Hyperhypervoicing in Crow

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Voicing is difficult to maintain in oral stops because the pressure differential above and below the glottis evens out as air flows from the lungs into the oral cavity; as the pressure equalizes, airflow over the glottis ceases, preventing voicing during oral closure. Some languages have tricks to make voiced stops more possible. These include imploding the stop by lowering the larynx, which increases the size of the oral cavity and decreases supralaryngeal air pressure (Ladefoged & Maddieson 1996:78); this occurs with and without preglottalization (eg, Vietnamese, Nguyen 1987:84). The other trick is prenasalizing the stop, as found in Mixtec (Iverson & Salmons 1996); prenasalizing voiced stops opens up the nasopharyngeal port and lets air leak into the nasal cavity, which again reduces supralaryngeal air pressure and allows air to pass over the glottis to maintain voicing (Lisker & Abramson 1971:775). 'Prenasalization appears most often with voiced stops, and, in the many languages where no plain voiced stops contrast with the prenasalized series, may be thought of as a way to facilitate the maintenance of voicing on stops' (Henton et al 1992:71).

I argue here that Crow (Missouri River Siouxan) has a similar but more radical process that nasalizes phonologically long stops more fully; rather than just prenasalizing them, Crow turns them into full nasals *m* and *n*. Hypervoicing prenasalizes singleton voiced stops in onsets in Mixtec, but in Crow we find *full* nasalization of voiced stops and only when they are geminated or occur in the coda, i.e. when they are phonologically long and bear a mora. I call this phenomenon *hyperhypervoicing* since nasalization is full rather than partial and since it takes place only when the sound is moraic. If this analysis is correct, nasalization promotes voicing in two ways across languages: *hypervoicing* turns voiced stops into prenasalized stops when they are phonologically short (Mixtec) and *hyperhyper-voicing* turns them into nasals when they are phonologically long (Crow). The reasoning: if voicing is hard to maintain in phonologically short (nonmoraic) stops and results in partial nasalization (Mixtec), then voicing should be more difficult to maintain in phonologically long (moraic) stops and should result in more complete nasalization (Crow).

Crow has (in traditional terms), two phonemes that alternate between a voiced stop, nasal, and voiced approximant (Kaschube 1967, Martin 1989, Graczyk 2007, my own fieldwork). The labial sound in (1) has three allophones, hilariously [b, m, w]; the coronal sound in (2) has corresponding allophones [d, n, l]. In both cases the voiced stops (b, d) and nasals (m, n) are in complementary distribution with each other and with the approximants (w, l); there is no morphological conditioning (it isn't consonant mutation) and the alternations are surface true and fully productive. Assuming that codas and geminates are both moraic (Hayes 1989), we can characterize the basic distribution as follows (where 'onset' excludes *intervocalic* onsets):

(1)	onset [b]:	[b͡aapá]	'day'	[išb͡úupči]	'his ball'
	moraic [m]:	[bačeém͡]	'a man'	[baam͡m͡áxi]	'buckskin'
	intervocalic [w]:	[aw͡á]	'earth'		
(2)	onset [d]:	[d͡áawii]	'three'	[áapd͡axči]	'hang'
	moraic [n]:	[koón͡]	'there'	[ann͡issúu]	'dance hall'
	intervocalic [l]:	[bal͡í]	'water'		

(3) pitə̀-lak ʤan-nak ʤemz-dak Ø-áxp-ak daá-u-k
Peter-and John-and James-and 3sg-with-SS go-PL-DECL
'Peter, John, and James went with him.' (Luke 9:28, Graczyk 2007:191)

Following underlying *h* the situation is slightly different: the stop still geminates and nasalizes but the first half is voiceless, retaining the aspiration of the *h* (Graczyk 2007:14):

(3) [dám̥miia] 'three times'
[an̥nuuší] 'eat a lot'

The facts in (1-3) are internal to the phonological phrase: word-initial voiced stops often turned to *w* and *l* when the preceding word ends in a vowel.

My analysis is that the voiced stops *b* and *d* lenite to *w* and *l* intervocalically; a similar process is found in the Djapu dialect of Yolngu where intervocalic *b* and *g* surface intervocalically as [w] and *d̪* and *ɟ* surface there as [j] (Morphy 1983:29; Gurevich 2011:1563). And, as discussed above, I propose that *b* and *d* nasalize when they are moraic (geminate or in the coda) to avoid phonologically long voiced stops. Avoidance of long voiced geminates is well-known and found in languages like Japanese (Kawahara 2005).

The traditional analysis is that the approximants *w* and *l* are underlying (Kaschube 1967), but Martin (1989) and Graczyk (2007) argue for underlying nasals (*m, n*). Kaschube requires occlusivization of approximants in onsets and occlusivization *cum* nasalization of glides when long or in the coda; neither process is phonetically or phonologically motivated. Martin/Graczyk requires denasalization in onsets and denasalization *cum* lenition intervocalically; denasalization is unmotivated in either case, though denasalization of voiced stops *does* occur word-initially in Korean (Kim 2011). Both approaches require that underlying sounds can't surface in the onset, which goes against expectations of markedness, since onsets are usually the best licensers of consonantal contrasts.

In terms of consonant inventory, all three analyses are weird. Kaschube requires a language with no underlying nasals, Martin/Graczyk require one with no liquids or glides. The present analysis requires one with no liquids, glides *or* nasals. An OT perspective mollifies this a little bit, as richness of the base helps us look away from underlying forms, but it doesn't ultimately help explain the oddity of the situation we find in Crow.

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