

THE HISTORICAL POSITION OF BAI

The Bai language in Yunnan presents some interesting challenges for Chinese historical linguistics. It is sometimes considered to be a Tibeto-Burman language infiltrated by several strata of Chinese loanwords — see, e. g., [Xu Lin 1984: 113–115]. On closer inspection, however, it turns out that there are virtually no Tibeto-Burman elements in Bai other than those having their counterparts in Chinese, too. In this paper I will try to show that Bai is, in fact, an archaic Chinese dialect, having separated from “mainstream” Chinese long before all other dialects (including Min) — somewhere around the late 1st millennium B.C. I base my study on the data in [Xu Lin 1984], mainly utilizing the evidence of the archaic Jianchuan dialect of Bai.

1. Phonological considerations

1a. Correspondences of tones.

The 4 Middle Chinese (MC) tones normally are reflected in Bai as follows:

| | 陰 | 陽 | Nasal and liquid initials |
|---|---|---|---------------------------|
| 平 | 4 | 7 | 4/7 |
| 上 | 1 | 1 | 1 |
| 去 | 2 | 3 | 2/3 |
| 入 | 6 | 2 | 6 |

There are some exceptions due to tonal sandhi or, sometimes, to later borrowings (in recent loanwords tones are reflected somewhat differently)

or misrecordings, but the overall system of tonal reflexes is quite clear (examples see below *passim*).

There is, however, one extremely interesting type of exceptions. Consider the following examples:

- MC 二 *nì* — Bai *ne*⁶ ‘two’
 MC 四 *sì* — Bai *sí*⁶ ‘four’
 MC 外 *ηwàj* — Bai *ηua*⁶ ‘outside’
 MC 歲 *sjwèj* — Bai *sua*⁶ ‘year’
 MC 肺 *phwàj* — Bai *phia*⁶ ‘lung’

All these words behave in Bai as if they had 入聲, i. e. ended in a stop. From Chinese historical phonology we know that Old Chinese (OC) had a front stop consonant (probably followed by *-s) here; it changed to a fricative around the 2d century B. C. and finally merged with *-j as late as in the 4th century A.D. [Старостин 1989: 456, 488]. Bai seems to reflect a stop here, thus pointing to a period not later than the 2d century B. C.

All the examples listed have voiceless or nasal initials; with voiced initials we would expect the Bai tone 2 in such cases. Indeed, we have the following evidence:

- MC 吠 *bwàj* — Bai *pia*² ‘to bark’
 MC 大 *dâj* — Bai *to*² ‘big’
 MC 壞 *γwàj* — Bai *kuε*² ‘to destroy’
 MC 胃 *wij* — Bai *vu*² ‘stomach’

These examples also follow quite neatly the development of the entering tone; since, however, tone 2 is also a frequent reflex of the MC falling tone (去聲), they are ambiguous.

1b. Initial consonants.

The general system of correspondences between MC and Bai is as follows:

| MC | Bai |
|-------------------------|--|
| <i>p, b</i> | <i>p</i> |
| <i>ph</i> | <i>ph</i> |
| <i>m</i> | <i>m</i> (η- before <i>ü</i>) |
| <i>w</i> (= <i>fw</i>) | <i>v</i> (η- before a nasal final consonant) |
| <i>t, d</i> | <i>t</i> (ć- before <i>-ie-</i> in the 4th division) |

| MC | Bai |
|-------------|--|
| <i>th</i> | <i>th</i> (<i>čh-</i> before <i>-ie-</i> in the 4th division) |
| <i>n</i> | <i>n</i> |
| <i>l</i> | <i>ɣ</i> (<i>j-</i> before <i>i</i> , <i>n-</i> before a nasal final consonant) |
| <i>t, d</i> | <i>c/ć</i> (but <i>t, d</i> in the Bijiang dialect) |
| <i>ʈh</i> | <i>ch</i> |
| <i>ɳ</i> | <i>j</i> (with nasalisation of the following vowel) |
| <i>c, ʒ</i> | <i>c/ć</i> |
| <i>ch</i> | <i>ch/čh</i> |
| <i>s</i> | <i>s/ś</i> |
| <i>z</i> | <i>c/ś</i> (but <i>j</i> in the Dali dialect) |
| <i>ç, ʒ</i> | <i>c</i> |
| <i>çh</i> | <i>ch</i> |
| <i>ʃ</i> | <i>s</i> |
| <i>ć, ʒ</i> | <i>c/ć</i> (but <i>t, d</i> in the Bijiang dialect) |
| <i>čh</i> | <i>ch/čh</i> (but <i>ʈh</i> in the Bijiang dialect) |
| <i>ś</i> | <i>s/ś</i> |
| <i>ʒ, j</i> | <i>c/slʃ</i> |
| <i>k, g</i> | <i>k</i> (<i>ć</i> before <i>i</i>) |
| <i>kh</i> | <i>kh</i> (rarely <i>x</i>) |
| <i>ŋ</i> | <i>ŋ</i> |
| <i>x</i> | <i>x</i> |
| <i>ɣ</i> | a) <i>ɣ</i> (<i>ŋ-</i> before a final nasal, <i>v-</i> before <i>-w-</i>) b) <i>k</i> |
| <i>ʔ</i> | <i>∅-</i> (<i>v-</i> before <i>u</i> , <i>j-</i> before <i>i</i>) |

Some other reflexes of MC initials may be encountered and may be used to identify more recent loanwords from standard Chinese. They are:

a) *p-*, *ph-*, *b-* > *f-* (or *v-*) before central and front labialized vowels in the 3d division (等) (like 肥 MC *bwij* ‘fat’ > Bai *fε⁶*, 蜂 MC *phöuŋ* ‘bee’ > Bai *fũ⁴*, 飛 MC *pwiʃ* ‘fly’ > Bai *fũ⁴*; cf. more archaic examples like 肺 *phwə̀j* = Bai *phia⁶* and 吠 *pwə̀j* = Bai *pia⁶* above, as well as MC 浮 *bəw* ‘float’ = Bai *pi²* and others);

b) velars > palatals in the 3d and 2d division (other than before the Bai vowel *i*), cf. 茄 MC *ga* > Bai *čhi⁴* ‘egg-fruit’, 球 MC *gəw* > Bai *čo²* ‘a k. of jade’, 假 MC *ká* > Bai *ča³* ‘to deceive’ etc. Cf. the numerous more archaic examples like MC 甲 *kəp* > Bai *kε⁶* ‘nail, armor’, MC 救 *kəw* > Bai *kɪ²* ‘to save’, etc.;

c) voiced stops > aspirated stops in 平聲 (cf. the words for ‘egg-fruit’ and ‘jade’ above);

d) *l* > *l*-, cf. 量 MC *lan* > Bai *liā* ‘a measure of capacity’, 綠 MC *lök* > Bai *liü*⁶ ‘green’ etc., as opposed to more archaic cases: MC 鎌 *lem* — Bai *jī*⁷ ‘sickle’, MC 柳 *lów* — Bai *γi*¹ ‘willow’, MC 力 *lik* — Bai *γi*² ‘sinew, strength’, MC 來 *lai* — Bai *γi*¹ ‘to come’, MC 漏 *liw* — Bai *γi*³ ‘to leak’, MC 六 *liük* — Bai *fiü*⁶ ‘six’ (here Bai has a voiceless reflex, which seems to support the reconstruction **rh-* for this word, based on Min evidence).

The last point is especially interesting because of the specific correspondence *l* : *γ*-. From Chinese historical phonology we know that MC *l*- goes back to OC **r-* that changed to *l*- in the beginning of the 1st millennium A. D. (probably around the 3rd century), after the development of original **l-* and **l̥-* into *d-*, *th-* [Старостин 1989: 476]. The Bai reflex *γ*- is much easier explained from **r-* than from *l-*, which also pushes the time of the divergence of Bai from “mainstream” Chinese to a date earlier than MC.

However, as we stated above, MC *d-* and *th-* are in most cases rendered as dentals in Bai, which seems to be the standard development. Nevertheless, there are a few very interesting cases:

蝴蝶 MC *γo-diep* (< OC **gā-lēp*) ‘butterfly’ : Bai *ko*⁴-*li*⁶;

退 MC *thòj* (< OC **s-lūj-s*) ‘to withdraw, retire’ : Bai *lo*³;

脫 MC *thwât*, *thwàj* (< OC **s-lōt*, **s-lōt-s*) ‘to take off, let loose’ : Bai *lui*⁴;

錫 MC *siek* (< OC **s-lhēk*) ‘tin’ : Bai (Bijiang dialect) *la*⁶.

These examples may represent an extremely archaic layer in Bai, later superseded by the standard Chinese dental reflexes. It is also worth noting that words containing the OC lateral initials sometimes reveal other irregularities in Bai: notably, MC *d-* going back to **l(h)-* can be reflected as *th-*, cf.

道 MC *dâw* (< OC **lhū?*) ‘road’ : Bai *thu*¹;

弟 MC *diěj* (< OC **L(h)āj?*) ‘younger brother’ : Bai *thi*¹,

while MC *th-* going back to **sl(h)-* can be reflected as *x-* or *s-*, cf.

湯 MC *thân* (< OC **λ(h)āŋ*) ‘warm water’ : Bai *xē*⁴;

痛 MC *thùŋ* (< OC **slōŋ-s*) ‘pain, sickness’ : Bai *sū*³;

天 MC *thien* (< OC **[sl]in*, although here the initial is not quite certain) ‘sky’ : Bai *xē*⁴.

There are also some other interesting moments in the consonant system of Bai (such as complete confusion of the reflexes of MC *j* and *ž* — which is a MC innovation; a distinction of **gh-* > *γ-* and **g-* > *k-* that was lost in MC), which, however, are difficult to use for the dating of the Bai-MC split.

1c. The system of finals.

The MC finals have the following correspondences in Bai.

MC 東: [A] *-uŋ* : *-ũ* [/-*ō* in late loanwords]; [B] *-uk* : *-ü* [/-*o* in late loanwords]; [C] *-üŋ* : 1) *-ũ* if it goes back to OC **-uŋ*, cf. 蟲 MC *ḍüŋ*, OC **Lhuŋ* ‘insect’ : Bai *cũ⁷*; 2) *-ĩ* or *-ō* if it goes back to OC **-əŋ*, cf. 夢 MC *müŋ*, OC **mhəŋ-s* ‘to dream’ : Bai *mĩ³*, 弓 MC *küŋ*, OC **k^wəŋ* ‘bow’ : Bai *kō⁴*; [D] *-ük* : 1) *-ü* if it goes back to OC **-uk*, cf. 六 MC *lük*, OC **rhuk* ‘six’ : Bai *fũ⁶*, 熟 MC *žük*, OC **duk* ‘be ripe’ : Bai *cü²*; 2) *-o* if it goes back to OC **-ək*, cf. 蝠 MC *pük*, OC **pak* ‘bat’ : Bai *po⁶*.

MC 冬: [A] *-oŋ* : *-ũ* [/-*ō* in late loanwords]; [B] *-ok* : (unknown).

MC 鐘: [A] *-öüŋ* : *-ũ* [/-*ō* in late loanwords]; [B] *-öük* : *-ü*.

MC 江 [A] *-aŋ* : *-ũ* [/-*ō* or *-uã* in late loanwords] (only reflexes of OC **-rōŋ* are known, cf. 江 MC *kaŋ*, OC **krōŋ* ‘river’ : Bai *kũ⁴*); [B] *-aŋ* : 1) *-ü* if it goes back to OC **-rōk*, cf. 角 MC *kaŋ*, OC **krōk* ‘horn’ : Bai *kü⁶*; 2) *-i* if it goes back to OC **-rūk*, cf. 學 MC *gaŋ*, OC **ghrūk* ‘to learn’ : Bai *γ²*.

MC 陽: [A] *-aŋ* : *-ō* [/-*ã* or *-iã* in late loanwords]; [B] *-ak* : *-o* [/-*a* in late loanwords].

MC 唐: [A] *-âŋ* : *-ō* ~ *-ē* with a not quite clear distribution; [B] *-wâŋ* : *-ũ* ~ *-uã* (also with unclear distribution); [C] *-âk* : *-o*; [D] *-wâk* : *-ua*.

MC 庚: [A] *-äiŋ* : *-ē*; [B] *-äik* : *-ε*; [C] *-äiŋ* : *-ē*.

MC 耕: [A] *-aiŋ* : (unknown); [B] *-aik* : 1) *-i* if it goes back to OC **-rēk*, cf. 脈 MC *maik*, OC **mhrēk* ‘vein’ : Bai *mĩ⁶*; 2) *-i* if it goes back to OC **-rāk*, cf. 麥 MC *maik*, OC **mrāk* ‘wheat’ : Bai *mĩ⁶*.

MC 清: [A] *-ieiŋ* : *-ē* (rarely *-ĩ*); [B] *-iek* : *-ε* (rarely *-i*).

MC 青: [A] *-jeŋ* : *-ē*; [B] *-jek* : *-ε*. [In a few cases *-iek* and *-jek* are reflected as back *-o* or *-a*, cf. MC 石 *žek* — Bai *co²* ‘stone’, MC 滴 *tiēk* : Bai *to⁶* ‘drop’; the reasons for this split are unclear, and do not seem to be conditioned by any OC distinctions.]

MC 蒸: [A] *-iŋ* (= *-iŋ*) : *-ĩ*; [B] *-ik* (= *-ik*) : *-i* [/-*i* in late loanwords].

MC 登: [A] *-aŋ* : *-ĩ*; [B] *-ak* : *-i*.

MC 侵: [A] *-im* (= *-im*) : *-ē* ~ *-ĩ* (with a not quite clear distribution); [B] *-ip* (= *-ip*) : *-ε*.

MC 覃: [A] *-am* : *-ã*; [B] *-ap* : *-a*.

MC 談: [A] *-âŋ* : *-ã*; [B] *-âp* : (unknown).

MC 鹽: [A] *-em* : *-ē* ~ *-ĩ*; [B] *-ep* : *-a* ~ *-i*.

MC 添: [A] *-iem* : *-ĩ*; [B] *-iep* : *-i* ~ *-a*.

MC 咸: [A] *-äm* : (unknown); [B] *-äp* : (unknown).

MC 銜: [A] *-am* : (unknown); [B] *-ap* : *-a* ~ *-ε* (with unclear distribution).

MC 嚴, 凡: [A] *-əm* : (unknown); [B] *-əp* : (unknown).

MC 真: [A] *-in* : *-ĩ* [/-*ẽ* in late loanwords]; [B] *-win* : *-ũ* ~ *-uĩ*; [C] *-it* : *-i*;
 [D] *-wit* : *-i* ~ *-ü* (here belongs also 蜜 MC *mjit* : Bai *ŋü¹* ‘honey’).

MC 殷: [A] *-in* : *-ĩ*; [B] *-it* : (unknown).

MC 文: [A] *-ün* : *-ũ* ~ *-õ*; [B] *-üt* : (unknown).

MC 魂: [A] *-on* : *-(u)ã* ~ *-ẽ*; [B] *-ot* : *-ua*.

MC 痕: [A] *-an* : *-uẽ*; [B] *-at* : (unknown).

MC 元: [A] *-ən* : *-ẽ*; [B] *-wən* : *-ũ*; [C] *-wət* : *-ua*.

MC 寒: [A] *-ân* : *-ã*; [B] *-ât* : *-a*.

MC 刪: [A] *-an* : *-ẽ*; [B] *-at* : *-a*.

MC 山: [A] *-än* : *-ũ* / *-uĩ*; [B] *-ät* : *-(i)a*.

MC 先: [A] *-ien* : *-ẽ* (sometimes probably misspelled as *-ẽ*) / *-ĩ*; [B] *-iet* : *-e*.

[In a few cases *-ien* and *-iet* can be reflected as *-ã*, *-a*, cf. MC 田 *dien* : Bai *tã³* ‘field’, MC 犬 *khwien* : Bai *khua¹* ‘dog’, MC 血 *xwiet* : Bai *sua⁶* ‘blood’; reasons for this split are not clear.]

MC 仙: [A] *-en* : *-ĩ*; [B] *-wen* : *-uĩ*; [C] *-et* : *-e* ~ *-i*; [D] *-wet* : *-ua*.

MC 支: [A] *-e* : *-e* / *-i* [*-i* in late loanwords]; [B] *-we* : *-ü* / *-ui*.

MC 脂: *-i* : *-i* (*-e* after nasals).

MC 之: *-i* : *-i* [*-i* in later loanwords].

MC 微: [A] *-ij* : *-i*; [B] *-wij* : *-ü*.

MC 齊: *-iej* : *-e* (*-i* after dental stops).

MC 祭: [A] *-ej* : *-i*; [B] *-wej* : *-ua*.

MC 廢: *-əj* : *-(i)a*.

MC 佳: [A] *-ä* : *-ε*; [B] *-wä* : *-ua*.

MC 皆: *-äj* : *-ε*.

MC 夬: *-aj* : (unknown).

MC 灰: *-oj* : *-ui* ~ *-e*.

MC 哈: *-aj* : *-i* / *-e*.

MC 泰: [A] *-âj* : *-o*; [B] *-wâj* : *-ua*.

MC 歌: [A] *-â* : *-o*; [B] *-wâ* : *-(u)o*.

MC 麻: [A] *-a* : *-ε* ~ *-o*; [B] *-wä* : *-uε* ~ *-ua*.

MC 魚: *-ö* : *-ü*.

MC 虞: *-ü* : *-i* (after labials sometimes also *-u*, *-o*).

MC 模: *-o* : *-u* ~ *-o* (after labials sometimes also *-i*).

MC 侯: *-aw* : *-i* (sometimes also *-u*, *-o* after labials and velars).

MC 尤: *-aw* : *-i* [/*-u*, *-o* in later loanwords].

MC 幽: *-iw* : (unknown).

MC 蕭: *-iew* : *-o*.

MC 宵: *-ew* : *-o* ~ *-u* (*-(i)ao* in later loanwords).

MC 肴: *-aw* : 1) *-u* if it goes back to OC **-rũ*, cf. 炒 MC *çhãw*, OC **chrũ?* ‘to roast’ : Bai *chu¹*; 飽 MC *pãw*, OC **prũ?* ‘be satiated’ : Bai *pu¹*; 2) *-a* if it goes

back to OC **-rāw* or **-rēw*, cf. 豹 MC *pəw*, OC **prē(k)w-s* ‘leopard’: Bai *pā̃* (with rather frequent secondary nasalisation); 咬 MC *ŋəw*, OC **ŋhrāw?* ‘to bite’: Bai *ŋã⁶*.

MC 豪: *-âw*: 1) *-u* (sometimes *-uε*) if it goes back to OC **-ū*, cf. 抱 MC *bāw*, OC **bhū?* ‘to carry in arms’: Bai *pu¹*; 早 MC *cāw*, OC **cū?* ‘early’: Bai *cu¹*; 道 MC *dāw*, OC **lhū?* ‘road’: Bai *thu¹*; 草 MC *chāw*, OC **chū?* ‘grass’: Bai *chu¹*; 好 MC *xāw*, OC **xū?* ‘be good’: Bai *xu¹*; 靠 MC *khāw*, OC **khū(k)-s* ‘to lean upon’: Bai *khue⁴*; 2) *-a* if it goes back to OC **-āw*, cf. 盜 MC *dāw*, OC **d(h)āw-s* ‘to rob’: Bai *ta³*; 桃 MC *dāw*, OC **Lhāw* ‘peach’: Bai *ta³*; 毛 MC *māw*, OC **mhāw* ‘hair’: Bai *ma⁷*; 刀 MC *tāw*, OC **tāw* ‘knife’: Bai *tā⁴*; 高 MC *kāw*, OC **kāw* ‘high’: Bai *kā⁴*

The distinction between **-ū* and **-āw* may be at the latest observed in the history of the Chinese language in the 3d century A. D. (they still form separate rhyme classes in the verses of Ji Kang and Yuan Ji, but have merged completely in the 4th century in the rhymes of Tao Yuanming and Xie Lingyun; see [Juhl 1973; Старостин 1989: 488]).

Phonetic analysis, therefore, leads us to a conclusion that the ancestor of the Bai language must have split from Old Chinese somewhere between the 2nd century B. C. and the 4th century A. D. A more precise date is, of course, hard to establish, because the particular ancestor dialect of Bai could have been more advanced than other Chinese dialects of that time (or vice versa), and we know too little about Old Chinese dialects.

2. Lexicostatistical considerations

Below I adduce Swadesh's standard 100-wordlist for Baihua, Bai, Fuzhou and Hakka (plus 10 additional items from Yakhontov's 35-wordlist). Corresponding items are marked by identical numbers; loanwords are marked by negative numbers; missing items are marked by -666.

| Word | Baihua | N ₀ | Bai | N ₀ | Fuzhou | N ₀ | Hakka | N ₀ |
|-------|---------|----------------|---|----------------|---------------------------------------|----------------|---------------------------------|----------------|
| all | 都 dōu | 1 | ca ⁵ ke ⁷ , ci ¹ | 2 | tou ⁵² | 1 | du ¹ | 1 |
| ashes | 灰 hūi | 3 | xui ⁴ | 3 | hui ⁵⁵ | 3 | foi ¹ | 3 |
| bark | 皮 pí | 4 | | -666 | chiu ³¹ phui ⁵² | 4 | su ⁴ pi ² | 4 |
| belly | 肚子 dùzi | 5 | fū ⁶ | -1 | pu ³¹ lo ⁵² | 5 | du ³ s ³ | 5 |
| big | 大 dà | 6 | to ² | 6 | tuai ²⁴² | 6 | tai ⁴ | 6 |
| bird | 鳥 niǎo | 7 | vu ⁴ co ⁶ | 7 | ceu ³³ | 7 | vu ⁴ co ⁶ | 7 |
| bite | 咬 yǎo | 8 | ŋa ⁶ | 8 | ka ²⁴² | 9 | ŋau ¹ | 8 |

| Word | Baihua | N ₀ | Bai | N ₀ | Fuzhou | N ₀ | Hakka | N ₀ |
|---------|------------|----------------|---|----------------|--------------------------------------|----------------|---|----------------|
| black | 黑 hēi | 10 | xi ⁶ | 10 | u ⁵⁵ | 11 | u ¹ | 11 |
| blood | 血 xuè | 12 | sua ⁶ | 12 | haik ²³ | 12 | hiat ⁵ | 12 |
| bone | 骨頭 gǔtōu | 13 | kua ⁶ ti ⁷ | 13 | kouk ²³ | 13 | gut ⁵ -teu ² | 13 |
| breast | 乳房 rǔfáng | 14 | pa ² | 15 | nein ⁵² | 16 | nen ⁴ -gu ¹ | 16 |
| breast | 奶 nǎi | 17 | | 0 | | 0 | | 0 |
| burn | 燒 shāo | 18 | | -666 | ʃiu ⁵⁵ | 18 | seu ¹ fo ³ | 18 |
| claw | 指甲 zhǐjia | 19 | si ¹ ti ⁷ kε ⁶ | 19 | cieŋ ⁵⁵ ŋak ²³ | 19 | su ³ z ³ gap ⁵ | 19 |
| cloud | 雲 yún | 20 | ŋü ⁷ | 20 | huŋ ⁵² chai ³¹ | 20 | iun ² | 20 |
| cold | 寒 hán | 21 | ki ⁴ | 22 | chein ³³ | 23 | hon ² | 21 |
| come | 來 lái | 24 | yi ² | 24 | li ⁵² | 24 | loi ² | 24 |
| die | 死 sǐ | 25 | si ¹ | 25 | ʃi ³³ | 25 | si ³ | 25 |
| dog | 狗 gǒu | 26 | khuā ¹ | 27 | khein ⁵⁵ | 27 | geu ³ -ui ³ | 26 |
| drink | 喝 hē | 28 | ĩ ⁴ | 29 | chüok ²³ | 30 | im ³ | 29 |
| dry | 乾 gān | 31 | kā ⁴ | 31 | ta ⁵⁵ | 32 | gon ¹ -ne ⁴ | 31 |
| ear | 耳朵 ěrduo | 33 | ĩ ¹ ti ⁷ kuā ⁴ | 33 | ŋai ²⁴² | 33 | ŋi ³ -gun ¹ | 33 |
| earth | 土地 tǔdì | 34 | ci ³ | 34 | tai ²⁴² | 34 | tu ³ -ti ⁴ | 34 |
| eat | 吃 chī | 35 | ji ⁶ | 36 | ʃiek ⁵ | 36 | st ⁶ | 36 |
| egg | 卵 luǎn | 37 | sē ² | 38 | louŋ ²⁴² | 37 | lon ³ | 37 |
| eye | 眼 yǎn | 39 | ŋui ¹ | 40 | möük ³ ciu ⁵⁵ | 41 | muk ⁵ -zu ¹ | 41 |
| fat | 脂肪 zhīfang | 42 | ci ⁴ | 42 | cie ⁵⁵ | 42 | iu ² | 43 |
| feather | 羽毛 yǔmáo | 44 | | -666 | ü ³¹ mou ⁵² | 44 | mo ¹ | 45 |
| fire | 火 huǒ | 46 | xui ¹ | 46 | hui ³³ | 46 | fo ³ | 46 |
| fish | 魚 yú | 47 | ŋü ⁴ | 47 | ŋü ⁵² | 47 | ŋ ² | 47 |
| fly | 飛 fēi | 48 | fü ⁴ | -2 | pui ⁵⁵ | 48 | bi ¹ | 48 |
| foot | 腳 jiǎo | 49 | ko ⁶ | 49 | kha ⁵⁵ | -1 | giok ⁵ pan ¹ | 49 |
| full | 滿 mǎn | 50 | ma ¹ | 50 | muaj ³³ | 50 | man ¹ | 50 |
| give | 給 gěi | 51 | | -666 | khöük ²³ | 52 | bun ¹ | 53 |
| good | 好 hǎo | 54 | xu ¹ , kε ⁶ | 54 | ho ³³ | 54 | ho ³ | 54 |
| green | 綠 lǜ | 55 | lü ⁶ | 55 | luok ⁵ | 55 | liuk ⁶ | 55 |
| hair | 毛 máo | 56 | ma ⁷ | 56 | mou ⁵² | 56 | mo ¹ | 56 |
| hand | 手 shǒu | 57 | si ¹ | 57 | chiu ³³ | 57 | su ³ | 57 |
| head | 頭 tóu | 58 | ti ⁷ po ⁷ | 58 | thau ⁵² | 58 | teu ² -na ² | 58 |
| hear | 聽 tīng | 59 | chẽ ⁴ | 59 | thian ⁵⁵ | 59 | taŋ ¹ | 59 |
| heart | 心 xīn | 60 | ʃĩ ⁴ | 60 | ʃin ⁵⁵ | 60 | sim ¹ -gon ¹ | 60 |
| horn | 角 jiǎo | 61 | kü ⁶ | 61 | kouk ²³ | 61 | gok ⁵ | 61 |
| I | 我 wǒ | 62 | ŋo ³ | 62 | ŋuai ³³ | 62 | ŋai ² | 62 |

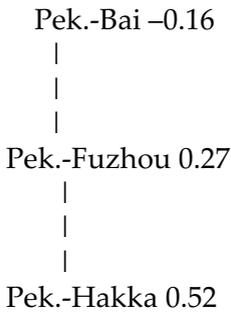
| Word | Baihua | № | Bai | № | Fuzhou | № | Hakka | № |
|----------|-----------|-----|--|------|---------------------------------------|------|-------------------------------------|-----|
| kill | 殺 shā | 63 | śa ⁶ | 63 | | -666 | sat ⁵ | 63 |
| knee | 膝頭 xitou | 64 | | -666 | | -666 | ci ⁵ -teu ² | 64 |
| know | 知道 zhīdao | 65 | sē ¹ | 66 | | -666 | di ¹ | 65 |
| leaf | 葉子 yèzi | 67 | se ⁶ | 67 | nuok ⁵ | 67 | iap ⁶ -bi ³ | 67 |
| lie | 臥 wò | 68 | | -666 | to ³³ | 69 | min ² den ³ | 70 |
| liver | 肝 gān | 71 | kā ⁴ | 71 | kaŋ ⁵⁵ | 71 | gon ¹ | 71 |
| long | 長 cháng | 72 | cō ² | 72 | touŋ ⁵² | 72 | coŋ ² | 72 |
| louse | 蝨子 shizi | 73 | śi ⁶ | 73 | ʂaik ²³ mo ³¹ | 73 | sep ⁵ -ma ² | 73 |
| man | 男人 nánrén | 74 | ci ¹ ji ⁷ | 75 | naŋ ³³ nöŋ ⁵² | 74 | nam ² -ŋin ² | 74 |
| many | 多 duō | 76 | ci ⁴ | 77 | sa ²⁴² | 78 | do ¹ | 76 |
| meat | 肉 ròu | 79 | ke ⁷ | 80 | lük ⁵ | 79 | ŋiuk ⁵ | 79 |
| moon | 月 yuè | 81 | mi ⁴ ŋua ⁶ | 81 | ŋuok ⁵ luoŋ ²⁴² | 81 | ŋiat ⁶ guoŋ ¹ | 81 |
| mountain | 山 shān | 82 | sü ² | 82 | ʂaŋ ⁵⁵ | 82 | san ¹ | 82 |
| mouth | 嘴 zuǐ | 83 | ćui ¹ ke ⁴ | 83 | chui ³¹ | 83 | zoi ⁴ | 83 |
| name | 名字 míngzì | 84 | miε ⁴ | 84 | mian ³³ cei ²⁴² | 84 | mian ² -c ⁴ | 84 |
| neck | 頸脖 jǐngbo | 85 | | -666 | ta ⁵ au ³³ | 86 | gian ³ -gin ¹ | 85 |
| new | 新 xīn | 87 | śi ⁴ | 87 | ʂiŋ ⁵⁵ | 87 | sin ¹ | 87 |
| night | 夜 yè | 88 | xē ⁴ miε ⁷ | 89 | maŋ ⁵⁵ muo ⁵⁵ | 90 | ban ⁴ -ia ⁴ | 88 |
| nose | 鼻子 bízi | 91 | ŋü ² khü ⁶ ti ⁷ | 92 | phei ³¹ | 91 | pi ⁴ -guŋ ¹ | 91 |
| not | 不 bù | 93 | a ³ , a ⁵ , ja ⁵ | 94 | me ⁵² | 95 | m ² | 95 |
| one | 一 yī | 96 | ji ⁶ , ji ⁵ , a ⁵ | 96 | ʂuok ²³ | 97 | it ⁵ | 96 |
| person | 人 rén | 98 | ji ⁷ | 98 | nöŋ ⁵² | 98 | ŋin ² | 98 |
| rain | 雨 yǔ | 99 | vu ¹ śui ¹ | 99 | ü ³¹ | 99 | i ³ | 99 |
| red | 紅 hóng | 100 | che ⁶ | 101 | öŋ ⁵² | 100 | fuŋ ² | 100 |
| road | 道 dào | 102 | thu ¹ | 102 | | 0 | | 0 |
| road | 路 lù | 103 | | 0 | lou ²⁴² | 103 | lu ⁴ | 103 |
| root | 根 gēn | 104 | mi ⁶ | 105 | chiu ³¹ kün ⁵⁵ | 104 | gin ¹ | 104 |
| round | 圓 yuán | 106 | ŋui ⁷ | 106 | ieŋ ⁵² | 106 | ian ² -ne ⁴ | 106 |
| sand | 沙 shā | 107 | so ⁴ ci ¹ | 107 | ʂai ⁵⁵ | 107 | sa ¹ | 107 |
| say | 話 huà | 108 | | | kouŋ ⁵⁵ ua ²⁴² | 108 | goŋ ³ fa ⁴ | 108 |
| say | 說 shuō | 109 | sua ⁶ | 109 | | 0 | | 0 |
| see | 看 kàn | 110 | xā ⁴ , ā ⁴ | 110 | khaŋ ³¹ | 110 | kon ⁴ | 110 |
| seed | 種 zhǒng | 111 | cũ ¹ | 111 | cün ⁵⁵ ci ⁵² | 111 | | 0 |
| seed | 籽 zǐ | 112 | | 0 | | 0 | z ³ | 112 |
| sit | 坐 zuò | 113 | kü ² | 114 | ʂuoi ²⁴² | 113 | co ¹ | 113 |
| skin | 皮膚 pífu | 115 | pe ⁷ | 115 | phui ⁵² | 115 | pi ² | 115 |

| Word | Baihua | N ₀ | Bai | N ₀ | Fuzhou | N ₀ | Hakka | N ₀ |
|--------|------------|----------------|-----------------------------------|----------------|---|----------------|------------------------------------|----------------|
| sleep | 睡 shuì | 116 | chē ¹ | 117 | khoun ³¹ | 118 | soi ⁴ -muk ⁵ | 116 |
| small | 小 xiǎo | 119 | se ³ | 120 | noun ²⁴² | 121 | se ⁴ | 120 |
| smoke | 煙 yān | 122 | xui ¹ šē ⁴ | 122 | hui ³³ ien ⁵⁵ | 122 | ian ¹ | 122 |
| stand | 站 zhàn | 123 | ci ³ , xi ⁴ | 124 | khie ²⁴² | 124 | ki ¹ | 124 |
| star | 星 xīng | 125 | šē ⁴ | 125 | ŋin ⁵⁵ | 125 | sen ¹ -ŋi ³ | 125 |
| stone | 石頭 shítou | 126 | co ² khui ⁴ | 126 | ŋuok ³ thau ⁵² | 126 | sak ⁶ -teu ² | 126 |
| sun | 日頭 rítou | 127 | jī ⁶ phī ³ | 127 | lik ³ thau ⁵² | 127 | ŋit ⁵ -teu ² | 127 |
| swim | 游水 yóushuǐ | 128 | | -666 | ŋiu ³¹ cui ⁵² | 128 | ciu ² se ³ | 128 |
| tail | 尾巴 wěiba | 129 | ŋü ¹ tü ⁴ | 129 | mui ³³ | 129 | mi ¹ -ba ¹ | 129 |
| that | 那 nà | 130 | mi ³ | 131 | hi ⁵² eik ²³ | 132 | ge ⁴ -ge ⁴ | 133 |
| this | 這 zhè | 134 | li ³ | 135 | ci ⁵² eik ²³ | 134 | li ³ -ie ⁴ | 136 |
| thou | 你 nǐ | 137 | no ³ | 137 | nö ³³ | 137 | ŋ ² | 137 |
| tongue | 舌頭 shétou | 138 | ce ² | 138 | chui ³¹ liek ⁵ | 138 | sat ⁶ -ma ² | 138 |
| tooth | 牙 yá | 139 | ci ¹ pa ⁶ | 140 | ŋai ³³ | 139 | ŋa ² | 139 |
| tree | 樹 shù | 141 | ci ³ | 141 | chiu ³¹ | 141 | su ⁴ -ui ³ | 141 |
| two | 二 èr | 142 | kō ¹ , ne ⁶ | 142 | nan ²⁴² , nei ²⁴² | 142 | ŋi ⁴ | 142 |
| walk | 走 zǒu | 143 | | -666 | kho ³¹ | 144 | hi ⁴ | 144 |
| warm | 暖和 nuǎnhuo | 145 | ui ⁴ vu ⁶ | 146 | nuon ³³ huo ⁵² | 145 | non ¹ | 145 |
| water | 水 shuǐ | 147 | śui ¹ | 147 | cui ⁵² | 147 | se ³ | 147 |
| we | 我門 wǒmen | 148 | ŋa ⁴ | 148 | ŋuai ⁵⁵ | 148 | ŋai ² -deu ² | 148 |
| what | 甚麼 shémma | 149 | a ⁴ sē ³ | 149 | ŋien ⁵² nok ²³ | 149 | mak ⁵ -ge ⁴ | 150 |
| white | 白 bái | 151 | pē ² | 151 | pak ⁵ | 151 | pak ⁶ | 151 |
| who | 誰 shuí | 152 | a ³ to ⁷ | 153 | tak ³ nöün ²⁴ | 153 | man ³ -ŋin ² | 150 |
| woman | 女人 nǚrén | 154 | jū ¹ jī ⁷ | 154 | nü ⁵⁵ ai ³¹ | 154 | ŋ ³ -ŋin ² | 154 |
| yellow | 黃 huáng | 155 | ŋü ⁷ | 155 | uon ⁵² | 155 | uon ² | 155 |
| far | 遠 yuǎn | 156 | tuī ¹ | 157 | huon ²⁴² | 156 | ian ³ | 156 |
| heavy | 重 zhòng | 158 | cū ¹ | 158 | töün ²⁴² | 158 | cun ¹ | 158 |
| near | 近 jìn | 159 | čī ¹ | 159 | köün ²⁴² | 159 | kiun ¹ | 159 |
| salt | 鹽 yán | 160 | pī ⁴ | 161 | ŋien ⁵² | 160 | iam ² | 160 |
| short | 短 duǎn | 162 | chi ⁴ | 163 | töü ³³ | 162 | don ³ | 162 |
| snake | 蛇 shé | 164 | khü ¹ | 165 | ŋie ⁵² | 164 | sa ² -go ¹ | 164 |
| thin | 薄 báo | 166 | po ² | 166 | pok ⁵ | 166 | pok ⁶ | 166 |
| wind | 風 fēng | 167 | pi ⁴ si ⁴ | 168 | hun ⁵⁵ | -666 | fun ¹ | 169 |
| worm | 蟲 chóng | 170 | cū ⁷ | 170 | thöün ⁵² | 170 | cun ² -ŋi ³ | 170 |
| year | 年 nián | 171 | | 0 | nien ⁵² | 171 | ŋian ² | 171 |
| year | 歲 suì | 172 | sua ⁶ | 172 | | 0 | se ⁴ | 172 |

The calculating technique that I employ was described in [Старостин 1989a], now implemented as a computer program. The table of percentages looks like this:

| | Bai | Fuzhou | Hakka |
|--------|------|--------|-------|
| Baihua | 0.70 | 0.78 | 0.83 |
| Bai | – | 0.68 | 0.68 |
| Fuzhou | – | – | 0.79 |

which gives us the following tree diagram for the four idioms in question (dates are given in millennia B.C. and A.D.):



We see, therefore, that glottochronology coincides rather well with phonological estimations of the divergence of Bai and Chinese.