Studies in Asian and African Geolinguistics

I

ILCAA Joint Research Project 2020 - 2022 'Studies in Asian and African Geolinguistics'
Research Institute for Languages and Cultures of Asia and Africa
Tokyo University of Foreign Studies

Studies in Asian and African Geolinguistics I

"Stop series"

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Tasks of "Studies in Asian and African Geolinguistics" 2020–2022

Mitsuaki ENDO

Aoyama Gakuin University

Abstract

This is a synopsis of the project "Studies in Asian and African Geolinguistics" at the Institute of Asian and African Languages and Cultures, Tokyo University of Foreign Studies, during academic years 2020–2022. The results of the previous 2015–2017 project are overviewed first. Second, details of team members and their coverage areas, as well as the themes of future meetings, are given. Finally, the results expected in 3 years are enumerated.

1 Introduction

The project "Studies in Asian and African Geolinguistics" at the Research Institute of Languages and Cultures of Asia and Africa (ILCAA), Tokyo University of Foreign Studies, during academic years 2020–2022, was aimed at enhancing geolinguistic studies in each language family of Asia and Africa. We extract these language families' formation processes, interrelationships, and typological tendencies, as well as trace migration patterns and language contacts among them. Because this is the second phase of the previous project "Studies in Asian Geolinguistics" (2015–2017), an overview of that project is provided first, and then, new points are introduced successively.

2 Results of "Studies in Asian Geolinguistics" (2015–2017)

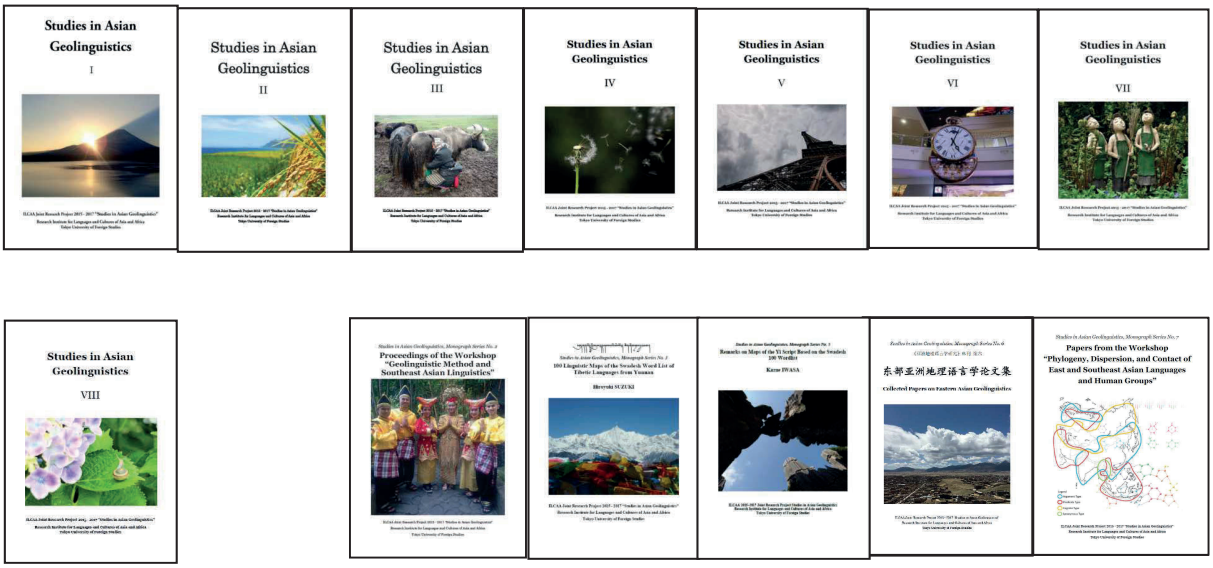
Eight regular, progressive reports dealing with "sun, rice, milk, wind, iron, how to count nouns, tone and accent, and it rains" were open to public in the form of an e-publication on the website of ILCAA: http://www.aa.tufs.ac.jp/ja/publications/e-publications

These reports were compiled into a book, *Linguistic Atlas of Asia*, which is to be published by Hituzi Syobo in Tokyo in August 2021.

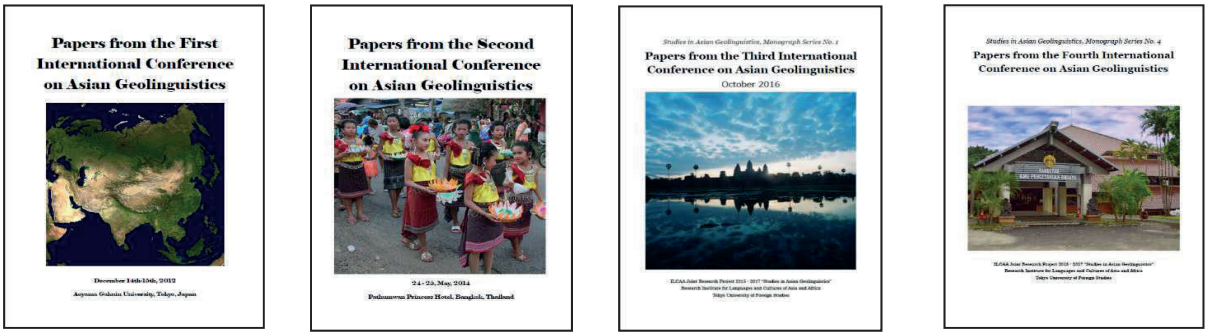
In addition, seven monographs were published as e-publications:

- Mitsuaki Endo (ed.), *Papers from the Third International Conference on Asian Geolinguistics*
- H. Suzuki & M. Endo (eds.), *Papers from the Fourth International Conference on Asian Geolinguistics*
- H. Suzuki & M. Endo (eds.), *Proceedings of the Workshop "Geolinguistic Method and Southeast Asian Linguistics"*
- Hiroyuki Suzuki, *100 Linguistic Maps of the Swadesh Word List of Tibetic Languages from Yunnan*
- Kazue Iwasa, *Remarks on Maps of the Yi Script Based on the Swadesh 100 Word List*

- Hiroyuki Suzuki, Keita Kurabe, & Mitsuaki Endo (eds.), *Collected Papers on Eastern Asian Geolinguistics* (in Chinese)
- Hiroyuki Suzuki, Keita Kurabe, & Mitsuaki Endo (eds.), *Papers from the Workshop "Phylogeny, Dispersion, and Contact of East and Southeast Asian Languages and Human Groups"*



Moreover, the International Conference on Asian Geolingustics has been held biannually. The first edition was held in Japan in 2012, the second in Thailand in 2014, the third in Cambodia in 2016, the fourth in Indonesia in 2018, and the fifth is to be held in Vietnam in the near future. (Proceedings of the first and second meetings are available at https://agsj.jimdo.com/.)



3 Concrete Plan of the Project

The project running the duration of 2020–2022 is covering the whole of Africa in addition to Asia. Furthermore, collaboration with researchers in genetics, archaeology, and other related disciplines became possible thanks to support from the MEXT Grant-in-Aid "Yaponesian Genome" 2018–2022 project.

Team members and their coverage areas are as follows (* denotes ILCAA Joint Researcher):

Japonic: Shinsuke KISHIE* (Nara University), Nobuko KIBE (NINJAL), Kohei NAKAZAWA (The University of Tokyo), and Akiko YOKOYAMA (JSPS/ILCAA, TUFS)
Korean: Rei FUKUI (The University of Tokyo)
Tungusic and Uralic: Ryo MATSUMOTO* (Kobe City University of Foreign Studies)
Mongolic and Turkic: Yoshio SAITÔ (Takushoku University)
Tibeto-Burman: Satoko SHIRAI (The University of Tokyo), Shiho EBIHARA (ILCAA Fellow), Kazue IWASA* (Nagoya University of Foreign Studies), Keita KURABE (ILCAA), and Hiroyuki SUZUKI* (Fudan University)
Sinitic: Kenji YAGI (Kokushikan University) and Fumiki SUZUKI* (Nanzan University)
Hmong-Mien: Yoshihisa TAGUCHI (Chiba University)
Kra-Dai: Mitsuaki ENDO* (Aoyama Gakuin University)
Austronesian: Atsuko UTSUMI (Meisei University)
Austroasiatic: Makoto MINEGISHI (ILCAA) and Masaaki SHIMIZU* (Osaka University)
Chukotko-Kamchatkan: Chikako ONO* (Hokkai-Gakuen University)
Ainu: Mika FUKAZAWA* (National Ainu Museum)
South Asia: Noboru YOSHIOKA* (National Museum of Ethnology)
Dravidian : Nozomi KODAMA* (Kumamoto University)
Iranian: Takamasa IWASAKI* (JSPS/ Kyoto University)
Semitic: Youichi NAGATO* (TUFS)
Nilo-Saharan: Shuichiro NAKAO* (Osaka University)
Niger-Congo: Daisuke SHINAGAWA (ILCAA) and Junko KOMORI* (Osaka University)
Kalahari Basin Area: Hirosi NAKAGAWA* (TUFS) and Kimihiko KIMURA* (TUFS)
Methodology: Chitsuko FUKUSHIMA* (University of Niigata Prefecture)

The studied themes are as follows:
2020-1 Stop series (subsystem of consonants), coordinated by Hiroyuki SUZUKI
2020-2 Grammatical relations (marking of *actor*, *patient*, etc.), coordinated by Satoko SHIRAI
2021-1 Animal vocabulary (*mouse*, *horse*, *wolf/dog*, *bear*, *chicken*, of which DNA information is available), coordinated by Akiko YOKOYAMA
2021-2 System of addressing sibling(s), coordinated by Chitsuko FUKUSHIMA
2022-1 Cultivated plant vocabulary (*millet*, *chestnut*, *taro*, etc., of which DNA information is available), coordinated by TBA
2022-2 System of numerals, coordinated by Shiho EBIHARA

4 Expected Results in Three Years

1) Systematic treatments on typological features have to be dealt with using macro- and micro-geolinguistic perspectives.
2) Active members are expected to study the geolinguistics of each word further and to publish those studies in optional papers and/or monographs.
3) Migration and the changing processes of language families and human groups are to be traced in collaboration with geneticists and archaeologists.
4) Internal and external factors of linguistic changes and language contacts are to be studied.

5) Empirical geolinguistic studies on Asia and African languages are to be accumulated.

As for publication plans:

1) *Studies in Asian and African Geolinguistics,* Vols. 1 to 6, and several monographs as e-publications of ILCAA
2) *Linguistic Atlas of Asia and Africa*, Vol. 1, and additional books are to be published after the project

Acknowledgements

This work was supported by MEXT KAKENHI Grant, JP18H05510.

Studies in Asian and African Geolinguistics **1**

Featured topic: Consonant system-stop series with subgrouping of languages

Subgrouping of Paleoasian Languages

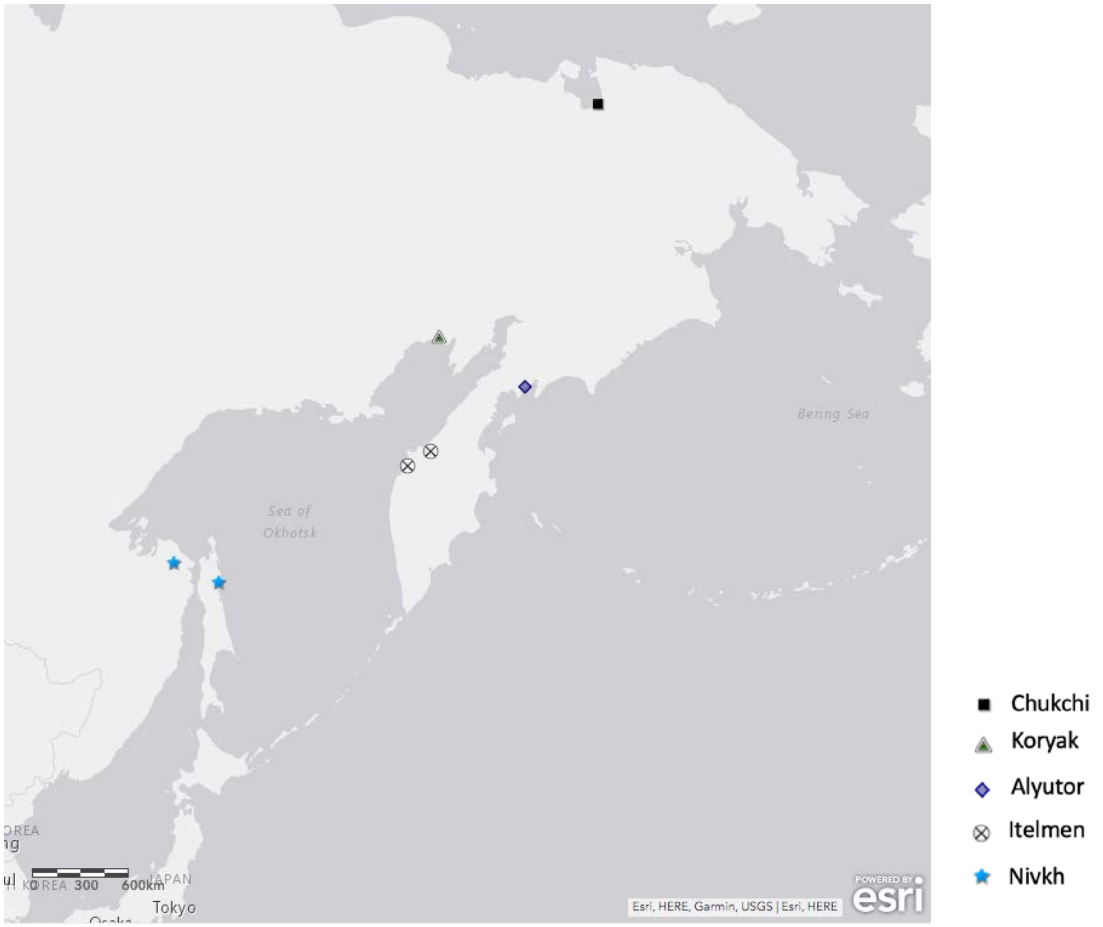
"Paleoasian" is not a genealogical grouping but an aerial one. The languages that belong to the Paleoasian group are Chukotko-Kamchatkan and Nivkh, and Yukagir and Ket have also been considered as group members. In recent years, it has been suggested that Ket could be a cognate with Na-Dene languages and that Yukagir and Uralic languages have a genealogical relationship.

The language data mapped in this volume are those of Chukchi, Alyutor, Koryak, Itelmen, and Nivkh.

・Chukotko-Kamchatkan
  Northern
    ———Chukchi
    ———Alyutor
    ———Koryak
  Southern
    ———Itelmen
      Northern dialect
      Southern dialect

・Nivkh
  Sakhalin dialect
  Amur dialect

(ONO Chikako)



Subgrouping of Japonic

Although there are various hypotheses about how to divide Japonic languages, we can broadly classify them into Japanese and Ryukyuan. Japanese is divided into Eastern Japanese (EJ), Western Japanese (WJ), and Kyūshū Japanese (KJ). Ryukyuan languages are divided into Northern Ryukyuan (NR, including Amami) and Southern Ryukyuan (SR). The criteria for classification are as shown in the table: forms for 'be' (LAJ 53), suffixes for 'purpose of motion' (GAJ 21), forms for the interrogative 'what' (Pellard 2015), and forms for 'say' (cf. SR *õĭz- < *ani+ip- 'say so,' *ip- 'scold' < 'say').

We include Hachijō dialect in Eastern Japanese since it shares innovations with the Eastern Japanese dialects (Igarashi 2018).

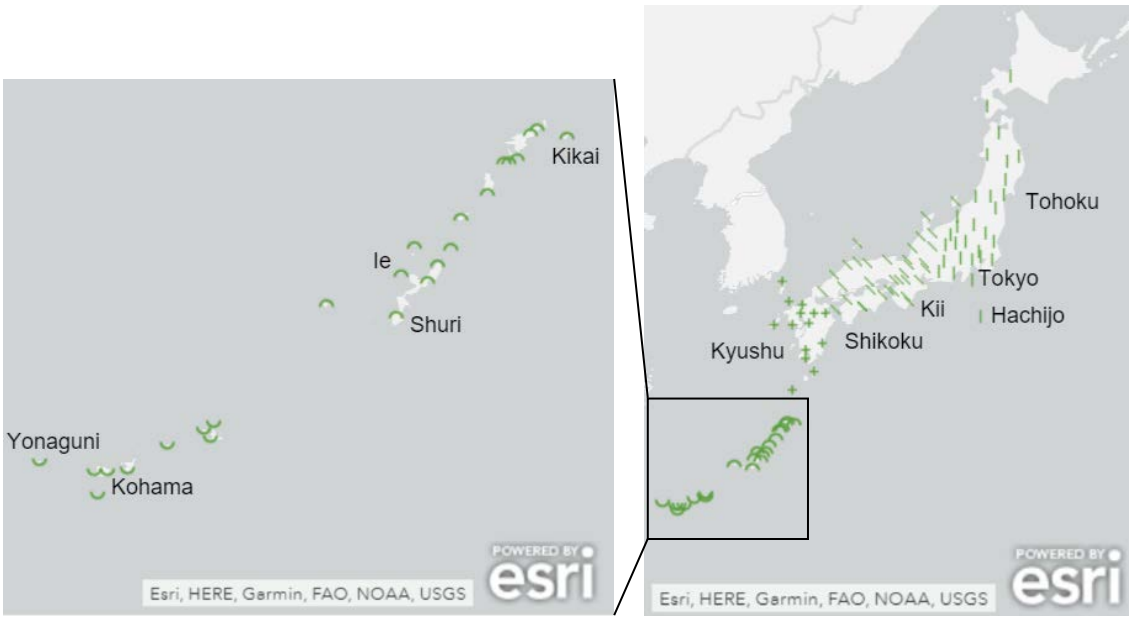
There are more narrow divisions than this, and there are many differences depending on the researcher.

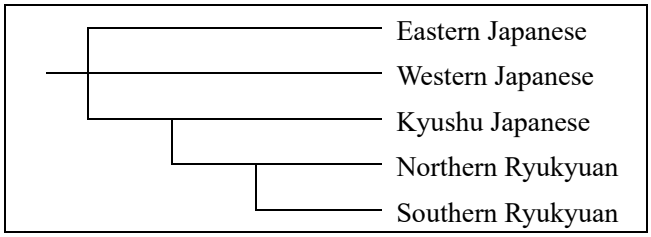
It is difficult to draw a phylogenetic tree because it is uncertain which forms are innovative or retained.

Table: Criteria for classification of Japonic

branch \ criteria	be	(go) for	what	say
EJ	*wi-	*-ni	*nani	*ip-
WJ	*wor-	*-ni	*nani	*ip-
KJ	*wor-	*-ga	*nani	*ip-
NR	*wor-	*-ga	*nawo	*ip-
SR	*wor-	*-ga	*nawo	*õĭz-

(NAKAZAWA Kohei and YOKOYAMA Akiko)





A proposal for the phylogenetic tree of Japonic languages

Subgrouping of Sinitic

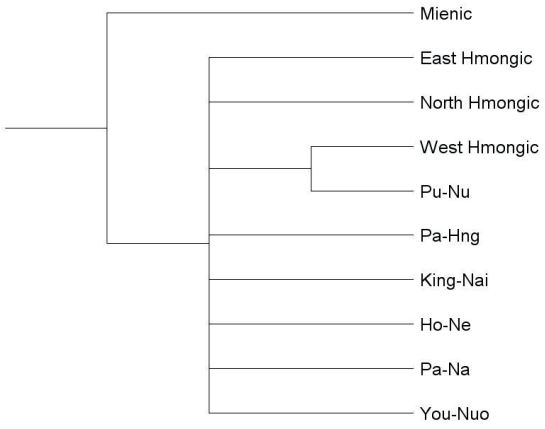
We basically adopt the subgrouping in Sinitic proposed in Wurm et al. 1987 (Data are from Zhan et al. 2017, Hou 2002, Qian 2010). 1. Mandarin, 2. Jin, 3. Wu, 4. Xiang, 5. Gan, 6. Kejia, 7. Yue, 8. Min, 9. Hui, 10. Ping / Tu hua. Mandarin is further divided into 8 subgroups. 1a. Beijing, 1b. Dongbei, 1c. Jilu, 1d. Jianghuai, 1e. Jiaoliao, 1f. Lanyin, 1g. Xinan, 1h. Zhongyuan.

This subgrouping is a kind of the traditional dialect classification in China, and is said to have some consistent with some phonological changes from middle Chinese, such as developments of voiced initials or entering tone. However, at this stage, it is difficult to create a phylogenetic tree because this classification also takes into account non-linguistic backgrounds such as social and cultural backgrounds or geographical distribution. (YAGI Kenji)

Subgrouping of Hmong-Mien

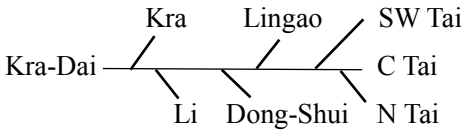
The subgrouping indicated by the following tree diagram is based on the phylogenetic study that the author conducted using lexical data. The tree indicates that the languages family comprises two branches: Hmongic and Mienic. It shows the internal structure of the Hmongic branch because it has more diversity inside than Mienic. West Hmongic and Pu-Nu constitute a clade, which might be called West Hmongic as a whole, but we here use traditional terms to denote each group. Some phonological evidence might suggest a tree with a higher resolution, which places North Hmongic and Pa-Hng in higher nodes than other Hmongic languages. Here, we rather conservatively place these two languages in a parallel fashion with other Hmongic languages.

(TAGUCHI Yoshihisa)



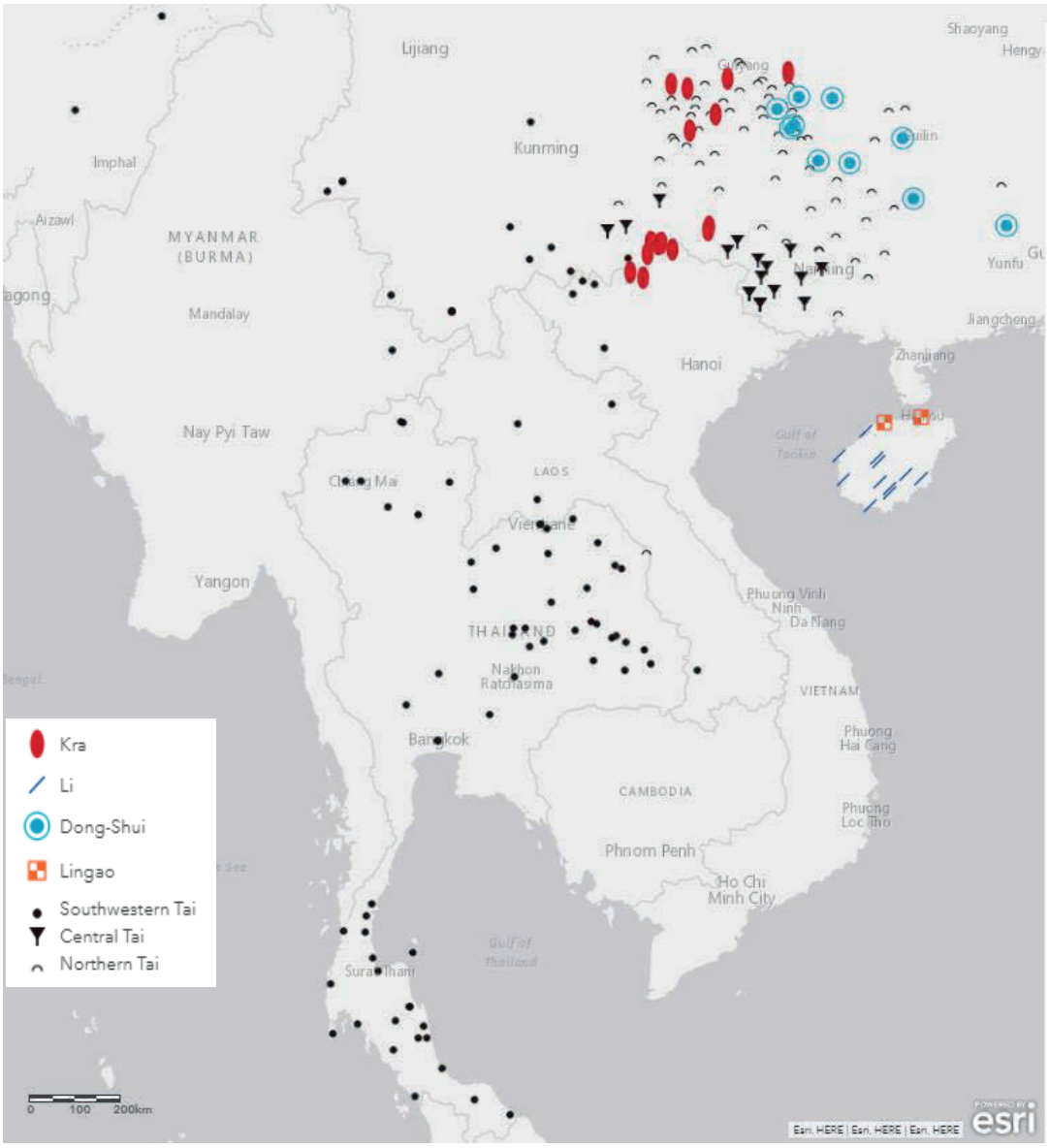
Subgrouping of Kra-Dai

We adopt the subgrouping and its hierarchy in Kra-Dai as proposed by Liang and Zhang (1996:13) to denote a whole. The established classification by Li (1977) is adopted for the sub-branches of the Tai branch.



Kra is the most conservative branch, while Li ranks second. They preserve common vocabulary with Austronesian, for example, numerals, and so on. Northern Tai is divided on the basis of a phonological criterion that no distinction of aspiration exists.

(ENDO Mitsuaki)



Subgrouping of Tibeto-Burman

There have been varying suggestions for the subgrouping of Tibeto-Burman (TB) (van Driem 2015; Matisoff 2015; Thurgood2017; Zhang et al. 2019; Sagart et al. 2019; Zhang et al. 2020). Here, the model following STEDT (Matisoff 2015) with some updates is referred to, with the TB language hierarchy shown in Figure 1. There are also one unclassified TB language and two Sinitic-Tibetic mixed languages.

Abbreviations: NE IAG: North-eastern Indian areal group; TQ: Tangut-Qiang; LBN: Lolo-Burmese-Naxi; 'NA': 'North Assam'; KC: Kuki-Chin; 'N'AG: 'Naga' areal group; TK: Tibeto-Kannauri; KMC: Kham-Magar-Chepang; LB: Lolo-Burmese.

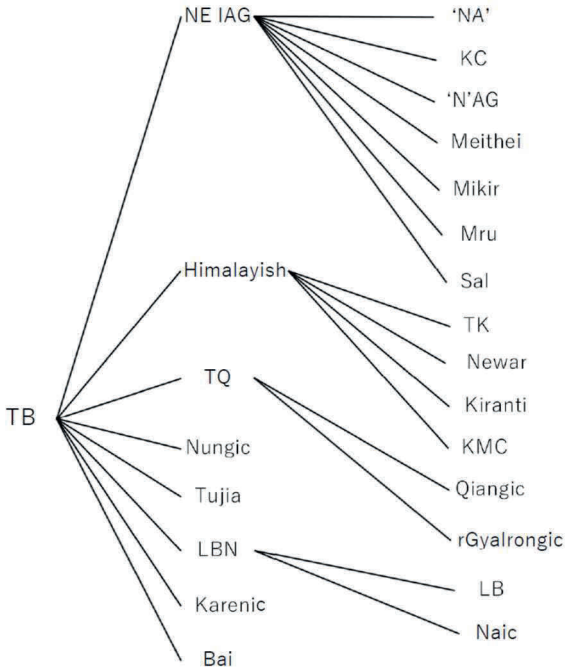
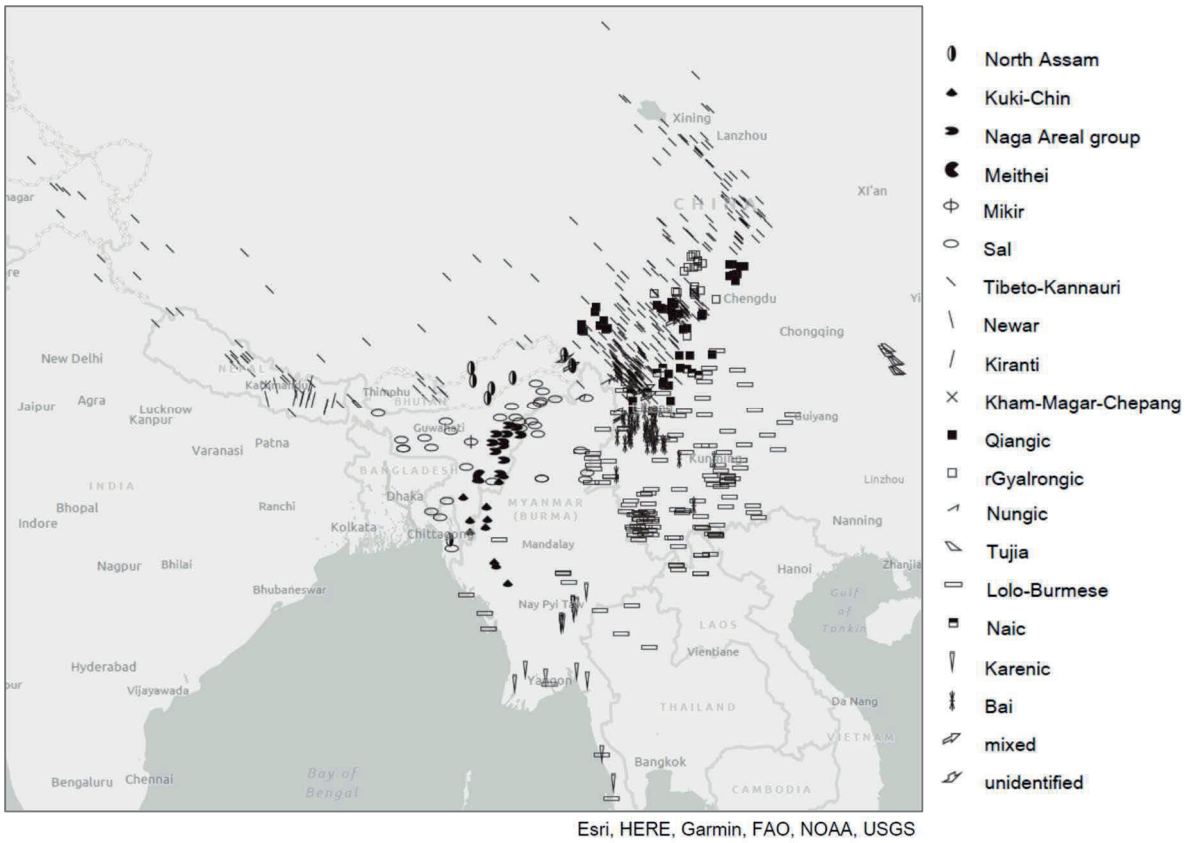


Figure 1: Subgrouping of TB

(SUZUKI Hiroyuki, EBIHARA Shiho, IWASA Kazue, KURABE Keita, SHIRAI Satoko)



Subgrouping of Austroasiatic

Austroasiatic is first divided into Munda and Mon-Khmer. Regarding Mon-Khmer, we adopt the subgrouping of Austroasiatic by Diffloth & Zide (1992) whose subgrouping is given below as Figure 1. Sidwell (2014), after describing the history of Austroasiatic classification proposals since the middle of the 19th century, offers 'provisional' classification. His tree is based on 'lexical, lexicostatistical, computational phylogenetic, and phonological studies', and is characterized as strongly branching: with eleven primary subgrouping nodes, among which only two nodes have secondary branching; one is Khasian and Palaungic, and the other, Aslian and Nicobarese.

(MINEGISHI Makoto & SHIMIZU Masaaki)

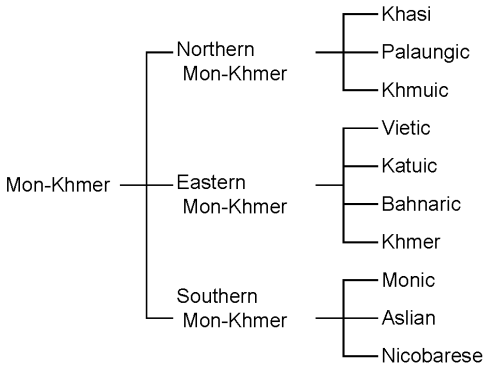
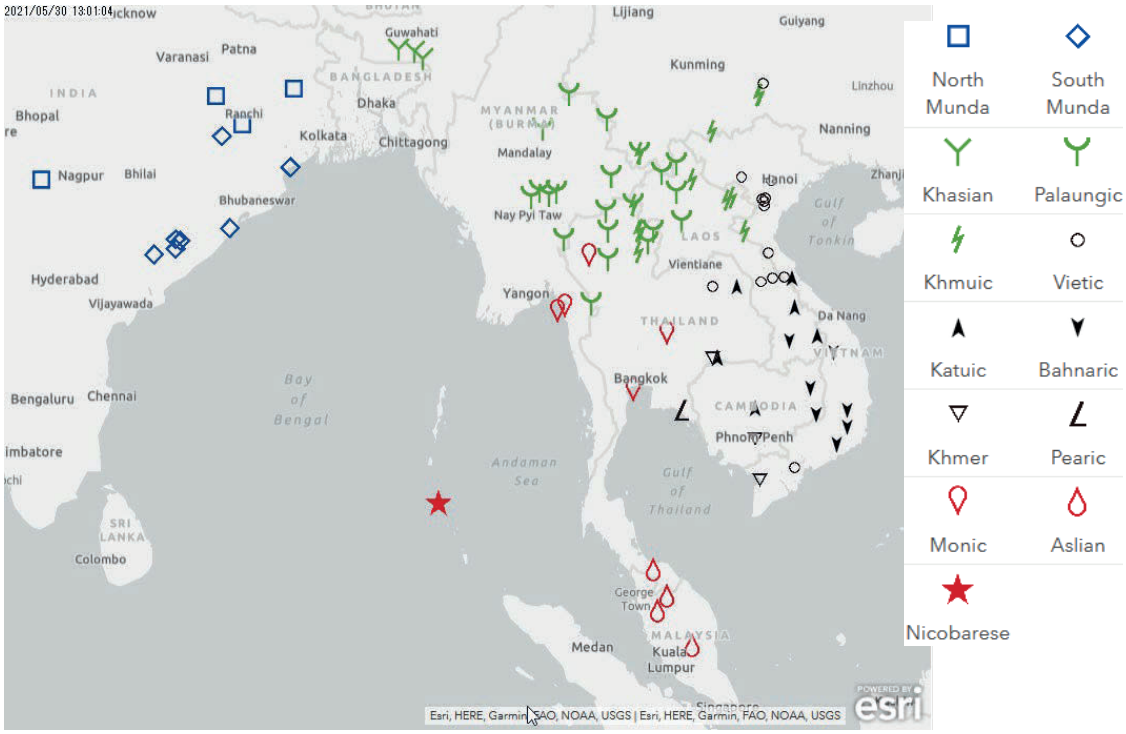


Figure 1: Mon-Khmer subgrouping

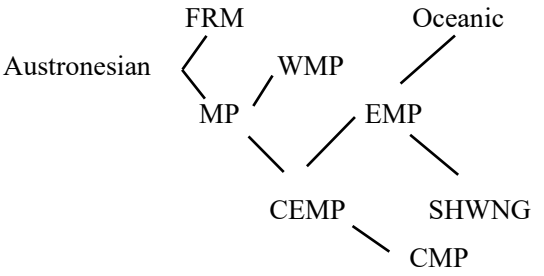


Subgrouping of Austronesian

We adopt the subgrouping and its hierarchy in Austronesian Languages proposed by Blust 1980 and Blust 1999. The Formosan languages, or the Austronesian languages of Taiwan belong to nine primary branches of the Austronesian family. They are "generally believed to be the most diverse in the entire Austronesian language family" (Li 2008). They do not form a subgroup linguistically, but for the purpose of this geolinguistic study, they are grouped together and referred to Formosan languages (FRM).

All of the non-Formosan languages belong to a tenth primary branch, which is Malayo-Polynesian (MP). MP split into West Malayo-Polynesian(WMP) and Central-East-Malay-Polynesian (CEMP), the latter of which split into Central-Malayo-Polynesian (CMP) and East Malayo-Polynesian (EMP). EMP are grouped into South-Halmahera-West-New-Guinea languages (SHWNG) and Oceanic languages.

The geological perspective as well as actual geolinguistic characteristics are considered for the subgrouping of non-Formosan languages. They are grouped into WMP, Oceanic, and the rest which will be referred as CEMP (i.e., CEMP languages except for Oceanic languages). WMP languages are frequently divided into Philippine languages and Indonesian languages when they show remarkable difference within WMP.



(UTSUMI Atsuko)

Subgrouping of Tungusic

According to Ikegami (1989), Tungusic languages are divided into four groups:

Group I Evenki, Ewen, Negidal, Solon (Evenki in China)
Group II Udehe, Orochi
Group III Nanym Ulcha, Uilta
Group IV Sibe (MATSUMOTO Ryo)

Subgrouping of Uralic

Here I show the subgroups of the Uralic language family in the traditional way. The Uralic language family is divided largely into two branches, Samoyedic and Finno-Ugric, and then Finno-Uric into two sub-branches, Ugric and Finno-Permic. Finno-Permic includes most languages of the Uralic family and has more subdivisions, but here:

A Finno-Permic

Komi, Udmurt, Mari (Hill Mari, Meadow Mari), Mordvinic (Erzya, Moksha), Finnish, Estonian, Livonian, Votic, Karelian, Veps, Ingrian, Sami

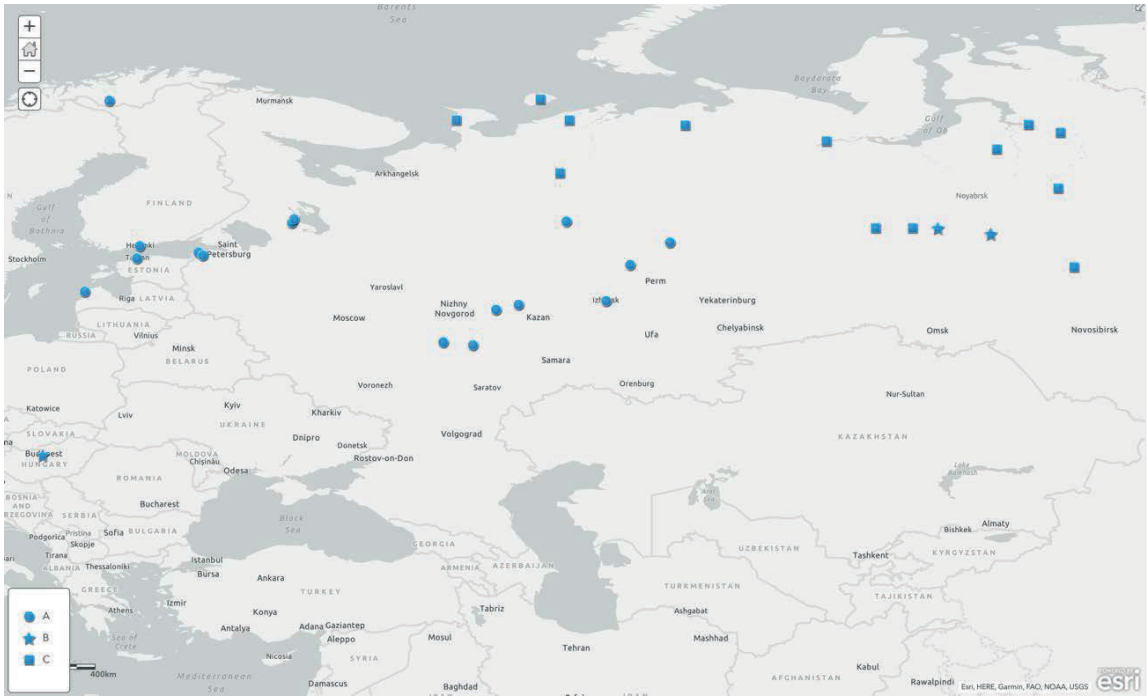
B Ugric languages

Hungarian, Khanty, Mansi

C Samoyedic languages

Nenets, Enets, Selkup, Nganasan

(MATSUMOTO Ryo)



Subgrouping of Mongolic and Turkic

Mongolic and Turkic groups of languages are now considered to be separate language families by the majority of researchers. A classification of languages may differ depending on the features chosen for criteria. The classifications shown below are mainly based on V. Rybatzki (2003) and L. Johanson (1998).

1 Mongolic languages

Northeastern: Dagur
Northern: Khamnigan, Buryad
Central: Mongol, Ordos, Oirad
South Central: Shira Yughur
Southeastern: Monguor, Baoan, Dongxiang, Kangjia
Southwestern: Moghol

2 Turkic languages

Oghuz (Southwestern): Turkish, Azeri, Gagauz, Turkmen, Khorasan Turkic, Kashkay, Afshar
Kipchak (Northwestern):
[Volga-Ural (Northern)] Tatar, Bashkir
[Ponto-Caspian (Western)] Kumyk, Karachay, Balkar, Crimean Tatar, Karaim
[Aralo-Caspian (Eastern)] Kyrgyz, Kazakh, Karakalpak, Nogay
Uighur (Southeastern): Uzbek, Uighur, Sarïg Yughur, Salar
Siberian (Northeastern):
[North Siberian] Sakha, Dolgan
[South Siberian] Tuva, Tofa, Khakas, Shor, Chulym, Altay
Oghur/Bulgar: Chuvash
Arghu: Khalaj

(SAITÔ Yoshio)

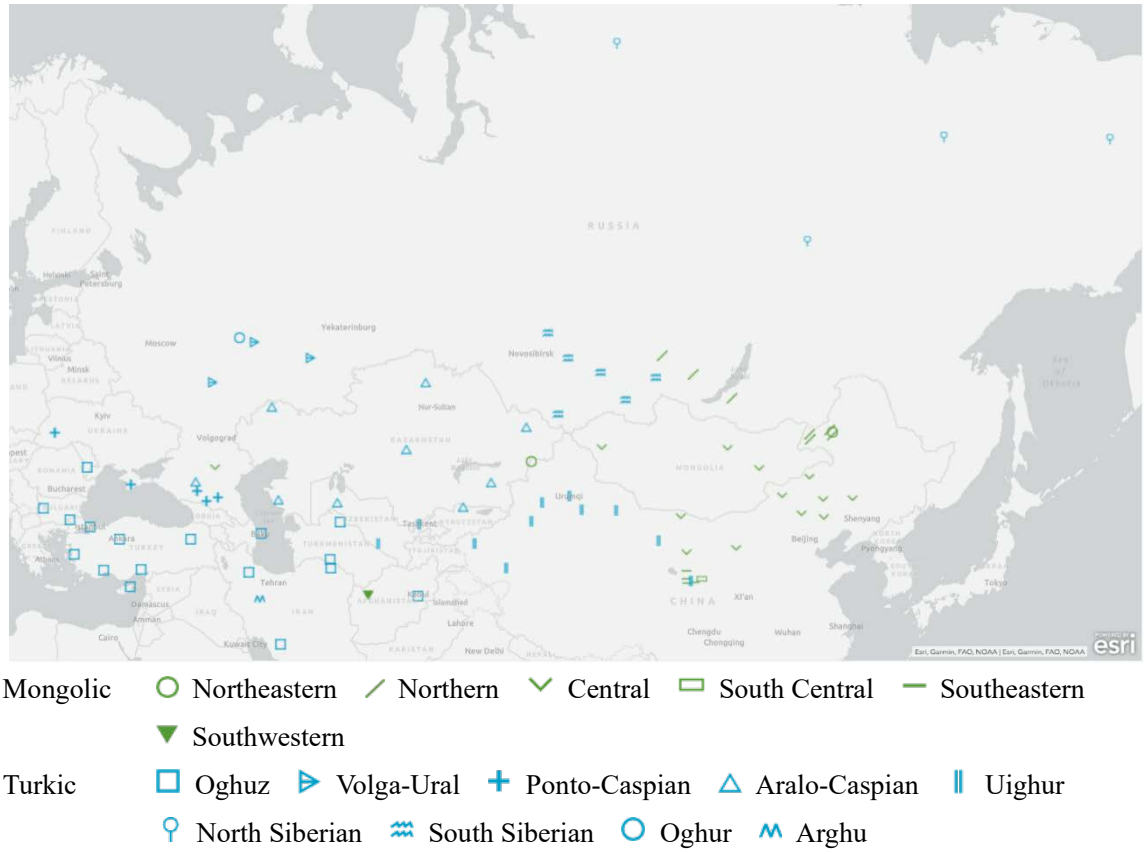
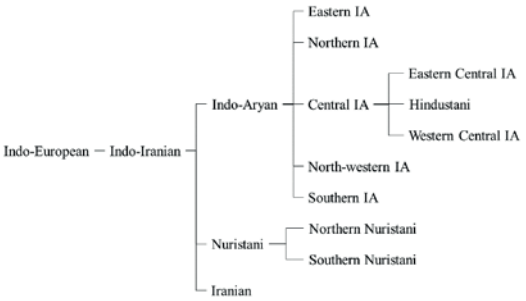


Figure: Subgroups of Mongolic and Turkic

Subgroupings of Indo-Aryan, Nuristani, Andamanese, and language isolates in South Asia

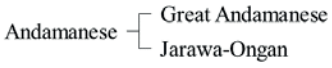
I show the subgroupings of the Indo-Iranian branch, with the exception of Iranian, of the Indo-European family, and of the Andamanese family and some language isolates, in the map.

The subgrouping in Indo-Aryan remains controversial. Here, I have simply classified the Indo-Aryan and Nuristani languages as per the following cladogram, with reference to Masica (1991), Eberhard, Simons, and Fennig (2021), and Hammarström, Forkel, Haspelmath, and Bank (2020).

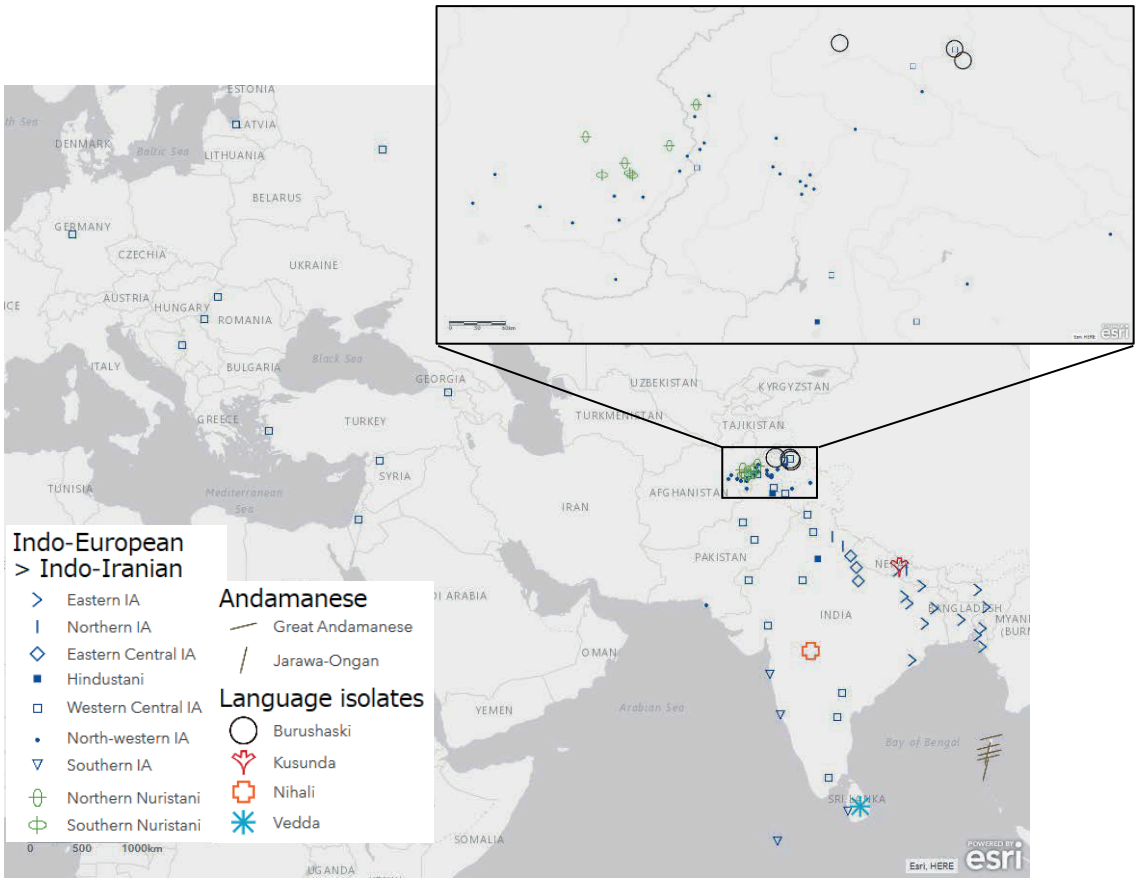


Nuristani is a subbranch of the Indo-Iranian branch and so, of course, parallels the Indo-Aryan and Iranian subbranches. This branch can be subdivided into two groups, northern and southern.

The Andamanese family has two branches, Great Andamanese and Jarawa-Ongan. The former can be further subgrouped into two or three areal groups. The latter branch has two living languages, Jarawa and Öñge. Furthermore, the Sentinelese language is found on the Sentinel island south-west of the Great Andaman. That language, however, remains undescribed as its speakers absolutely refuse to make contact with outsiders, so it cannot be classified anywhere phylogenetically.



(YOSHIOKA Noboru)



Subgrouping of Dravidian

The Dravidian languages were recognized as a language family as early as 1816 by Francis Whyte Ellis, who was in the civilian service at Madras. Krishnamurti (2003) replaced the earlier tripartite classification of Dravidian languages with the following four subgroups by splitting the erstwhile Central Dravidian based on his genealogical assumptions.

1. South Dravidian (SDI)
Tamil
Malayalam
Irula
Kodagu
Toda
Kota
Kannada-Badaga
Tulu-Koraga*

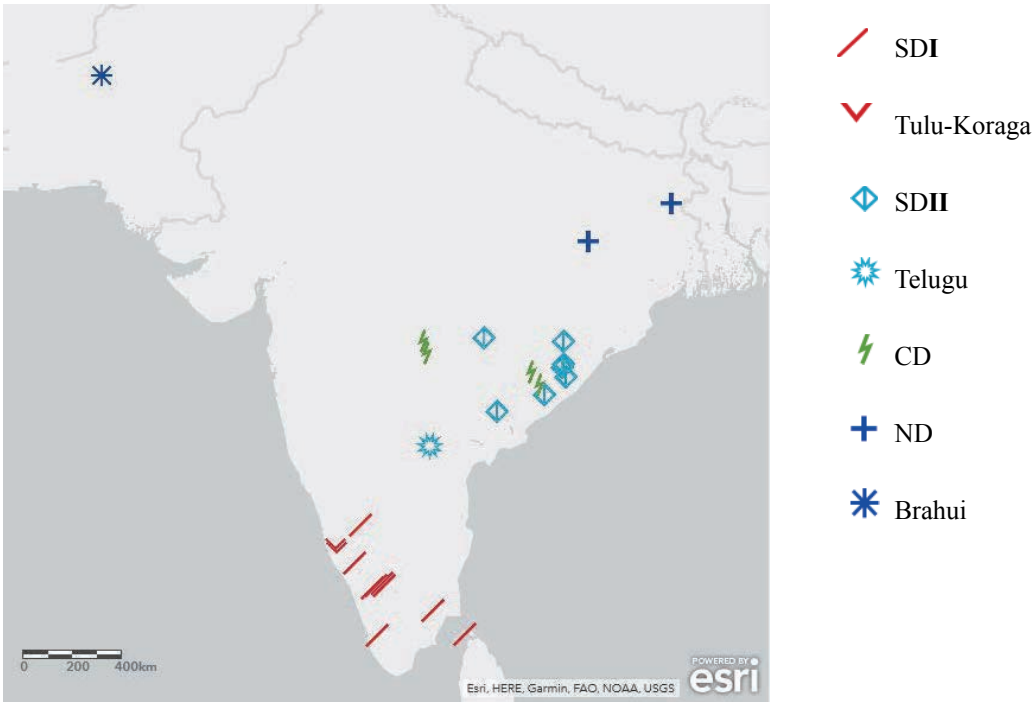
2. South Central Dravidian (SDII)
Telugu*
Gondi
Konda
Kui
Kuvi
Pengo
Manda

3. Central Dravidian (CD)
Kolami
Naiki
Parji
Gadaba

4. North Dravidian (ND)
Kurukh
Malto
Brahui*

The four-way classification is accepted by most researchers, although inclusion of Tulu-Koraga, Telugu and Brahui in their respective subgroups may be viewed by some as more tentative than conclusive.

The phylogenetic relationship between the four subgroups, which would have a direct implication on the issue of the geographical diffusion of the language family, remains unsettled. Kurukh-Malto and Brahui are isolated from each other as well as from other subgroups. If they comprise a single phylogenetic branch i.e. North Dravidian, their spatial distribution could be attributed to highly migratory nature of their speakers at some point in the past, entailing that south-to-north diffusion of the language family cannot be ruled out. (KODAMA Nozomi)



Subgrouping of Armenian and Iranian

Armenian is an independent branch of the Indo-European languages. It is divided further into two major subgroups, namely East and West. The Iranian languages are a subgroup of Indo-Iranian in Indo-European language family. They spread a vast area from Western China (Xinjiang) in the east, to Central Turkey in the west, and from North Caucasus (Russia and Georgia) in the north, to the southern Pakistan and the northern Oman in the south.

In terms of historical and typological linguistics, this branch is generally classified into Eastern and Western Iranian. These are divided further into four subgroups, namely North-Western, North-Eastern, South-Western and South-Eastern Iranian. Each of them has its archaism and innovation, therefore we cannot surmise which language best preserves archaism on the whole.

It is arguable whether Ormuri and Parachi are classified into Western or Eastern Iranian. Efimov (1986: 8) includes them into North-eastern Iranian, while Morgenstierne (1929: 12) classify them into central position among the Iranian languages.

Note that the subgroup names do not always correspond with the geographical distribution of the modern Iranian languages. For example, Ossetic, although it belongs to North-Eastern Iranian, is spoken in the western region. Also, Balochi spreads rather to the southeastern area while it is classified into North-Eastern Iranian. Figure 1 shows the distribution and subgrouping of the modern Iranian languages.

(IWASAKI Takamasa)

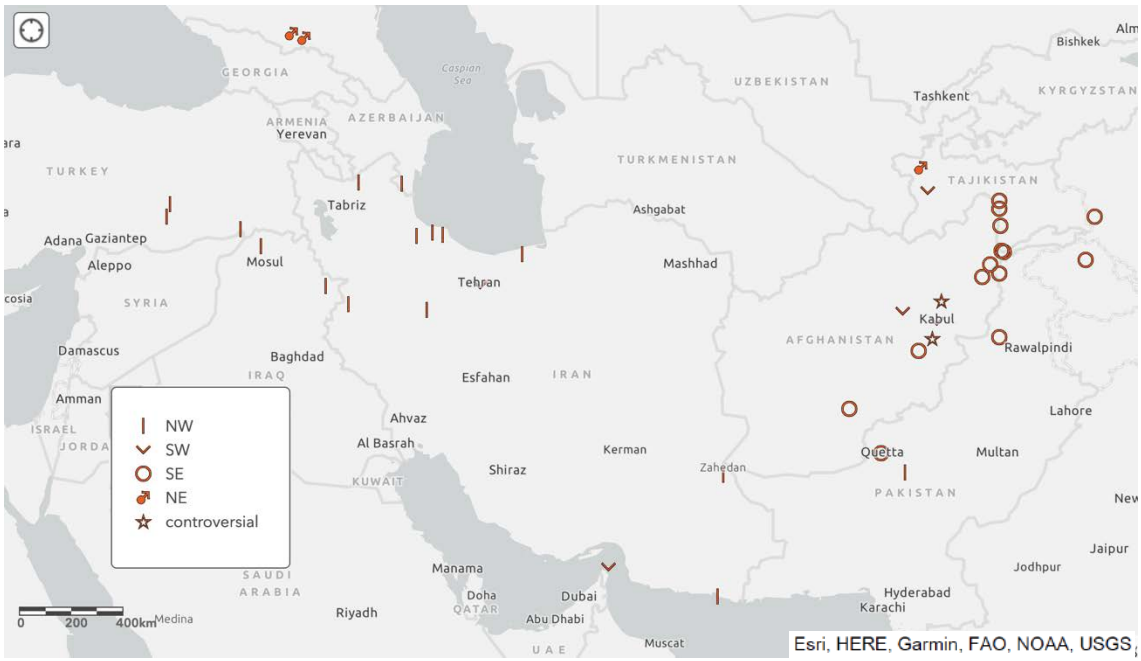


Figure 1: Distribution of the Iranian languages

Subgrouping of Semitic

The Semitic is a branch of the Afroasiatic phylum. The earliest attested Semitic is Akkadian in Mesopotamia, which belongs to East Semitic.

In the Syro-Palestinian area there were several Semitic languages such as Eblaite and Ugaritic. Then during the second millennium BCE, Canaanite (Hebrew, Phoenician) and Aramaic emerged. Hezron (1974, 1976) proposed subgrouping of this group as Central Semitic, in which Hetzron grouped Arabic, insted of South Semitic. Aramaic was used as a lingua franca in Babylonian and Persian empires between the seventh and the forth centuries BCE. It remained in use as a literary language until the fifth century CE. Modern varieties of Aramaic survive in a number of linguistic enclaves such as Ma'lūla in Syria (Currently, most of the village residents have fled the country), Tūr 'Abdīn in Western Kurdistan.

Canaanite is a collective term for Hebrew, Phoenician and a few other languages. Hebrew is the language of the Jewish Bible (1200-200 BCE.) and one of the two national languages of Israel now.

South Semitic is divided into three groups, Epigraphic South Arabian, Modern South Arabian and Ethiopian. Epigraphic South Arabian is languages of probably between the eighth century BCE and the sixth century CE. Modern South Arabian languages, such as Mehri, Jibbālī, Soqotrī and Hobyōt in Yemen and Oman, probably go back to spoken varieties of Epigraphic South Arabian. To Ethiopian, belong a large number of languages such as Tigre, Tigriña and Amharic, the official language of Ethiopia. Ge'ez is the Classical Ethiopic, the language of the empire of Aksum in first centuries CE.

(NAGATO Youichi)

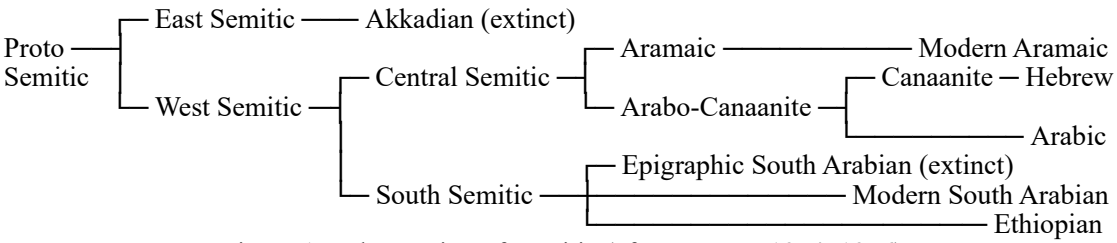
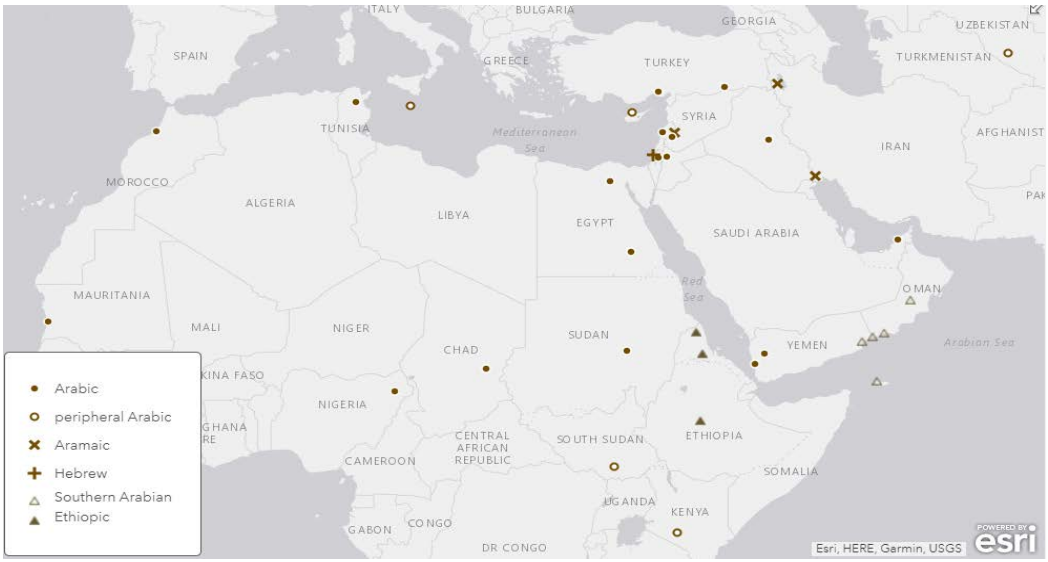


Figure 1: Subgrouping of Semitic (after Hetzron 1974, 1976)



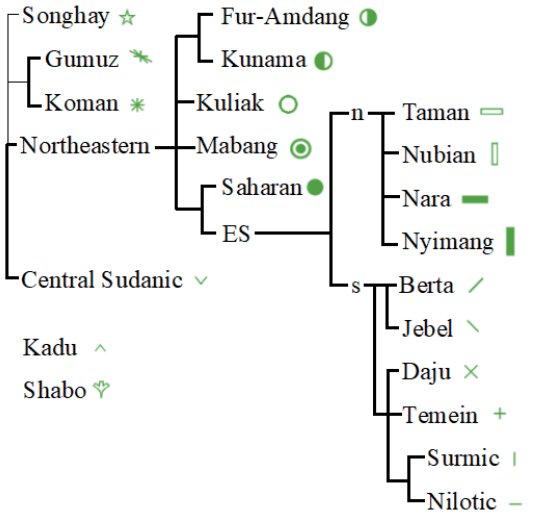
Subgrouping of Nilo-Saharan

For the time being, there is no full consensus about the membership or the subgrouping of Nilo-Saharan. For convenience in this map, we adopt Dimmendaal, Ahland, Jakobi & Kutsch Lojenga (2019)'s proposals.

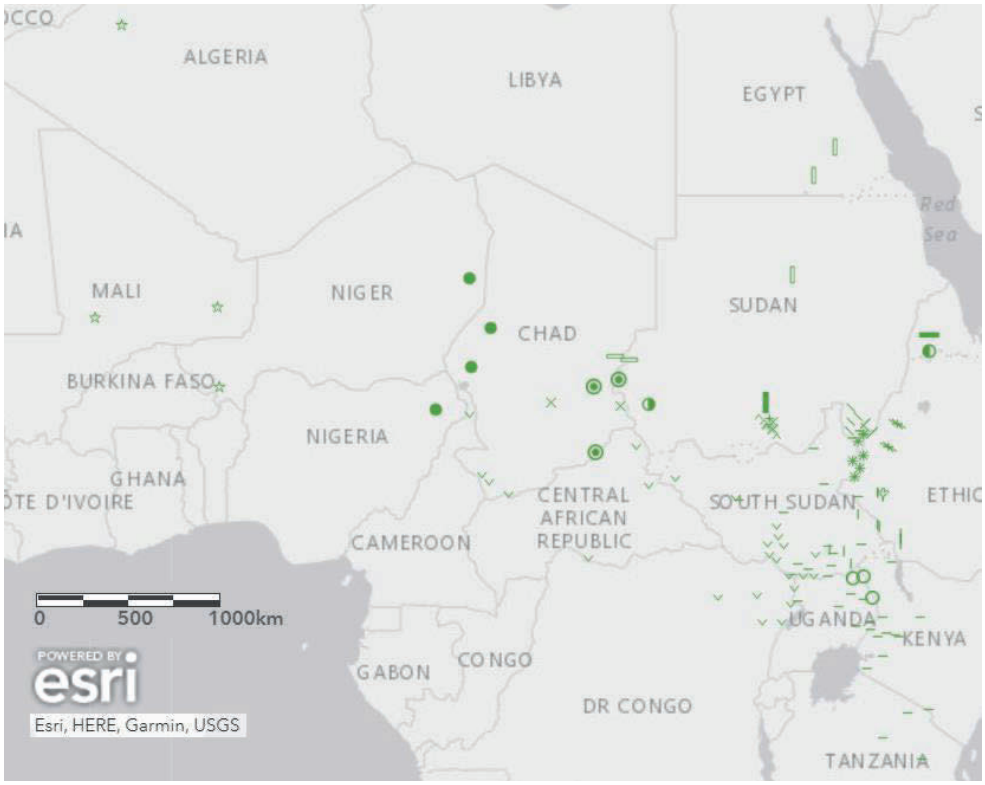
Nilo-Saharan consists of two major branches, Central Sudanic and Northeastern Nilo-Saharan, to these one may add Songhay, Koman and Gumuz (the latter two seem related). Shabo and Kadu languages are sometimes argued within the Nilo-Saharan framework, they are excluded.

The Northeastern (NE) branch consists of Eastern Sudanic and the other small branches, Saharan, Mabang, Fur-Amdang, Kunama and Kuliak. Fur and Kunama, Eastern Sudanic (ES) and Saharan may constitute a single branch.

Eastern Sudanic consists of northern (n) and southern (s) sub-branches. The northern branch consists of Taman, Nubian, Nara and Nyimang (including Afitti), while the southern branch consists of Berta, Jebel (or 'Eastern Jebel'), Daju, Temein, Surmic and Nilotic branches.



(NAKAO Shuichiro)

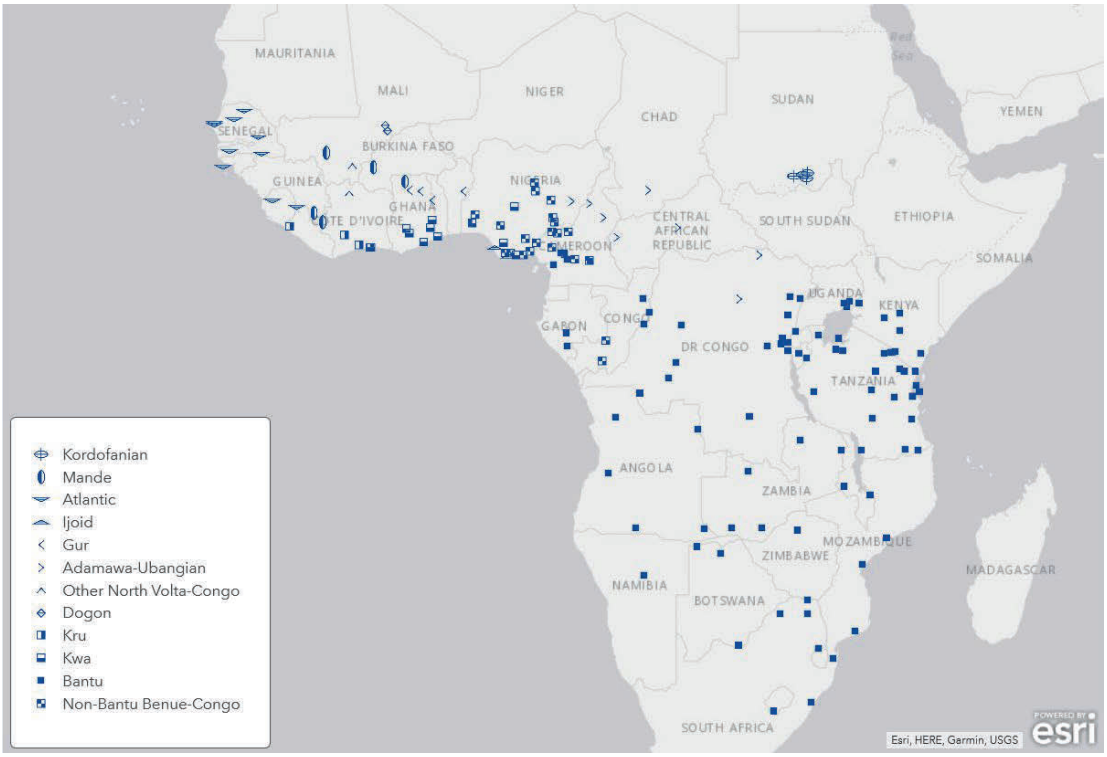


Subgrouping of Niger-Congo

The current understanding of genetic classification of the Niger-Congo languages is established on the basis of Greenberg's (1963) well-known classification of African languages, which classifies NC into six subgroups, namely Mande, West Atlantic (renamed as Atlantic), Adamawa-Eastern (renamed as Adamawa-Ubangian), Gur, Kwa, and Benue-Congo that include Bantu which was previously regarded as an independent genetic unit. Together with Kordofanian, it forms the macro-phylum originally called Congo-Kordofanian, which is equivalent to today's understanding of NC. The classification adopted in this volume follows the simplified model proposed by Dimmendaal and Storch (2016), which is based on Williamson (1989), reflecting major revisions on Greenberg (1963), including reclassification of Eastern Kwa into West BC by Bennette and Sterk (1977). Readers may refer to Williamson and Blench (2000) for a general overview of the genetic classification of NC, and to Watters (2018) for external and internal classification of East BC.

I. Kordofanian
II. Mande
III. Atlantic-Congo
  III-1. Atlantic
  III-2. Ijoid
  III-3. Volta-Congo
    III-3-i. North Volta-Congo including Gur and Adamawa-Ubangian
    III-3-ii. Dogon
    III-3-iii. Kru
    III-3-iv. Kwa
    III-3-v. Benue-Congo including Bantu

(SHINAGAWA Daisuke)



Subgrouping of languages in the Kalahari Basin area

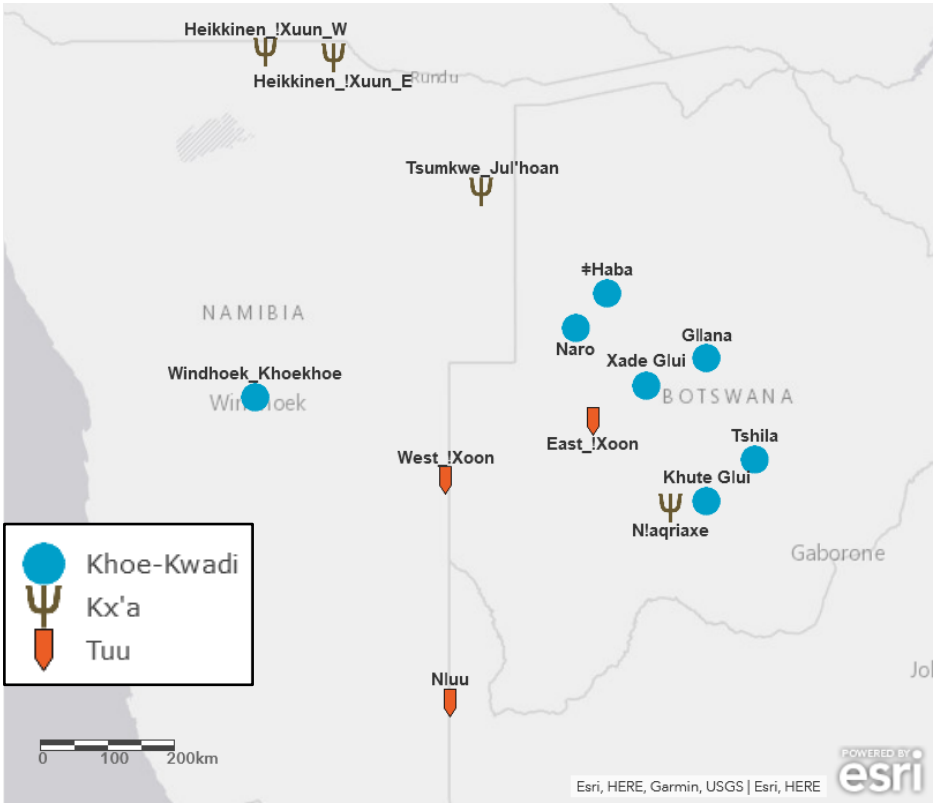
Under the currently accepted genealogical classification presented in Güldemann (2014), the languages spoken in the Kalahari Basin area (hereafter KBA), aka Southern African Khoisan languages, are classified into three language families, namely, Tuu, Kx'a and Khoe-Kwadi. Each family consists of individual language varieties or continua of varieties called language complexes.

Table 1 summarizes the language families in KBA and their constituent subdivisions that are sampled in the present volume. Language varieties are plotted on the below map, where Khoe-Kwadi languages are marked with filled circles, Kx'a with trident marks and Tuu with downward pentagon marks.

(KIMURA Kimihiko, NAKAGAWA Hirosi)

Table 1: Subgrouping of the KBA language families

Language family	Language (complex)	Variety
Tuu	N‖ng	N‖uu
	Taa	West !Xoon
		East !Xoon
Kx'a	ǂ'Amkoe	N!aqriaxe
	Ju	Tsumkwe Ju‖'hoan
		Heikkinen !Xuun W
		Heikkinen !Xuun E
Khoe-Kwadi	Namibian Khoekhoe	Windhoek Khoekhoe
	Ghanzi-Hanahai	Naro
		ǂHaba
	Eastern Okwa	Xade G‖ui
		Khute G‖ui
		G‖ana
		Tshila



Stop series in Asian and African languages

This project, SAAG-1, overviewed the stop series sound system in more than 2500 Asian and African languages (including regiolects and vernaculars if available), with the main focus being on dental/denti-alveolar/alveolar (henceforth D/A) plosives, and nasal sounds.

1. Data components

The D/A stop series was primarily selected for this project. This series sought to determine the most complex patterns in the articulatory positions in most languages, dialects, and varieties. While some languages may distinguish dental and alveolar sound, this distinction was secondary. Dental sounds typically appear in Indo-Iranian and Dravidian languages, denti-alveolar sounds appear in Sinitic and Tibeto-Burman languages (see Zhu's 2010 system), and alveolar sounds appear in Japanese. Note that these articulatory positions are more complex when there are fricatives.

The project examined a system of D/A stop series, based on the following components /th-t-t'-d-dh-ɗ-nd-nt-nth-n-nh/ (e.g., [t^h-t-t'-d-$d^ɦ$-ɗ-^{n}d-^{n}t-$^n t^h$-n-n̥] for a phonetic description). Plosives and nasals were included as /n/ can be regarded as a *nasalised* stop in phonetics. Note that there are also nasalised fricatives; for example, see 'rhinoglottophilia' by Matisoff (1975) and 'nasalised the aspiration' in Suzuki (2015). However, although affricates are members of the stop, they were excluded. Other sounds, such as /d'/ [t̪] (Tibeto-Burman), /ʔn/ [ˀn] (Hmong-Mien; Austroasiatic), /ʔd/ [ˀd] (Austroasiatic), /'t/ (Korean), and /$t^ʕ$, $d^ʕ$/ (Semitic) were also properly counted as data for the project. Ejectives and clicks were also included even though their geographical distribution is limited. Ejectives are pervasive in Caucasian languages, of which types such as /t^h-t'-d-n/ (Kartuli) /t^h-t-t'-d-n/ (Lezgi) are attested (Klimov 1994). Clicks (sounds including a dental /ǀ/) are found in the Kalahari Basin Area and can be combined with voicing, aspiration, and ejective features.

In other words, using this model, the historical changes and the plosive typologies were examined based primarily on the phonation or laryngeal features, and the geographical distributions encoded. Non-pulmonic sounds were also included in the description to elucidate the potential correlations and interactions between non-pulmonic and pulmonic sounds synchronically and diachronically and to determine their geographical distribution in more detail than in previous works such as WALS (Dryer and Haspelmath eds. 2013). This approach also differed from the theoretical, typological analysis in Duanmu (2016).

Prenasalisation was also included as a potential feature to trace some crucial sound changes in phonological systems; however, the preaspiration and postnasalisation 'series' by Maddieson (1984) were excluded. Preaspiration has a crucial function in the consonant system in several languages, such as Tibetic (Tibeto-Burman) and Saami (Uralic). The preaspirated consonants in these languages are respectively derived from consonant clusters and long consonants (Suzuki 2011b; Korhonen 1981).

There were also challenges. For example, there were discrepancies in the traditional and individual phonological analysis preferences and the phonetic notation customs (despite the existence of the International Phonetic Alphabet and its extended edition, extIPA; Ball et al. 2018). For example, it has been disputed whether /d'/ [t̪] (Tibetic) is an independent consonant phoneme or a consonant /t/ with a breathy suprasegmental (tonal) feature. The classification terminologies also differed, such as the use of 'fortis/lenis' rather than 'voiceless/voiced'. In several Uralic languages, the plosives voicing contrast is understood as fortis/lenis, with the 't' and 'd' described as /t/ [t^h, t] and /d/ [t, d̥] in Northern Saami. In this case, it was debatable whether /t-d/ (as in Nielsen 1979) or /t^h-t/ should be used (as in Nickel 1994) in the project. It was, therefore, necessary to explain the invisible phonetic features in the phonological analysis.

2. Types of the D/A stop series

A two-way distinction is the minimum D/A stop series system, in which the /t-n/ components are most widely attested in languages such as in Ainu, Japonic, Austroasiatic, Austronesian, Uralic, Turkic, Arabic, Nilo-Saharan, and Niger-Congo. The striking features are summarised below following the language families and groups presented in the project, SAAG-1.

Voicing contrast

A contrast between voiceless and voiced plosives

is attested in Japonic, Sinitic, Hmong-Mien, Kra-Dai, Tibeto-Burman, Austroasiatic, Austronesian, Tungusic, Uralic, Mongolic, Turkic, Indo-Aryan, Burushaski, Dravidian, Iranian, Armenian, Nilo-Saharan, Niger-Congo, Tuu, Kx'a, and Khoe-Kwadi.

Aspiration contrast

A contrast between voiceless aspirated and voiceless nonaspirated plosives is attested in Korean, Sinitic, Hmong-Mien, Kra-Dai, Tibeto-Burman, Austroasiatic, Austronesian, Mongolic, Turkic, Indo-Aryan, Burushaski, Dravidian, Iranian, Armenian, Nilo-Saharan, Niger-Congo, Tuu, Kx'a, and Khoe-Kwadi.

In Iranian languages, an aspirated feature has been derived from a voiceless sound in the voicing contrast. In these cases, the contrasts between the voicing and aspiration are mutually related. As suggested in the Sinitic and Tibeto-Burman language descriptions, a part of the words that have aspirated features is derived from the voicing contrast.

The aspirated voiced plosive /dh/ (/$d^{ɦ}$/) is attested in Sinitic, Tibeto-Burman, Indo-Aryan, Dravidian, Iranian, Niger-Congo, Tuu, and Kx'a. Languages with this phoneme tending to have a voiceless aspirated counterpart; however, it is not a prerequisite, as seen in Sinitic and Dravidian.

Contrasts consisting of plosive voicing and aspiration combinations

A tripartite contrast /th-t-d/ is widely attested in Sinitic, Hmong-Mien, Kra-Dai, Tibeto-Burman, Austroasiatic, Austronesian, Indo-Aryan, Burushaski, Armenian, and Niger-Congo.

Other tripartite contrasts comprising voicing and aspiration distinctions are marginally attested, such as the /th-d-dh/ (Sinitic) and /t-d-dh/ (Dravidian).

Indo-Aryan is a typical language that has a quadripartite contrast of plosives, such as /th-t-d-dh/. This type is also attested in Kx'a.

Ejectives

Ejective sounds are restricted to a voiceless feature /t'/ in the languages mentioned in the project, except for Tuu, which has a click voiced ejective /g|'/. /t'/ is attested in Chukotko-Kamchatkan, Iranian, Semitic, Nilo-Saharan, Niger-Congo, Tuu, Kx'a, and Khoe-Kwadi. In Semitic languages, the ejective /t'/ can be related to the emphatic *t*, which appears as a pharyngealised feature /$t^{ˤ}$/ in many Arabic languages.

Implosives

Implosives are usually voiced; however, a voiceless counterpart was also found. The voiced implosive /ɗ/ is attested in Sinitic, Kra-Dai, Tibeto-Burman, Austroasiatic, Austronesian, Indo-Aryan, Semitic, Nilo-Saharan, and Niger-Congo. The voiceless implosive /ƭ/ is attested only in Niger-Congo as a phonemic status.

As suggested by Li (1977), implosive sounds are related to glottalised sounds such as /ʔd/ in Kra-Dai, and is also possibly true in Sinitic and Austroasiatic. Shuichiro Nakao (p.c.) suggested that it is possible that the /ɗ/ in Semitic, Nilo-Saharan, and Niger-Congo languages spoken near Lake Chad is phonetically realised as [ʔd].

Prenasalisation /^{n}d-^{n}t-$^{n}t^{h}$/

Prenasalised plosives are attested in Japonic, Sinitic, Kra-Dai, Tibeto-Burman, Austronesian, Nilo-Saharan, and Niger-Congo. While the voiced prenasalised sound is pervasive in these languages, Tibeto-Burman, Austronesian, and Niger-Congo also have voiceless (and aspirated) counterparts.

Prenasalisation is both posited as a more archaic form (Japonic, Kra-Dai, Tibeto-Burman, etc.) and a newly emerged form (Japonic, Sinitic, etc.). De-prenasalisation ($^{n}d > d$) is attested in Japonic and Tibeto-Burman, and progressive assimilation ($^{n}d > n$) is also attested in Tibeto-Burman.

Pharyngealisation /$t^{ˤ}$-$d^{ˤ}$/

Pharyngealised plosives are attested in Iranian, Semitic, and Nilo-Saharan. The voiced type /$d^{ˤ}$/ is not attested in the majority of Nilo-Saharan.

Voiceless nasal /n̥/

A voiceless nasal /n̥/ is attested in Hmong-Mien, Tibeto-Burman, Austroasiatic, Austronesian, Uralic (Saami), and Iranian. In Tibeto-Burman languages, voiceless nasals have a clear origin derived from a consonant cluster of /s/ and a nasal (Matisoff 2015).

Glottalised stops

Glottalisation has two types: preglottalised and postglottalised. A preglottalised plosive /ʔd/ is attested in Sinitic, Kra-Dai, Hmong-Mien, and Indo-Aryan. A preglottalised nasal /ʔn/ is attested in Japonic

(Ryukyuan), Hmong-Mien, Kra-Dai, and Tibeto-Burman, and a postglottalised stop /dˀ/ is found in Indo-Aryan (Bishnupriya).

Other than the mentioned features, several marginal features were also found. The Korean /'t/ is so striking that its phonetic status is still being debated (cf. Kim and Duanmu 2004, Duan and Zhu 2018). An aspirated nasal /nɦ/ is attested in Indo-Aryan, and while a lack of nasal sounds was noted in some Sinitic, Kra-Dai, and Tibeto-Burman languages that originated from a merger from /n/ into /l/, it does not mean that all nasals are lacking in each sound system. Various click sounds are found in the language families of the Kalahari Basin Area, namely Tuu, Kx'a, and Khoe-Kwadi.

3. Geographical relationships over language families

The description here focuses on the features characterised by the cross-linguistic geographical distribution described earlier.

Aspiration+voicing quadripartite plosive series

The /th-t-d-dh/ series is attested in languages spoken in South Asia and around the Himalayas, such as Tibeto-Burman, Indo-Aryan, Dravidian, and Iranian. As suggested in the Tibeto-Burman and Dravidian language group descriptions, this series is attributed to Indo-Aryan language contact. It is also noteworthy that the quadripartite plosive series appeared in the Brāhmī script system (third century BCE; see Machida 2001).

The same series is also attested marginally in Sinitic languages, but is not related to Indo-Aryan.

Ejective /t'/

The ejective sound is found around the Caucasus, in Ethiopia, in easternmost Siberia, the Kalahari Basin Area, and southernmost Africa. In Ethiopia, both Nilo–Saharan and Semitic languages have an ejective. As suggested in the Semitic language description, ancient Semitic languages that were distributed in Mesopotamia and Syria, such as Akkadian and Ugaritic, had ejectives. In the Caucasus region, the ejective plosive is pervasive in Caucasian languages (Kartvelian, Abkhazo-Adyghean, and Nakho-Dagestanian; see Alekseev 1999) as well as in the Ossetic (Iranian) languages in that region.

Implosive /ɗ/

An implosive /ɗ/ is attested in various language groups. Some cases have not been analysed as genetic features but as contact-induced acquisition. For example, the /ɗ/ attested in Tibeto-Burman languages is a feature that was acquired through Austroasiatic language contact.

Pharyngealisation

A systematical pharyngealised consonant feature /tˤ-dˤ/ is mostly attested in Semitic languages. This feature also expands to Iranian to the west and Nilo-Saharan to the south that connect to Semitic-speaking regions. Nilo-Saharan languages with pharyngealised features mainly possess /tˤ/ as do some Semitic and Iranian languages. As suggested in the Semitic language descriptions, pharyngealisation is related to ejective sounds, which are generally called 'emphatic consonants'.

As a reference, pharyngealised sounds have also been attested on vowels in Tibeto-Burman (see Evans 2006; and Suzuki 2011a). The sounds are often related to velarisation, uvularisation (Gong 2019) and retroflex (Suzuki 2013). In Tibetic languages, the pharyngealised sounds are derived from a consonant /r/ preceding a vowel.

Historically, pharyngealisation is reconstructed in Old Chinese (Baxter and Sagart 2014); however, no pharyngealised sounds remain in modern Sinitic languages.

Prenasalisation

Languages with prenasalised features are mainly found in East Asia, Austronesian areas, and middle Africa. These features appeared due to internal phonological development rather than language contact acquisition.

Voiceless nasal /n̥/

This sound is principally attested in East and Southeast Asia. However, as this is a feature derived from individual sound development processes in each language group, it is not considered a regional feature.

Glottalised stops

Preglottalised stops (both plosives and nasals) are mainly found from East Asia to South Asia, with the preglottalised plosive often being related to an

implosive. Preglottalised nasals are found in the Ryukyu islands, and as suggested in Japonic descriptions, are attributed to internal sound change processes.

Lack of D/A nasals

A lack of D/A nasal sounds is attested in some Sinitic, Kra-Dai, Tibeto-Burman, and Niger-Congo languages, the first three of which are spoken in East and Southeast Asia. However, it appears that both Sinitic and Kra-Dai independently developed a merger of /n/ into /l/ as there is no evidence of mutual language contact influences. This feature is also attested in Tibeto-Burman (Tujia), which was because of Sinitic language contact with Sinitic (Southwestern Mandarin).

The present analysis revealed detailed regional connections between the striking phonological features within and beyond language groups. By drawing up linguistic maps, it is possible to assess how language contact occurred and functioned in given areas.

(SUZUKI Hiroyuki)

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Stop series in Paleoasian

1. Classification

1.1. Chukotko-Kamchatkan languages

Chukotko-Kamchatkan languages have six vowels: /i, e, a, o, u, ə/ (Kurebito et al. 2001).

Chukchi has 14 consonants: /p/, /t/, /k/, /q/, /ʔ/, /s/, /ɣ/, /ɬ/[ɬʲ], /w/, /j/, /r/, /m/, /n/, and /ŋ/ (*ibid.*). The alveolar plosive /t/ is voiceless, and there is no distinction between aspirated and unaspirated stops. In Chukchi, /t/ appears in word-initial, medial, and final position: *tawtaw* 'bark', *ɬiɬit* 'mittens' (Skorik 1961, Inenlikej 2006).

Koryak has 18 consonants: /p/, /t/, /tʲ/[tʲ], /k/, /q/, /ʔ/, /c/[ʧ], /v/, /j/[ʒ~j~ɟ], /ɣ/, /ʕ/, /m/, /n/, /nʲ/, /ŋ/, /l/, /lʲ/, and /w/ (Kurebito et al. 2001). The alveolar plosive, nasal, and lateral in Koryak have a non-palatalized/palatalized opposition: /t/-/tʲ/, /n/-/nʲ/ and /l/-/lʲ/ (Kurebito 2009).

Alutor has 18 consonants: /p/, /t/, /k/, /q/, /ʔ/, /tsʲ/ (sʲ), /r/, /v/, /ɣ/, /ʕ/, /m/, /n/, /nʲ/, /ŋ/, /l/, /lʲ/, /w/, and /j/. The Alutor alveolar nasal /n/ and lateral /l/ show a non-palatalized/palatalized opposition: /n/-/nʲ/ and /l/-/lʲ/ (Kurebito et al. 2001).

Itelmen has 26 consonants: /p/ [p], /p'/ [p'], /t/ [t], /t'/ [t'], /k/ [k], /k'/ [k'], /q/ [q], /q'/ [q'], /c/ [ʧ], /c'/ [ʧ'] , /ʍ/ [ɸ~ʍ~x], /w/ [β~w~ɣ], /s/ [s~ʃ], /z/ [z~ʒ], /x/ [x], /χ/ [χ], /m/ [m], /n/ [n], /nʲ/ [nʲ], /ŋ/ [ŋ], /l/ [l], /lʲ/ [lʲ], /ɬ/ [ɬʲ], /r/ [r], /j/ [j], and /ʔ/ [ʔ] (Ono 2020). In Itelmen, /t/ appears in word-initial, medial, and final position: *tuzaʔn* 'you (pl.)', *itχ* 'they, them', *səmt* 'earth, ground'.

Itelmen plosives and affricates have the non-ejective/ejective opposition /p/-/p'/, /t/-/t'/, /k/-/k'/, /q/-/q'/, and /c/-/c'/. /t'/ also occurs in word-initial, medial, and final position: *t'ot'ot'* 'sandpiper'.

Personal pronoun 'you (pl.)' in Chukotko-Kamchatkan

Ch.	Kor.	Alu.	Itl.
turi	tuju	turu(wwi)	tuzaʔn

1.2. Nivkh

Nivkh has 6 vowels /i, ɨ, e, a, o, u/ and 32 (Amur dialect) or 33 (Sakhalin dialect) consonants: /p/, /pʰ/, /b/, /t/, /tʰ/, /d/, /ʧ/, /ʧʰ/, /ʤ/, /k/, /kʰ/, /g/, /q/, /qʰ/, /ɢ/, /f/, /ř/ [r̊], /r/, /s/, /z/, /x/, /ɣ/, /χ/, /ʁ/, /m/, /n/, /ɲ/, /ŋ/, /l/, /j/, /h/, and /v/[v~w] (Sakhalin dialect) (Siraishi & Tangiku 2015, Grudzeva 1997).

Nivkh plosives show an aspirated/unaspirated opposition. Nivkh also shows certain consonant alternations at morpheme boundaries: a) morpheme-initial plosives fricativize following a vowel, a glide, or a plosive; and b) morpheme-initial fricatives are realized as plosives following a fricative or a nasal (Shiraishi 2010).

2. Geographical distribution

See Figure 1.

(ONO Chikako)

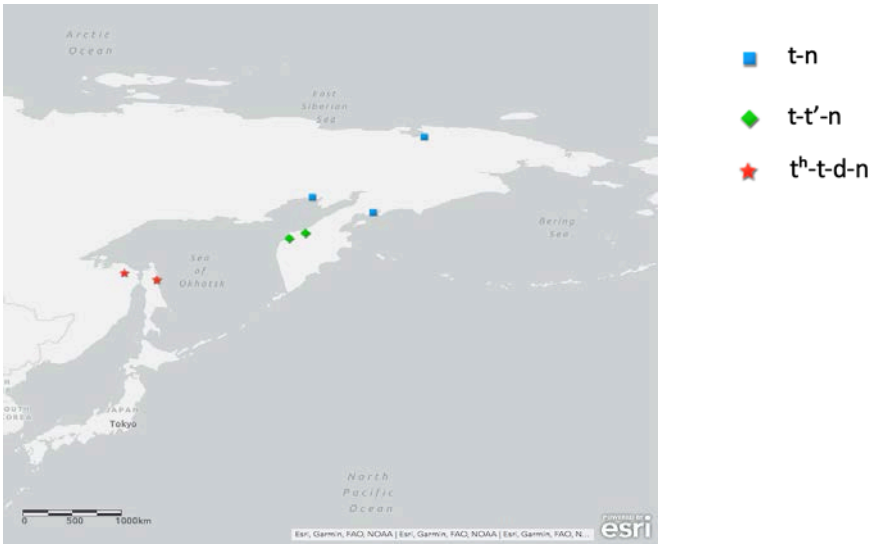


Figure 1: Stop series in Paleoasian

Stop series in Ainu

1. Classification of stop series

The Ainu language has five vowels, /i, e, a, o, u/, and eleven (or twelve including a glottal stop, /ʻ/ [ʔ]) consonants, /p/ [p, b], /t/ [t, d], /k/ [k, g], /c/ [ʧ, ʦ, ʤ, ʣ], /s/ [ʃ, s], /m/, /n/, /r/ [ɾ], /w/, /y/ [j], and /h/ [h, x].

The (denti-)alveolar plosive /t/ has no voiced/voiceless opposition and no aspirated/unaspirated distinction (Tamura 2000: 21). In Hokkaido Ainu dialects, when /t/ occurs syllable-finally, it ends with the closure of the articulatory organs as shown by [t̚]. In most Sakhalin dialects, the coda /-t/ have historically changed to /-h/ [-x].

In the 1792 Japanese-Ainu dictionary "Moshiogusa," which was compiled by a native Japanese translator, the word for 'seashore' was recorded as "オタシヤム" [otaʃam]; however, it was also recorded as "オダシヤム" [odaʃam] in the handwritten copy. Since Japanese has voiced/voiceless opposition, in this case represented by /t/ and /d/, there are often different katakana characters for writing the Ainu /t/ plosive in Japanese materials.

For the dialects of the Kuril Islands, the only existing materials were written by some explorers around the 19th century. We can see both the letters t- and d- for /t/:

WORD	Material A	Material B	
'hand'	*tek*	*dēk*	/tek/
'wing'	*teikup*	*dīkkūp*	/tekup/
'two'	*túup*	*dūpk*	/tup/

(Murayama 1971: 44)

(Murayama compiled the written materials of northern Kuril Ainu. Material A is quoted from Krascheninnikov, S. P., *Vocabularium latino-curilice-chuhachtscha-Kamtschtzice-ukinice*, and material B is Klaproth, J., *Asia Polyglotta* in 1823.)

Ainu also has a nasal stop /n/, which may optionally velarize [ŋ] before [k]. An informant of Ochiho dialect seemed to pronounce the nasal /n/ as [ɴ] in Hattori and Chiri (1960), although that may have been influenced by his second native language of Japanese: *cinkew* [ʨiɴkeɯ] for 'root', *ahto ran* [ɑxto rɑɴ] for 'it rains,' *kunne* [kuɴne] for 'black,' and so on.

2. Geographical distribution

See Figure 1.

(FUKAZAWA Mika)

Figure 1: Stop series in Ainu

Stop series in Japonic

1. Classification

In the maps, the synchronic types of stop series in Japonic (Japanese and Ryukyuan) are classified into seven categories:

A: t-ⁿd-n, type with prenasalized voiced obstruents
B: t-d-ⁿd-n, type with distinctive prenasalization in the (voiced) obstruents
C: t-d-n, type without prenasalization in the voiced obstruents
D: t-tˀ-d-n-ʔn, type with distinctive glottalization in both the (voiceless) obstruents and nasals
E: t-tˀ-d-n, type with distinctive glottalized (or unaspirated) phonation in the (voiceless) obstruents
F: t-d-n-ʔn, type with distinctive preglottalization in the nasals
G: t-n, type with no voiced obstruents

2. Geographical distribution and interpretation

On the mainland side, Type A is spread across the Kii Peninsula, Shikoku and the area around Kyushu; Type B in the Tohoku region; and Type C in most of the remaining regions. In the Ryukyu Islands, types with distinctive glottalization—D, E, and F are distributed in the Northern Ryukyus from Kikai island to northern Okinawa. Type C is distributed in the Southern Ryukyus (except for Type E in Yonaguni and Type G in Ōgami island) and the southern Okinawa.

Regarding the types with prenasalized obstruents (A and B) and those without (C, D, E, F, and G), we naturally assume that the former underwent phonetic changes to the latter through denasalization. Regarding Type A and B, B—which has more phonemes—appears to be older than A at first glance. However, when focusing on the phonological environment, /d/ of Tohoku dialects (Type B) evolved from intervocalic */-t-/, such as that within *mado* 'target' < *mato; it is distinguished from /ⁿd/, such as that within *maⁿdo* 'window.' In other words, because it is in Type B that the allophones [t] ~ [d] have phonemized, Type A, where this split has not occurred, is older than B. Most of the mainland dialects have shifted directly from A to C through denasalization, but in C of Tochigi, Ibaraki, and part of Iwate, */-t-/ > [-d-] occurred as in B; thus, it is presumed that those areas changed in the order of A > B > C.

In the Ryukyu Islands as well, the proto-system is thought to be Type A: in the Kohama dialect of the Southern Ryukyus, the cluster [nd] corresponds to standard Japanese [d], such as *junda* 'branch' (Jpn. *eda*) and *sundi* 'sleeve' (Jpn. *sode*). In the Northern Ryukyus, the change from Type A to C was followed by a change to D, with glottalized consonants, and then E (loss of glottalized nasals) or F (loss of glottalized obstruents). Glottalized consonants developed from compensation for the loss of preceding syllables, such as *ta:* (< *ta) 'rice field' vs. *tˀai* (< *putari) 'two people,' *na:* (< *mipa) 'garden' vs. *ʔna* (< *ʔima) 'already' in Ie dialect.

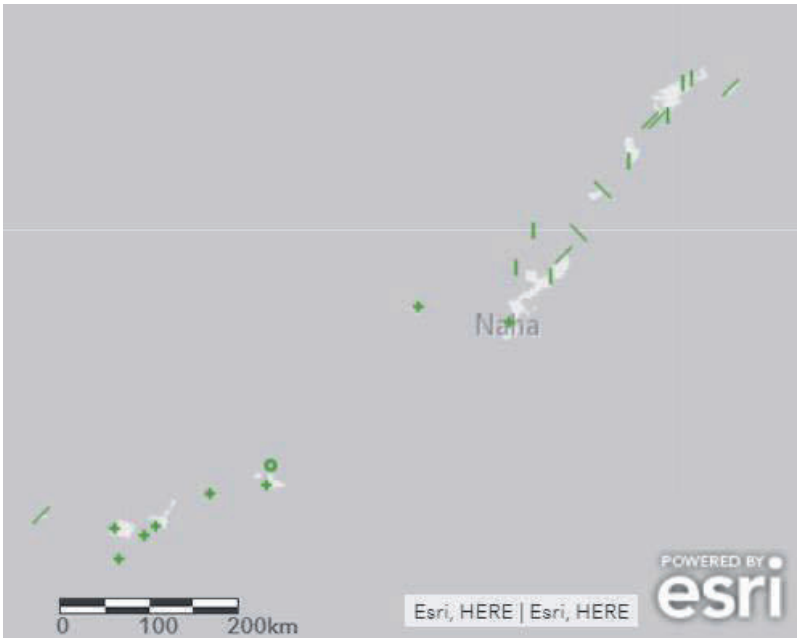
In the southern Okinawa and in Southern Ryukyus, Type C has spread, with the exceptions of Ōgami and Yonaguni. However, C of the southern Okinawa and that of Southern Ryukyus have different processes. In the southern Okinawa, after passing from C to D, E, and F, the glottalized sounds were lost again in the shift to C. Evidence for this theory is found in Shuri dialect, which is one of the southern Okinawa dialects: /m/ and /N/ (moraic nasal) are distinguished from glottalized /ʔm/ and /ʔN/, and geminate obstruents, such as *ttɕu* 'person' (< *pito), also demonstrate the one-time glottalization. Conversely, there are no traces of the glottalization in the Southern Ryukyus, except for Yonaguni; hence, there was a direct move from A to C in the same way as mainland dialects. Regarding Yonaguni's glottalization, those originating from sound reduction such as *tˀa* 'tongue' (< *sita) (cf. *ta* 'rice field') can be observed as in the Northern Ryukyus; however, the *C > Cˀ / __$V_{[+high]}$, which also happened in the Northern Ryukyus, does not occur in Yonaguni; the glottalization occurred through parallel change. The Ōgami dialect is of a rare type (G) that changed from Type C to voiced obstruents becoming voiceless and merging with the voiceless obstruents.

The summary of historical changes is as follows:

A = A (mainland surrounding area)
A > B (Tohoku)
A > B > C (part of East Japan)
A > C (most of the mainland and Southern Ryukyus)
A > C > D (part of the Northern Ryukyus)
A > C > D > E or F (")
A > C > D > E or F > C (")
A > C > E (Yonaguni)
A > C > G (Ōgami)

(NAKAZAWA Kohei and YOKOYAMA Akiko)

Figure 1: Stop series in mainland Japan



- A: t-ⁿd-n
- B: t-d-ⁿd-n
- C: t-d-n
- D: t-tˀ-d-n-ʔn
- E: t-tˀ-d-n
- F: t-d-n-ʔn
- G: t-n

Figure 2: Stop series in Ryukyu Islands

Stop series in Korean

1. Classification

It is well known that the Korean language has three oral stops and a nasal stop.

(1) t^h – t – t' –n
(2) Examples:
t^hal 'mask', tal 'moon', t'al 'daughter', nal 'day'

The three oral stops have been called variously according to authors. The following table summarizes terms used to denote these three stops found in a few recent publications.

	t^h	t	t'
Kagaya (1974)	aspirated	lax	forced
Ladefoged and Maddieson (1996)	aspirated	unaspirated	stiff voice
IPA Handbook (1999)	aspirated	lenis	fortis
Lee and Ramsey (2011)	aspirate	plain	reinforced

Traditionally, the three oral stops have been described phonetically as follows:

Aspirate: Characterised by a strong aspiration. Kagaya (1974) observes positive abduction of the vocal folds and heightened subglottal pressure.
Plain: Slightly aspirated initially and (sometimes) voiced intervocalically. With no positive laryngeal gestures.
Reinforced: Voiceless unaspirated. Kagaya (1974) observes a complete adduction of vocal folds before the explosion, stiffening of vocal folds and increasing subglottal pressure and/or lowering of the glottis, and so on.

1.2 Descriptions on recent Seoul speakers

It has been reported that young Seoul speakers pronounce initial aspirates and plain stops with almost the same amount of aspiration and the distinction between these two types are maintained by a high pitch associated with aspirates (for example, Silva (2006)). This can be called another case of tonogenesis. However, we have to keep in mind that aspirate and plain stops are maintained as such in intervocalic positions so that the merger is not complete yet.

1.3 Nasal stop

It has been observed that an initial nasal is sometimes pronounced something like [n^d], with the loss of nasality at the release of the oral closure. Such pronunciations can be heard as a voiced stop for speakers of a language having the initial voicing contrast.

There are no dialectal differences except for minor phonetic details. For examples, some dialects, such as the Kyŏngsang dialects, are said to show a smaller amount of aspiration for plain stops.

Historically, reinforced stops are developed from consonant clusters. In Middle Korean we have initial consonant clusters like sp-, st-, sk-, pt-, ps-, pc-, pst-, psk-, all developed into a reinforced stop.

However, we have in fact pronunciations which seem quite similar to modern reinforced stops in Middle Korean. Such cases appear not within a lexically simple morpheme, appearing only medially in a specific combination of morphemes, and in such cases they used a symbol for the glottal stop or a geminate.

(FUKUI Rei)

t^h – t – t' –n

Stop series in Sinitic

1. Classification

We collected the published data of 2343 Chinese dialects. Classification is shown below.

A1. /t/ type
Sanya; Jiangmen

B1. /t^h-t/ type
Hefei; Nanjing; Guiyang

B2. /t-^{n}d/ type
Xinhui

B3. /t-n/ type
Duchang; Qionghai; Dongkou

C1. /t^h-t-d/ type
Quanzhou; Xingan; Guanyang

C2. /t^h-t-^{n}d/ type
Doumen; Taishan; Kaiping

C3. /t^h-t-n/
Beijing; Nantong; Taiyuan

C4. /t^h-d-n/
Nanhui

C5. / t^h-ɗ-n / type
Wuchuan

C6. /t-d-n/ type
Wenchang; Xingzi; Yueyang;

C.7 /t-d^h-n/ type
Tongcheng; Pingjiang; Chibi

C8. /t- ɗ-n/ type
Changhua; Dongfang; Qiongzhong

D1. /t^h-t-d-n/ type
Shanghai; Wenzhou; Yongzhou

D2. /t^h-t-d^h-n/ type
Xuancheng; Shaoxing; Shanghai

D3. /t^h-t-ɗ-n/ type
Tengxian; Hezhou; Ledong

D4. /t^h-t-d-n/ type
Taigu; Yanzhou; Ziyang

D5. /t^h-d-d^h-n/ type
Songjiang; Yongkang

D6. /t-d-dh-n/ type
Yueyang

D7. /t-d-ɗ-n / type
Wenchang; Wanning

E1. /t^h-t-d-d^h-n/ type
Zhengfang; Zhongjiang

E2. /t^h-t-d-ɗ-n/ type
Chongpo

E3. /t^h-t-d-n-n^h/ type
Chongming; Jiading; Yangshuo

F1. /t^h-t-d-d^h-n-n^h/ type
Dinghai

G1. /t^h-t-d-d^h-nd-n-n^h / type
Yiwu

2. Geographical distribution and interpretation

The most common type of Sinitic language is C3, which also corresponds to standard Chinese. This type is widely distributed throughout China (Figure 1). (Chao (1968), however, states that in standard Chinese, t actually corresponds to ḍ, and is realized as d in the pronunciation of a word.)

The second most common type is D1, which contains d in addition to t, t^h and n. This type is characteristic of Wu and Old Xiang dialect. Centering on the Yangtze River basin, D1 is widely distributed in the southern area (Figure 2). (Chao (1928) also notes that in Wu dialect, d is generally unvoiced, with voiced airflow like [$t^ɦ$] at the beginning of a word, while it becomes voiced when placed between vowels.)

Types E1, E2, and F1 have four variations of t. They are sporadically distributed in Yangtze River basin and in the Hainan island. In Chongming, /t-t^h-n(ʔn)/ and /d-n^h(ɦn)/ both form complementary distribution by tone. In Zhongjiang, however, the appearance of d^h is only limited to tone III (52), while minimal pairs of t, t^h, d, and d^h exist (Table 1).

Table 1: Four variations of t

E3: Chongming: Zhang (2009)
刀 tɔ^{55}, 滔 t^hɔ^{55}, 逃 dɔ^{24}, 拿ʔnɔ^{55}, 挠 ɦnɔ^{24}
E1: Zhongjiang: Cui (1996)
逮 tai^{21}, 踏 t^ha^{21}, 貸 dai^{21}, 台 d^h ai^{21}

Types A1 and B3 have only one kind of t, and the presence of these types indicates that large-scale changes of the initial consonant system are underway in these areas. They are distributed in Jiangxi, Hunan, Guangdong and Hainan. In Sanya and Jiangmen, *t^h is merged with x, and *n is merged with l; therefore only t remains. In Duchang and Dongkou, t^h has merged with l and x respectively (Table 2).

Table 2: Types possessing only one kind of t

B3: Duchang: 刀 tau　套 lau 桃 lau　(Lu 2007)
B3: Dongkou: 刀 tau　套 xau 桃 xau　(Long 2008)

Implosive ɗ is distributed in the Hainan island, Guangdong, and Guangxi province.

(YAGI Kenji)

Figure 1: Stop series in Sinitic

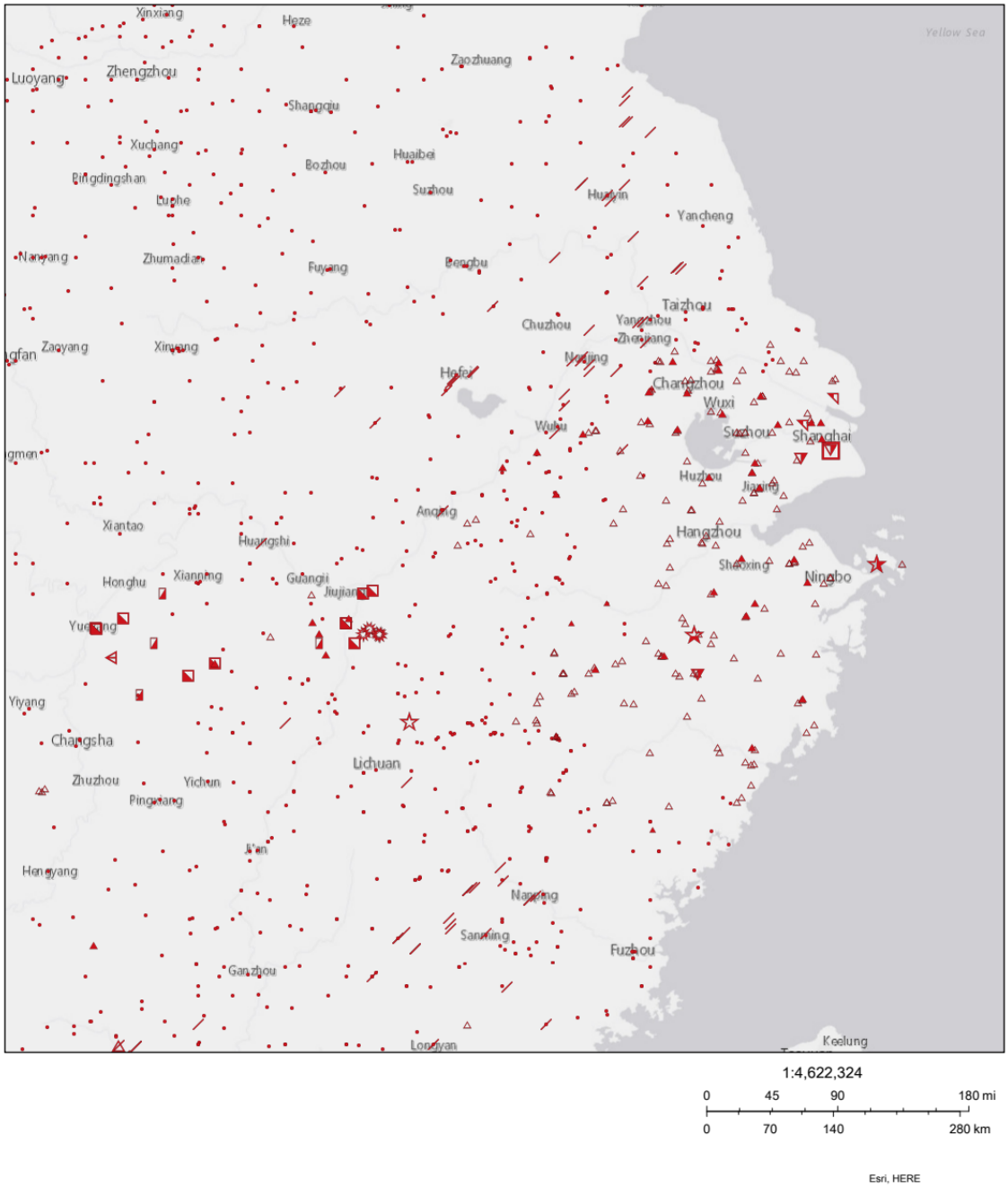


Figure 2: Stop series in Sinitic (east central area)

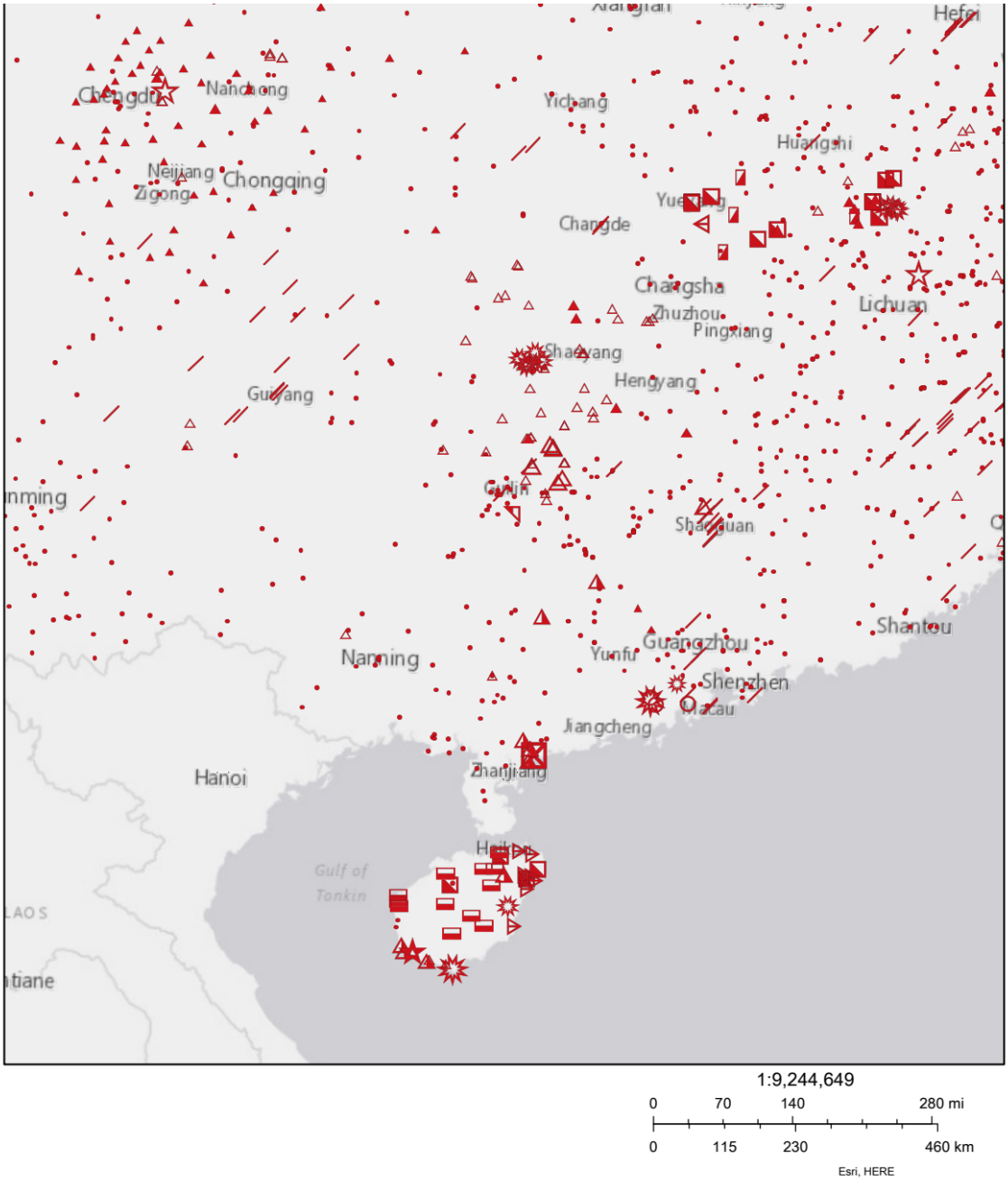


Figure 3: Stop series in Sinitic (southern area)

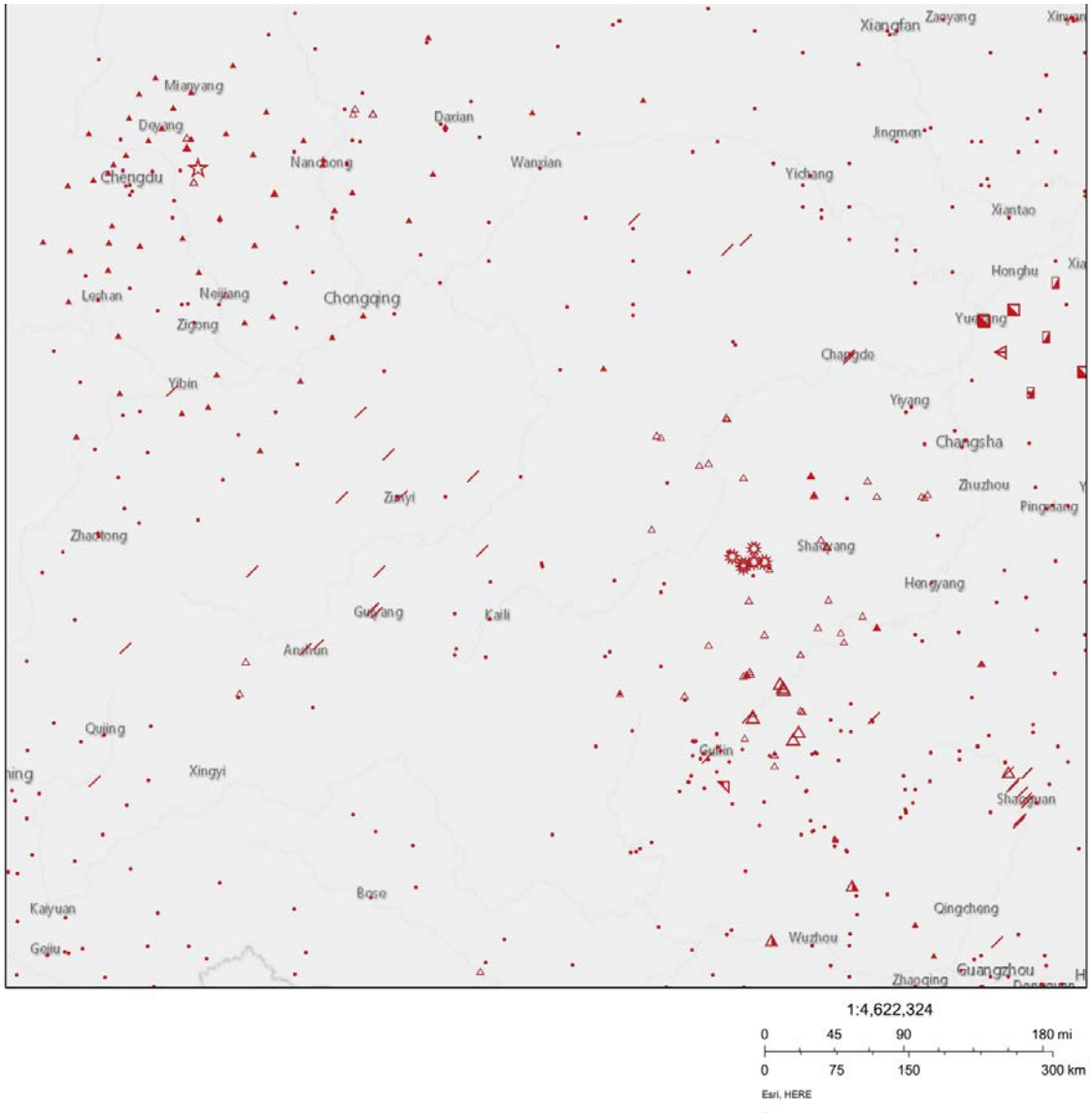


Figure 4: Stop series in Sinitic (south central area)

Consonant series in Hmong-Mien

1. Classification

Based on the comparative evidence, types of consonant series are classified into 18 categories. It is believed that Proto-Hmong-Mien has the following consonant series at the initial position of a syllable: th-t-d-nd-nt-nth-n-nh-ʔn. The first three consonants (th-t-d) are plain plosives, the next three (nd-nt-nth) are prenasalized plosives, and the last three (n-nh-ʔn) are nasals. Further, lects are classified according to their position in the diagram illustrating the historical order of the phonological changes that the proto-consonant series has undergone (Figure 1). The first change—which is represented by Type B in Figure 1—is a merger of voiced and voiceless consonants, i.e., *t and *d, *nt and *nd, and *n and ʔn. Five of the 18 types have not undergone the merger. These are classified as subcategories of Type A (A1 to A5). All the other types—the descendants of Type B—have undergone this change. Types C–G signify consonant series that have experienced aspiration and/or prenasalization loss. Type H represents a stage wherein the Type B consonant series undergoes loss of prenasalization and voicing of the plosive (e.g., nt > d).

If it is known that the consonant series of two lects originate from different sources, then these are classified as two different types even if the patterns of their consonant series are the same. The 18 types are indicated below ('0' indicates a gap compared with the consonant series of Proto-Hmong-Mien).

A
- A1: th-t-0-nd-nt-nth-n-nh-ʔn
- A2: th-t-d-nd-nt-nth-n-nh-0
- A3: th-t-tɦ-ntɦ-nt-0-n-nh-nɦ
- A4: th-t-d-0-0-0-n-nh-ʔn
- A5: th-t-d-0-0-0-n-0-0

B: th-t-0-0-nt-nth-n-nh-0
C: th-t-0-0-0-0-n-nh-0
D: th-t-0-0-0-0-n-0-0
E: th-t-0-0-nt-0-n-nh-0
F: th-t-0-0-nt-nth-n-0-0
G: 0-t-0-0-nt-0-n-0-0
H: th-t-d-dh-0-0-0-n-nh-0
I: 0-t-d-0-0-0-n-0-0
J: 0-t-d-ʔt-0-0-0-n-0-0
K: th-t-d-ʔd-0-0-0-n-0-0
L: th-d-ʔt-0-0-0-n-0-0
M: th-t-d-0-0-0-n-nh-0
N: th-t-d-0-0-0-n-0-0

2. Geographical distribution and interpretation

Type A—which exhibits an archaic state—is spread across the northwestern part of the distribution area. The lects that belong to this type constitute relic areas. Type H and its descendants (Types I–N, Figure 1) are distributed across the eastern and southern parts of the area. Most lects that belong to these types are Mienic languages and Northern Hmongic languages (aka, Xiangxi dialects). They represent more innovative states.

Map A depicts the distribution of prenasalization in the consonant series. It indicates that prenasalization is observed in the northern and western parts of the area, including the relic area mentioned above. In the eastern and southern parts, prenasalization tends to drop with or without making the following obstruent element voiced.

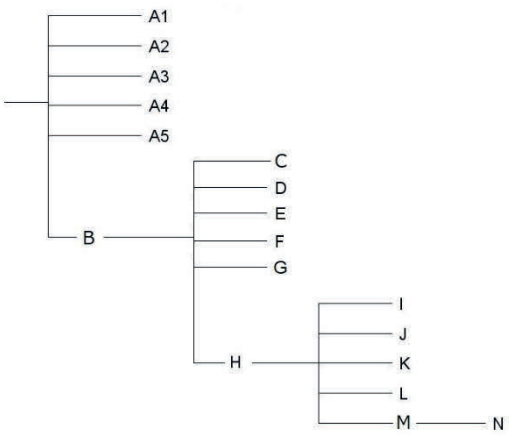
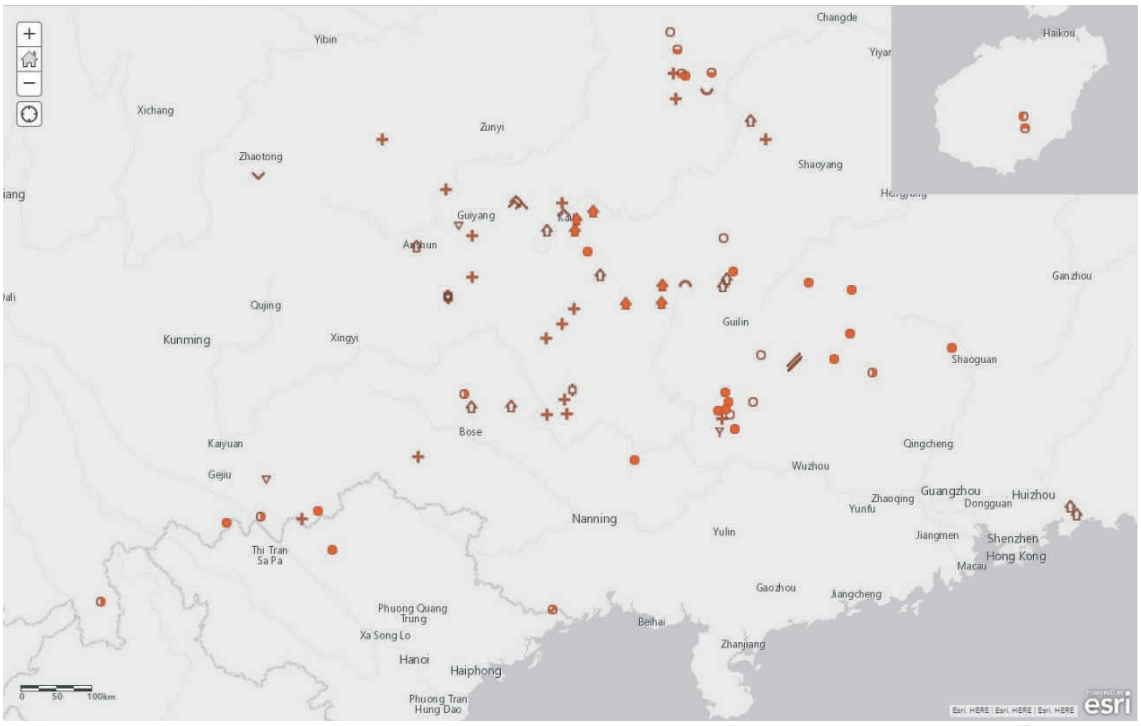


Figure 1



A1		A5		E		I		M	
A2		B		F		J		N	
A3		C		G		K			
A4		D		H		L			

Map A

prenasalization

no prenasalization

Stop series in Kra-Dai

1. Classification

There are 13 types of initial dental stop series in Kra-Dai.

A: th-t-ɗ-nd-n-nh-ʔn
B: th-t-d-ɗ-n-nh
C: th-t-d-nd-n-ʔn
D: th-t-d-n-nh
E: th-t-ɗ-n-ʔn
F: th-t-n-nh
G: th-t-n-nt
H: th-t-ɗ-n
I: th-t-n
J: th-ɗ-n
K: th-t
L: t-ɗ-n-ʔn
M: t-ɗ-n

2. Geographical distribution and interpretation

Type H, which is indicated by a small dot, is the most widespread variety, as it is found across the whole Kra-Dai area and includes Bangkok Siamese and Lunchow Zhuang. The corresponding rule between proto-Tai and Type H is as follows (Li, 1977):

proto-Tai	*t-	*th-	*d-	*ʔd-	*n-	*hn-
Siamese	t-	th-	th-	d-	n-	n-
Lungchow	t-	th-	t-	d-	n-	n-

Li (1977:107) described the phonetic nature of *ʔd-, as follows: “This consonant is preserved as a preglottalized consonant ʔd- in Wu-ming, but is represented by d- in most dialects – at least so transcribed. It is generally pronounced with some laryngeal stricture and depression, and may even be implosive in the pronunciation of certain speakers.” In this study, [ɗ] is used to indicate this sound, but it can also be transcribed as ɗ-, as mentioned above. It is noteworthy that the pure voiced consonant *d- has disappeared in almost all Kra-Dai dialects, with lower series of each tone emerging in its place. This has also occurred in a majority of Sinitic dialects and it appears that voiced initial consonants easily disappear in tonal languages.

The descendants of *ʔd- occur in the upper tones, and this series lacks a velar counterpart. These properties indicate that the voicing is due to later innovations caused by a change into an implosive.

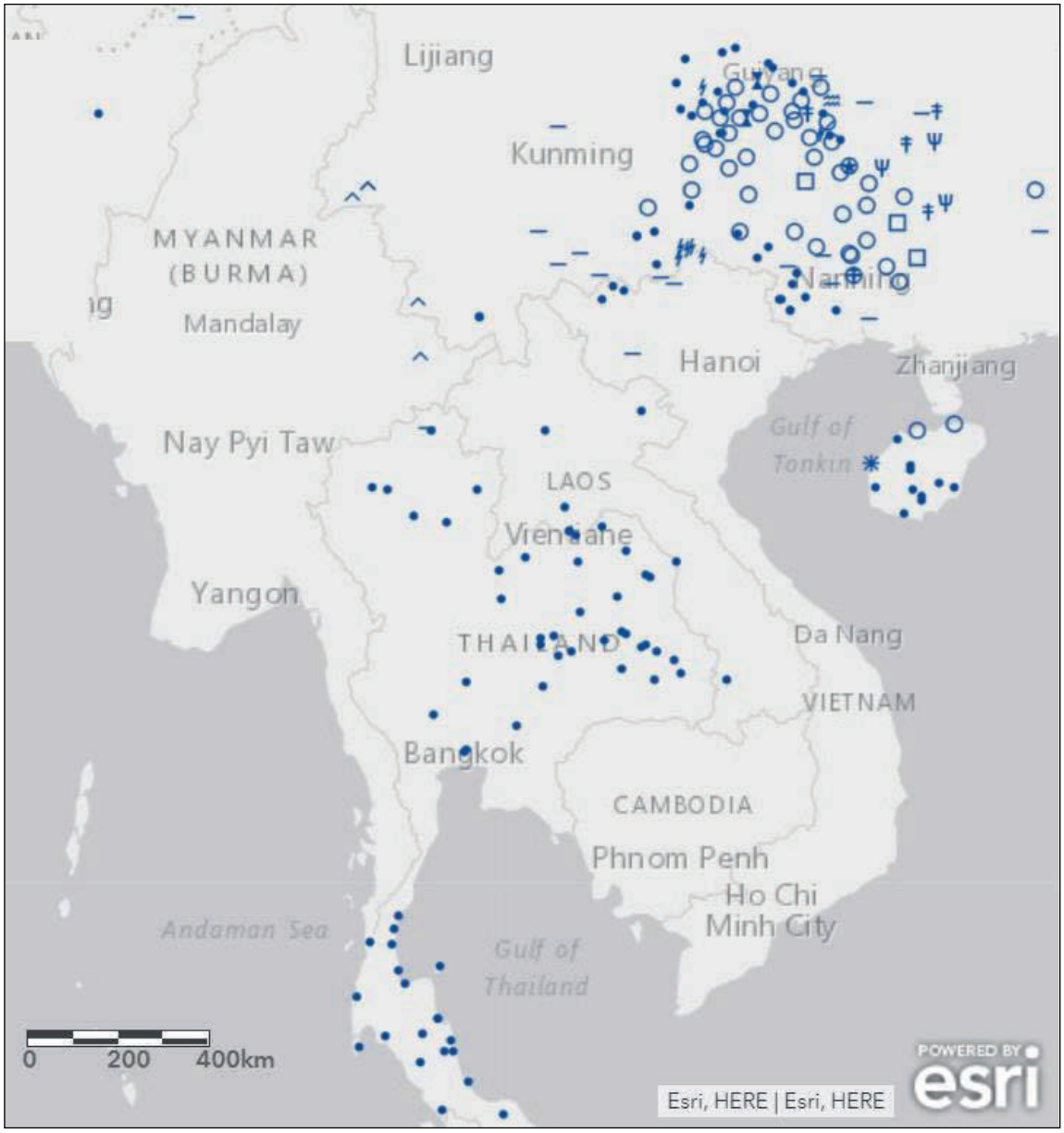
Voiceless nasals also existed in proto-Tai, which in the modern Siamese orthography are indicated by clusters preceded by h- that occur in the upper tones and are merged with the ordinary nasals.

Type M, which is indicated by the round symbol, is the second most frequent type. Type M, in which the aspirates merge to non-aspirates, is found in Northern Zhuang, Southern Buyi, and Be. While the sound change from Type H: th-t-ɗ-n to Type M: t-ɗ-n is widespread in these areas, some scholars have postulated a reversed direction of change, claiming that the aspirates emerged later.

There are four other types occurring in the Tai branch. Type E: th-t-ɗ-n-ʔn and Type L: t-ɗ-n-ʔn, which are more conservative and have glottalized nasals, are distributed in the east of the Kra-Dai area next to the non-Tai branches, as shown in the map below. These glottalized nasals are possibly retention of an archaic distinction. Type L also has a de-aspiration and in Type I: th-t-n, the *ʔd- has changed to n- and in Type K: th-t, the n- has changed to l-.

In the southern group, Hlai and Be from Hainan island have experienced the same changes as in the Tai branch, that is, Type H > Type M. There is also a Type J: th-ɗ-n in the Cun language, which is adjacent to Hlai. In this type, the t- is lacking and is replaced by tθ-, which may have been because of a change from t- > tθ-. The northern Kra-Dai, Kra, Lakkia, and Kam-Sui groups have more and less complicated systems. For example, the Sui language has the most complicated Type A: th-t-ɗ-nd-n-nh-ʔn system, and there is also a pre-nasal voiced stop in Type C: th-t-d-nd-n-ʔn. Voiceless nasals are preserved in Type A and Type B: th-t-d-ɗ-n-nh, D: th-t-d-n-nh, and F: th-t-n-nh, and in Type G: th-t-n-nt, there is a voiceless stop after the nasal. The geographical distribution of these conservative types is scattered, and it is hard to tell why they occurred from a comparative linguistic point of view. Cognate words are relatively difficult to find between the Tai and non-Tai branches; therefore, the sound correspondences are also less stable than in the Tai branch.

(ENDO Mitsuaki)



A: th-t-ɗ-nd-n-nh-ʔn

B: th-t-d-ɗ-n-nh

C: th-t-d-nd-n-ʔn

D: th-t-d-n-nh

E: th-t-ɗ-n-ʔn

F: th-t-n-nh

G: th-t-n-nt

H: th-t-ɗ-n

I: th-t-n

J: th-ɗ-n

K: th-t

L: t-ɗ-n-ʔn

M: t-ɗ-n

Stop series in Tibeto-Burman

1. Classification

A. /t-d/ type (/t-d-n/ only)

Trung; Puroik; Bangru; Galo (Tani)

B. /t^h-t-d/ type

B1a /t^h-t-d-^{n}d-^{n}t-$^nt^h$-n-n̥/ type

Tibetic (Zulong, mPhagri); nDrapa (Ngwirdei); Zakhring

B1b /t^h-t-d-^{n}d-^{n}t-$^nt^h$-n/ type

Tibetic (Babzo); rGyalrongic (Situ, bTsanlha, Khroskyabs, sTau, Nyagrong Minyag)

B2a /t^h-t-d-^{n}d-$^nt^h$-n-n̥/ type

Majority of dialects of Tibetic languages in Khams; nDrapa (Mätro); Choyu; Lhagang Choyu; Lamo; Larong sMar; Drag-yab sMar; Lizu

B2b /t^h-t-d-^{n}d-$^nt^h$-n/ type

Tibetic (sKyangtshang, Bragkhoglung, Phyugtsi, Daan); Namuyi (Dzolo); Ersu

B3a /t^h-t-d-^{n}d-n-n̥/ type

Tibetic (mDungnag); Betsi Choyu; Shuhing; Yi Northern (Senza); Songlin

B3b /t^h-t-d-^{n}d-n/ type

Tibetic (Chabcha, Mangra, Brag-g.yab, rTsamda, Limi, Tabo); Pema; Basum; Darmdo Minyag; Yi Eastern (Nersu, Nipu); Naxi; Malimasa; Dao; Selibu (Shuimofang)

B4 /t^h-t-d-$^nt^h$-n/ type

Alo; Yi Eastern

B5a /t^h-t-d-n-n̥(ʔn)/ type

Lidim; Laluba; Lalu; Northern Prinmi; Central Prinmi; Burmese (Yangon, Yaw); Daai Chin

B5b /t^h-t-d-n/ type

Tibetic (gTsangbawa, kLurtse, Ladaks, Balti, Khumbu, Chocha-ngacha); Rmaic (Mawo, Ronghong, Longxi, Taoping); nGochang (Qianxi); Yongning Na; Yi Western (Lalo, Lipo); Yi Southern (Narsu, Nesu); Yi Central; Axi; Lisu; Burmese (Palaw, Myeik); Kaman; Idu; Hayu; Dolakha Newar; Chantyal; Kinnauri

B6 /t^h-t-d/ type

Tujia (Tanxi, Xiaqieji, Xiadu)

C. /t^h-t-d-t‘(d’/$d^ɦ$)/ type

Ca /t^h-t-d-$d^ɦ$-n-n̥/ type

Kathmandu Newar; Camling

Cb /t^h-t-d-t‘-n/ type

Tibetic (Denjongke, Dzongkha, Brokpa); Wambule Rai

D. /t^h-t/ type

D1 /t^h-t-^{n}d-n/ type

Lahu; Kucong; Tibetic (Lhasa, Largyab, Shigatse, Ruthog)

D2a /t^h-t-n-n̥/ type

Ganan; Ao; Xiandao; Taungyo Burmese

D2b /t^h-t-n/ type (including /t^h-d-n/)

Azha; Bai; Zozo; Hani (Biyue, Shuigui); Jino; Zaiwa; Jinghpaw; Kadu; Selibu (Longwangbian); Tujia (Xianren); Phom; Manang

D3 /t^h-t/ type

Tujia (Pojiao, Tasha, Laxidong)

E. others (with an implosive sound)

Karenic (Bwe, Geba, Manu, Kyonpyaw Pwo); Asho Chin; Cak

2. Geographical distribution and interpretation

The reconstruction of proto-Tibeto-Burman (PTB; Matisoff 2003) includes a bipartite system of ‘voiceless’ *t and ‘voiced’ *d in plosives. This is common with Sinitic (Old Chinese; Baxter & Sagart 2014). Hence, this bipartite system (Type A) takes first position in the present classification as the most archaic form, though we do not confirm that the system reflects the reality of archaic forms. Referring to the sound development attested principally in Tibetic languages, we list the types as follows: a tripartite system, voiceless aspirated, voiceless non-aspirated, and voiced (Type B); a quadripartite system (Type C); and another bipartite system, aspirated and non-aspirated (Type D). Second, the number of prenasalisations is classified (e.g., B1 & B2); finally, the nasals are considered (e.g., B1a & B1b). The following types are in chronological order.

/n̥/ (or voiceless nasals) is mainly derived from an *s prefix, of which the evidence, in most cases, remains in Written Tibetan forms as well as rGyalrongic languages. The latter (B1b) still maintains a consonant cluster /sn/ instead of /n̥/.

Type A is marginally found. In our data, several languages distributed between Bhutan and Northwestern Yunnan are classified into this type.

Type B exhibits the widest distribution, which nearly covers the whole TB area. It is first subclassified based on the prenasalised pattern: Tripartite (Type B1), bipartite (Type B2), voiced only (Type B3), voiceless only (Type B4), and no prenasalisation (Type B5). Note that we find a restriction of the appearance of prenasalised forms. There are reports of several languages, such as Ladaks and Balti, in which prenasalisation only appears in word-medial position. However, we do not reflect this case in the classification

or the maps.

Some discrepancies due to different conventions of transcription are unified into a representative one for simplicity. For example, 'th-t-d-nt-nth-n' in Ringmo Tibetan is unified into Type B2b. The transcription 'ʔn' in Laluba is considered as bearing a close status to /n̥/, although we need confirmation.

Type B1 is mainly distributed in the Ethnic Corridor of West Sichuan. Note that the Tibetic languages with Type B1 are derived from those with Type B2 due to individual innovations. We also find it in Zakhring, which has had strong language contacts with Khams Tibetan (B2a) and Kaman (B5b), spoken in Dzayul (Tibet).

Type B2 is found in the eastern Tibetosphere. There is a discrepancy between previous works and our description regarding the existence of the prenasalised voiceless aspirated /^{n}t^{h}/ in Khams Tibetan. We follow a description that recognises this sound as a part of the system.

Type B3 is marginally found: Tibetic languages spoken in the northeasternmost and southeasternmost areas, the Yi Northern and Eastern groups, as well as Sinitic-based 'mixed languages' such as Dao and Selibu.

Type B4 is found in Yi Eastern in the small easternmost area. It seems that this type is rare.

Type B5 is mainly distributed in the south of the Tibeto-Burman linguistic sphere: from Guizhou to Yunnan, Arunachal Pradesh, Bhutan, and Ladakh.

Types B6 and D3 lack the nasal sound; however, this is due to a merger of [n] with /l/. This phenomenon is widely attested in Southwestern Mandarin (Cao 2008).

Type C is found on the southern side of the Himalayas, namely, Nepal, Sikkim, and Bhutan. It can have two patterns of origin: adaptation of the Indic sound system and a transitional status between Types B and D. These two are not classified in the maps. For the latter origin, we find several ways of representing the *fourth* feature, including /t'/, /d'/, and /d^{ɦ}/, which all represent a breathy sound. Some studies have described it as 'murmur voice'; at the present stage, we consider both 'breathy' and 'murmur' in a single unit. There is an analysis of these types of phonation as part of suprasegmental realisations and thus not in the consonant system. In this case, the breathy feature would also appear resonant.

Considering its historical position, we find that this phoneme is derived from a voiced simplex *d in Dzongkha and Denjongke and is to be merged with /t^{h}/ as attested in Lhasa Tibetan, whereas in Brokpa, it seems that /d^{ɦ}/ is derived from complex initials of which the main initial is *d; a similar phenomenon is attested in dPalskyid Tibetan (B2b).

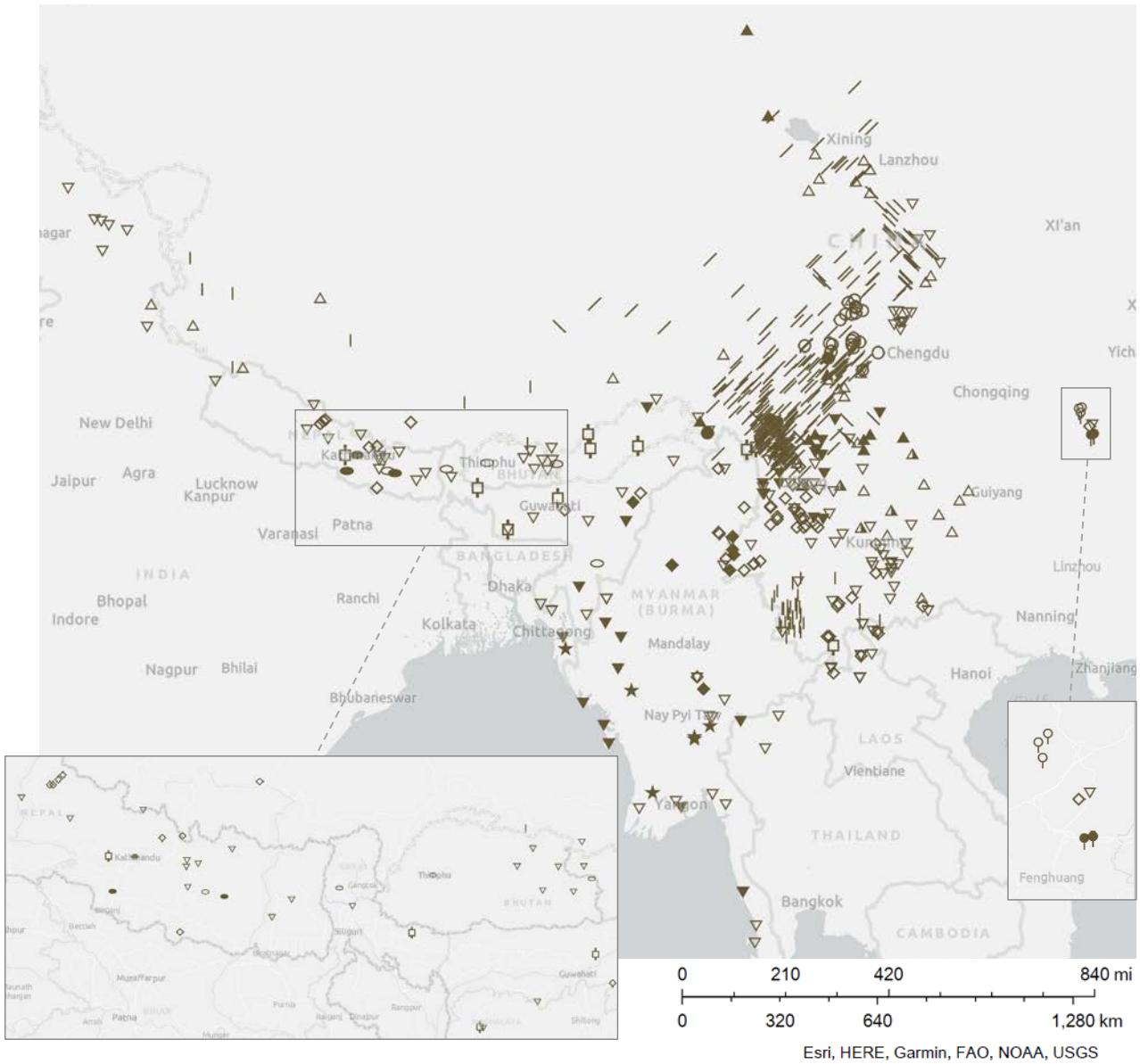
Type D is found in the Tibet Plateau, scattered, as well as in the border area of China (Yunnan) and Laos. Type D1 seems similar to a subtype of Type B. However, a prenasalised sound /^{n}d/ is not regarded as a substitute for a simple /d/, regardless of its phonological status. Lahu's phonological description is /t^{h}-t-d-n/, but its phonetic realisation is [t^{h}-t-^{n}d-n]. We follow the latter for the present analysis. Moreover, observing the tendency of sound change in Lhasa Tibetan, we can see Type D1 going to merge into Type D2.

Type E is a group possessing an implosive /ɗ/. The languages of Type E are spoken in Myanmar and Bangladesh. Kato (2009:180) claims that it is already an implosive at the proto-Karenic stage. At least this phoneme does not date back to PTB. Hence, we set Type E independently. A potential source of its acquisition is language contact with Kra-Dai, Mon-Khmer, or Austroasian languages.

Even languages distributed in a small area display different types. For example, Selibu has two points: Shuimofang belongs to Type B3b, and Longwangbian to D2. The difference is due to the degree to which words of Tibetan origin are incorporated into the system. Tujia is also in the same situation. Tanxi belongs to Type B5, and Pojiao to D3. The former has a more complex system than the latter that reflects the sound change process.

We collected the data of around 710 points. Although PTB (and Old Chinese) includes a voiceless and voiced series in the plosives, almost all languages and varieties of Tibeto-Burman have a distinction of aspirated voiceless and non-aspirated voiceless series. Languages in Nepal often have a quadripartite system of aspirated voiceless, non-aspirated voiceless, voiced, and breathy voiced, and several languages in Myanmar have acquired an implosive which does not exist in PTB. These phenomena are suggestive of intense language contact influencing the sound system.

(SUZUKI Hiroyuki, EBIHARA Shiho, IWASA Kazue, KURABE Keita, and SHIRAI Satoko)



A: /t-d/ (/t-d-n/ only)
B1a: /th-t-d-nd-nt-nth-n-ɳ/
B1b: /th-t-d-nd-nt-nth-n/
B2a: /th-t-d-nd-nth-n-ɳ/
B2b: /th-t-d-nd-nth-n/
B3a: /th-t-d-nd-n-ɳ/
B3b: /th-t-d-nd-n/
B4: /th-t-d-nth-n/
B5a: /th-t-d-n-ɳ(?n)/
B5b: /th-t-d-n/
B6: /th-t-d/
Ca: /th-t-d-dɦ-n-ɳ/
Cb: /th-t-d-tʻ-n/
D1: /th-t-nd-n/
D2a: /th-t-n-ɳ/
D2b: /th-t-n/
D3: /th-t/
E: others

Figure 1: Stop series in Tibeto-Burman

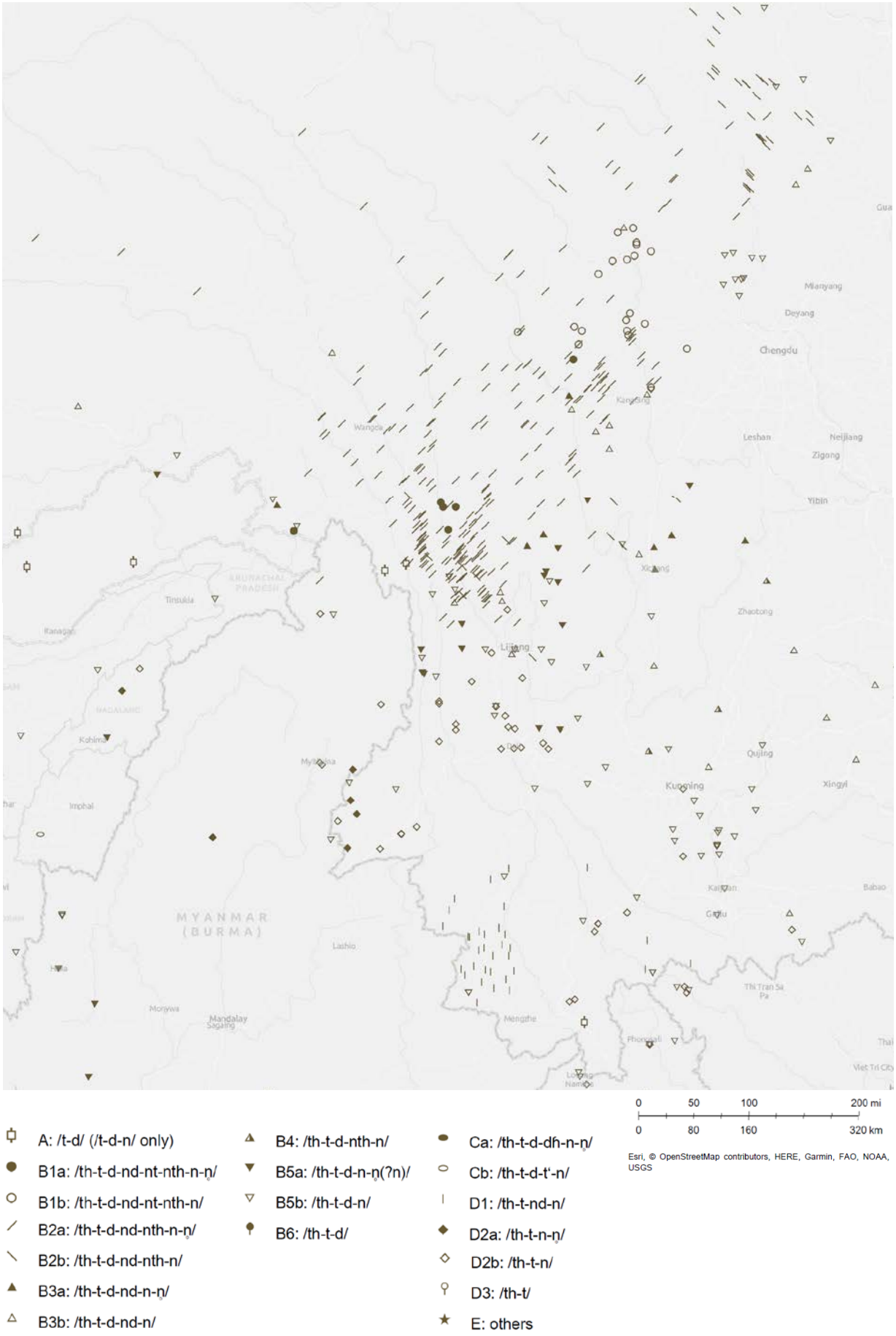


Figure 2: Stop series in Tibeto-Burman: An enlarged version

Stop series in Austroasiatic

1. Classification

This map shows types of (denti-)alveolar plosive consonant series in Austroasiatic (AA) languages. In languages with sesquisyllabic structures (C_1-C_2VC_3), the initial consonants of the major syllable (C_2) are taken into account. The types are classified into five large categories as follows ('/' stands for 'or' and '|' for 'and/or').

A. th-t-d/ɗ-n type
  A-1 th-t-d-n type
    th-t-d-n
    th-t-d-dh-n-(nh)
    th-t-d-n-nh-(ʔn)
    th-t-d-nd|nt|nth-n-(nh)
  A-2 (th)-t-ɗ-n type
    (th)-t-ɗ-n
    th-t-dh-ɗ-n
    th-t-ɗ-nd|nt|nth-n
    th-t-ɗ-(nd|nt|nth)-n-nh
    th-t-ɗ-nd|nt|nth-n-nh-ʔn
B. th-t-d-ɗ-n type
    th-t-d-ɗ-n-(nh)
C. th-t-n type
    th-t-n
    th-t-n-ʔn/ʔd
    th-t-nd|nt|nth-n
    th-t-(nd|nt|nth)-n-nh
    th-t-nd|nt|nth-n-nh-ʔn
D. t-d-n type
    t-d-n
E. t-n type
    t-n

2. Geographical distribution and interpretation

Proto AA contains the dental series *t-d-ɗ-n (Sidwell 2015), and most of the languages cited here contain /th/. Hence, the classification proposed above is based on the series: th-t-d-ɗ-n. Since the implosive sounds are widespread in Southeast Asia (Maddieson 2013) and phonologically distinguished from the normal plosives in proto AA, we think it important to distinguish the voiced plosive /d/ from the implosive /ɗ/, even when the distinction makes no sense phonologically. Here, we follow the description of each author, even though the identical target is sometimes described differently, such as in the case of [ɗ] as /d/ or [ʔd].

Type A-1 is quite common in the Katuic, Khasic, Khmuic, Mangic, Monic and some Vietic languages.

Type A-2 is common in the Bahnaric, Khmeric, Monic, Palaungic, Pearic, Vietic and a few Waic languages.

Type B is conservative in that it contains the complete proto AA series. The Kơho (Southern Bahnaric), Mlabri (Khmuic) and Danaw (Palaungic) languages use this system.

Type C lacks the voiced and voiceless contrast, which is a typical case of the emergence of registral or tonal contrasts. Most languages of this type (Suai, Khmu, Lamet, Lai, Mường Danh, Kontoi Plang and Samtao) have registral or tonal contrasts, except for Lawa (Waic). However, Lawa has a full nasal series: th-t-nd-n-nh-ʔn.

Type D is typical in the Aslian and Munda languages.

Type E is only found in the Car Nicobarese language.

In addition to the stop series considered above, AA languages also possess prenasalized stops (nd-nt-nth), a voiceless nasal (nh) and a preglottalized nasal one (ʔn). Their geographical distribution is shown in Fig.1.

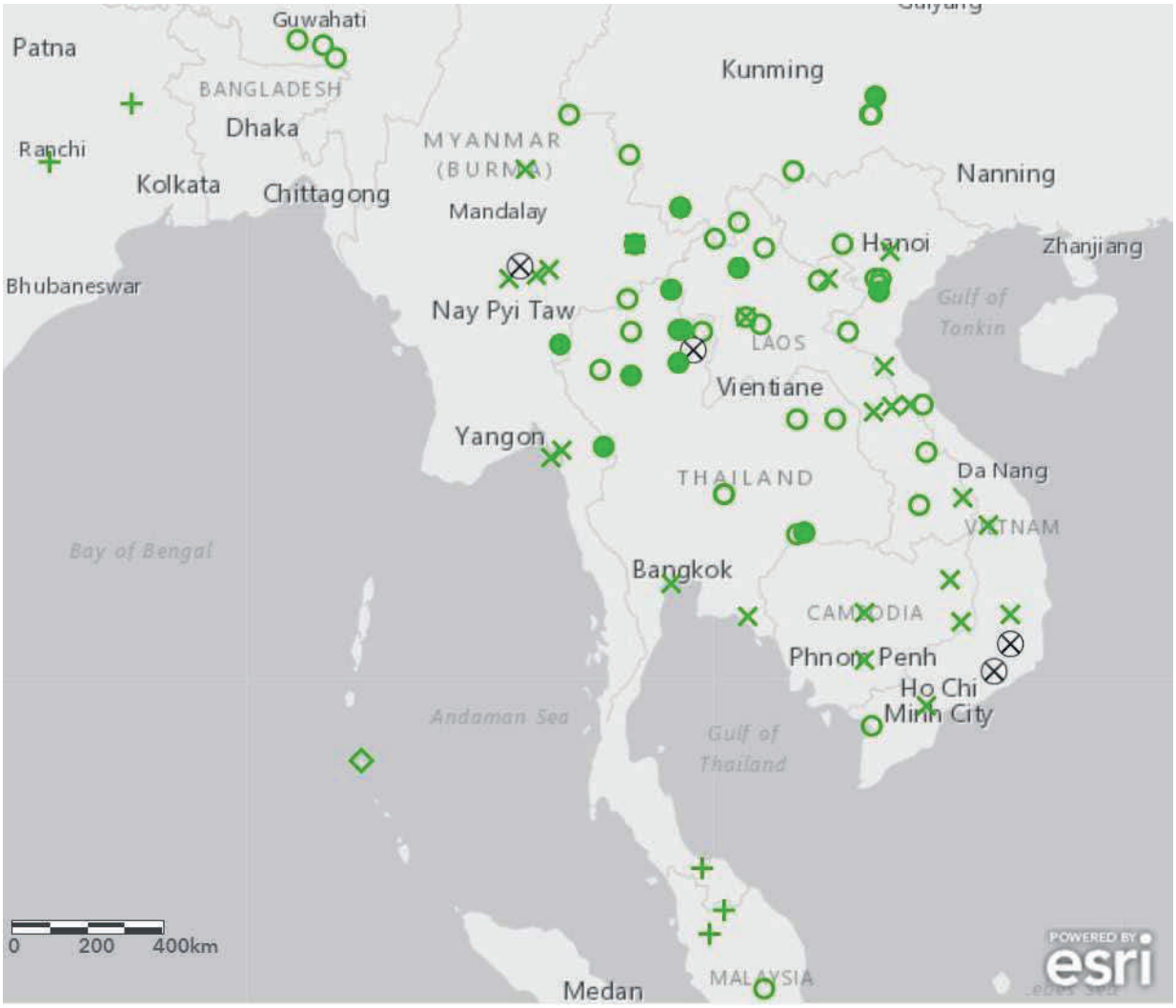
Prenasalised series are found in the Bahnaric, Khmuic, Palaungic, Bugan (Mangic), Nyah Kur (Monic), Lai (Vietic) and Lawa (Waic) languages.

Voiceless nasal stop is quite common in the Bahnaric, Katuic, Khmeric, Khmuic, Monic, Palaungic and Waic languages.

Preglottalized nasal stop is found in the Sedang (Northern Bahnaric), Eastern and Western Khmu (Khmuic) and Lawa (Waic) languages.

(SHIMIZU Masaaki, MINEGISHI Makoto)

Figure 1: nd/nt/nth: nh: + ʔn:○



A-1.	th-t-d-n type	○
A-2.	(th)-t-ɗ-n type	×
B.	th-t-d-ɗ-n type	⊗
C.	th-t-n type	●
D.	t-d-n type	+
E.	t-n type	◇

Stop series in Austronesian

1. Classification

Consonants in Austronesian languages do not differ very much if we look at dental stops and nasals.

A: t-n Languages with a voiceless stop and a nasal.

B: Languages with a voiceless and a voiced stop and a nasal.

B1: t-d-n

B2: t-ɖ-n, t-d-ɖ-n With a retroflex voiced stop

C: t-d-dh-n Languages with a voiceless and a voiced stop, a nasal and other voiced consonant; an aspirated voiced stop or a voiced retroflex stop

D: Languages with (a) prenasalised stop(s)

D1: t-d-nd-n/t-d-ndr-n/t-d-nt-n Languages with a voiceless and a voiced stop, a prenasalised stop, and a nasal

D2: t-d-nt-nd-n/t-d-ɗ-n-nt-nd-n Languages with two prenasalised stops in addition to stops and a nasal

E: Others: languages with aspirated consonants.

t-th-d-n-nh/t-th-nt-d-n-nh/t-th-d-n-nh

2. Distribution

Austronesian languages most frequently exhibit B-1 type, in which a voiceless and a voiced stop and a nasal dental consonants (t-d-n) are found, and one language has a retroflex voiced stop /ɖ/ instead of /d/. A few languages lack a voiced stop (A type). In Taiwan, the Philippines, and Sumatra, most languages fall into either A or B types. C type is only found in Madurese. There are no languages that exhibit a prenasalised stop.

D-1 and D-2 types, which have more than one prenasalised stop in a dental series are found in Sulawesi, Papua, and some Oceanic languages. More complicated inventories, such as t-th-d-n-nh, t-th-nt-d-n-nh, and t-th-d-n-nh, are found in some Oceanic languages. However, B type remains the most frequent pattern in these areas, too.

Consonants in Proto-Austronesian (PAN) do not add up to a large number. The four vowels, /i, a, u, ə/ and four dephthongs /iw, ay, aw, uy/, are almost unequivocally posited for proto-Austronesian (Dyen 1953, Dahl 1981, Mills 1981, Blust 2009, Wolff 2010, among others). As for consonants, including semi-vowels, researchers may disagree. Blust 2009 posits 25 consonants, *p, *b, *m, *t, *d, *n *S, *C(ʦ), *l, *r, *R(/ɾ/ or /ʁ/), *ɲ, *s(ç), *c(ʧ), *z(j), *N(lʲ), *D(/ɖ/), *k, *g, *j(gʲ), *ŋ, *q, *h, *y(/j/), *w (Symbols in the brackets are suspected actual phones). Wolff 2010 reconstructs the following 19: *p, *b, *m, *t, *d, *s, *n, *ɬ, *l , *c, *j, *k , *g, *ŋ, *ɣ, *q, *h, *w, *y, and Ross 1995 posits the following 23 consonants: *p, *b, *m, *t, *d1(/d/), *d2(/ʣ/), *d3(/ɖ/), *C(ʦ), *n, *s, *S(/ʂ, ç/), *Z(/ʒ/), *L(l, ɬ/), *l(/ɭ, ɻ/), *r, *k, *g, *ŋ, *q, *ʁ, *h, *w, *y.

It is hard to determine the sets of consonants, but there are some consistent points. Place of articulation are bilabial, alveolar, alveolar retroflex, palatal, velar, uvular, and glottal. All the consonants are pulmonic. Manners of articulation are stop, nasal, fricative, lateral, and trill.

Overall, PAN is supposed to have a fairly simple phonemic system, so are the stop series.

(UTSUMI Atsuko)

Figure 1: Taiwan and Philippine

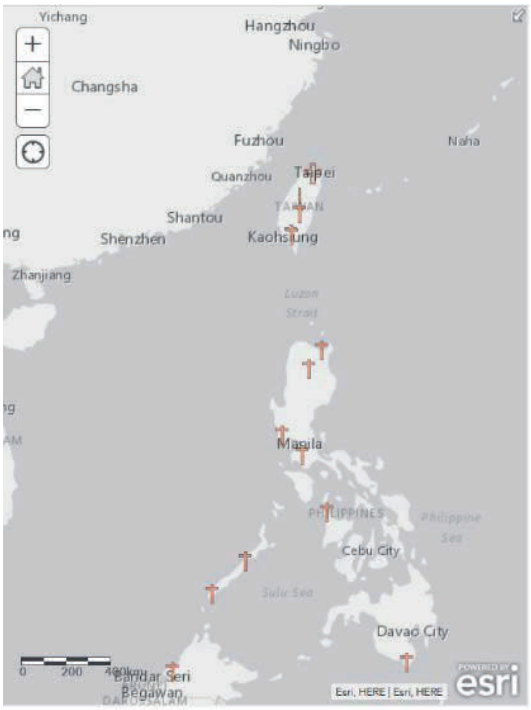


Figure 2: Papua New Guinea and nearby islands

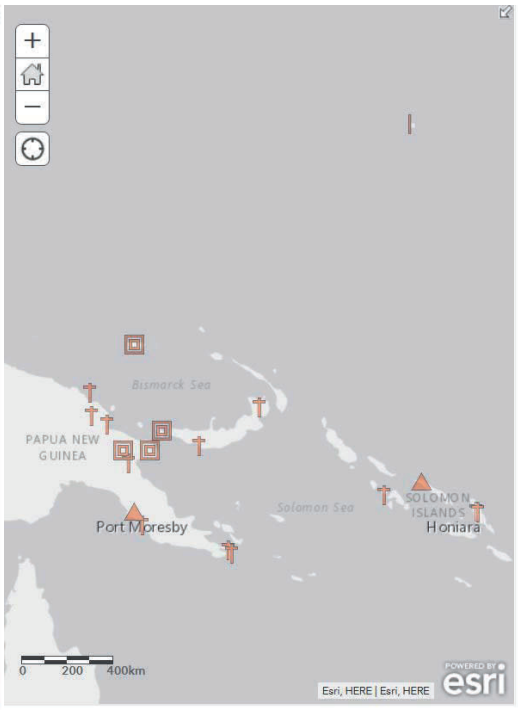
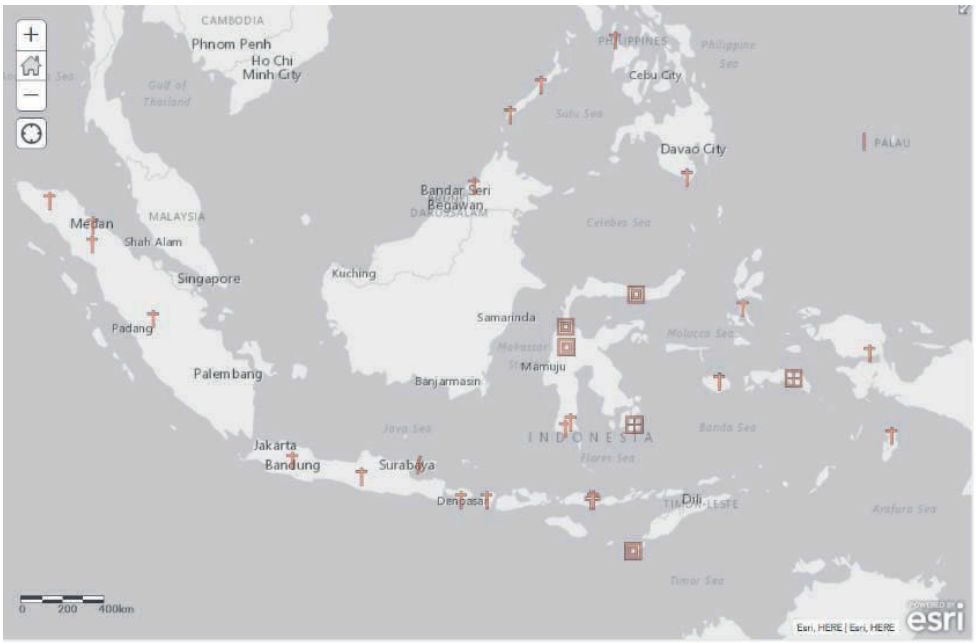


Figure 3: Indonesia



A type: t-n	B-1 type: t-d-n	B-2 type: t-ɖ-n, t-d-ɖ-n
C type: t-d-dh-n	D-1 type: t-d-nd-n/t-d-ndr-n/t-d-nt-n	
D-2 type: t-d-nt-nd-n/t-d-ɗ-n-nt-nd-n		
E type (others) t-th-d-n-nh/t-th-nt-d-n-nh/t-th-d-n-nh		

Stop series in Tungusic

1. Classification

Tungusic languages have almost less differences in phonetic inventories. For example, Evenki's inventory is as following: stops /p/ [p], /b/ [b], /t/ [t], /d/ [d], /k/ [k], /g/ [g], affricates /č/ [tɕ], /ǰ/ [dʑ], fricatives /s/ [s], /h/ [h], nasals /m/ [m], /n/ [n], /ŋ/ [ŋ] and others /l/ [l], /r/ [r], /v/ [w], /j/ [j].

In Tungusic languages only one type A is observed:

A t-d-n

2. Geographical distribution and interpretation

It is possible to say that all Tungusic languages have the distinctive features of [+/- voice] and [+/- nasal].

This type is also observed in other obstruents as [k]/[g]/[ŋ], but it may not be applicable to the labial plosive, as in Evenki words which begin with /p/ are relatively less than words with /b/ in the initial.

(MATSUMOTO Ryo)

Figure 1: Stop series in Tugusic

● A t-d-n type

Stop series in Uralic

1. Classification

Uralic languages are classified into 3 groups, A1, A2 and B, as shown in Figure 1.

Type A1 has phonetically 3 series of alveolar plosive; voiceless, voiced and nasal, but in Type A2 and B voiceless and nasal are distinctive in the initial phoneme of a word. In Type A2 voiced plosive can appear only in the middle of a word mainly as the result of the morpho-phonemic alternation.

The phonetic form of the phoneme /d/ is different according to the language group. In Type A2, which includes Balto-Finn languages, it is pronounced by weak-voiced or half voiced [d̥].

2. Geographical distribution and interpretation

Type A2 is widely observed in Uralic languages. Especially most of the Finnic languages are belonging to this type with the consonant gradation (CG). For example, the Finnish CG of the alveolar series is shown in the table 1. It depends mainly on the morphological and phonetic conditions, which grade should be used.

Table 1: CG in Finnish

Strong Grade (SG)	Weak Grade (WG)
tt	t
t	d

For example:

(1) mai**t**o maid**d**o-ssa
milk.NOM *milk*.INESS

Sulkala and Karjalainen (1992: 366) also mention:

> *<u>/d/</u> is substituted by other phonemes in the dialects, and occurs only in word-medial position in native Finnish words, acting as the weak variant of /t/ in consonant gradation.*

In Permic languages, 3 series of stops as Type A1 are distinctive by [±voice] and [±nasal], as in Altaic languages observed. They reside next to Tatar and Bashkir, it is possible to expect that it is influenced from neighboring Turkic languages. On the other hand, Tatar and Bashkir are having contact also with Volga-Finnic languages (Mari and Mordvin) in the west, which are type A2 without the phoneme /d/.

In Ugric languages, except Hungarian which was moved to far west from the homologous Khanty and Mansi, it seems that they do not have the feature of [±voice]. Selkup in Samojed has the same stop series as Ugric, it may be because of the areal feature of languages of peoples along Yenisei called "Ostyak".

(MATSUMOTO Ryo)

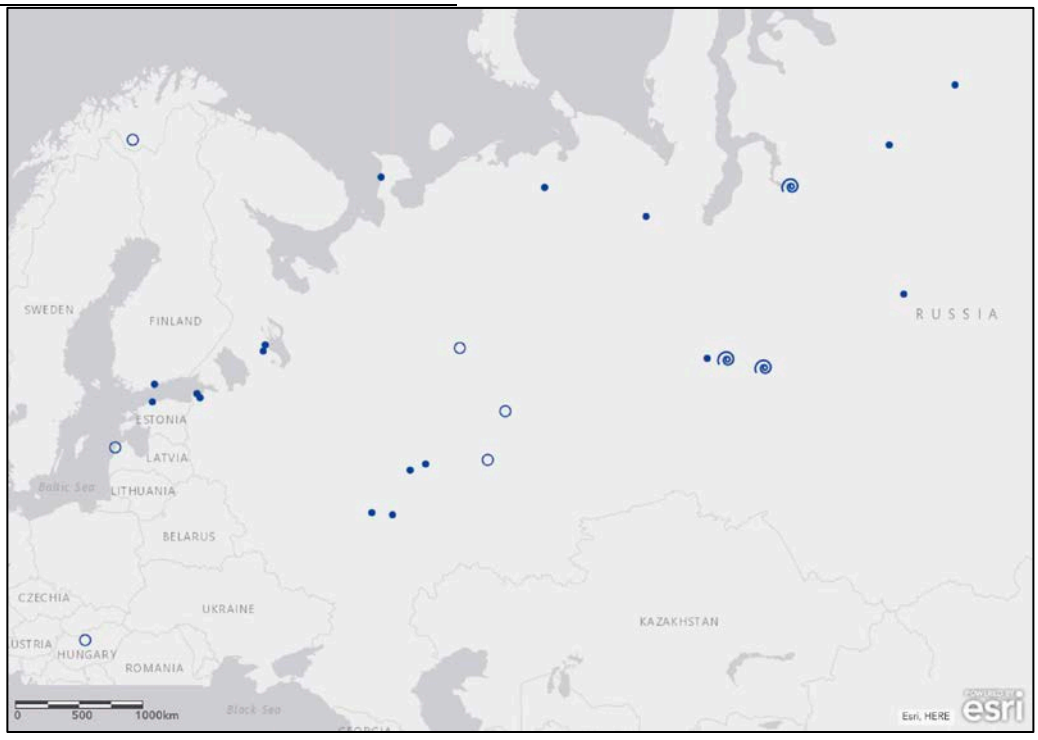


Figure 1: Stop series in Uralic

Stop series in Mongolic and Turkic

1. Classification

At the phonological level, there are two types of initial dental stop series in Mongolic and Turkic:

t-n Chuvash (a Turkic language)
t-d-n Other languages

The *t-d-n* type includes two sub-categories on the phonetic level characterized by voice and aspiration.

All Mongolic languages belong to the */t/-/d/-/n/* type. Kalmyk in the lower Volga region, Buryad in southern Siberia and Moghol in Afghanistan have a voicing contrast between /t/ and /d/, while the other Mongolic languages including Oirad, which is closely related to Kalmyk, show a contrast in terms of aspiration between them:

A [t]-[d]-[n] (/t/ can be realized as a slightly aspirated [t^h])
Buryad, Kalmyk, Moghol

B [t^h]-[t]-[n]
Dagur (Butha), Dagur (Tacheng), Khamnigan, Bargu Buryad, Mongol (Chakhar, Khalkha, etc.), Oirad, Shira Yughur, Monguor, Baoan, Dongxiang, Kanjia

All Turkic languages except Chuvash belong to the */t/-/d/-/n/* type.

A [t]-[d]-[n] (/t/ can be realized as a slightly aspirated [t^h])
Turkish, Azeri, Gagauz, Turkmen, Tatar, Bashkir, Crimean Tatar, Kyrgyz, Kazakh (Kazakhstan), Noghay, Uzbek, Uighur, Sakha, Dolgan, Khakas, Shor, Chulym

B [t^h]-[t]-[n]
Kazakh (China), Sarïg Yughur, Salar, Tuvan (, Uighur)

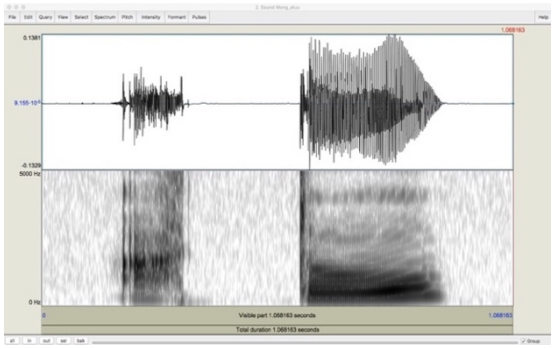
Chuvash belongs to the *t-n* type. Voiced stops, however, appear in Russian loanwords. The realization of /t/ may vary to some extent depending on the environment.

(For the languages and dialects for which clear phonetic descriptions are not available, the author made use of recordings of native speakers provided by institutions and individuals including those uploaded on the Internet as well as linguistic and learning materials on the market. If voicing was observed in /d/ in a sentence-initial position, the language or dialect was classified as a member of the type A group. As the amount of data the author could obtain was small and variations in terms of area and generation within a language or a dialect may exist, this is just a tentative classification.)

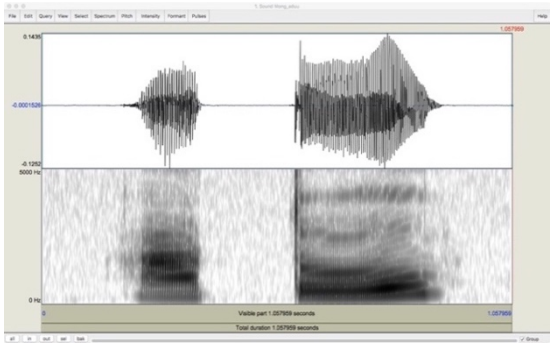
2. Geographical distribution and interpretation

Oral stops are mainly distinguished by voice in the western and northeastern languages as in Russian and by aspiration in southeastern ones as in Chinese.

Development of preaspiration in some languages is reported (Karlsson and Svantesson 2012). The figures below show phonetic features of the Khalkha Mongolian intervocalic /t/ and /d/. The phonemes are both realized as a voiceless stop. The spectrograms show that /a/ is breathy voiced with partial devoicing before /t/ and modal voiced before /d/. (Creakiness observed at the beginning of /a/ in /atū/ in this utterance is just an accompaniment of a low pitch and should be ignored in this discussion. Noise caused by breath before /a/ in /adū/ has nothing to do with the discussion, either.) We can also see the difference between the vowels from the waveforms. This situation can be interpreted as the contrast between preaspirated and non-preaspirated consonants, and the words can be transcribed as [$a^h$to:] and [ato:] respectively.



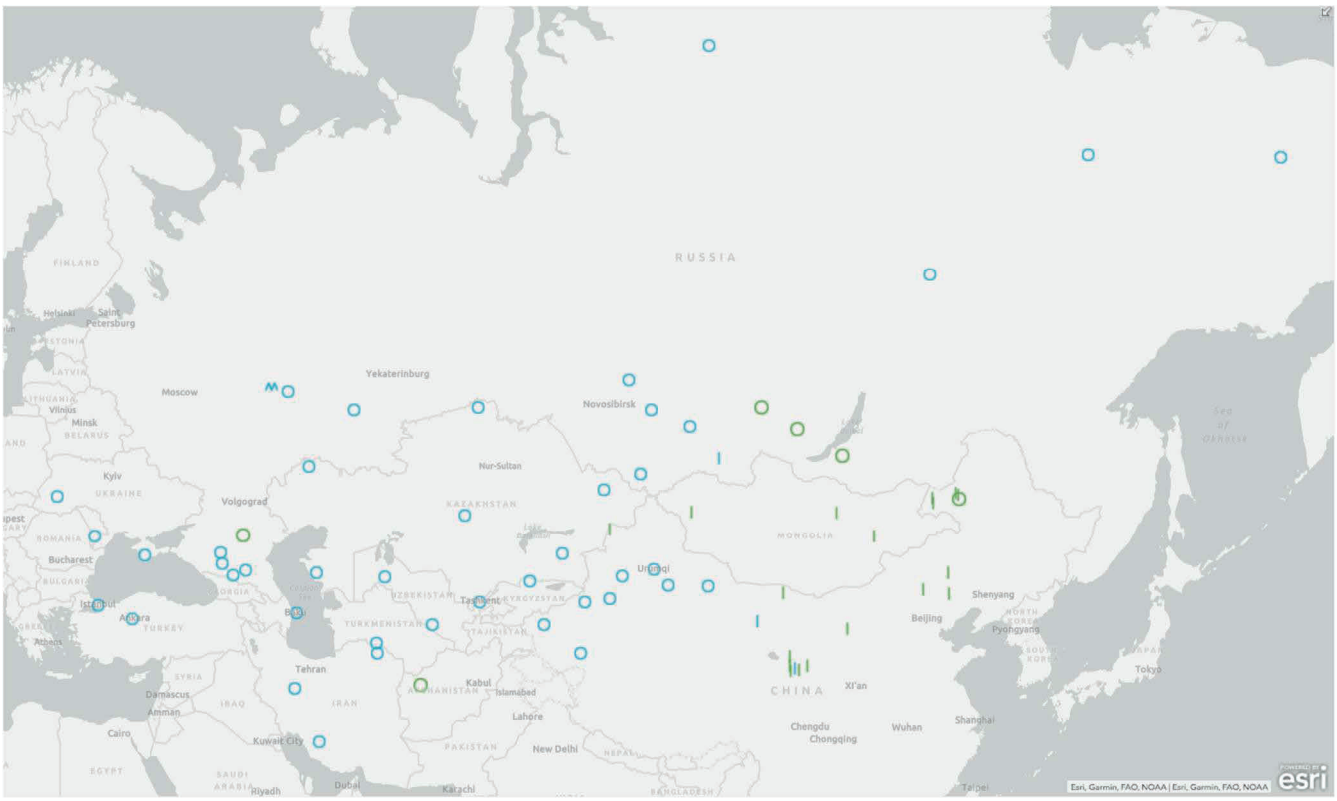
/atū/ ‘female fish’



/adū/ ‘horse’

Figure 1: Preaspirated and plain voiceless stops in Khalkha Mongol (The waveforms and spectrograms were obtained using the Praat program developed by Paul Boersma and David Weenink.)

(SAITÔ Yoshio)



Mongolic	t-d-n	t^h-t-n	
Turkic	t-d-n	t^h-t-n	t-n

Figure 2: Stop series in Mongolic and Turkic

Stop series in South Asia

1. Classification

Here, I describe the languages of Indo-Aryan (hereinafter IA), several small language families/branches, and language isolates in South Asia. On Figure 1, the manners of articulation of the alveolar stop series are classified into ten types.

2. Geographical distribution and interpretation

As far as the entire Indian subcontinent is concerned, we can see that geographical rather than genealogical relationships have a stronger influence on the manner of articulation of consonants (Figure 1).

Historically, Sanskrit, an archaic language of IA, had five distinct alveolar stops <th-t-d-dh-n> (Cardona 2003); thus, it belongs to the type A classification of this paper. Even now, 21 (19 are IA) out of the 76 languages have the same five stops, that is, voiceless aspirated, voiceless nonaspirated, voiced nonaspirated, voiced aspirated plosives, and voiced nasals, just like Sanskrit. These languages are distributed over India (except the south), Bangladesh, and Nepal, and some northwest IA languages in northern Pakistan belong to this type.

Type B has lost the consonants of the voiced aspirated series and kept the four-way distinction. Languages belonging to this type are located in peripheral zones such as the Andaman Islands and an area from Indian-administrated Kashmir via northern Pakistan to northeastern Afghanistan. Genealogically, it includes the languages of the Andamanese family, Burushaski (isolate), and the northwest group of IA. Besides the inland languages other than Andamanese, Panjabi (both western and eastern dialects), which is located slightly to the south, also exhibits this four-way distinction. This language has lost the aspirated voiced plosives and exhibits distinctive tones instead.

Further along in type B, the distinction of aspiration has been lost even in voiceless stops, and the distinction has become three-way <t-d-n> in type C1 languages. In South Asia, this type consists of Onge (Andamanese) on Little Andaman Island, Pashayi (IA) and most Nuristanis in Afghanistan, and Chittagonian (IA) in Bangladesh. How has this language completely lost its aspiration distinction while being surrounded by type A languages is not clear. That Učida (1970) says that the fact that the language has a tonal system may be relevant to the loss.

In the Indian Ocean, there exist type C2 languages. This type is a subtype of C1 and has three languages: Sinhala, Dhivehi (both IA), and Vedda (a creole between pre-Vedda, a language isolate, and Sinhala). These languages have a three-way distinction, <t-d-n>, in the word-initial position, same as the C1 languages. However, the existence of a series of prenasalised stops <nd> in C2 languages is noteworthy. Prenasalised stops in such languages occur only in the onset of a word-internal syllable. They behave as single consonants and contrast with nasal + stop clusters (e.g. *ka.ⁿdə* 'tree trunk' vs. *kan.də* 'hill' [Gair 2003: 779] in Sinhala).

Marathi, Konkani, Vaagri Boli, and Saurashtra in central-to-southern India, Bhojpuri and Awadhi in northern India, and Torwali in northern Pakistan are all IA and type D languages, which have a series of aspirated nasals <nɦ> even word-initially, in addition to the series of type A languages.

Type E contains only Sindhi (IA), and type F has two languages, Saraiki and Marwari (both IA). These three languages are located across or near the borders of Pakistan and India. They gained a series of implosives, anew, and type F languages have voiced aspirated nasals, similar to type D languages. Type E has a six-way distinction, <th-t-d-dh-ɗ-n>, while type F has a seven-way, <th-t-d-dh-ɗ-n-nɦ>. Note that Sindhi and Saraiki have lost the distinction between dental and retroflex implosives; they are actually pronounced as the merged implosive as [ɖ] rather than [ɗ] in Sindhi, and vice versa in Saraiki, for example *ɖiṭho* 's/he saw' (Khubchandani 2003: 647) in Sindhi vs. *ɗiṭhimis* 'I saw it' (Bashir & Conners 2019: 220) in Saraiki.

Only Bishnupriya, which has the set <th-t-d-dʔ-n>, is classified as Type G in this study. This language has lost its voiced aspirated series, instead showing a series of 'voiced plosive with glottal closures' (Sinha 1981).

Outside South Asia, there are several IA languages in the west, see Figure 2. All Romani dialects and Lomavren in and around Europe belong to type B, and the dialects of Domari in the Middle East are of type H1 <t-tˤ-d-dˤ-n> (Jerusalem) and H2 <t-tᵛ-d-dᵛ-n> (Aleppo). These pharyngealised or velarised dentals are the result of contact with Arabic, and are found mainly in words borrowed from Arabic, but also in some non-Arabic words, i.e., Indo-Aryan words. For example, Jerusalem *dˤandˤ* 'tooth' (Matras 2012: 43) and Aleppo *pēṭ* [peːtᵛ]'belly' (Herin 2012: 7) correspond to *dā̃t* and *pēṭ* in Hindi-Urdu respectively.

(YOSHIOKA Noboru)

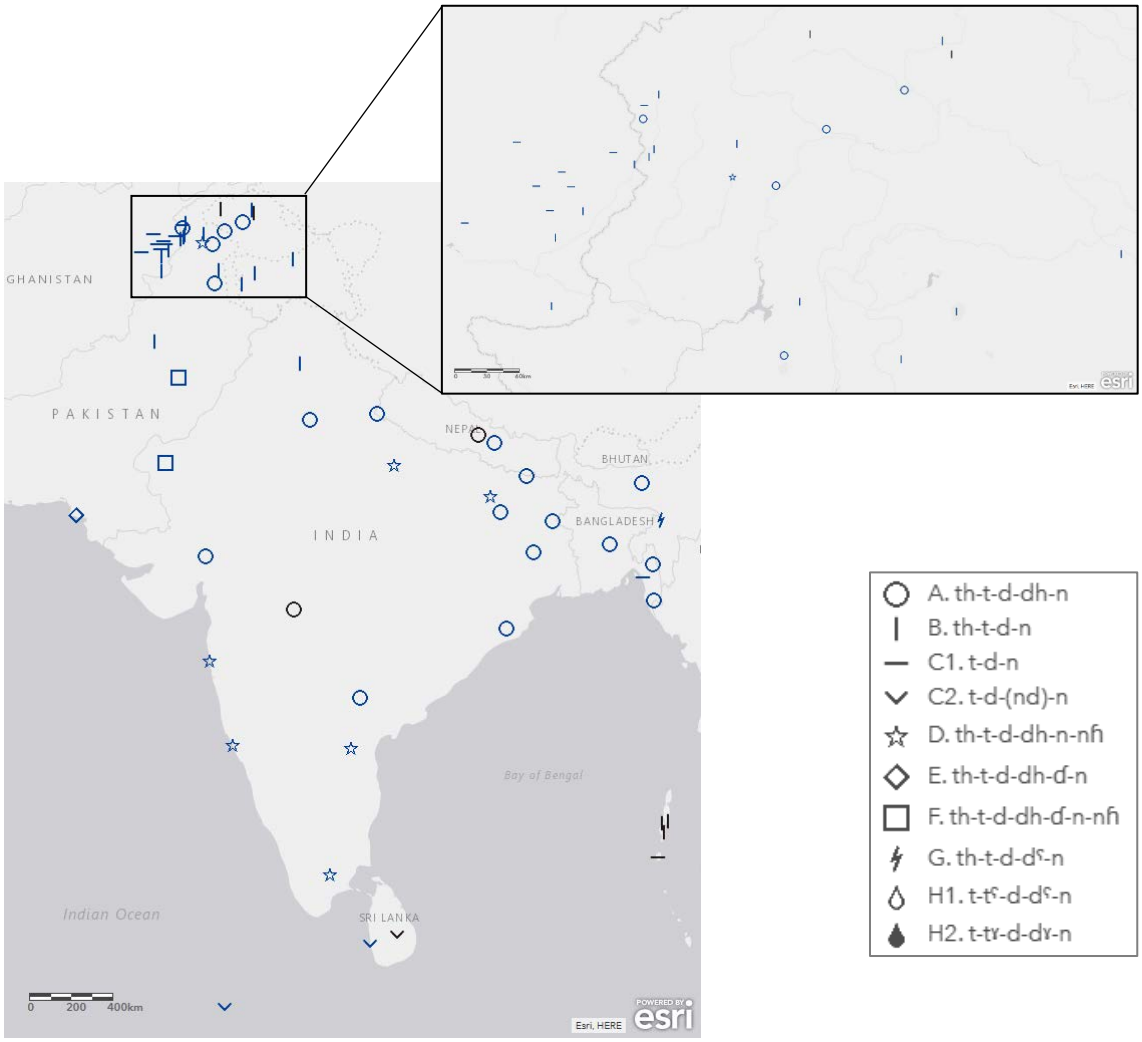


Figure 1: Types of stop series in Indo-Aryan, Nuristani (both in blue), Andamanese, and language isolates (those in black)

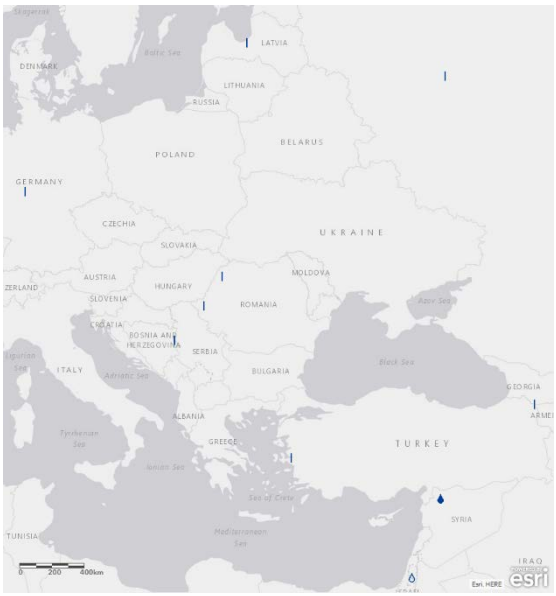


Figure 2: Types of Indo-Aryan languages outside of South Asia

Stop series in Dravidian

1. Classification

In this map, stop series are classified as 3 large categories: *t-n* type, *t-d-n* type, and *t-d-dh-n* type.

A. *t-n* type

t- [t-], n- [n-]

-t- [-ð-], -n- [-n-]

-tt- [-tt-] (< *-tt, <*-ntt)

-nt- [-nd-] -nn- [-nn-]

B. *t-d-n* type

t- [t-], d- [d-], n- [n-]

-t- [-t-], -d- [-ð-]~[-d-], -n- [-n-]

-tt- [-tt-], -dd- [-dd-], -nn- [-nn-]

-nt- [-nt-](<*-ntt), -nd- [-nd-](<*-nt)

C. *t-d-dh-n* type

C-1 *t-d-dh-n* type

t [t^h], d [d], dh [$d^ɦ$]~[$t^ɦ$], n [n]

C-2 *th-t-d-dh-n* type

th [t^h], t[t], d [d], dh [$d^ɦ$], n [n]

2. Geographical distribution and interpretation

The Proto-Dravidian stop series are reconstructed as belonging to the *t-n* type, without phonemic distinctions between voiced/voiceless nor aspirated/non-aspirated stop consonants, as is the case with Old Tamil. Since Tamil Brāhmī script shed all the voiced or aspirated consonant characters for oral stops, Tamil orthography has never reintroduced a device to distinguish the voiced stops which appears to have become phonemic through lexical borrowing at least in the word initial position in most spoken Tamil dialects on the subcontinent. The stop series in Lankan Tamil dialects, on the other hand, are reported to have remained of this archaic type, such as in Jaffna variety recorded by S. Kuno (1958).

The *t-d-n* type is dominant elsewhere for the stop series in Dravidian. The reflex of the PDr. series as reconstructed above is observed in alternation between the initial voiceless and voiced stops as allomorphy in most languages.

Types which involve aspiration, i.e. C-1 and C-2 are attributed to the contact with Indo-Aryan languages. C-1 type is typically observed in the so-called educated speech of the languages with a long literary tradition, which incorporated a large amount of Sanskrit vocabulary and (except Tamil) its phonetic and phonological treatises. Voiceless aspirated stops are the less stable of the two aspirated series in this type, probably because voiceless stops in these languages were inherently aspirated. In order to maintain the distinction, borrowed voiceless aspirated stops tend to be either replaced by voiceless fricatives or characterized by an extra-long VOT which makes the following vowel as breathy as those following the voiced aspirated stops. The dental series in Telugu is known to have taken the latter course, ending up in a merger of the voiced and voiceless aspirated stops, as is shown on the map. Similar phonetic descriptions on some varieties of Kannada and Malayalam are found in literature but not represented on the map.

C-2 type is also found in tribal languages in north and central India. Only Kurukh and Naiki are shown on the map as this type, although there are reports of dialects of this type in Gondi and Pengo. This type may suggest the extent of bilingualism with a Modern Indo-Aryan languages in the area.

Aspirated stops are not limited to borrowings and expressives in some languages. Kobayashi & Tirkey(2017: 34-35) discusses Kurukh spontaneous aspiration in medial positions in addition to the initial *kh* which is cognate to Malto *q*. Aspirated sounds and consonant clusters are reported to be distinct in Kurukh.

Bh. Krishnamurti (2003: 155) includes aspiration in Telugu and Old Kannada numerals in his evidence for the Dravidian laryngeal theory. (PDr. *CVHCV > Telugu C[H]VCV).

OTe. *padi* ‘10’ *ēṃbhadi* ‘50’

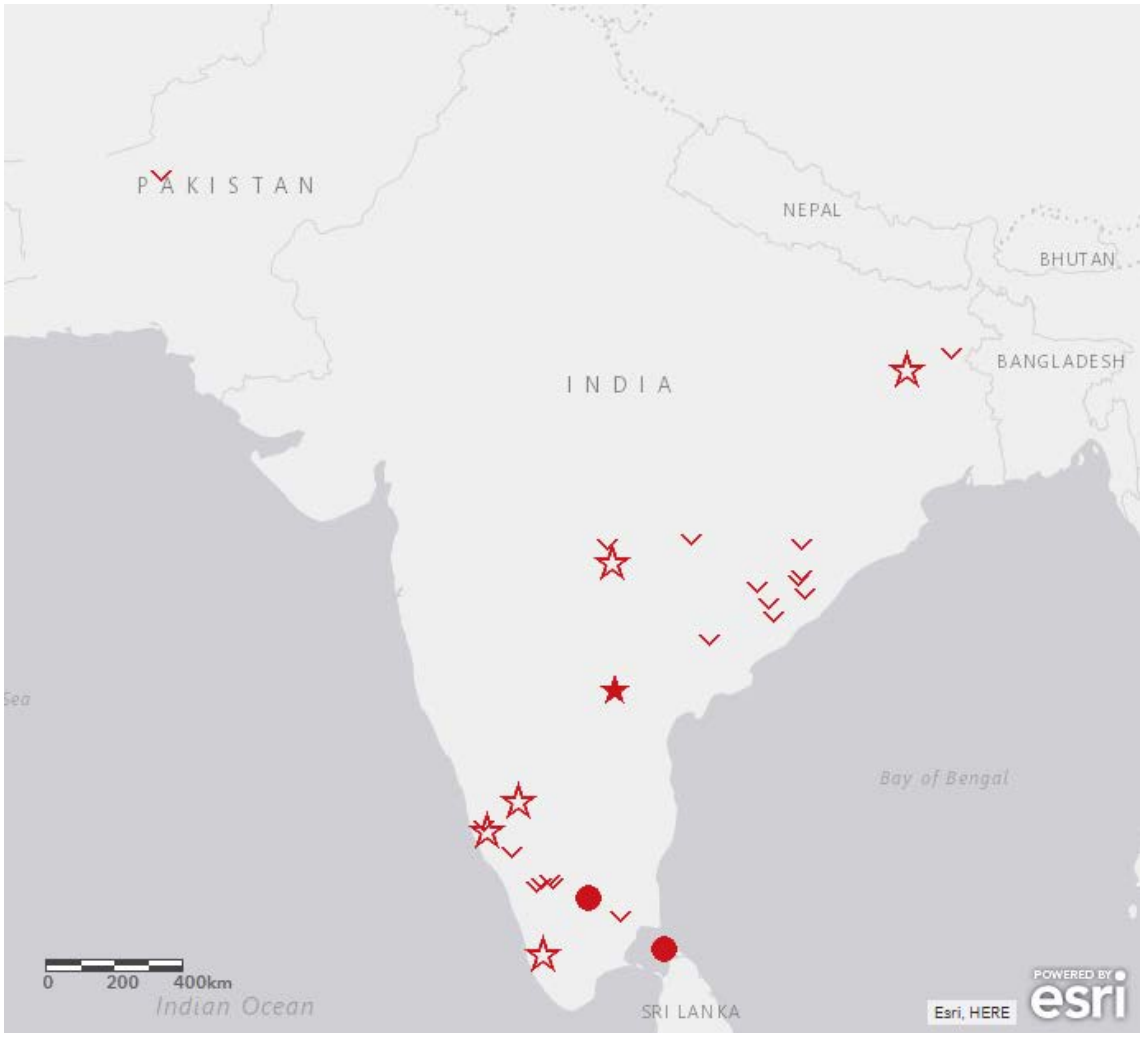
OKa. *ombhattu* ‘9’ *tombhattu* ‘90’ cf. *hattu* < *pattu* ‘10’

Mod.Te. *padi* ‘10’ *iravay* ‘20’ *mupphay* ‘30’ *nalabhay* ‘40’ *ēbhay* ‘50’ *aravay* ‘60’ *ḍebbhay* ‘70’ *enabhay* ‘80’ *tombhay* ‘90’

Together with some more examples of Telugu numerals shown below, these may suggest a cluster origin of the Telugu aspirated stops. Inserted *-h-* appears below to block deletion of the preceding short vowel by a V-V sandhi which would result in a monomoraic allomorph.

pada-k-oṇḍu ‘11’ *paṇ-ṇeṇḍu* ‘12’ *pada-mūḍu* ‘13’ *pad(h)-nālugu* ‘14’ *padi-h-ēnu* ‘15’ *pada-h-āru* ‘16’ *padi-h-ēḍu* ‘17’ *padd-h-enimidi* ‘18’ *pan-dhommidi* ‘19’

(KODAMA Nozomi)



A. *t-n* ●
B. *t-d-n* ˅
C-1 *t-d-dh-n* ★
C-2 *th-t-d-dh-n* ☆

Figure 1: Stop series in Dravidian

Stop series in Iranian and Armenian

1. Classification

Many modern Iranian languages have the same stop series as that of Proto-Iranian (PIr.), in which *t-*d-*n is reconstructed. However, some Iranian languages have developed new stop series, such as aspirated, ejective and pharyngealized/ velarized stops mainly due to language contacts. Although it is not an Iranian language, we also deal with Armenian here because it has strong relation with Iranian languages both linguistically and geographically.

In this map, stop consonant series are divided into following five large categories (type A through type E) with some subgroups.

Type A		t-d-n
Type B	B-1	th-d-n
	B-2	th-t-d-n
	B-3	th-t-dh-d-nh-n
Type C		th-t'-d-n
Type D	D-1	t-t$^{\varsigma}$-d-n
	D-2	t-t$^{\varsigma}$-d-d$^{\varsigma}$-n
Type E		th-t-t$^{\varsigma}$-d-n

2. Geographical distribution and interpretation

Type A is the commonest stop series in Iranian languages, especially in Eastern regions. Although type A is the same as the reconstructed PIr. stop series (*t-*d-*n), this does not straightforwardly correspond with type A (t-d-n) respectively. This type includes Persian, Tajik and Dari (Southwestern), Central Kurdish (Sorani) and some dialects of Balochi (Northwestern), Pashto, Yazglami, Shughni-Roshani group with Sarikoli, Ishkashimi-Snglechi, Wakhi and Munji-Yidgha (Southeastern), Yaghnobi (Northeastern) and Ormuri (controversial).

Type B is frequently observed around the Caspian Sea and Armenia. This group is divided further into three subgroups: B-1, which includes Tatic (Tati, Vafsi, Talysh), Caspian (Gilaki) and Gorani/Hawrami (Northwestern); B-2, which includes Northern Kurdish (Kurmanji, Northwestern); B-3, which includes Parachi (controversial).

The aspirated stops occur not only in loanwords. For example, According to Stilo (2019: 676), all voiceless stops (except /ʔ/) are aspirated in Tatic and Caspian languages. Also, aspirated consonants are found in Northern Kurdish native words (see Haig 2018: 171). Armenian is classified into B-1. Haig (2018: 170) supposes that Kurdish aspirated phonemes are due to Armenian influence.

In addition, Eastern Balochi may also have the phoneme /th/, whose status as phoneme needs further research (see Korn 2005).

Type C is quite a unique series, which is found only in Ossetic (Iron and Digoron dialect), spoken in Caucasus, where ejective is quite common. There is a three-way contrast in stops: aspirated voiceless, ejective and voiced. Ejectives occur mainly in loanwords, although they could occur in some inherited words from Proto-Iranian.

ex.) Iron. t'yssyn-/ t'st- 'to thrust' < *tund-s cf. OIA. tud- 'beat, hit' (Abaev 1979: 358)

Type D has pharyngealized (or velarized) stops. This group is scattered around Arabian Peninsula, where Arabic is overwhelmingly dominant. It has two subgroups: D-1 and D-2. The former has one pharyngealized stop /t$^{\varsigma}$/ whereas the latter has two (/t$^{\varsigma}$/ and /d$^{\varsigma}$/).

Type E shows features of both type B-1 and D-1, that is, it has both aspirated stop /th/ and pharyngealized one. Only Behdini dialect of Kurdish (Iraq) falls into this type. Interestingly, Type E is located between Type B and Type D-1 zone, which enables us to suppose that neighboring languages play an important role here too.

In conclusion, the stop series types in Iranian languages correlate roughly with their geographical distribution except for Sorani (Type A) and Parachi (Type B-3). This implies that language contact plays important role in Iranian stop series. In fact, many scholars point out that Iranian languages have attained new phonemes through the substrata or neighboring languages (Oranskij (1988: 41) for Eastern Iranian, Ėdel'man and Dodyxudoeva (2009) for Pamir languages, Haig (2018: 170) for Kurdish).

Parachi, spoken in Afghanistan, not being contiguous to any other languages that have aspirated phonemes, do not seem to be explained by neighboring language's influence.

(IWASAKI Takamasa)

A t-d-n

B-1 th-d-n

B-2 th-t-d-n

B-3 th-t-dh-d-nh-n

C th-t'-d-n

D-1 t-t$^{\varsigma}$-d-n

D-2 t-t$^{\varsigma}$-d-d$^{\varsigma}$-n

E th-t-t$^{\varsigma}$-d-n

Figure 1: Stop series in Iranian and Armenian

Stop series in Semitic languages

1. Classification of stop series

The stop series are classified as follows.

A. *t-t'-d-n* series
- **A-1.** *t-t'-d-n* type
- **A-2.** *t-ṭ-d-n* type

B. *t-tˤ-d-n type*
- **B-1.** *t-tˤ-d-n* type
- **B-2.** *t-tˤ-d-n-dˤ* type
- **B-3.** *t-d-n-ɗ-dˤ* type
- **B-4.** *t-d-n* type
- **B-5.** *t-n* type

2. Geographical distribution and interpretation

A. *t-t'-d-n* type

Type A (*t-t'-d-n*) with an ejective is distributed in the modern period in the Ethiopian area and the southern Arabian peninsula. The Ethiopian Semitic languages such as Amharic (*t'amə* 'taste'), the official language of Ethiopia, Tigrinya (*t'əʕmə*) of the Christian language in Eritrea, and Tigre (*t'əʕma*), spoken by Muslims in the area, all exhibit this type. In addition, in the southern Arabian peninsula, the South Arabian languages including Jibbali (*t'ad* 'one'), Hobyot (*t'áat'*) in Oman, Mehri (*t'ād*) in Yemen, and Soqotri (*t'ad*) in the Soqotra island exhibit this type.

The ancient Semitic languages in these area such as Ge'ez, the classical language of Ethiopia, and the South Arabian epigraphic languages such as Sabaean in Yemen probably had the ejective *t'* as the emphatic *ṭ* because the modern varieties have it.

Type A-2 (*t-ṭ-d-n*) was distributed in the ancient Semitic languages in the Mesopotamia and Syria area, such as Akkadian (*ṭaːbu* 'good'), Ugaritic (*ṭaːbu* 'good'), and ancient Hebrew (*ṭoːb* 'good') These Semitic languages had the emphatic consonants *ṭ*, *ṣ*, and *ḳ*. These emphatics were probably ejectives rather than the pharyngalized *tˤ* (or uvularized, palatalized) as in Arabic because of the lack of a voiced counterpart (Nakano 1998: 15).

B. *t-tˤ-d-n* type

This type is widely distributed throughout the Arabic area, namely in the regions other than the Ethiopian area and the southern Arabian peninsula. In the Syrian region, where the North Semitic languages were spoken, the innovation of the pharyngalization of the ejective *t'* took place.

Thus, classical Syriac (*ṭaːb* 'good') and classical Arabic likely exhibited Type B-1 (*t-tˤ-d-n*). It is possible that the realization of *ṭ* of classical Arabic was a voiced [dˤ], but there is some discussions about this realization in Proto Arabic (Nakao 2018.)

Modern Aramaic languages such as Syriac (*tˤaːb* 'good'), Mandaic, Ma'lula Aramaic (*tˤoːb* 'good') and Assyrian, spoken in Iraq and Syria (*tˤava* 'good), Arabic nomadic (Bedouin) dialects such as Iraqi (*tˤeːr* 'bird'), Arabian peninsula and Tunisian have a pharyngal *tˤ* as an emphatic but do not have a pharyngal *dˤ*. In addition, the reflex of *ḍ* in Arabic Bedouin dialects is the fricative *ðˤ*.

Type B-2 (*t-tˤ-d-n-dˤ*) is found in the urban dialects of Arabic such as Cairene in Egypt, Damascine in Syria, and Maghrebi in Morocco, in which the interdental pharyngal fricative *ðˤ* and **d͡ɮˤ* or **d͡lˤ* (< Proto Semitic *ɬˤ* according to Lipiński 2001: 135) merged into *dˤ* (Cairene *dˤalma* < **ðˤalma* 'darkness'; *dˤarab* < **d͡ɮˤarab* 'to hit'). Thus, the system of the stop series has achieved symmetry in these dialects. Moreover, the dialects have developed the pharyngalized consonants *bˤ*, *mˤ*, and *zˤ* apart from the *rˤ* and *lˤ* that exist in classical Arabic.

Type B-3 (*t-d-n-ɗ-dˤ*), which is a variety of Type B-2, is found in Nigeria. In this dialect, the reflex of *ṭ* is a dental implosive emphatic [ɗˤ] and the reflex of *ḍ* of classical Arabic is *dˤ* (Owens 1993.) An implosive [ɗ] as the reflex of *ṭ* in Aswan, South Egypt is also reported (Schroepfer 2015.)

Type B-4 (*t-d-n*) is found in the peripheral varieties of Arabic dialects such as Maltese, Ki-Nubi in Kenya and Bukhari in Uzbekistan, and modern Hebrew. In these varieties, the emphatic phonemes have merged into the non-emphatic counterpart, thus *tˤ* into *t* and *dˤ* into *d*; Ar. *tˤaːr* > Maltese *tar*. In the Bukhari dialect, the interdental fricatives *θ*, *ð*, and *ðˤ* merged into plane dental fricatives *s* and *z*. The speakers of modern Hebrew of European origin pronounce /ṭ/ as *t*, although the speakers of that of the Arabian origin pronounce it as *tˤ* as in Arabic.

Type B-5 (*t-n*) is found only in Cypriot Arabic. In this dialect, the opposition between voiced and unvoiced has disappeared in the stops, as has that between emphatic and non-emphatic.

(NAGATO Youichi)

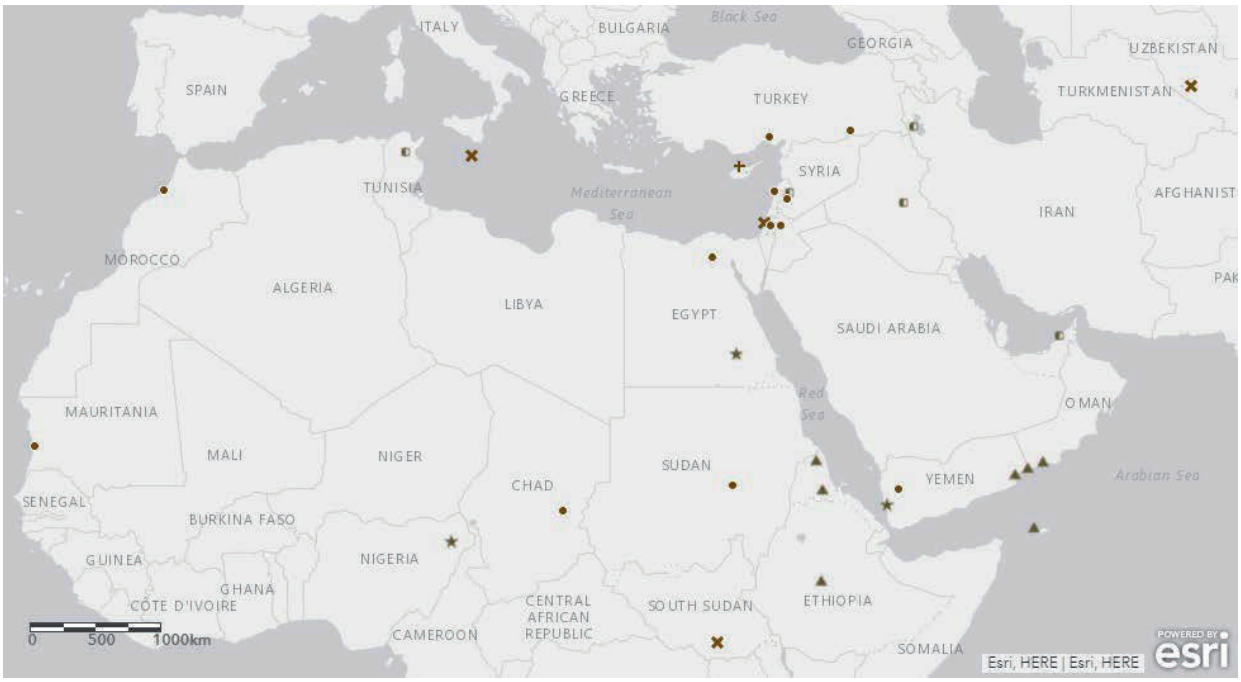


Figure 1: Stop series in Semitic

▲ A-1. t-t'-d-n
△ A-2.t-ṭ-d-n
◐ B-1. t-tˢ-d-n
● B-2. t-tˢ-d-n-dˢ
★ B-3. t-d-n-ɗ-dˢ
✖ B-4. t-d-n
\+ B-5. t-n

Figure 2: Stop series in Semitic (Old Semitic)

Stop series in Nilo-Saharan

1. Classification

On this map, the stop series is classified as consisting of 10 types, which could be consolidated into five main types:

A. *t-D-n* types (two-way laryngeal distinction)
  A-1 *t-d-n* type (core type)
  A-2 *t-ɗ-n* type (including /ɗ/ [d]~[ɗ])
  A-3 *t-d-n-nd* type (A-1 plus a prenasalized stop)
  A-4 *t-ɗ-n-nd* type (A-2 plus a prenasalized stop)
B. *t-n* type (no laryngeal distinction)
C. *T-d-ɗ-n* type (three-way laryngeal distinction)
  C-1 *t-d-ɗ-n* type (core type)
  C-2 *t'-d-ɗ-n* type (with an ejective stop)
  C-3 *t-d-ɗ-n-nd* type (C-1 plus a prenasalized stop)
D. *t-t'-d-ɗ-n* type (four-way laryngeal distinction)
E. *th-t-t'-d-ɗ-n* type (five-way laryngeal distinction)

2. Geographical distribution and interpretation

Nilo-Saharan is a loosely defined group of African languages spoken between the domains of Afroasiatic and Niger-Congo language phyla. Although there is no consensus about the phylogenetic membership or the internal relationships, at least two large families have been established in the comparative linguistic debates: Central Sudanic (with its Western and diverse Eastern branches) and Eastern Sudanic (Nubian, Nara, Taman, Nyimang, Eastern Jebel, Temein, Daju, Surmic, and Nilotic). The largest of these groups is the Nilotic languages, with its Southern, Eastern and Western sub-branches. In addition, the following languages have appeared in the arena of "Nilo-Saharan" linguistics: Berta, Fur-Amdang, Mabang, Kuliak, Kunama and Saharan, as well as Koman, Gumuz, Songhay, Kadu and Shabo, whose Nilo-Saharan affiliations have been disputed (Dimmendaal 2020). In the following maps, at least one member of these groups is represented. To these we could add the two extinct languages not represented here: Meroitic, spoken in ancient Sudan, and "Mimi of Decorse," recorded in ca. 1900 in Chad.

There is as yet no accepted phylum-level sound correspondence, and the findings of previous studies cannot be taken for granted. To take an example, Ehret (2001) once proposed the proto-Nilo-Saharan stop series as **t-*t'-*d-*ɗ-*n-*nd*, analyzing then available Uduk (Koman; Type E) and typical Central Sudanic (Type C-3) data as the most archaic types. The membership of Uduk (or Koman in general) within Nilo-Saharan, however, is disputable, and it has been recently confirmed that the Koman languages have an additional phoneme *th* (Killian 2015; Otero 2019).

Type A-1 is the most prevalent type, represented by Korandje (Songhay) in Algeria, Nobiin (Nubian) in Egypt, and Datooga (Southern Nilotic) in Tanzania (although the *t* vs. *d* opposition in Datooga could be theoretically analyzed as /tt/ vs. /t/; see Hieda 2001).

Some phonemes and types exhibit obviously areal distributions. The implosive *ɗ* (Types A-2, A-4, C, D, E) is frequent in so-called Sudanic belt, i.e., from the West African coasts to the southern and western fringes of the Ethiopian Highlands, which is often postulated as an areal feature of this region (Clements and Rialland 2008; Güldemann 2008). Ejective *t'* (Type C-2, D, E) is found almost exclusively among disputed Nilo-Saharan branches (Koman, Gumuz, and Shabo) spoken on the fringes of Ethiopian Highlands, with the notable exception of Ethiopian Berta, which uniquely attests C-2. The existence of the ejective series (and *ɗ*) is a feature shared with Afroasiatic languages of the same region (Omotic, Cushitic, and Ethio-Semitic) and often postulated as an areal feature (Crass & Meyer 2008). Central Sudanic Ngiti (Type D) actually has an implosive [ᶑ], which is here integrated as a phonetic variant of *t'*. Type B is found only among Southern Nilotic languages in East Africa.

Many Nilo-Saharan branches attest a full or partial distinction of dental vs. alveolar (most Western Nilotic, Gaam (Eastern Jebel), Nyimang and Maba (Mabang)) or alveolar vs. retroflex (Eastern Nilotic Kakwa and some Central Sudanic) series. The point of articulation may be incoherent in some other languages, such as in Mamvu (Central Sudanic; Type A-1) and in Chamus and Ongamo (Eastern Nilotic; Type A-2). Phonetically, however, Mamvu has *t̪-d-ŋ*, Chamus has *t̪-ɗ-n̪*, and Ongamo has *t̪-ɗ-n*. All Kadu languages have alveolar *ɗ* and *n* in addition to dental *t̪* (and *ɖ*) and retroflex *ʈ* (and *ɖ*) and are classified here as Type A-2. Similarly, Didinga (Surmic), with *t̪-ʈ-d-ɗ-n*, is classified as C-1. Central Sudanic Kresh and Bagirmi (*t-d-n-ʈ-ɖ-ɖ*) and Mangbetu (*t-d-n-ʈ'-ɖ-ɖ*), classified as Type A-1, and Southern Nilotic Pökoot (*t-n-ɖ*), classified as Type B, have retroflex implosive (and ejective). In addition, a few languages under Arabic and/or Berber influence, such as Northern Songhay and Sudanese Berta attest pharyngealized stops /tˤ/ (and /dˤ/).

(NAKAO Shuichiro)

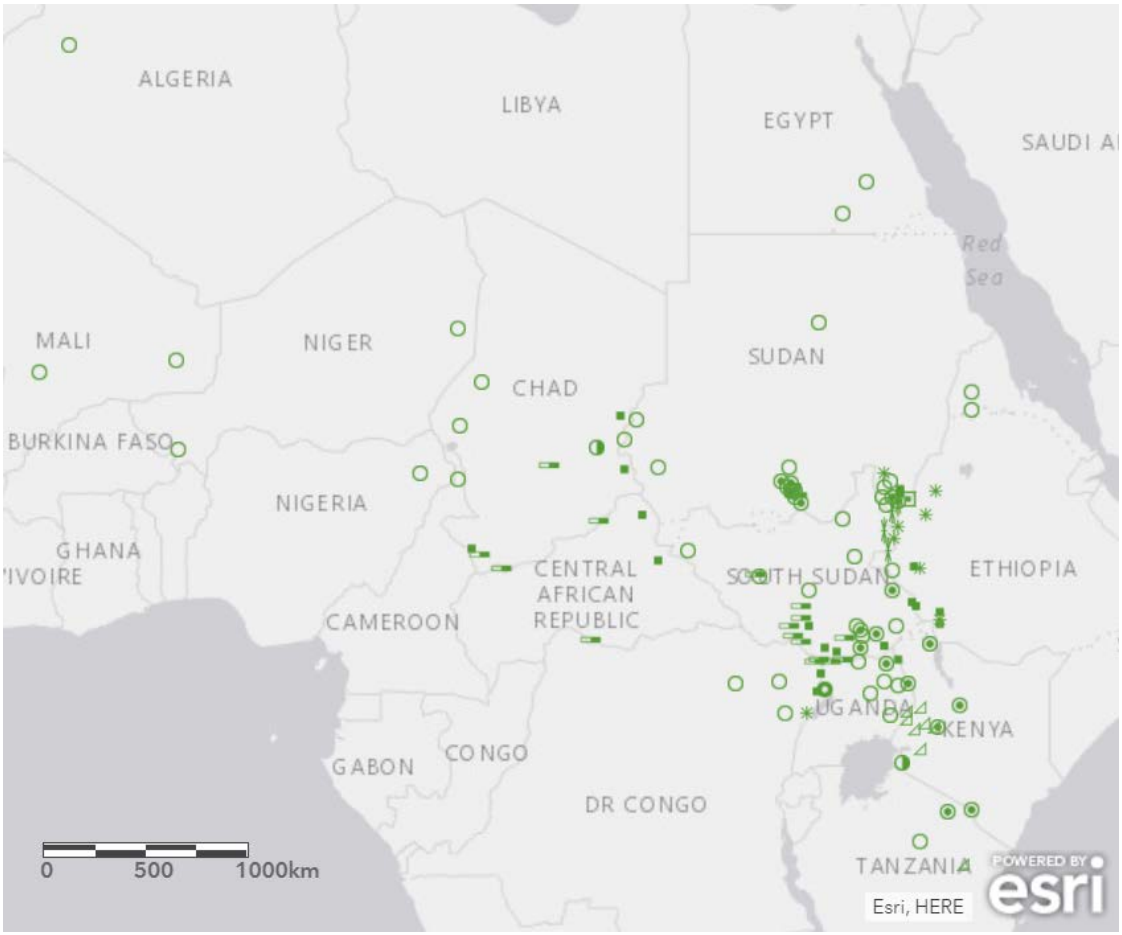


Figure 1: Stop Series in Nilo-Saharan (in general)

A-1. *t-d-n*
A-2. *t-ɗ-n*
A-3. *t-d-n-nd*
A-4. *t-ɗ-n-nd*
B. *t-n*
C-1. *t-d-ɗ-n*
C-2. *t'-d-ɗ-n*
C-3. *t-d-ɗ-n-nd*
D. *t-t'-d-ɗ-n*
E. *th-t-t'-d-ɗ-n*

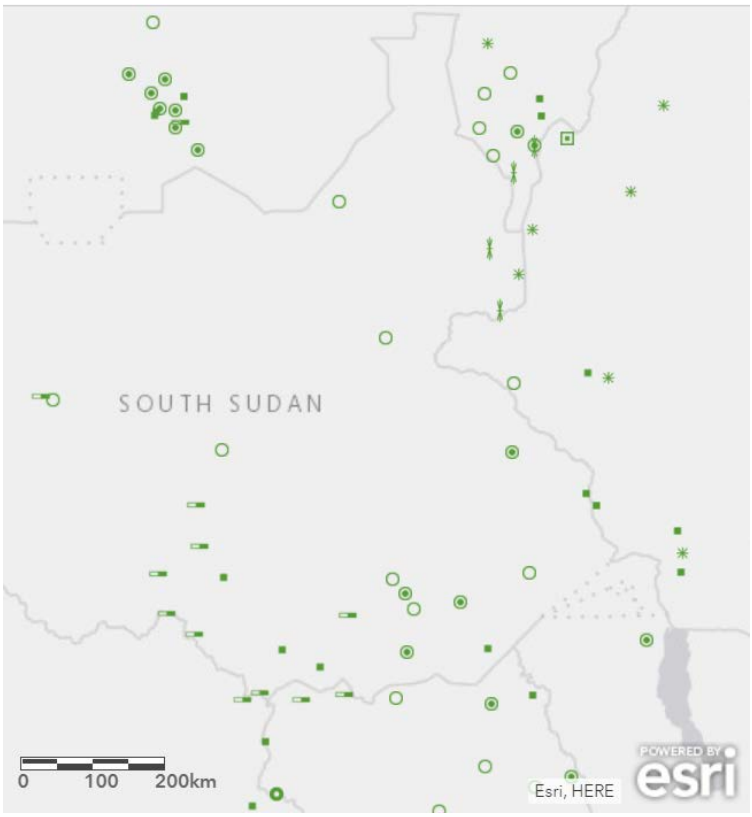


Figure 2: Stop Series in Nilo-Saharan languages around South Sudan

Stop series in Niger-Congo

1. Classification

The following is a list of articulatory types of stop consonant series attested in 85 sample languages from the following branches: 1. Kordofanian (2 languages), 2. Mande (5), and sub-branches of Atlantic-Congo including 3a. Atlantic (8), 3b. Ijoid (2), and 3c. Volta-Congo (68, including 25 Bantu languages spread over 13 of 15 zones of geographic classification proposed by Guthrie 1970:11−15). Systematic types are primarily classified by the number of distinctions, ranging from 2 to 7, and further subcategorised by the following features defining each subtype: [A͡] Aspiration (*th*), [A̰] Breathiness (*dh*), [NC̥] Voiceless Prenasal/ Nasal Cluster (*nt*), [NC] Voiced Prenasal/ NC (*nd*), [GC̥] Ejective (*t'*), and [GC] Implosive (*ɗ*). Type codes, consisting of the number of distinctions and feature tags, are provided in square brackets (e.g. [4-A͡-GC̥] for the 4-way distinction with aspirated and ejective consonants), and the number of attested languages of each pattern is shown in parentheses.

A. 2-way distinction
  A-1: [2] *t-d* (1)
  A-2: [2'] *t-n* (1) or *d-n* (1)
B. 3-way distinction
  B-1: [3] *t-d-n* (36)
  B-2: [3-A͡] *th-d-n* (4) or *th-t-n* (1)
  B-3: [3-NC] *t-nd-n* (3) or *t-d-nd* (1)
C. 4-way distinction
  C-1: [4] *t-d-nd-n* (5)
  C-2: [4-A͡] *th-t-d-n* (2)
  C-3: [4-A͡-GC̥] *th-t-t'-n* (1)
  C-4: [4-A̰-NC] *th-t-nd-n* (1)
  C-5: [4-GC] *t-d-ɗ-n* (7)
  C-6: [4-GC-NC] *t-ɗ-nd-n* (1)
  C-7: [4-NC̥] *t-d-nt-n* (1)
  C-8: [4-NC̥-NC] *t-nd-nt-n* (1)
D. 5-way distinction
  D-1: [5] *t-d-ɗ-nd-n* (8)
  D-2: [5-A͡] *th-t-ɗ-nd-n* (1)
  D-3: [5-A̰-A͡-GC̥] *th-t'-dh-ndh-n* (2)
  D-4: [5-NC̥] *t-d-nd-nt-n* (5)
E. 6-way distinction
  E-1: [6] *t-d-ɗ-nd-nt-n* (1)
  E-2: [6-A̰-A͡] *th-t-ɗ-d-dh-n* (1)
F. 7-way distinction
  F-1: [7-A̰-A͡] *th-t-dh-ɗ-nd-ndh-n* (1)

What is immediately suggested by these patterns is that feature [A͡] plays a distinctive role in subcategorisation of all types defined by the number of distinctions, except Type A, which itself can be divided into the 'voice contrast' type (A-1: [2] *t-d*) and the 'oral-nasal' type (A-2: *t-n* or *d-n*). The latter type, in turn, can be regarded as a basis for Type B-2: [3-A͡], which is configurated by adding [A͡] to Type A-2: [2']. On the other hand, the 'voice contrast' type serves as a basis for the 'canonical' type where the marked feature [A͡] is not relevant to the systematic configuration. A configurational hierarchy of the canonical types is formalised as follows: A-1 > +*n* > B-1 > +*nd/ɗ* > C-1/C-5 > +*ɗ/nd* > D-1 > +*nt* > E-1.

2. Geographical distribution and interpretation

A general tendency of geographical distribution is that the Benue-Congo (BC) sub-branch of the Volta-Congo (VC) languages, especially Southern Bantu languages, shows more complexity than other languages spoken in the western part of the continent (for further discussions on phonological areas in Africa, see Clements & Rialland 2008).

Type A is attested in Kwa and Kru sub-branches of VC as well as in Kordofanian.

Type B, which is the overwhelming majority of all types of distinctions, is spread widely throughout the continent but with a concentration in the west. It is also noted that the less marked canonical subtypes are densely distributed in the non-BC area, while [3-A͡] seems to be typical in Kwa (VC), and [3-NC] is dominant in the Bantu area.

Type C consisting of the greatest number of subtypes still shows a regular geographic pattern; while all subtypes with [NC] are distributed in the Bantu area, those with the [GC] feature are well observed in non-Bantu BC and other VC subgroups such as Kwa and Ubangian.

Type D is also distributed in a principled way; the canonical type is exclusively found in North Volta-Congo as well as in non-VC languages such as Atlantic and Ijoid, while marked subtypes are predominantly distributed in the Bantu area.

While two Type E languages are sporadically found in Igboid (VC) and Atlantic, Type F, the most complex pattern in our sample, is found in the Southern Bantu zone, following the general tendency.

(SHINAGAWA Daisuke & KOMORI Junko)

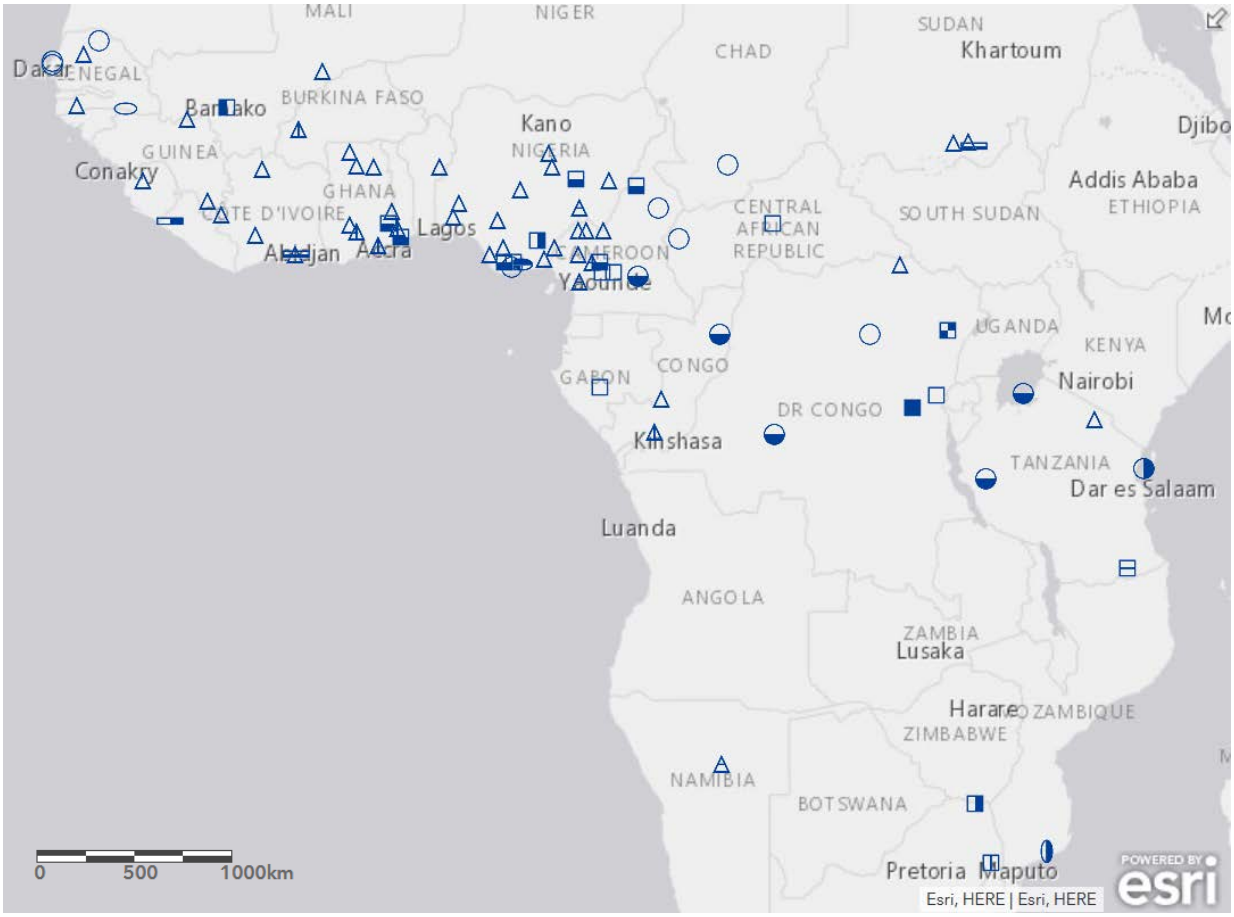


Figure 1: Geographical distribution of systematic types of stop series in Niger-Congo languages *Geographical information for plotting the sample languages is based on Glottolog 4.3 (Hammarström et al. 2020).

Figure 2: Enlargement of the Western Coastal area

A-1	[2]	*t-d*		C-6	[4-GÇ-NÇ]	*t-ɗ-nd-n*	
A-2	[2’]	*t-n* or *d-n*		C-7	[4-NÇ]	*t-d-nt-n*	
B-1	[3]	*t-d-n*		C-8	[4-NÇ-NÇ]	*t-nd-nt-n*	
B-2	[3-Ạ]	*th-d-n* or *th-t-n*		D-1	[5]	*t-d-ɗ-nd-n*	
B-3	[3-NÇ]	*t-nd-n* or *t-d-nd*		D-2	[5-Ạ]	*th-t-ɗ-nd-n*	
C-1	[4]	*t-d-nd-n*		D-3	[5-Ạ-Ạ-GÇ]	*th-t’-dh-ndh-n*	
C-2	[4-Ạ]	*th-t-d-n*		D-4	[5-NÇ]	*t-d-nd-nt-n*	
C-3	[4-Ạ-GÇ]	*th-t-t’-n*		E-1	[6]	*t-d-ɗ-nd-nt-n*	
C-4	[4-Ạ-NÇ]	*th-t-nd-n*		E-2	[6-Ạ-Ạ]	*th-t-f-d-dh-n*	
C-5	[4-GÇ]	*t-d-ɗ-n*		F-1	[7-Ạ-Ạ]	*th-t-dh-ɗ-nd-ndh-n*	

Coronal stop series in the Kalahari Basin area

1. Classification

Figure 1 shows the geographical distributions of selected coronal stop consonants in KBA languages. Classifications are made based on the series types, which are specified in terms of three laryngeal features, that is, voicing, aspiration, and ejection.

In the current sample, five click series types are attested, as illustrated with the relevant laryngeal features below (the click type is represented by the dental |).

A: |-g|-$|^h$-g$|^h$-|'-g|' [±voiced, ±aspirated, ±ejective]
B: |-g|-$|^h$-g$|^h$ [±voiced, ±aspirated]
C: |-g|-$|^h$-|' [±voiced, ±aspirated, ±ejective]
D: |-g|-$|^h$ [±voiced, ±aspirated]
E: |-$|^h$ [±aspirated]

NB: There is a hierarchy: {|, $|^h$} > g| > {g$|^h$, |'} > g|'. (This implies [±aspirated] > [±voiced] > [±ejective].) Non-click alveolar stops also show a parallel tendency to the click series with some disagreements, which yield two subtypes for series types C and D. Table 1 presents the series types of KBA coronal clicks and non-clicks, together with sample languages.

Table 1: Series types of KBA coronal consonants (Gaps are indicated with Ø)

Type	Click	Non-click	Language
A	|-g|-$\|^h$-g$\|^h$-|'-g|'	t-d-t^h-d^h-t'-Ø	• West !Xoon • East !Xoon
B	|-g|-$\|^h$-g$\|^h$	t-d-t^h-d^h	• Tsumkwe Ju|'hoan • Heikkinen !Xuun W • Heikkinen !Xuun E
C1	|-g|-$\|^h$-|'	t-d-t^h-t'	• ǂHaba • Xade G|ui • G‖ana • Tshila
C2	|-g|-$\|^h$-|'	Ø-Ø-Ø-Ø	• Khute G|ui • N!aqriaxe
D1	|-g|-$\|^h$	Ø-Ø-Ø	• N|uu
D2	|-g|-$\|^h$	t-d-t^h-t'	• Naro
E	|-$\|^h$	t-Ø	• Windhoek Khoekhoe

On Figure 1, series types of click and non-click stops are combined, and displayed as types A-E. The three language families in KBA, namely Tuu, Kx'a and Khoe-Kwadi, are marked with orange, brown and light blue symbols respectively.

Note that, for reasons of space, other non-click coronal consonants, namely affricates, fricatives, nasals, and liquids, are not discussed in this article.

2. Geographical distribution and interpretation

As seen on Figure 1, the relationship between the geographical and genealogical distributions of stop series types is not straightforward. Type A is observed only in the Tuu family, type B only in the Kx'a family, and type E only in Namibian Khoekhoe of the Khoe-Kwadi family. In contrast, the other two types are shared by two families: type C by Khoe-Kwadi and Kx'a, and type D by Khoe-Kwadi and Tuu. The cross-family distribution of type C can apparently be explained in terms of language contact, but at this stage, it is still unclear how the cross-genetic distributions of type D should be accounted for.

In addition, the distribution of click series types indicates that the ubiquitous laryngeal feature among KBA languages is [±aspirated] instead of globally unmarked [±voiced]. Historically, this can be explained as a result of the tonogenesis occurring in Khoekhoe (Haacke 1999). Khoekhoe is the only language (cluster) in KBA that contrasts four level tones and two simple (non-complex) stop series, that is, [–voiced, –aspirated] vs. [–voiced, +aspirated]. In contrast, all other sample languages contrast less than four level tones and at least three simple series, that is, [–voiced, –aspirated], [–voiced, +aspirated], and [+voiced, –aspirated]. This suggests that the pitch lowering associated with the voiced series was phonologized and the contrast in voicing was neutralized during a certain stage of Khoekhoe history. However, this is an over-simplified scenario and there are complicated details that we are not ready to present at this stage.

Unlike clicks, the non-click alveolar stops in the KBA languages involve many gaps, the detailed discussion of which is beyond the scope of this article. Comparative investigations have revealed that palatalization (/t d t^h t'/ > /c ɟ c^h c'/) yielded the gaps of the alveolar stops (type C2) in Khute G|ui, Khoe-Kwadi (Nakagawa 1998), and N!arqriaxe, Kx'a (Gerlach 2018). A similar sound shift probably involved the loss of the alveolar stops in N|uu (type D2) in the Tuu family.

(KIMURA Kimihiko, NAKAGAWA Hirosi)

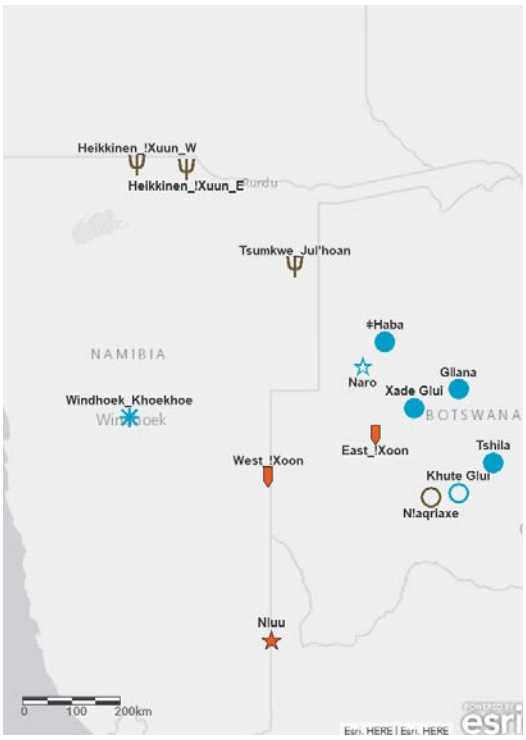


Figure 1: The geographical distribution of coronal series types

Tuu (orange)

A:	|-g|-|ʰ-g|ʰ-|'-g|'	t-d-tʰ-dʰ-t'-Ø
D1:	|-g|-|ʰ	Ø-Ø-Ø

Kx'a (brown)

B:	|-g|-|ʰ-g|ʰ	t-d-tʰ-dʰ
C2:	|-g|-|ʰ-|'	Ø-Ø-Ø-Ø

Khoe-Kwadi (light blue)

C1:	|-g|-|ʰ-|'	t-d-tʰ-t'
C2:	|-g|-|ʰ-|'	Ø-Ø-Ø-Ø
D2:	|-g|-|ʰ	t-d-tʰ-t'
E:	|-|ʰ	t-Ø

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Interesting sounds and sound changes in Japonic

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Abstract

In this article, we summarize the notable points about the consonant system of Japonic languages (Japanese and Ryukyuan) and their changes: 1. a change of d > r (rhoticism) can be seen as in *maro* 'window,' 2. voiceless nasals such as [n̥] in *n̥ne* 'ship'are found, 3. various geminate consonants such as *tta* 'did' and *madde* 'as if' are seen, 4. it is presumed that the Ryukyuan languages also had prenasalized consonants: 5. regarding the phonologization of allophones, such as [t-] ~ [-d-], and 6. about the proto-Japonic consonant system (I: t-ⁿt-n).

0 Introduction

The synchronic types of stop series in Japonic (Japanese-Ryukyuan) are classified into seven categories:

A: t-ⁿd-n type with prenasalized voiced obstruents
B: t-d-ⁿd-n type with distinctive prenasalization in the voiced obstruents
C: t-d-n type without prenasalization in the voiced obstruents
D: t-tˀ-d-n-ʔn type with distinctive glottalization in both voiceless obstruents and nasals.
E: t-tˀ-d-n type with distinctive glottalization in the voiceless obstruents
F: t-d-n-ʔn type with distinctive glottalization in the nasals.
G: t-n type with no voiced obstruents

In addition, there are other stop consonants in Japonic that cannot be described under these categories. In this study, we report interesting sounds and sound changes in the Japonic languages. We also talk about the changes that cannot be fully discussed in the main article. However, this paper deals only with alveolar stops following the main article, and does not examine other places or the manners of articulation.

1 Rhotacism

The Naha dialect (southern Okinawan) does not have /d/ and, at first glance, looks like Type G (t-n). In actuality, this dialect has voiced obstruents such as in *tabi* 'trip' and *kaagi* 'shape' (Uchima and Nohara 2006) so we must classify it as Type C. The lack of /d/ is due to rhotacism from /d/ to [r] (e.g. *ruru* < *duru* 'mud'). Although there are not so many dialects where /d/ has completely merged with /r/, such as the Kunigami-Uka dialect and the Benoki dialect of Okinawa (Karimata 2010: 129), the confusion between /d/ and /r/ is widely observed, including in mainland dialects (e.g. *ido* ~ *iro* 'water

well' in Fukuoka). Like *dakura* < *rakuda* 'camel' in some Awaji dialects, there is a tendency for both /d/ and /r/ to be realized as [d] at the beginning of a word and [r] in the interior of a word. In the Kami-Yaku and Naka-no-shima dialects, /d/ > [r] has also occurred, but this [r] is somewhat different from the original /r/ (Kamimura 1966: 46). In this case, /d/ and /r/ have not completely merged. In the present Iwaya dialect of Awaji Island, rhotacism has not been found, but this is due to standardization (replacement by standard Japanese), so words that do not have standard forms such as *otoroi* < *otodoi* 'brothers' retain the rhotic form. In Awaji Island, there are dialects in which word-medial /d/ is realized as [ɾ̃] or [ɪ̃] (e.g. *soɾ̃atsu* 'to grow,' *imaɾ̃aɲi* 'still'). This is distinct from /n/ (cf. Eng. *winter* [ˈwɪɾ̃ɚ] vs. *winner* [ˈwɪnɚ]).

Map 1: Rhotacism of /d/ in Japonic

In the Kamikoshiki-mura Segami dialect (Kagoshima Prefecture), intervocalic /-t-/ regularly changes into [r] as a result of rhotacism, as can be seen with *arama* 'head' and *oro* 'sound'. In the Segami dialect, intervocalic /d/ merges with [n] (e.g. *jonai* 'drool,' *sone* 'sleeve,' *nono* 'throat') (Kibe 2001: 45).

In addition, the rhotacism of /n/ > /r/, such as in *garime, garima(me)* 'crab' in the Hachijo dialect (cf. *kani* 'crab' in standard Japanese) is attested (Yamada 2010: 66–67). In the Yonaguni dialect, there are examples such as *mbirumi* 'anus' < *tubenome (cf. Shuri *cibinumi*) and *taruŋa* 'shrimp' < *tanaga* (cf. Shuri *tanagee*) (Ikema 2003). In Ryukyuan languages, there are many dialects in which /n/ of *kunebu 'orange' has become /r/ (e.g. Okinoerabu *kuribu*, Kin *kiribu ~ kirubu*) (Lawrence 2011: 117). In the Shuri dialect, *tanunuɴ ~ tarunuɴ* 'to ask' and *maruʧa* < *manaita 'chopping board' also demonstrate the change of /n/ > [r] (NINJAL ed. 1969). Words in (northern) Ryukyuan languages such as *gai* 'crab' and *tai* 'tick' in the Ie dialect (Oshio 2009) are also considered to reflect this change such as *gani > *gari and *tani > *tari (cf. *nai* < *nari 'fruit'). **kani* > **kari* might also have occurred in Yonaguni *kainuʦu* 'meconium' (cf. Yonaguni *nai* < *nari* 'fruit,' Hateruma *kaᵑgï* 'meconium,' Jpn. *kani[kuso]* 'meconium'). However, there is no dialect that lacks /n/ due to this change because /n/ > /r/ is a sporadic change in all Japonic languages[1].

Although not the theme of this paper, /z/ may also turn into [r] (e.g. Oita *surume* < *suzume* 'sparrow,' Kudaka-jima *hara* < *kaza* 'smell'). After all, alveolars /t/, /d/, /n/ (, and /z/) can all change into /r/. In addition, there are dialects where /d/ and /z/ have merged, but in these dialects, the direction of the merger is /z/ > /d/. Thus, /z/ is missing due to the merger, as in the Yoron and Yonaguni dialects, but no dialect lacks /d/.

/d/ > [r] is a kind of lenition, and a similar lenition is observed for other consonants: /b/ > [w] in Toyama *kawa* 'hippo,' *ʃiwa* 'firewood,' Izena *ɸiːwa* 'fang,' *tawi* 'travel,' *naːwi* 'pot,' Nago *suwa* 'side,' *ta(:)wi* 'travel.' /g/ sometimes dropped, as in *kaami* 'mirror' and *tamaeru* 'be surprised' in the Nagano-Iiyama dialect.

[1] On the other hand, in some dialects, /mi/ corresponds to the nasal vowel [ĩ](e.g. *kagaĩ* 'mirror,' *hasaĩ* 'scissors,' *suĩ* 'ink,' *goĩ* 'garbage'). So it is possible that the correspondence between /ni/ :: /i/ was established through the process of /ni/ > [ĩ]> /i/ instead of /ni/ > [ri] > /i/. /ŋi/ (< [gi]) :: /nʲi/ ~ [ĩ]~ /i/ also supports this change: Kikai-jima *muŋi* 'wheat,' Yaku-shima *kuĩ* 'nail,' Kabira *mui* 'wheat,' Kohama *mui* 'wheat'.

2 Voiceless nasals

Map 2: Voiceless nasals

Voiceless nasals such as [n̥] are phonetically observed in some dialects of Yaeyama, such as in the Hateruma dialect (e.g. *pn̥a* 'flower') (Asō 2020), but they do not seem to be phonological and are instead allophones of /n/.

In the Hateruma dialect, short vowels that follow voiceless consonants are devoiced, and consonants after voiceless vowels are also devoiced. Therefore, sonorants [n], [m], and [r] are devoiced, and the voiced obstruents merge with the voiceless obstruents (e.g. *tn̥pi* < *tabi 'trip,' *kn̥pusï* < *kebusi 'smoke,' *sn̥purïɴ* < *tuburi 'gourd,' *kn̥ʦi* < *kaze 'wind'). Alternation below indicates that [n̥], [m̥], and [r̥] are not phonemic but phonetic: *kn̥ni* 'metal' ~ *fu-gani* 'iron,' *kn̥m̥i* 'jar' ~ *buta-gami* 'big jar,' *tn̥r̥ï* 'bird' ~ *miʃu-durï* 'sparrow'. Hateruma *kn̥r̥ï* < *kani 'meconium' has experienced both devoicing and /n/ > /r/. Voiceless [n̥] can also be found in Ishigaki-Kabira, Iriomote-jima, Hatoma-jima, Aragusuku-jima, and Kohama-jima in the Yaeyama Islands. If the complementary distribution is broken and become contrastive, voiceless [n̥] will be phonologized.

Consonant devoicing after voiceless vowels is also found in Iwate Prefecture (Uwano 2021: 116): *kn̥ta* < *kuda 'tube,' *hi̥ta* < *hida 'fold,' *hn̥ta* < *huda 'label,' *hn̥te* < *hude 'brush'. A similar correspondence can be seen for /b/, such as *ki̥pa* < *kiba 'fang' and *kn̥po* < *kubo 'hollow'. Note that /g/ in standard Japanese corresponds to /ŋ/ (e.g. *muŋi* 'wheat,' *kaŋe* 'shade').

Voiceless nasals are also found in the Miyako Ikema dialect (e.g. *n̥nu* 'horn') (Pellard and Hayashi 2012: 44), but they do not seem to be *consonant* phonemes: they may be phonologically interpreted as /hN/ or /N̥/ (e.g., [n̥nu] /hNnu/ or /N̥nu/), where /N/ is a *moraic* phoneme. Northern Yambaru *hini* [çiɲi] 'ship' and Okinoerabu *hinni* [çiɲɲi] 'ship' are thought to be developed from N̥ɲi [n̥ɲi] (as in Aguni-jima and Tonaki-jima dialects) (Karimata 2010:139–140). The change of /N̥/ [n̥] > [çi] or [çiN] is a kind of unpacking, the separation of the features of one segment into plural segments.

The Yonaguni dialect might have once had [n̥]: *nnatˀi* < [n̥natˀi] < *tunapiki 'tug-of-war,' *nni* < [n̥ne] < *pune 'ship,' *nnu* < [n̥nu] < *kinou 'yesterday'. These [n̥n] may have been distinguished from [nn] in *nnatˀu* < *minato 'port,' *nni* < *mune 'chest,' and *nnu* < *mino '(straw) raincoat'. However, all of them are /N̥/, which is different from an onset consonant (C in CV), in that /N̥/ can make a syllable by itself. *nda* < [n̥da] < *kuda 'tube,' *ndai* < [n̥dai] < *pidari 'left' would also have been distinguished from *nda* < *nigasa 'bitterness'.

Voiceless nasals also appear phonetically in some Japanese dialects, such as *n̥na* 'such,' *n̥de* 'and' in Kyoto (Nakai 2002a: 575–579) and *n̥ne* 'ship' in Awaji, where they are interpreted as /N̥na/, /N̥de/, and /hune/, respectively. The change from /N̥/ into the usual /N/ has occurred in Osaka dialect and the younger Kyoto dialect (*Nna*, *Nde*), which probably also has occurred in Yonaguni dialect.

3 Geminate obstruents

In standard Japanese, geminate consonants are distinctive in the middle of a word (e.g. *ɕita* 'did' vs. *ɕitta* 'knew'), but not at the beginning of the word. On the other hand, geminate (obstruent) onsets are

found in some Japonic languages.

(1) *tta* ‘did,’ *ttotsu* ‘one,’ *ttatsu* ‘two’ in the Nakagawa dialect, Kyoto (Nakai 2001, Nakai 2002b)

There are glottalized sounds in the Irabu Nagahama dialect, but they are interpreted as geminate obstruents rather than singletons.

(2) *ʔttaɻ* /ttar/ ‘came,’ *ʔttjaː* /ttjaa/ ‘then’ (Shimoji 2018)

Map 3: Sounds corresponding to standard Japanese [nd]

If we include (initial) geminate obstruents, glottalized sounds are widely seen in Japanese and Ryukyuan languages and are considered a matter of phonotactics (cf. *ttɞu* /Qcu/ ‘person’ in the Shuri dialect). In fact, geminate obstruents are phonologically glottalized, but they are distinguished from glottalized sigletons (e.g. *wuttʔi* ‘day before yesterday’ vs. *ʔumutʔi* ‘obverse’ in the Ie dialect, Oshio 2009). It may be necessary to consider the possibility of language contact and the influence of the substratum in addition to the possibility that the phonologization of the laryngeal sounds is limited to the northern Ryukyuan and the Yonaguni dialect (Hashimoto 1978).

Voiced geminates such as [dd] are prohibited in standard Japanese except for loanwords and some emphasized forms (e.g. *beddo* ‘bed’ and *hidde:* ‘terrible’), but we can find voiced geminates in some dialects (e.g. *teddo:* ‘railroad,’ Kami-goto *madda* ‘pillow’ and *adda* ‘oil’ in Nagasaki Prefecture, *madde* ‘as if’ and *kudda:* ‘will come’ in Awaji). In some dialects, voiced geminates are avoided and [dd] is changed into [nd] or [tt] (e.g. *mande* ~ *matte* ‘as if’ < *madde* < *marude* in Awaji). Relatedly, in Hateruma *da* ‘you’ and Yonaguni *nda* ‘you,’ such changes as [ɾɾ] > [dd] > [nd] are considered (**ura* > **rra* > **dda* > *da* / *nda*. cf. Ie-jima *ʔra*). In mainland Japan, there are cases where [ɾɾ] is avoided, turning into [nɾ] and further [nz], such as in Awaji *daɾɾa* ~ *danza* ‘who (plural)’ and *boɾɾjoɾu* ~ *bonɾjoɾu* ~ *bonʒoɾu* ‘be leaking’.

According to Nomura (1980), there are “implosives” in the Tonyū dialect of Gifu Prefecture (e.g. *noˢdo* ‘throat,’ *huˢdoʃi* ‘waistcloth’). [ˢd] is distinct from [dd], as in *udde* ‘giving birth’ and *ʃidda* ‘died’. If phonation has both voicing and glottalized features, it might be implosive (i.e. [ɗ]). However, it is unclear whether they are really implosive. The relationship between [ˢd] and [dd] seems to be parallel to that between [ⁿd] and [nd]. [-dd-] corresponding to [-nd-], such as *seddaku* for *sendaku* ‘washing,’ can be found in various dialects, frequently in East Japan. In the case of Tonyu, [-nd-] > [-dd-] has definitely occurred, so it is possible that [-ⁿd-] has changed into [-ᵈd-] ([-ˢd-]) in parallel, but when we check the examples, we can find variants like [noˢdo] ~ [noddo], so there is a greater possibility that some of them changed from [-dd-] to [-ˢd-]. [ˢd] is phonologically opposed to [d] in the Tonyu dialect. [d] corresponds to a singleton, [ˢd] corresponds to an old geminate, and [dd] corresponds to new geminates.

In the Awaji Yura dialect, length distinction is observed in nasal geminates at the beginning of words, as in (3).

(3) *ňneru* ‘simmer’ vs. *nˑne* ‘big sister,’ *m̆meru* ‘(can) see’ vs. *mˑmeru* ‘bury’

This may be due to the difference in syllabification (i.e., /Nne/ vs. /N.ne/ and /Nme/ vs. /N.me/).

The difference between [ˢd] and [dd] in the Tonyu dialect may also lie in the length, as in Awaji. However, in the Awaji dialect, there is no difference within a word, and it is difficult to interpret the difference of [ˢd] and [dd] in the Tonyu dialect as a difference of syllabification like Awaji.

If the prior report on the Tonyu dialect is correct, we must classify the consonant system of the Tonyu dialect as Type H: t-d-ˢd-n. The following relationships can be considered between consonant sequences and phonemes.

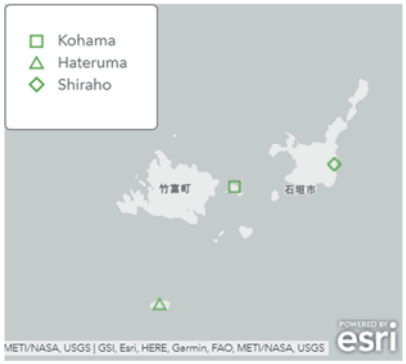
Table 1: The correspondence between consonant sequence and phonemes

consonant sequence	tt	< (>)	dd	< >	nd
	∨		∨		∧ ∨
phoneme	tˀ	?	ˢd	?	ⁿd

A > B: A (can) change to B

4 Evidence for prenasalization in Ryukyus

Types with prenasalization (A and B) are distributed in the mainland dialects but are not distributed in Ryukyuan languages. There is some evidence, that Ryukyuan languages may have had prenasalized consonants. For example, Okinawan *d is written as {nd} or {nt} in some old texts recorded by speakers of foreign languages (e.g. 日頭 텬다 tʰjən-ta /tïda/ ‘sun’ and 筆 푼디 pʰun-ti /pudï/ in *Haedong Jegukgi*). In the Kohama dialect, a voiced obstruent within a word became /NC/, such as [nd], suggesting that Ryukyuan languages also had prenasalized consonants. However, these may be notational conventions or the result of phonotactic constraints. Here, we consider other evidence of prenasalization in Ryukyuan languages.



Map 4: Traces of prenasalization in Ryukyuan

After the Great Yaeyama tsunami in 1771, Shiraho village was rebuilt by immigrants from Hateruma. From this, we know that the two dialects are descended from a common ancestor spoken only approximately 250 years ago. Therefore, full mutual comprehensibility has been reported between the Hateruma and Shiraho dialects. Nevertheless, there are some differences between Hateruma and Shiraho.

(4) H *pi̯n̯ari* :: S *pi̯tari* ‘left,’ H *ʃi̯n̯a* :: S *ʃi̯ta* ‘sun’ (Hateruma :: Shiraho)

Hateruma [n̯] and Shiraho [t] correspond to standard Japanese /d/ (e.g. *hidari* ‘left’). We cannot explain Hateruma [n̯] from [d] because there is no motivation for nasalization, such as phonotactics, as you can see from the Shiraho dialect. Instead, it must be reconstructed as follows, [ⁿd]: Strong aspiration is a common feature (see section 2), so Hateruma *pi̯n̯ari* and Shiraho *pi̯tari* may be derived from *piⁿdari > pi̯d̯ari [pi̯tari]: This is one piece of strong evidence for the existence of prenasalization in Ryukyu. The fact that Ryukyuan languages also had prenasalized sounds strongly supports the hypothesis of reconstructing prenasalization in Proto-Japonic.

5 Phonologization of conditional allophones

Some analyses of phonological consonant systems in Tohoku dialects do not regard [ⁿd] as a phoneme: There are only /t/ [t-] ~ [-d-] and /d/ [d-] ~ [-ⁿd-]. These interpret intervocalic [-d-] as /t/ and [d-] as /d/. Therefore, [d] is interpreted as a different phoneme at the beginning and within a word. However, we found that synchronically there are minimal triplets.

(5) *sʉ̈ita* 'did' ↔ *süda* 'laid' ↔ *sü^{n}dare-* 'drooping' (Uwano 1973: 29)

Map 5: Dialects which have more distinctive features than standard Japanese

In addition, we cannot explain the motivation for prenasalization phonetically. We have to admit three distinctive phonemes synchronically: /t/, /d/, and /ⁿd/.

On the other hand, [ᵐp], [ⁿʦ] and [ᵐb], [ⁿʣ] are in complementary distribution (i.e. [ᵐpV̥] ~ [ᵐbV] and [ⁿʦV̥] ~ [ⁿʣV]), so they do not need to be regarded as separate phonemes. Free variants such as [toᵐpi̥tɛ] ~ [toᵐbitɛ] 'want to fly,' [toⁿʦi̥tɛ] ~ [toⁿʣɨtɛ] 'want to close' are also observed (Uwano 1986: 11). Note that [ᵐb] and [ⁿʣ] (other than [ⁿʣɨ]) tend to alter in [b] and [ʣ] because prenasalization is often lost where there is no phonological contrast of prenasalization.

Phonologization of conditional allophones can be found in the phonological reorganization for /t/ [tʰ-] ~ [-t(ˀ)-] due to the occurrence of [tˀ-] at the beginning of a word. On the other hand, [n̥] (and [ⁿt]) does not require such a reorganization, so it is difficult to regard them as phonemes.

In addition, we have to consider whether the laryngeal features of Ryukyu languages really only involve a binary opposition between /t/ and /tˀ/. Considering compound words, there may be three-way distinction in (voiceless) obstruents: *ubut^{h}u* 'mighty ocean,' *butu* 'husband,' and *ubut^{ʔ}u* 'adult'.

6 The type of proto-Japonic

Type A (t-ⁿd-n) is considered to be the oldest synchronic type of stop series in modern Japonic languages, but it is debatable whether the proto-Japonic consonant system was actually type A.

Type A is redundant in that obstruents are distinguished by both voicing and nasal features. Therefore, either voicing or nasality is the original distinctive feature, and either may be redundant. The voiced/voiceless opposition is found in almost all dialects (except the Ogami dialect), while prenasalization is found only in some of the mainland dialects. However, some voiced obstruents correspond to nasal + stop clusters such as *hude* < *pumde < pumite 'brush' and *nodo* < nomdo < *nomito 'throat,' and the nasal sounds are reconstructed not only in the mainland but also in Ryukyu; therefore, we think that prenasalization can be reconstructed for proto-Japonic. In Japonic languages, as a general rule, /d/ does not appear at the beginning of a word, and word initial /d-/ has occurred through sporadic changes: *dasu* < idasu 'emit' and *doko* < idoko 'where' (aphaeresis); *dare* < tare 'who' and *dani* < tani 'tick' (initial voicing), which also indicates that most /d/ may have originated from the NC cluster.

It is likely that the consonant system of proto-Japonic may be reconstructed as t-ⁿt-n (Type I), which

has a system distinguishing consonants only by nasality. Although *[ⁿt] > [ⁿd] occurred in all Japonic languages, the stage of [ⁿt] might have long been retained in Tohoku dialects since devoicing occurs even with prenasalized consonants, which may reflect the retention of [ⁿt].

(6) *oⁿʦʉ̈ko* 'little brother' < *woⁿti-ko(??)

Prenasalized obstruents might come from nasal-obstruent clusters, namely, NC > ⁿC. If so, the proto-Japonic consonant system would ultimately be Type G (t-n), which is the same as that of the Ōgami dialect. However, Ōgami's Type G is not a retention of the proto-Japonic system. In Ogami, [b] from word-initial /w/ is also found (as in *pakamunu* from *wakamono*, in comparison to *bakamunu* in other Miyako dialects), so it is clearly an innovation of the Ogami dialect and ([nt] >) [ⁿt] > [ⁿd] > [d] also occurred in this dialect.

There is a claim that prenasalized [ⁿd] comes from voiced geminate *dd (Hizume 2004). In Proto-Japonic, voicing was not distinctive in stops, so */t/ was always voiced in medial position and was simply an allophone of */t/ [t- ~ -d-]. Moreover, some instances of *t were lengthened at the morpheme boundary to indicate emphasis, resulting in [-dd-] > [-nd-] > [-ⁿd-]. Since -t- > -d- and -dd-> -nd-> -ⁿd- are actually attested or assumed, [ⁿd] < *dd is a possible change if -d-> -dd- occurred. In any case, this would indicate that the oldest consonant system of proto-Japonic was Type G (t-n).

Both voicing and devoicing were observed in Tohoku, Kagoshima, and Yaeyama. This may also be a reflection of the Proto-Japonic language lacking the voiced/voiceless distinction. In ancient Kansai dialects, the usage in the Man'yōgana and pronunciation of Chinese loanwords clearly shows that *[ⁿt] > [ⁿd] had already occurred.

In conclusion, it is presumed that Proto-Japonic is of Type G or Type I, without a distinctive voiced feature.

7 Further Research

In this paper, we do not discuss anything other than the alveolar stops (plosive and nasal) except for rhotacism, but in the Japonic languages, there are also interesting consonant types: oppositions between affricates and fricatives, the distribution of labiodental consonants ([f], [v], and [ɱ]), nasalized approximants ([j̃] and [w̃]), and phonotactic phenomena such as the opposition between [jwa] and [wja]. We would like to discuss this on another occasion.

Sources

The data for Awaji dialect(s) are from the first author's field notes. Data for other dialects which do not have particular references are from Uwano (ed.) (1989).

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Prenasalisation in Tibetic languages in the eastern Tibetosphere

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Abstract

This article describes details of prenasalised sounds attested in Tibetic languages in the eastern Tibetosphere. The existence of prenasalisation is one of the striking features of these languages. However, previous descriptions varied in their view of the phonemic status of prenasalised aspirated sounds. The article provides an overview of prenasalised stops, represented by the denti-alveolar series.

1 Introduction

Suzuki et al. (2021) provide linguistic maps based on the dataset of Tibeto-Burman languages (as well as a small number of Chinese-Tibetan mixed languages) regarding the stop series of the consonant system following the first topic of the *Studies in Asian and African Geolinguistics-I* (SAAG-1) project. We found that many Tibetic languages in the eastern Tibetosphere possess prenasalised stops. However, comparing previous descriptions with ours highlights a crucial difference in the attitude to the voiceless aspirated prenasalised sounds. This article clarifies the factor of the different observations and analyses and claim that we should consider two aspects separately: the existence and the phonological function of the given sound.

sKal-bzang 'Gyur-med and sKal-bzang dByangs-can (2002:92) describe prenasalised stops of Derge Tibetan (Northern Route, a.k.a. Zalmogang Khams), which include the voiced initial type, as well as the voiceless aspirated initial type *in parentheses*, namely, /(n̥th)/ and /(ŋ̊kh)/ for instance. Häsler (1999:22-23), describing the same target language, Derge, considers both types to exist, adding a note: 'Prenasalised aspirated stops and affricates frequently occur as the initial of a second syllable. In absolute initial position, prenasalised aspirated stops and affricates are less frequent and often difficult to perceive' (p. 23).

Based on my description of Derge Tibetan (the dGonchen dialect), the prenasalised voiceless aspirated initial type exists in the pronunciations among speakers of various generations. The sound itself is attested not only as prenasalisation but a nasalised initial or nasalised aspiration. For this phenomenon, I provided the following observation regarding the Cherje dialect of Amdo Tibetan (Suzuki 2004:160):

> In the above-mentioned phonetic description [prenasalisation], I describe, for example, ⁿ̥ts^{h} as a phonetic notation [ⁿ̥ts$^{ⁿ̥h}$]. This phonetic realisation is explained as a sound whose [post-]aspirated part is accompanied by resonance in the nasal cavity. In this case, the prenasalised part preceding the release of the stop may be so weak that the prenasalisation seems to be omitted. This is the manner of pronunciation which is characteristic of the Chabcha/Cherje dialect; however, it is not always necessary that the [post-]aspirated sound be accompanied by resonance in the nasal cavity.

The notation [ⁿ̥ts$^{ⁿ̥h}$] in this citation can also be described as [ⁿ̥ts$^{h̃}$] (Suzuki 2015a). The realisation of prenasalisation observed and described by the present author differs from the descriptions by sKal-bzang 'Gyur-med and sKal-bzang dByangs-can (2002) and Häsler (1999). However, the relationship between a glottal fricative and a nasal feature has been discussed in some Tibeto-Burman languages, which Matisoff (1975) terms 'rhinoglottophilia'. Suzuki (2015a) also describes relevant

phenomena attested in Tibetic languages. I have never seriously discussed the phonological function of the given sound in any previous descriptions; however, the nearly ubiquitous existence of the nasalised feature in the voiceless aspirated initial series has been confirmed through fieldwork on more than 200 dialect points from the eastern Tibetosphere. This prenasalised feature has clearly effected a sound change in some dialects.

The following sections deal with the sound correspondences of prenasalised sounds in Tibetic languages with Literary Tibetan (LT) forms (Section 2) and non-straightforward sound correspondences (Section 3) attested in several varieties from the eastern Tibetosphere. For a phonetic description, the method for displaying the syllable structure follows Suzuki (2005). The description of segmental sounds follows the framework by Zhu (2010) as well as Suzuki (2016a), including IPA (International Phonetic Alphabet) and additional indispensable phonetic symbols employed in Chinese linguistics. The analysis of suprasegmental sounds follows Kitamura (1977), with necessary expansions.

2 Regular sound correspondences of prenasalised initials

As many works describe, prenasalisation corresponds to LT preinitials *'* and *m* preceding voiced and voiceless aspirated initials *kh*, *g*, *ch*, *j*, *th*, *d*, *ph*, and *b*, as well as several consonant combinations including them; see sKal-bzang 'Gyur-med and sKal-bzang dByangs-can (2004) for the provisional sounds of LT forms. Hence, if the sound correspondence is straightforward, a given Tibetic language may have the voiced initial type and the voiceless aspirated initial type. Since the SAAG-1 project focuses on the denti-alveolar series, the following description also concerns the same series.

I tabulate data from Tibetic languages in the eastern Tibetosphere which have already appeared in a publication so that we can refer to the full picture of the sound system and more examples. Each example in Table 1 is accompanied by an English translation and LT form in italics.

Table 1: Prenasalisation as a regular sound correspondence.

Language	/ⁿd/-type	/ⁿ̥tʰ/-type	Source
Chabcha/Cherje Amdo	ⁿdə 'this' *'di*	ⁿ̥tʰəɣ po 'thick' *'thug po*	Suzuki (2004)
Mabzhi Amdo	ⁿda rə 'damaru' *'dar bu*	ⁿ̥tʰəŋ 'drink, eat' *'thung*	Tsering Samdrup and Suzuki (2019)
rNgawa Amdo	ⁿdə 'this' *'di*	ⁿ̥tʰək 'pick' *'thog*	Suzuki and Yeshemtsho (2006)
Bragkhoglung Cone	⁻ⁿda 'arrow' *mda'*	ˊⁿ̥tʰõ ᵐbo 'high' *mthon bo*	Suzuki (2012d)
dGonpa mBrugchu	ⁿdə 'arrow' *mda'*	ⁿ̥tʰɯ ɦɤ 'thick' *'thug po*	Suzuki (2015b)
Babzo dPalskyid	ⁿdoʔ 'colour' *mdog*	ⁿ̥tʰo ʰpo 'high' *mtho po*	Suzuki (2007b)
Astong Sharkhog	ⁿdə̃ ᵐba 'mad' *'dam ba*	ⁿ̥tʰõ ᵐbo 'high' *mthon bo*	Suzuki (2010c)
Lhagang Khams	⁻ⁿda 'arrow' *mda'*	ˋⁿ̥tʰõ ᵐbo 'high' *mthon bo*	Suzuki and Sonam Wangmo (2015)
Khromtshang Khams	ˋⁿda 'arrow' *mda'*	⁻ⁿ̥tʰuʔ po 'thick' *'thug po*	Suzuki (2010a)
Sakar Khams	ˊⁿda pa 'mud' *'dam pa*	⁻ⁿ̥tʰũ mo 'thick' *mthon mo*	Suzuki (2012a)
Choswateng Khams	⁻ⁿda 'arrow' *mda'*	⁻ⁿ̥tʰa 'edge' *mtha'*	Suzuki (2014b)
Zhollam Khams	ˊⁿdɛ ʱbA 'mud' *'dam pa*	ˋⁿ̥tʰõ tɛj 'high' *mthon ?*	Suzuki (2011a)
Sangdam Khams	⁻ⁿda 'arrow' *mda'*	⁻ⁿ̥tʰa mõ 'thumb' *mthe mong*	Suzuki (2012b)

According to the examples in Table 1, prenasalisation exhibits a regular correspondence with LT forms. See also Suzuki (2007a, 2008abc, 2009abc, 2010b, 2011cde, 2012c, 2013abd, 2014acd, 2020), Suzuki and Sonam Wangmo (2016), and Suzuki and Yudron (2019) for further references to phonetic descriptions of prenasalisation as well as word lists of various Tibetic languages in the eastern Tibetosphere.

Note that there are several dialects which only have the prenasalised voiced stop series; for instance, dialects belonging to the Tsongkha group of Amdo Tibetan (Tournadre and Suzuki 2021), also known as the farmers' dialect group of Amdo Tibetan.

3 Irregular sound correspondences of prenasalised initials

This section discusses cases which do not fit the regular sound correspondences described in Section 2. I present the following two phenomena:

- prenasalised voiceless unaspirated initial type and its sound correspondence with LT
- prenasalisation which does not correspond to LT

The following description contains both published and unpublished data of the present author.

3.1 Prenasalisation of voiceless unaspirated stops

Prenasalised voiceless unaspirated stops are attested in some dialects belonging to the dPalskyid group (mDzorge and Khodpokhog [a.k.a. gZitsa sDegu] counties of rNgawa Prefecture, Sichuan) and the sDerong-nJol group (sDerong County of Kandze Prefecture, Sichuan, and nJol County of Dechen Prefecture, Yunnan). These groups are distributed far from each other. In addition, the mechanism of producing the given sounds also differs.

Babzo Tibetan (Suzuki 2007b) has a prenasalised voiceless unaspirated plosive series: /ᵐ̥puʔ/ 'blow' *'bug*; /ⁿ̥tɑʔ/ 'border' *mtha'*; and /ᵑ̊ka: ra/ 'blacksmith' *mgar ba*. As the LT forms show, the prenasalised voiceless unaspirated plosives are derived from combinations with both voiced and voiceless aspirated initials. The same case is also attested in gZhungwa Tibetan (Suzuki 2008b). For example, /ᵐ̥pe:/ 'shout' *'bod* and /ⁿ̥te:/ 'read' *'don*. These dialects also have regular prenasalised stops (see Section 2); hence, the prenasalised voiceless unaspirated plosive series is an irregular form that we cannot explain based on the LT forms.

Another case is described by Suzuki (2011b, 2013c): a prenasalised voiceless unaspirated plosive series triggered by an iambic prosodic pattern. This case is widely attested in dialects spoken along the Jinshajiang River. This phenomenon occurs in any aspirated initials in the word-initial position of a multi-syllabic word, for example, /ˊpu:/ 'piglet' *phag gu* and /ˊce wa/ 'rain' *char pa*. When prenasalisation is expected from the LT forms, the target phenomenon appears: /ˊⁿ̥tə tɕʰẽ/ 'thumb' *mthe chen* and /ˉᵑ̊̊tɕɯ rɯ/ 'lip' *mchu ru*. This sound correspondence is further applied in a proper name. The Chinese administrative name of the township where mPhagri Tibetan is spoken is *Bari*, reflecting a voiceless unaspirated form (Suzuki 2011b). This Chinese transcription represents the sound /ˊᵐ̥pa rə/ *'phag ri*, an unaspirated realisation caused by the iambic prosody (see also Suzuki 2017).

3.2 Prenasalisation which does not correspond to LT *'* and *m* preinitials

There are word forms with prenasalisation that does not correspond to LT *'* and *m* preinitials. However, such examples often have a nasal final consonant in the corresponding LT form, for example, *khang* 'house' and *phreng* 'religious beads'. Varieties with these examples are found from the Amdo region to the easternmost Khams region. Tournadre and Suzuki (2021) suggest that this is an exceptional but to some extent regular sound development. Table 2 displays two lexical examples:

Table 2: Irregular sound correspondences concerning prenasalisation.

Language	'house' *khang ba*	'religious beads' *phreng ba*
gSerkha Tibetan (rMewa Amdo)	ᵑ̊kʰə ŋa	ᵐ̥ʈʰeŋ wa
sTaglo Tibetan	ᵑ̊kʰɑ:	ᶯ̊ʈʰɑ:
Rangakha Tibetan (Minyag Rabgang Khams)	-	⁻ᶯ̊ʈʰe wa:

In addition, Tibetic varieties spoken in Khodpokhog (Jiuzhaigou) underwent one more sound change of voicing after having acquired the present prenasalisation derived from the nasal final *ng*. For example, nKhyungkyog Tibetan /ᵑgo wɐ/ 'house' *khang ba* and gTsangtsa Tibetan /ᶯɖɛ̃ bo/ 'religious beads' *phreng ba*. It is also noteworthy that this rule applies to proper names such as the word-initial /ᵑg/ of Khodpokhog (which suggests its origin as *Khongpokhog*) and /ᵑdz/ for nKhyungkyog. This phenomenon is also attested in Baima (Nishida and Sun 1990, Zhang 1997).

3.3 Other relevant phenomena

Irregularity of sound changes relevant to prenasalisation is also attested. I summarise two phenomena below. The first is nasal stops derived from prenasalised sounds, and the second is prenasalised glottal fricatives derived from prenasalised voiceless aspirated initials.

Nasal stops derived from prenasalisation are further divided into voiced and voiceless aspirated initials. However, the appearance of the two differs: The voiced series principally appears in dialects in the Southern Khams region, whereas the voiceless aspirated series is attested in several specific dialects of Amdo in the easternmost Tibetosphere.

The first case is that /n/ appears when one expects /ⁿd/ based on the sound correspondence with LT. For example, mTshongu Tibetan /^nə mbɑʔ/ 'mad' *'dam pa* and /¯nɛ̃j/ 'read' *'don*. This type appears in individual lexical items. We also find postplosive-nasals (see Zhu 2007:10) written as /nd/, distinguished from /ⁿd/: Myigzur Tibetan /¯ndã/ 'read' *'don*. See also Suzuki (2016b). This nasal production process is also attested in denti-alveolar affricates (*ⁿdz > /nd/ > /n/) in several varieties spoken along the Lancangjiang River (Suzuki and rTa-mgrin Chos-mtsho 2012).

The second case is not widely attested; moreover, it appears in a limited number of words through morphological innovation. In the varieties of, for example, Astong, rMewa, and gSerkha, one finds an imperative forms /n̥əŋ/ or /n̥oŋ/ 'drink!' *'thung* instead of /ᵑ̊tʰəŋ/ or /ᵑ̊tʰoŋ/. This phenomenon is counted as a shared innovation when determining the genetic proximity of dialects (Suzuki and Sonam Wangmo 2019). The lexical innovation is probably related to the aspiration character of the imperative stem, which is widely attested in various dialects of Amdo Tibetan and its surrounding varieties. See, for example, Haller (2004:269) and Sun (2006:115).

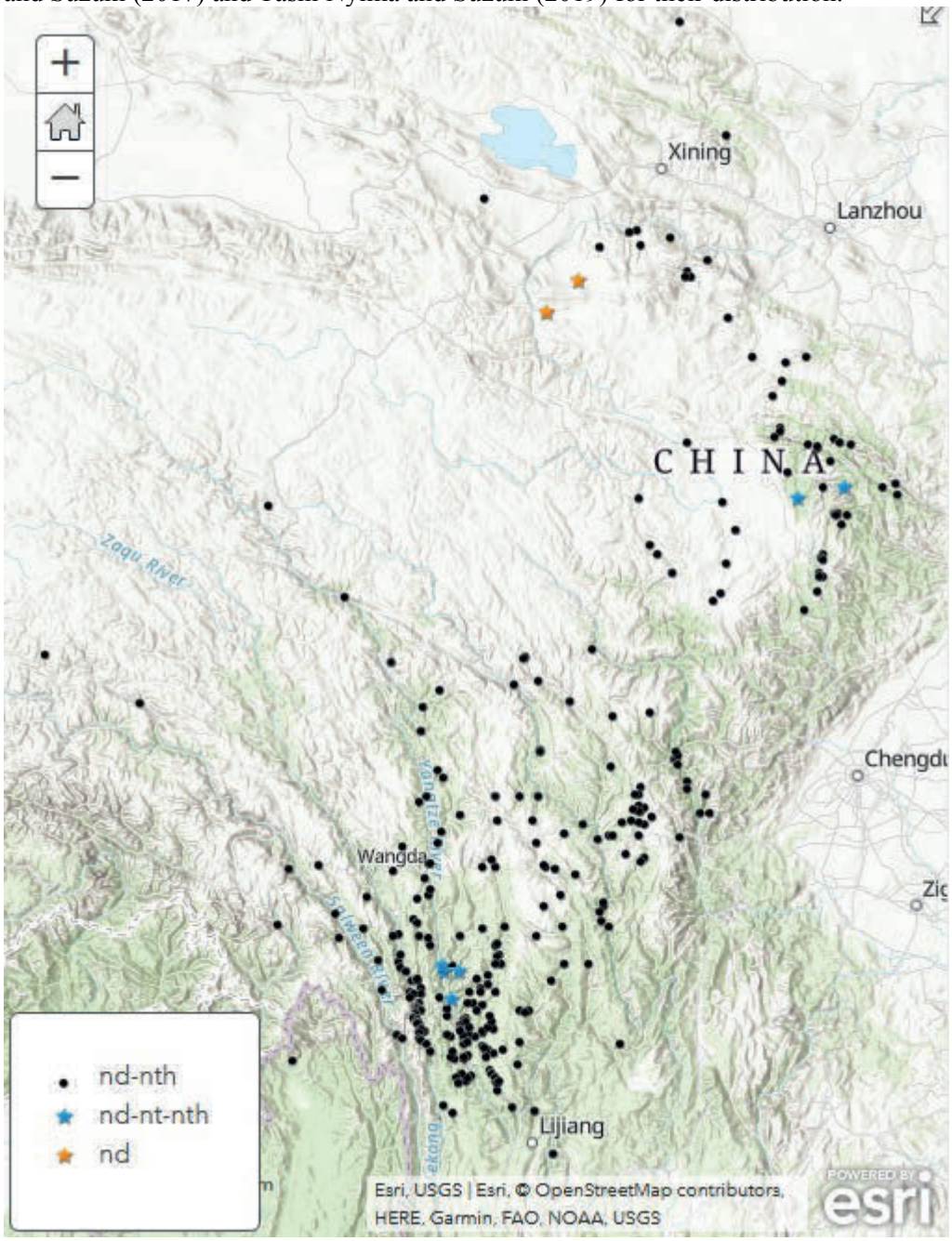
The second phenomenon is a prenasalised glottal fricative /ᵑ̊h/ derived from the prenasalised voiceless aspirated initial /ᵐ̥pʰ/ (see Suzuki 2015a). Prenasalisation of fricatives is rarely attested even in Tibetic languages in the eastern Tibetosphere (and the SAAG-1 project does not count prenasalised fricatives; see Suzuki et al. 2021). The prenasalised glottal fricative is attested only in several varieties in the Amdo region.

4 Concluding remarks

In the eastern Tibetosphere, the phonological distinction of prenasalised sounds is pervasive. Prenasalisation of voiced and voiceless aspirated initials appears as a regular sound correspondence with LT forms, as well as of voiceless unaspirated initials as an irregular counterpart. The present article presents examples of prenasalised initials from the single descriptive view with their LT correspondence. However, their phonemic status may be argued from various phonological viewpoints and approaches. The crucial point is to take a single phonological viewpoint when drawing linguistic maps of sound variation in a language group or a linguistic area.

Appendix: Map of Tibetic languages with prenasalisation in the eastern Tibetosphere

The following map highlights the varieties with the irregular sound correspondences described in Section 3. The map does not include non-Tibetic languages; see Suzuki et al. (2021) as well as Roche and Suzuki (2017) and Tashi Nyima and Suzuki (2019) for their distribution.



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Stop series in Caucasian languages: Preliminary mapping

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Abstract

This article arranges data of the stop series from previous works on Caucasian languages (Kartvelian, Abkhazo-Adyghean, and Nakho-Dagestanian) as supplementary material for the *Studies in Asian and African Geolinguistics* project. These languages generally show a quadripartite system in which the ejective feature is nearly pervasive, while the aspirated feature is regarded as a variant of an unaspirated voiceless sound and thus analysed as 'non-ejective'.

1 Dataset and sources

This article provides supplementary data of the Caucasian languages for the project *Studies in Asian and African Geolinguistics-I* (SAAG-1). The distribution of Caucasian languages and their topography is reflected in Map 1.

Map 1: Distribution of Caucasian languages with topography.

Map 1 reflects three language groups of the Caucasian languages: Kartvelian, Abkhazo-Adyghean, and Nakho-Dagestanian.

The sources of data for each language shown in the maps are in Table 1. Main reference works for this article are Klimov (1994), Alekseev (red) (1999), and Hewitt (2004). Literary (or standardised) language (indicated as 'L') data are also included.

Table 1: Dataset.

Language	Dental/alveolar stop series	Source
Kartuli (Georgian)	t-t’-d-n	Hewitt (2004)
Mingrelian	t-t’-d-n	Klimov (1999a)
Laz	t-t’-d-n	Klimov (1999b)
Svan	t^h-t’-d-n	Sharadzenidze (1999)
Adyghe	t^h-t’-d-n	Kumakhov (1999a)
Kabardian (East Circassian)	t-t’-d-n	Shagirov (1999)
Temirgoi (West Circassian) (L)	t-t’-d-n	Hewitt (2004)
Abzhywa (Abkhas)	t^h-t’-d-n	Klychev & Chkadua (1999a) / Yanagisawa (2010)
T’ap’anta (Abaza)	t-t’-d-n	Klychev & Chkadua (1999b) / Hewitt (2004)
Ubykh	t^h-t’-d-n	Hewitt (1986) / Kumakhov (1999b)
Chechen	t-t’-d-n	Desherieva (1999)
Ingush	t-t’-d-n	Desheriev & Desherieva (1999)
Bats (Ts[’]ova-Tush)	t-t’-t:-t:’-d-n	Holisky & Gagua (1994) / Hewitt (2004)
Avar	t-t:-d-n	Chikobava & Tsertsvadze (1962) / Hewitt (2004)
Avar	t-t’-d-n	Alekseev (1999a)
Andi	t^h-t’-d-n	Alekseev (1999b)
Botlikh	t^h-t’-d-n	Magomedbekova (1999a)
Godoberi	t-t’-d-n	Tatevosov (1999)
Akhvakh	t^h-t’-d-n	Magomedbekova (1999b)
Karata	t^h-t’-d-n	Magomedbekova (1999c)
Bagvalal	t-t’-d-n	Lyutikova & Tatevosov (1999)
Tindi	t^h-t’-d-n	Magomedbekova (1999d)
Chamalal	t^h-t’-d-n	Magomedova (1999)
Bezhta	t-t’-d-n	Testelets & Khalilov (1999)
Hunzib	t-t’-d-n	Berg (1995) / Hewitt (2004)
Tsez	t-t’-d-n	Khalilov (1999)
Hinukh	t-t’-d-n	Khalilov & Isakov (1999)
Khvarshi	t-t’-d-n	Testelets (1999)
Lak	t-t’-t:-d-n	Gigineishvili (1977) / Hewitt (2004)
Dargwa	t-t:-d-n	Berg (2001) / Hewitt (2004)
Dargwa	t-t’-d-n	Musaev (1999)
Sanzhi Dargwa	t-t’-d-n	Forker (2020)
Mehweb	t-t’-d-n	Moroz (2019)
Lezgi	t^h-t-t’-d-n	Meylanoba & Sheykhov (1999)
Maza Lezgi	t^h-t-t’-d-n	Ganieba (2011)
Gutum Lezgi	t^h-t-t’-d-n	Ganieba (2011)
Tabasaran	t^h-t-t’-d-n	Khanmagomedov (1999)
Agul	t^h-t-t’-d-n	Alekseev (1999c)
Rutul	t^h-t’-d-n	Alekseev (1999d)
Ts’akhur	t-t’-t:-d-n	Gigineishvili (1977) / Hewitt (2004)
Ts’akhur	t^h-t-t’-d-n	Talibov (1999)
Archi	t^h-t’-t:-d-n	Kibrik (1994, 1999)
Kryz	t^h-t’-d-n	Saadiev (1999)
Budukh	t-t’-d-n	Sheykhov (1999) / Talibov (2007)
Udi	t-t’-d-n	Dzheylanishvili (1999)
Khinalug	t-t’-t:-d-n	Alekseev (1999e)

Among various phonological interpretations, /t/ in Kartuli may include unaspirated and aspirated variants: [t, t^h], whereas Tschenkéli (1965:XXXII-XXXIII), Fähnrich (1993:18-19), and Kojima (2011:17) clearly mentions that /t/ (interpreted in Table 1) is aspirated. Aliroev (2004:18) describes /t/ in Chechen as an aspirated sound. I follow the description cited in the 'Source' column of Table 1 and recognise this phoneme as /t/ in the system of the present SAAG-1 project.

The phoneme described as /тт/ in the original documents has two explanations: 'intensive' (Alekseev 1999e) and 'unaspirated' (Meylanoba & Sheykhov 1999, Ganieva 2011). In Table 1, they are interpreted as /t:/ and /t/, respectively; in the latter case, the original /т/ is consequently interpreted as /t^h/.

According to Desheriev (1959:12-15), the alveolar stop series in Khinalug is /t-t'-t:-t:'-d-n/. This description and that of Alekseev (1999e) are mutually different, but the background of the difference is unidentified.

There are reports on dialectal differences of the languages above, for example, Gigineishvili et al. (1961) on Kartuli. However, in this article, I do not mention details on dialectal differences.

2 Mapping with ArcGIS online

Map 2 shows the dental/alveolar stop series of the Caucasian languages cited in Table 1.

Map 2: Stop series in the Caucasian languages.

Noteworthy differences in the components of the series are aspirated and geminate features. It is unclear whether a given language has an aspirated or unaspirated (non-ejective) feature in most cases (except for Type /t^h-t-t'-d-n/). In the Caucasian languages, the ejective feature is nearly pervasive, while the aspirated feature is regarded as a variant of an unaspirated voiceless sound and thus analysed as 'non-ejective', for example in the description by Kartuli by Dzidziguri and Chanishvili (1999:27). A similar phenomenon that a voiceless plosive is often realised as an aspirated sound is attested in several Iranian languages, as reported by Iwasaki (2021).

The existence of the geminate ('intensive' or 'unaspirated') consonant is attested in several languages spoken in the region from South Dagestan to Azerbaijan. This sound is related to an

unaspirated feature, which might form a contrast with an aspirated feature represented by non-intensive voiceless phoneme.

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Stop series in Saami languages: A geolinguistic approach

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Abstract

This article arranges data of the stop series from previous works on Saami languages (Uralic) and provides a geocoding mapping for future geolinguistic studies as well as for the project *Studies in Asian and African Geolinguistics* (SAAG). Many works on these languages have been described with SUT (Suomalais-ugrilainen transkriptio) 'Finno-Ugric transcription', which has functioned as a barrier in a typological and cross-linguistic analysis, particularly on phonetics and phonology. The article first interprets each phonetic description with SUT to correlate the data of Saami with the project and tries to re-describe it in another phonetic alphabet system similar to IPA as a working hypothesis. With the newly described dataset, the article produces linguistic maps with ArcGIS online.

1 Introduction

This article contains supplementary data from the Saami languages[1] (Uralic; see Abondolo 2017) for the project *Studies in Asian and African Geolinguistics-I* (SAAG-1), in relation to Matsumoto (2021), with a linguistic map. For Saami languages, most data are transcribed in SUT (Suomalais-ugrilainen transkriptio); however, I re-analyse each description using modern phonetic terminology, and thus have interpreted the entirety of the data to adjust them to the framework of the SAAG-1 project.

First I present an overview of the classification of the Saami languages. The language/dialect classification of Sammallahti (1998:6-34) is summarised as follows:

Western Saami languages
- Northern group
  - North Saami (*Davvisámegiella*[2])
    - Sea Saami
      - Eastern dialect
      - Central dialect
      - Western dialect
    - Finnmark Saami
      - Eastern dialect group
        - Sieiddá-Bonjakas dialect
        - Skiippagurra-Buolbmát dialect
        - Njuorggán-Sirbmá dialect
        - Upper Deatnu dialect
          - Vuovdaguoika subdialect
          - Anárjohka subdialect
          - Kárášjohka resident subdialect
          - Kárášjohka reindeer herder subdialect

[1] I use the term 'Saami languages' following Sammallahti (1998). Note that he (1998:3) also uses another term 'Saamic', which designates a protolanguage.

[2] As a glottonym, I use the term Davvi, which denotes 'the direction towards the sea' (Jensen and Buljo 2014:93-94).

- Porsáŋgu subdialect
- Western dialect group
  - Máze-Láhpoluoppal dialect
  - Guovdageaidnu dialect
  - Eastern Eanodat dialect
  - Vuočču dialect
- Torne Saami
  - Finnish Wedge dialect
  - Gárasavvon dialect
  - Čohkkiras-Jukkasjärvi dialect
  - Girjjis dialect

Western group
- Lule Saami (*Julevsámegiella*)
  - Northern dialect
  - Central dialect
  - Southern dialect
  - Forest dialects
- Pite Saami
  - Northern dialect
  - Central dialect
  - Southern dialect

Southern group
- Ume Saami
- South Saami (*Åarjelsaemien*[3])
  - Northern dialect
  - Southern dialect

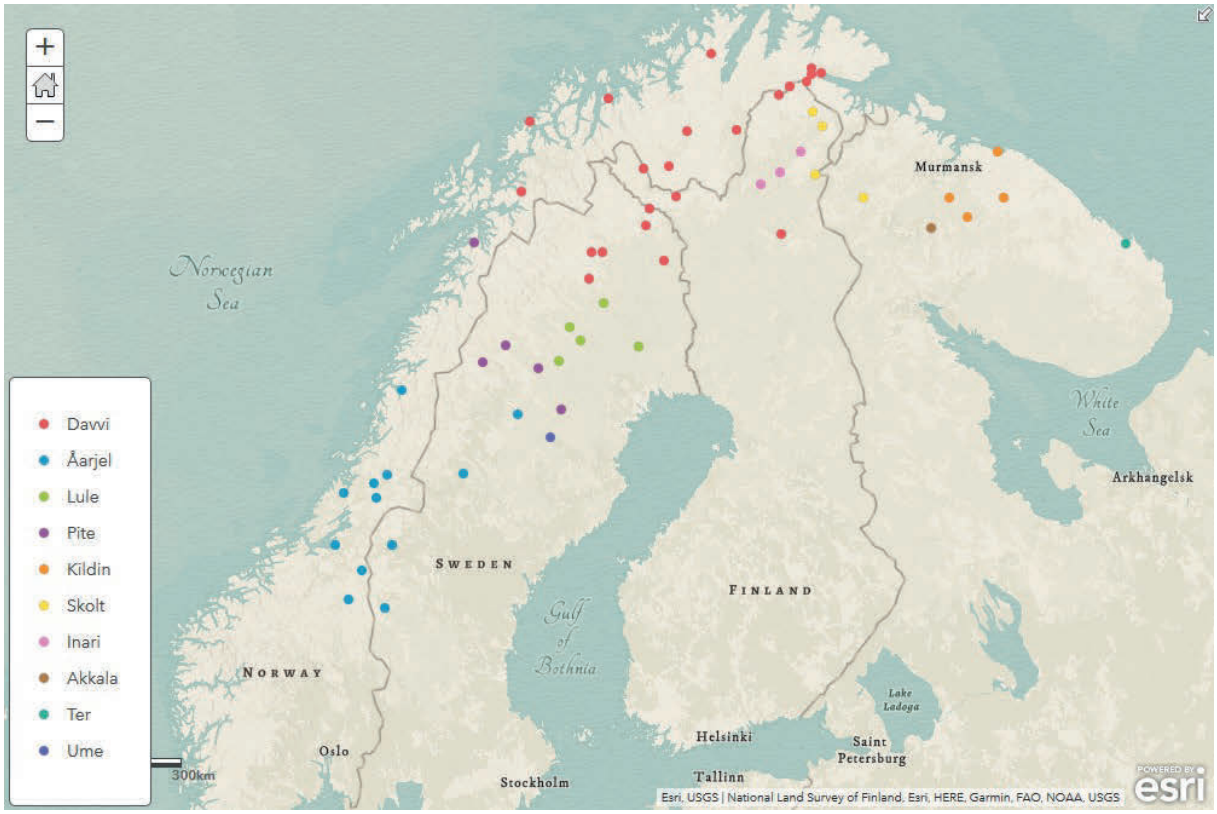
Eastern Saami languages

Mainland group
- Inari Saami
- Skolt group
  - Skolt Saami
    - Northern group
      - Neiden dialect
      - Paatsjoki dialect
    - Southern group
      - Suõ´nn'jel dialect
      - Njuõ´ttjäu´rr dialect
  - Akkala Saami

Peninsular group
- Kildin Saami
  - Šoŋguj dialect
  - Teriberka dialect
  - Luujaavv'r dialect
  - Aarsjogk dialect
- Ter Saami

Among the entries in the classification list, the names with 'Saami' are considered language names. Most dialects are based on toponyms. The location of the languages above can be displayed as in Map 1.

[3] As a glottonym, I use the term Åarjel, which exclusively designates the South/Southern Saami language. The word åarjel denotes 'the left direction towards the coast' (Jensen and Buljo 2014:93-94).



Map 1: Distribution of the Saami languages, displayed by dots. Data from Sammallahti (1998), Lagercrantz (1939) and works cited in Table 1.

The symbols of Map 1 reflect a classification of ten languages, as indicated in the legend. Note that some communities have been relocated to new settlements, but Map 1 reflects the places found in the references.

The distribution map of the Saami languages has been displayed by regions (Bartens 1989:534; Sammallahti 1998:5), not with dots as shown in Map 1. However, for a geolinguistic study, each variety should be pointed out separately. Nevertheless, the essay of Map 1 is not always appropriate, because many Saami people have long spent their lives as pastoralists, principally herding reindeer (see Turi 1987, Benjaminsen et al. 2016, etc.); moreover, there have been migrations to newly built settlements.[4] Therefore, Map 1, a collection of the data recorded from the end of the nineteenth to the twenty-first centuries (from Wiklund 1890 to Rießler, forthcoming; see Section 2), does not always reflect the present language distribution.

2 Dataset and the sources

Many works on the Saami languages and dialects have used phonetic descriptions following SUT, for instance, Lagercrantz (1923, 1926ab, 1929). Since the SAAG project deals with a phonemic description, we should interpret the data phonologically. We find some phonemic approaches in previous works. For example, Bergsland (1992:167-169) uses the 'phonemic' description for Røros Saami. However, we encounter a difficulty; there are works which do not provide an overview of sounds but focus on specific topics such as 'grade alternation' (*astevaihtelu* in Finnish; *Wechsel* or *Quantität* in German), such as Itkonen (1916), Lagercrantz (1929), Itkonen (1946), and McRobbie-Utasi (1999).[5]

[4] Pastoralists' speech in geolinguistics requires careful examination. For the case of varieties spoken by pastoralists in the Tibetosphere, see Tsering Samdrup and Suzuki (2017) and Suzuki and Tsering Samdrup (2018), as well as Suzuki and Sonam Wangmo (2019).

[5] See Toivonen and Nelson (2007) for the exhaustive bibliography of Saami linguistics.

In general, the phonemic description is connected to the orthography of each language. The literary languages have been established based on many phonetic descriptions by scholars; in this case, the orthography might more or less reflect phonemic status. Referring to the treatment in the orthography in Roman and Cyrillic alphabets, I interpret the sound description of each work employing phonetic notation.[6]

The languages (the order is south to north; west to east) and the sources are as follows.

Table 1: Dataset for the present mapping.

Language	Toponym	Interpreted dental/ alveolar stop series	Source
Åarjel	Røros	t^h-t-n	Bergsland (1946)
Åarjel	Vefsn	t^h-t-n-n̥	Lagercrantz (1923)
Åarjel	Tännäs	t^h-t-n	Collinder (1943)
Åarjel	Vilhelmina	t^h-t-n	Hasselbrink (1981)
Ume	Malå	t-d-n	Schlachter (1958)
Pite	Stenudden	t^h-t-n	Ruong (1943)
Lule	Gällivare	t^h-t-n-n̥	Grundström (1952-1954)
Lule	Jokkmokk	t^h-t-n-n̥	Grundström (1952-1954)
Lule	Flakaberg	t^h-t-n-n̥	Grundström (1952-1954)
Davvi	Guovdageaidnu	t-d-n-n̥	Nielsen (1979)
Davvi	Kárášjohka	t-d-n-n̥	Nielsen (1979)
Davvi	Polmak	t-d-n-n̥	Nielsen (1979)
Davvi	Eanodat (Itä-Enontekiö)	t-d-n-n̥	Sammallahti (1998)
Inari	Anár	t^h-t-n	Itkonen (1986-1991)
Skolt	Paaččjokk	t-d-n	Sammallahti & Mosnikoff (1991)
Skolt	Sevettijärvi	t-d-n	Feist (2011)
Skolt	Njuõ´ttjäu´rr	t-d-n	Sammallahti & Mosnikoff (1991)
Kildin	unspecified	t-d-n-n̥	Kuruch (1985)
Kildin	unspecified	t-d-n	Kert (1971)
Ter	Jokanga	t-d-n-n̥	Itkonen (1916)

The sound system reflected in literary languages or the orthography (i.e. a variety standardised to some extent) is not counted as a source for geocoding in the present analysis. However, we observe the following:

Table 2: Sound system based on the literary languages.

Language	Interpreted dental/ alveolar stop series	Source
Davvi	t^h-t-n-n̥	Nickel (1994)
Åarjel	t^h-t-n	Bergsland (1994)
Lule	t^h-t-n	Nystø & Johnsen (2000)
Inari	t-d-n	Sammallahti & Morottaja (1993)

In addition to the present task, when we consider a geolinguistic approach to word forms in Saami languages, we can refer to the following lexicographical works: Lagercrantz (1926a), Collinder (1943), Hasselbrink (1981), and Bergsland & Magga (1993) for Åarjel, Schlachter (1958) for Ume, Grundström (1952-1954) for Lule, Nielsen & Nesheim (1979) for Davvi, Itkonen (1986-1991) and Sammallahti & Morottaja (1993) for Inari, Sammallahti & Mosnikoff (1991) for Skolt, and Kuruch (1985) for Kildin.

[6] Several recent works such as Wilbur (2014) and Rießler (forthcoming) have provided a phonemic analysis which differs from previous works. For example, Wilbur (2014:37) counts *t*, *ʰt*, *t:*, *ʰt:*; *n*, and *n:* in the alveolar stop series. I do not include this description in Table 1.

3 Mapping on the stop series

Map 2 reflects the stop series represented by dental/alveolar sounds in the interpreted phonemic description.

Map 2: Stop series in Saami languages.

Preliminary findings are as follows:

The interpretation relating 'fortis/lenis' to an aspirated-prominence feature (i.e. possibility of an *emerging* aspirated feature[7]) is shown using coloured symbols (black: aspirated-unaspirated; yellow: voiceless-voiced). Based on the distribution of Map 2, I suggest that a strong influence from Nordic (Germanic) languages contributes to the acquisition of the aspirated feature, except in the case of Ume (Schlachter 1958). The aspirated distinction at a word-initial position is attested in some varieties, and the aspirated initial consonant is mainly attested in loanwords from Nordic languages. The varieties spoken in the Kola Peninsula are marked with yellow symbols, where other spoken languages such as Finnish and Russian do not have an aspirated-unaspirated distinction.[8]

The existence of the voiceless nasal /n̥/ is shown as the shape of the symbols (diamond: with /n̥/; star: without /n̥/). Note that /n̥/ does not appear word-initially in any Saami language, and that it appears marginally. This phoneme is considered an acquired member in the consonant inventory; however, as Map 2 shows, varieties having /n̥/ are spoken in the northern part of the Saami linguistic sphere. Hence, it is also a potential understanding that /n̥/ emerged in an earlier stage of the (proto-)Saamic language and then began to diminish in the southern part.

[7] The aspirated or 'post'-aspirated feature is not attested at any protolanguage-levels of Finno-Ugric, Finno-Saamic, and Uralic. Cf. Collinder (1955, 1960) and Korhonen (1981). However, if we pay attention to preaspiration in Saami languages, we may consider that they have an 'aspirated' feature.

[8] The difference of the nature of aspiration between Davvi and Kildin is illustrated in Sammallahti and Khvorostukhina (1991:89-94).

4 Concluding remarks

This article examined a geolinguistic approach to the stop series of the Saami languages by referring to previous works. The linguistic map (Map 2) shows that the 'fortis' of the fortis-lenis distinction is interpreted as an aspirated-prominence feature in the Saami languages spoken in the Nordic-speaking region. We consider that this distribution is a result of mutual, constant language contact.

For Saami linguistics, reports on dialectal variation have been accumulated (see Map 1); however, the dialectal data for phonetic and phonological description are limited (see Map 2) or restricted to specific sound phenomena. To examine lexical variety, fewer data are available than for the sound system. Nevertheless, following the present article's approach, we can try to apply a geolinguistic analysis of lexical varieties to published data of the Saami languages.

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