone Categories	Smooth Syllable			Checked Syllable	
		A	B	C	DL	DS
Proto-Voiceless Sounds	Aspirations	A1-A: 242	B1-A: 32	C1-A: 11?	DL1-A: 32	DS1-A: 32
	Continuants	A1-C: 353	B1-C: 32	C1-C: 11?	DL1-C: 32	DS1-C: 55
	Unaspirated Stops	A1-U: 353	B1-U: 32	C1-U: 11?	DL1-U: 32	DS1-U: 55
	Unaspirated Stop + -*r- Clusters	A1-UC: 242	B1-UC: 32	C1-UC: 11?	DL1-UC: 32	DS1-UC: 32
	Glottal Sounds	A1-G: 353	B1-G: 32	C1-G: 11?	DL1-G: 32	DS1-G: 55
Proto-Voiced	Voiced Sounds	A2: 55	B2: 42	C2: 53?	DL2: 42	DS2: 55
Proto-Breathy	Voiced Aspirations & Breathy Sounds	A1/2-A: 242	B1/2: 32	C1/2: 11?	DL1/2: 32	DS1/2-A: 32
		A1/2-C: 353				DS1/2-C: 55

The derived tone in the A column shows that the pitch-lowered effect by aspiration may be too slight to cause a final split, and it may merge back to the original pitch if the deriving process stops like the possible process having been accomplished in the B, C, and DL columns. On the other hand, the clear derived tone in the DS column may have forced the original high tone to become higher to merge into the original low tone which has long been high pitch since tonal flip-flop, to end in a two-way register split: derived tone vs. original odd/even tone. All these suggest tonal split may be progressiving, just like it has undergone from three-way to two-way in the DS column.

We therefore can imagine that in those Tai varieties which secondary tonal splits edding in a two-way register split may have undergone an similar process as that the derived tone splitting from the high register form a three-way register first, and then the pitch get lower and lower, at last merge into the low register to end in a new two-way register pattern.

6. Conclusion

Responding back to the hypothesis of this paper, the diachronic scheme of Tai tonal development is briefly outlined as follows. (1) Tonogenesis: Tones arose after the

dropping or weakening of the syllable finals **-h* and **-ʔ* in the earlier stage of PT, for keeping the semantic distinction among syllables with earlier plain (> *A), **-h* (> *B) and **-ʔ* (> *C) finals respectively. (2) Primary tonal splits: The mergers between voiceless and voiced continuants caused PT tones felt into two series of tones – original high and original low tones. At the same time original voiceless continuants, voiceless stops, and glottal sounds felt into the high register, and original voiced continuants and voiced stops went together. The eight tones A1, A2, B1, B2, C1, C2, DL1, DL2, DS1 and DS2 came on the scene. (3) Secondary tonal splits: Glottalized stops commonly condition secondary tonal splits in all Tai groups. Although SWT, CT and YN have robust aspirated sounds, only CT and YN are found to have secondary tonal splits conditioned by aspirated sounds. Secondary tonal splits conditioned by unaspirated stops are only found in CT / SWT as they are treated as the byproduct of secondary tonal splits conditioned by glottalized sounds. (4) From three-way to two way registers: Derived tones splitting from the original high register cause three-way split in some CT / SWT varieties. In more Tai varieties, the bearing capacity of the tone numbers in a language often cause the derived tone to merge into the original low tone to make two-way splits always be the mainstream.

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