

Supplementary Materials

Place typology and evolution of implosives in Indo-Aryan languages

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Table 1: Sound changes involved in the evolution of implosives across languages (Blust 1980, 2016; Campbell 1973; Clements and Rialland 2008; Fallon 2002; Fordyce 1980; Greenberg 1970; Jaeger 1978; Michailovsky 1988; Sidwell 2014; Varyani 1974; Xi 2009).

Sound changes	Languages
plain voiced stops → implosives	African, Austronesian, Indo-Aryan
voiced aspirated stops → implosives	Austronesian
plain voiceless stops → implosives	Austronesian, Sino-Tibetan
voiced geminate stops → implosives	African (Surmic), Austronesian, Indo-Aryan
coalescence of glottal stops and voiced stops → implosives	Austronesian
Labio-velar gb → implosives	Southwestern Mande
ejectives → implosives	Mayan
voiceless ejectives → voiceless implosives → voiced implosives	Quichean
crasis of nasal and a homorganic plain voiced obstruent → implosives	Austronesian
crasis of a plain voiced obstruent and following sibilant → implosives	Austronesian

Table 2: Place typology of implosives (glottalic consonants) in Indo-Aryan languages.

Language	Bilabial	Dental-alveolar	Retroflex	Palatal	Velar
Bishnupriya Manipuri	bʔ	dʔ	ɖʔ	ʃʃʔ	ɡʔ
Dhatki	ɓ	-	ɖ	-	-
Kacchi	ɓ	d̪	ɖ	-	ɡ
Khetrani	ɓ	d̪	-	f	ɡ
Lawatiyya	ɓ	d̪	-	f	ɡ
Northern Marwari	ɓ	-	ɖ	-	-
Southern Marwari	ɓ	-	ɖ	-	-
Odki	ɓ	-	ɖ	f	ɡ
Parkari	ɓ	d̪	ɖ	-	ɡ
Sindhi	ɓ	-	ɖ	f	ɡ
Siraiki	ɓ	d̪	ɖ	f	ɡ
Tharadri	ɓ	d̪	ɖ	f	ɡ
Wadiyari	ɓ	d̪	ɖ	f	ɡ

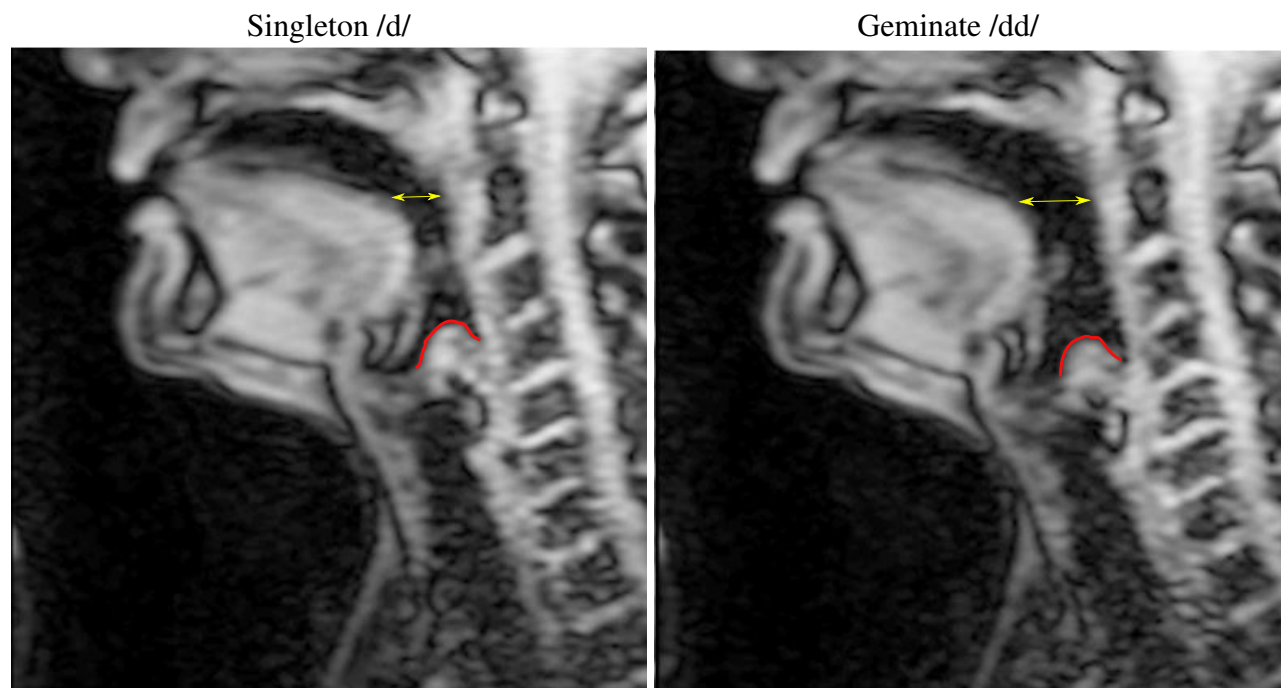


Figure 1: Real-time Magnetic Resonance Imaging (rt-MRI) frames of Ikema Miyako Ryukyuan's word-medial alveolar singleton /d/ and geminate /dd/ (used with the permission of the authors: Fujimoto and Shinohara 2017). Arrows in yellow show the pharyngeal expansion and/or tongue root advancement. Tracings in red indicate the larynx lowering.

Table 3: Stop consonants of Indo-Aryan languages indicating that implosives are found in large consonant inventories (IPA symbols were modified where needed, e.g., /p^h/ instead of ph in Bishnupriya Manipuri). ISO codes are provided where available. Implosives/glottalic consonants are highlighted in bold. The data are based on authors phonetic/phonological fieldwork and primary sources (where applicable, "Own fieldwork" is added in the table). Some languages have different spelling conventions for their names (e.g., Siraiki/Saraiki, Kacchi/Kacci/Kachi).

Language	Bilabial	Dental-alveolar	Retroflex	Palatal	Velar	Source
Bishnupriya Manipuri (bpy)	p p ^h b bʔ	t t ^h d dʔ	ʈ ʈ ^h ɖ ɖʔ	ɕ ʝ ʒ ʒʔ	k k ^h g gʔ	Sinha (1981)
Dhatki (mki)	p p ^h b b ^{fi} ɓ	t t ^h d d ^{fi}	ʈ ʈ ^h ɖ ɖ ^{fi} ɗ	tʃ tʃ ^h dʒ dʒ ^{fi}	k k ^h g g ^{fi}	Own fieldwork
Kacchi (kfr)	p p ^h b ^{fi} ɓ	t t ^h d ^{fi} ɗ	ʈ ʈ ^h ɖ ^{fi} ɗ	tʃ tʃ ^h dʒ ^{fi}	k k ^h g ^{fi} ɡ	Own fieldwork; Zubair (2016)
Khetrani (xhe)	p p ^h b b ^{fi} ɓ	t t ^h d d ^{fi} ɗ	ʈ ʈ ^h ɖ ɖ ^{fi}	tʃ tʃ ^h dʒ dʒ ^{fi} f	k k ^h g g ^{fi} ɡ	Birmani and Ahmed (2017)
Lawatiyya (luv)	p p ^h b ɓ	t t ^h d ɗ	ʈ ʈ ^h ɖ	tʃ tʃ ^h dʒ f	k k ^h g ɡ	Own fieldwork
Northern Marwari (mve)	p p ^h b b ^{fi} ɓ	t t ^h d d ^{fi}	ʈ ʈ ^h ɖ ɖ ^{fi} ɗ	tʃ tʃ ^h dʒ dʒ ^{fi}	k k ^h g g ^{fi}	Own fieldwork
Southern Marwari (mve)	p p ^h b b ^{fi} ɓ	t t ^h d d ^{fi}	ʈ ʈ ^h ɖ ^{fi} ɗ	tʃ tʃ ^h dʒ dʒ ^{fi}	k k ^h g g ^{fi}	Own fieldwork
Odki (odk)	p p ^h b b ^{fi} ɓ	t t ^h d d ^{fi}	ʈ ʈ ^h ɖ ɖ ^{fi} ɗ	tʃ tʃ ^h dʒ dʒ ^{fi} f	k k ^h g g ^{fi} ɡ	Own fieldwork
Parkari (kvx)	p p ^h b ^{fi} ɓ	t t ^h d ^{fi} ɗ	ʈ ʈ ^h ɖ ^{fi} ɗ	tʃ tʃ ^h dʒ dʒ ^{fi}	k k ^h g ^{fi} ɡ	Own fieldwork
Sindhi (snd)	p p ^h b b ^{fi} ɓ	t t ^h d d ^{fi}	ʈ ʈ ^h ɖ ɖ ^{fi} ɗ	tʃ tʃ ^h dʒ dʒ ^{fi} f	k k ^h g g ^{fi} ɡ	Own fieldwork
Siraiki (skr)	p p ^h b b ^{fi} ɓ	t t ^h d d ^{fi} ɗ	ʈ ʈ ^h ɖ ɖ ^{fi} ɗ	tʃ tʃ ^h dʒ dʒ ^{fi} f	k k ^h g g ^{fi} ɡ	Own fieldwork
Tharadri	p p ^h b b ^{fi} ɓ	t t ^h d ^{fi} ɗ	ʈ ʈ ^h ɖ ^{fi} ɗ	tʃ tʃ ^h dʒ dʒ ^{fi} f	k k ^h g g ^{fi} ɡ	Own fieldwork
Wadiyari (kxp)	p p ^h b b ^{fi} ɓ	t t ^h d d ^{fi} ɗ	ʈ ʈ ^h ɖ ɖ ^{fi} ɗ	tʃ tʃ ^h dʒ dʒ ^{fi} f	k k ^h g g ^{fi} ɡ	Own fieldwork; Zubair (2016)

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