Towards a typology of secondary articulations

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This study provides a typological overview of four major types of secondary articulations present in the languages of the world: labialization, palatalization, pharyngealization, and velarization. The first distribution analysis in ~ 317 languages was provided by Maddieson (1984). Other typological investigations of phoneme inventories (e.g., Gordon, 2016) did not address secondary articulations in more detail. Although large data on phoneme inventories are available today, it is still a fringe phenomenon in quantitative investigations. This study takes steps to fill this gap by investigating secondary articulations on a broader data basis using the PHOIBLE dataset (Moran & McCloy, 2019). We analyze token/type frequency patterns of these articulations, their dependencies and variability in terms of voicing, place and manner of articulation features.

The dataset constructed for this study consists of one randomly sampled phoneme inventory for each language according to the Glottocode (Hammarström et al., 2021) present in PHOIBLE. The study is thus based on 2177 phoneme inventories. The phonemes were grouped according to their secondary articulation, place of primary constriction, manner of articulation and voicing. Voicing and manner groupings were done based on the feature matrix provided in the dataset. The secondary articulations and places of articulation groups were built according to the respective IPA symbols in the standardized phoneme transcription (for the standardization see Moran, 2012).

We report here some results from a broader overview to more specific observations. About a quarter of the phoneme inventories in the dataset contains at least one secondary articulation (500/2177). Languages with one secondary articulation are the most common (399/500). 98 languages have two secondary articulations (e.g., Tamazight has both labialization and pharyngealization), and only three languages have three secondary articulations (Irish Gaelic, Abkhaz and Mfumte). Labialization is the most common, followed by palatalization; pharyngealization and velarization are the least distributed (Fig. 1). If a language has two secondary articulations it is highly likely to have labialization and palatalization (84% of the phoneme inventories). If a consonant has simultaneous double secondary articulations labialization is always one of the secondary articulations (e.g., /m$^{w\gamma}$/ in Satawalese). Languages with simultaneous double secondary articulations are mostly found in Northwest Caucasian family, and exclusively in this family for simultaneous labialization and pharyngealization (as for /g^{w§}/ in Rutul, for e.g., see Beguš, 2020).

The set of consonants with a secondary articulation in a given language is always inferior or equal to the set of their plain counterparts (e.g., Fig. 2 for labialization in dorsals). A language is most likely to have secondary articulation in stops (85% of the languages with secondary articulation) and most unlikely in taps or trills (13 %) and affricates (11%). No such clear pattern emerges in terms of voicing, although there is a slight preference for palatalization, pharyngealization and velarization to target voiced consonants, while labialization is more often observed in voiceless consonants. The pattern in terms of place of articulation varies depending on the type of secondary articulation. When looking at the absolute and discretized distances between the primary and secondary place of articulation, it is observed that the highest phoneme variety clusters close to the secondary constriction for palatalization, while the highest phoneme variety for pharyngealization is found at a greater distance (Fig. 3). Because places of articulation are not evenly distributed in the phonemic inventories (coronals are more frequent), the results are reported with normalized data. They show that labialization is more often found with dorsals, while palatalization is more often found in coronals. Pharyngealization and velarization also preferentially target coronals. If a language has labialized dorsals, then around 60% of its plain dorsals are labialized, but if a language has labialized labials, only 10% of the plain labials are labialized. These and additional frequency patterns are analyzed to see how feature-based principles, namely Feature Economy and Marked Feature Avoidance, govern the shapes of phoneme inventories (e.g., Clements, 2009; Hall, 2011; Mielke, 2008), and to call attention to the importance of considering secondary articulations to test generalizations about cross-linguistic phoneme typology.

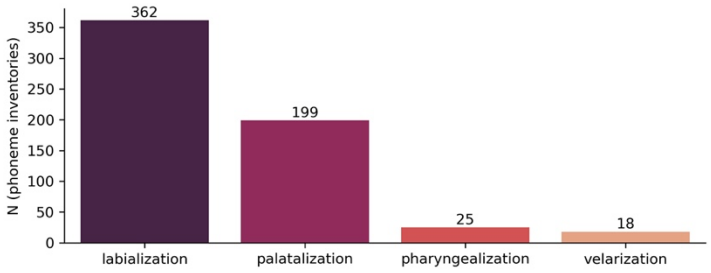

Figure 1: Number of phoneme inventories with secondary articulation. Languages with multiple secondary articulations count for each type.

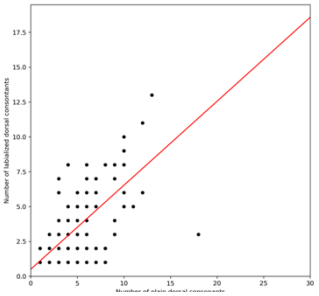

Figure 2: Number of labialized phonemes by the number of plain dorsal phonemes, along with the estimated regression line. One data point can correspond to more than one phoneme inventory.

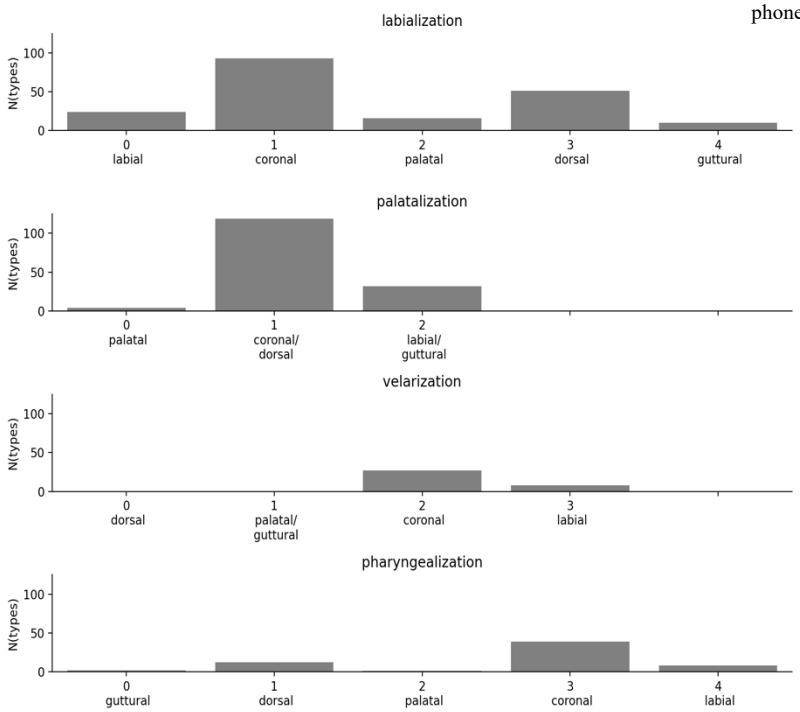

Figure 3: Number of phoneme types by absolute distance between the locations of secondary and primary constrictions. An index was assigned to each place (labial = 1, coronal = 2, palatal = 3, dorsal = 4, guttural = 5) and secondary articulation (labialization = 1, palatalization = 3, velarization = 4, pharyngealization = 5) to compute absolute distance. Labels on the x-axes indicate the places of the primary constriction according to their distance to the secondary constriction (e.g., |index(pharyngealization) – index(coronal)| = 3, |index(palatalization) - index(dorsal)| = 1 → coronal/dorsal). Note: these distances were not calculated on normalized data.

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