The Typology of PIE Syllabic Sonorants

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Abstract

One of the most prominent features of reconstructed PIE phonology is sonorant syllabicity: sonorant consonants function as syllable peaks when, generally speaking, they are not adjacent to a vowel. The general acceptance of this phenomenon in its various contours has persisted (see e.g. Mayrhofer 1986, Fortson 2009, Meier-Brügger 2010, Weiss 2011, etc.), despite the absence, for the most part, of any attempt to ascertain its credibility along the cross-linguistic dimension. In this paper, we evaluate the reconstructed PIE system from precisely this perspective. In comparing the established properties of PIE syllabic sonorants—including their distribution across words and morphemes, the complexity of their syllable margins, their participation in prosodic phenomena, their morphophonological alternation, and the directionality of their vocalization—against a survey of syllabic consonants across the languages of the world, we demonstrate the typological plausibility of the reconstruction, and so reinforce the confidence with which it has been maintained.

Keywords

PIE – sonorants – syllabicity – typology – directionality

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1 Introduction

Sonorant consonant syllabicity has long been a prominent feature of reconstructed PIE phonology (Osthoff 1876, Brugmann 1876, Cuny 1912, Meillet 1937, Saussure 1995; et al.). More striking than the prominence of this straightforward and economical reconstruction is perhaps its stability—where other aspects of the reconstructed language, similarly economical, have been the subject of intense debate (the stop series, notoriously), both the notion that sonorant consonants in PIE could function as syllable peaks in the first place, as well as many of the properties they exhibited in doing so, have largely gone unquestioned (see e.g. Mayrhofer 1986, Fortson 2010, Meier-Brügger 2010, Weiss 2011, etc.).

Still, if our goal in reconstructing PIE is to reconstruct what had been an actual language spoken by actual speakers, then it should only be natural for typological considerations to come into play in evaluating what has been proposed to hold for it, sonorant syllabicity included. In short, explicitly subjecting the reconstructed system to typological scrutiny should be a welcome, and useful, enterprise.

Typologically, it would be a welcome development if the reconstructed PIE system were to find analogues in other languages with syllabic consonants. This is not to say, of course, that for the system to pass typological muster we must necessarily identify a single language sharing with PIE every aspect of its system of syllabic consonants; nor should we expect that such a language even exists. Rather, important steps towards developing a sense of the system's typological plausibility can be made, if we evaluate the extent to which the various individual properties of syllabic sonorants in PIE find parallels in other languages with syllabic consonants.

The aim of this paper, then, is to address the typological standing of the PIE syllabic sonorants. Ultimately we intend to demonstrate that confidence in the reconstructed system is justified as far as this dimension is concerned. In order to provide a firm and explicit basis for consideration of the relevant issues, we

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1 Arguably the most controversial property is vocalization of the right-hand sonorant in sequences like CRRC, most often exemplified by the form *k̑u̯n̥-b̑is inst. pl. > Vedic śvabhīḥ ‘dog’; see section 2.6 on directionality.

2 A similar argument can be made for the usefulness of subjecting the system to theoretical scrutiny, assessing the ease with which it finds analysis within current approaches to phonological theory; see Cooper 2012a for consideration of this issue. Phonological theory should have space in its explanatory capacity to account for PIE, even if it is a reconstructed language.
begin in section 2 with an overview of the properties of syllabic sonorants in PIE. The prevalence of these properties within and across other languages with syllabic consonants will be examined in section 3, in which we present the results of an ongoing cross-linguistic survey. Finally, we conclude in section 4, and provide directions for future work in this domain.

2 Properties of Syllabic Sonorants in Proto-Indo-European

In this section we review the properties of the PIE syllabic sonorants, as evidenced by reconstructed PIE forms and their reflexes in key daughter languages. Further, as these segments have an intuitive similarity to both consonants and vowels, where relevant we will also draw comparisons between these properties and those of ‘true’ consonants and vowels. Lastly, we note at the outset that the scope of the current study excludes the behavior of the laryngeals, a decision we make in practical recognition of the relatively less clear picture they present in this context.

2.1 Syllabicity

The first and most basic property of PIE syllabic sonorants is syllabicity itself: the ability to serve as the peak of a syllable. Essentially, all PIE sonorants *m, *n, *l, *r, *i̯, *u̯ are syllabic when they are the most sonorous element in their context—in other words, when they are not adjacent to a syllabic segment. The forms in (1) exemplify this reconstructed property:

(1) Syllabicity of PIE sonorants

| Form | Meaning | Language | Reference |
|------|---------|----------|-----------|
| *gʷm-joh₂ pres. | Greek βαίνω ‘I go’ | (LIV 209–210) |
| *k̑n̥-néu̯- pres. | Younger Avestan ā-sənaoiti ‘climbs up’ | (LIV 324) |
| *sl̥-jé- pres. | Greek ἅλλομαι ‘spring’ | (LIV 527–528) |
| *kʷn̥-néu̯- pres. | Vedic क्रणोति ‘do, make’ | (LIV 391–392) |
| *dīu̯-ós gen. sg. | Vedic दि० ‘sky’ | (NIL 69–81) |
| *k̑un-ós gen. sg. | Greek κυνές ‘dog’ | (NIL 436–440) |

Paradigmatically speaking, PIE sonorant syllabicity can be characterized as sonority-driven: all and only the most sonorous consonants in the language have the capability of being syllabic, where ‘most sonorous’ in this case simply refers to any non-obstruent. In terms of the sonority hierarchy, then, for PIE one could simply propose Sonorant > Obstruent (though in fact sonority-driven syllabicity of this sort could also be compatible with more fine-grained hierarchies such as the traditional Glide > Liquid > Nasal > Obstruent, or even
Glide > Rhotic > Lateral > Nasal > Fricative > Stop). Sonority-driven syllabicity means that the implication noted by Blevins (1995) and Zec (1995) holds: lower-sonority syllabic segments imply higher-sonority syllabic segments.

2.2 Distribution
The distribution of PIE syllabic sonorants can be analyzed in at least two ways: with respect to positions in the word (initial—medial—final), and with respect to morpheme type (prefix—root—suffix—ending).

2.2.1 Distribution in the Word
The distribution of syllabic sonorants is relatively free in the domain of the word. These sounds can occur word-initially, as in (2), or medially, as in (3):

(2) a. *ns- aor. > Greek ἀσμενός ‘saved’ (LIV 454–455)
   b. *rg₁-ské- pres. > Greek ἀρχω ‘begin’ (LIV 498)

(3) a. *dhões-éje- pres. > Vedic dhvasáyati ‘lets scatter’ (LIV 159)
   b. *dru²-jé/ó- pres. > Greek ἄφρωτω ‘break, crumble (tr.)’ (LIV 156)

Note that our understanding of word-initial and word-final positions here is absolute; the word-medial examples we cite do occur in the initial syllable of the respective forms. Lastly, syllabic sonorants can occur word-finally as well:

(4) a. *pó/ed-m acc. sg. > Greek πόδα ‘foot’ (NIL 526–540)
   b. *uód₇ nom. acc. sg. > Hittite wātar ‘water’ (NIL 706–715)

The free distribution of syllabic consonants across multiple positions in the word raises an important point of comparison between these segments and ‘true’ consonants and vowels: in this regard syllabic consonants more clearly pattern with consonants rather than vowels. As an extension of the Benvenistean hypothesis that all PIE roots began with a consonant (1935: 143–173), and given the general paucity of prefixes (let alone vowel-initial ones), one sees few securely-reconstructed cases of word-initial vowels in PIE (consider the treat-

3 The issue is complicated slightly by the behavior of *m; see 2.7.
4 For a more detailed account of the distribution of syllabic consonants in PIE, see the survey presented in Cooper 2012a. A couple of restrictions perhaps worth noting: in the verbal domain, no examples could be found of syllabic *l or *j in absolute word-initial position, nor syllabic *n in absolute word-final position (but cf. deverbal neuters in *-mn̥ and *h₁neu̯n̥ ‘nine’ > Ved. náva).
ment of forms like *(h₁)albʰos ‘white’ > Hittite alpās ‘cloud’, Greek ἄλφος ‘white leprosy’, Latin albus, with first laryngeal proposed to maintain a Benvenistean view). While it may seem obvious that syllabic sonorants should behave as ‘true’ consonants do, we will see in our discussion of typology at least one example of a language with syllabic consonants occurring only in those positions permitting vowels; thus this aspect of the PIE system should not be taken for granted.

2.2.2 Distribution across Morpheme Types
In terms of morpheme type, syllabic sonorants can occur in prefixes, roots, suffixes, and endings, as shown by the examples in (5):

(5) a. *h₁neg. pref. > Greek ἀ- (as in e.g. ἀμβρότος ‘immortal’ < *h₁mr̥to-

b. *gʷm̥-ioh₂ pres. > Greek βαίνω ‘I go’

c. *ph₂-tr̥-si dat. pl. > Greek πατράσι ‘fathers’

d. *pó/ed̮-m acc. sg. > Greek πόδα ‘foot’

At this time no limitations on the distribution of the sonorants can be identified, but we expect given the general scarcity of prefixation in PIE that syllabic sonorants would least frequently occur in this type of morpheme.

2.3 Margins
Generally speaking, in terms of onsets and codas (and abstracting away from complex onsets and complex codas), there are four logically possible types of syllable that a syllabic sonorant could head:

(6) a. Ğ

b. CĊ

c. ĊC

d. CĊC

In theory, a syllabic sonorant could constitute the sole component of its syllable (6a.); it could be preceded by an onset, but lack a coda (6b.); it could be followed by a coda, but lack an onset (6c.); or it could be both preceded by an onset and followed by a coda (6d.).

Given the reconstructed inventory of PIE forms, we observe syllabic sonorants hosting syllables of all four of these shapes. That is, a syllable may possess either an onset (7) or a coda (8), both (9), or neither (10).5

5 For the determination of syllable boundaries in these forms we rely on our analysis in...
(7) a. *gʷm-johw₂ pres. > Greek βαίνω ‘I go’ (LIV 209–210)
b. *κʷʷ-néu̯- pres. > Vedic κρνότि ‘do, make’ (LIV 391–392)

(8) a. *nb₄-ro- neut. > Vedic abhrá- ‘thundercloud’ (NIL 499–504)
b. *rg₂-sk̑é- pres. > Greek ἀρχῶ ‘begin’ (LIV 498)

(9) a. *ml₂kʷ-i̯é- pres. > Greek βλάπτω ‘harm’ (LIV 434–435)
b. *mr̥s-i̯é- pres. > Vedic mṛ́ṣyate ‘forgets’ (LIV 440–441)

(10) a. *n-gʷm-tos > Greek ἄβατος ‘impassable’
b. *ŋgʷen > Greek ἀδήν ‘groin’

Though each of these four shapes can be exemplified in PIE, they are not expected to occur with the same frequency. Onsetless syllables as in (8) and (10) should be relatively rarer than their onsetful counterparts in (7) and (9), given basic aspects of PIE morphophonology. In particular, syllables featuring a syllabic consonant alone are predicted to have the most limited distribution. If a syllabic segment usually arises only when not adjacent to another syllabic segment (typically a vowel), then a word-medial or word-final syllabic sonorant will presumably have to be preceded by a consonant. Given the cross-linguistically robust preference for onsets over codas, which we have no reason to believe is not also relevant in PIE itself, this preceding consonant will be syllabified as an onset of the syllable headed by the syllabic sonorant. So syllables of shape C̥ are predicted to be impossible in either word-medial or word-final positions. As for word-initial position, we do have examples as in (10); but we expect that these represent a limited array of options. The privative prefix is exceptional in PIE, both in its status as a prefix, as well as in its consistently syllabic form (even in cases where purely phonological considerations would favor otherwise; e.g. *ŋ-udros > Greek ἄν-υδρος ‘water-less’, with a sequence of two onsetless syllables; see Mayrhofer 1986: 160). While it would constitute a syllable unto itself when affixed to a form beginning with a single consonant (or, analogically, to a form beginning with a vowel), this is essentially the only productive means of realizing a syllable of this shape. Otherwise it should generally be the case that initial syllabic sonorants will have a coda (as *ŋ would if followed by a form beginning with two consonants), given the general propensity for both consonant-initial morphemes and roots minimally of shape CVC

Cooper 2012a, which maintains heterosyllabification of medial two-consonant sequences (i.e., VC.CV).
in PIE, coupled with the fact that it is roots which are usually to be found at the left edge of the word. So a sonorant-initial root, in zero-grade (thereby allowing for a syllabic sonorant to surface) and located at the left edge of the word, would likely be followed by a morpheme beginning with a consonant, i.e. #RC-CV, in which case the syllable headed by the syllabic sonorant would have a coda. The case of \*\textit{ngwēn} (> Greek ἀδήν ‘groin’) in (10) appears to be a rare exception to this general expectation.

The flexibility exhibited by syllables hosted by syllabic consonants is not exactly shared by ‘true’ vowels. Certainly vocalic nuclei in PIE can be flanked by an onset, or both an onset and a coda: compare the aforementioned forms \*\textit{uōdr̥} in (4b.) and \*\textit{gʷmjectivesah₂} in (1a.), (5b.) and (7a.). Vocalic nuclei diverge from syllabic consonantal nuclei, however, in being incapable of hosting syllables lacking an onset. The only environment in which a syllable of shape VC could conceivably and reliably occur is word-initial position; yet as already noted earlier in subsection 2.2.1, given a Benvenistean view of PIE root structure, examples are difficult to marshal (\*\textit{h₁-less *albḥos} would be one). For the same reason, the prospect of a vowel functioning as a syllable unto itself is also implausible.

### 2.4 Prosody

The domain of prosody allows us to make an additional comparison between syllabic sonorants and ‘true’ consonants and vowels. Unlike the case of word-based distribution discussed above in 2.2.1, where we observed that syllabic sonorants pattern with consonants, in terms of prosody, syllabic sonorants seem to share at least one property with vowels. This is, namely, the ability to host an accent; though admittedly examples are rare: \*\textit{septḿ̥ ‘seven’} (Gk. ἑπτά, Ved. saptā; possibly contaminated with \*\textit{ok̑tṓ ‘eight’}), \*\textit{u̯lkʷos ‘wolf’} (Ved. vṛ̥ka-).\footnote{Vedic would seem to offer the broadest array of relevant cases; cf. also \textit{pītēḥ} acc. pl. ‘father’ (< \*\textit{ph₂-tr-n̥s}), \textit{gāchati} ‘comes’ (< \*\textit{gʷm-sḵ-e-ti}), and so forth. At what point the syllabic consonants (or their reflexes) became accented is unclear; forms like these may be due to secondary developments.}

An additional prosodic property potentially shared by both PIE syllabic sonorants and vowels, length, is dubious; so-called ‘long’ syllabic sonorants can in the proto-language be analyzed as a sequence of syllabic sonorant followed by laryngeal (Gąsiorowski 1997). While this is also true of many cases of long vowels as reflected in the daughter languages, there are nonetheless a number of instances of long vowels of non-laryngeal origin already present in PIE.
2.5 Alternation
Morphological structure as discussed in 2.2.2 above raises the issue of the way in which the majority (if not all) syllabic sonorants arise: through morphophonological alternation of full- and zero-grade forms. Such alternation allows the same sonorant to be contextually non-syllabic or syllabic, as shown in (11).

(11) a. *(h₁)ē-gʷem-t ‘he went’ (Vedic ágán) ~ *gʷm-jogh₂ ‘I go’ (Greek ἴνω)
b. *ten- ‘stretch’ (Latin tenère) ~ *tn-tós ‘stretched’ (Latin tentus)
c. *peld- ‘beat’ (Latin pell-ō) ~ *pl̥tós ‘beaten’ (Latin pulsus)
d. *k̑red(s)- ‘believe’ (Latin crēdō) ~ *k̑rd- ‘heart’ (Latin cor)
e. *díéus ‘sky god’ nom. (Vedic dyáuh) ~ *díyós gen. (Vedic āvāh)
f. *u̯éd-ōr ‘water’ nom. acc. pl. (Hittite widār) ~ *udn- obl. (Vedic udnāh)

In the left-hand column of data we see sonorants functioning as consonants—as a syllable coda in (11a.–c.), and as (part of) a syllable onset in (11d.–f.). In the associated forms in the column on the right, the morpheme containing the sonorant is in zero-grade, eliminating the vowel and, if not for sonorant syllabicity, otherwise resulting in an unsyllabifiable sequence of segments.

2.6 Directionality
The final property of syllabic sonorants we present here is what we refer to as directionality: in a sequence of more than one sonorant not adjacent to a syllabic segment, the right-hand one is consistently syllabic (as per e.g. Meillet 1937). This is shown in (12):

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7 Some syllabic sonorants lack a reconstructed vowel-adjacent counterpart, as in, for example, the instrumental plural ending *-bʰis. Indeed one could posit a full-grade variant *bʰejs (or, for that matter, *bʰjęs, although a morpheme shape CCVC is less common) to maintain the strongest version of this claim, but such a form would lack any reflex in the daughter languages. Admittedly, as the sonorant in question is a high vowel/glide, the exception may find another explanation.

8 Maintained by e.g. Schindler (1977), Mayrhofer (1986), Meier-Brügger (2010), Weiss (2011), and others; the pattern is acknowledged by Kobayashi (2004) and Keydana (2008 [2010]), although analyzed differently (for details and evaluation of their approaches, see Cooper 2012a). On the other hand, Klein (2006: 407) expresses skepticism of this treatment, in view of Ved. śvāsu (loc. pl. ‘dog’) versus Gk. κυσί (dat. pl. ‘dog’), the latter form suggesting a left-hand glide vocalized over a right-hand nasal. But κυσί over *ku̯n̥si (which would have been the outcome of *ku̯n̥si) could be analogical, taking into account e.g. Gk. φρήν nom. sg. ~ φρενός gen. sg. ~ φρεσί / φρασί dat. pl. ‘midriff’. According to Beekes (2011), assignment of syllabicity in sequences of sonorants is dependent on phonotactics and morphological constraints (140).
Returning to the relevance of sonority, considered earlier in 2.1 above, recall that paradigmatically speaking, the set of syllabic sonorants in PIE is compatible with a variety of conceptions of the sonority hierarchy, provided, crucially, that a boundary is maintained between sonorants and obstruents (even if this boundary manifests as one between the more specific classes of nasal and fricative). However, as we observe in view of the data in (12), syntagmatic syllabicity—that is, the syllabicity of a consonant in a given morphophonological context—shows different degrees of compatibility with alternative sonority hierarchies. Syntagmatically, given the phenomenon of right-hand vocalization, if one wishes to maintain a sonority-driven account of syllabicity, one must maintain the simple hierarchy Sonorant > Obstruent; more fine-grained hierarchies would be incompatible with the vocalization of e.g. a nasal over a liquid (as in (12a.)), or a liquid over a glide (as in (12d.)). On the other hand, even with this most basic hierarchy, sonority alone cannot predict which segment will be syllabic in a sequence such as CRRC; some appeal must be made to directionality (or perhaps to analogical syllabic structure9).

2.7 A Note on the Status of *m

Before concluding this section, a final word is necessary on the status of *m, an additional aspect of the reconstructed PIE system worth considering from a typological perspective.

9 In other words, a sonorant that is postvocalic in full-grade may be said to have a special status that is carried over to the associated zero-grade—in the morphophonological analysis developed in Cooper 2012a (cf. Steriade 1988 on Sanskrit), this special status was formalized as moraicity. As such this sonorant would be marked as the preferred target of vocalization, over a sonorant that in full-grade would precede the vowel.

Still requiring explanation under this approach, however, would be cases in which a sonorant vocalizes, which would precede the vowel in an associated full-grade: e.g. *pr̥k̑-sk̑é- (Ved. pr̥ccháti) built to *prek̑- ‘ask’ (LIV 490–491). In the case of Sanskrit, Steriade (1988: 96) proposes a process of "restructuring," Calabrese (1999: 697–698) a process of resyllabification, to account for the analogous facts. But this raises the question, if such phonological repair strategies are available and required in any case, why not just maintain a simpler account relying on them alone?
It appears that the labial nasal does not exactly abide by the same principles of syllabicity as the other sonorants do. This is chiefly observed in terms of the property of directionality: right-hand syllabicity does not seem to apply to *m. For example, Latin dormiō, -īre ‘sleep’ is said to reflect a PIE jé/ó-present *drm-je- built to the root z.*drem (LIV 128); it would be difficult to trace the Latin form to the otherwise expected †drm-je- (cf. veniō < *gʷm-ė- ‘come’). Furthermore, as noted by Schindler (1977), in the accusative of acrostatic and proterokinetic i-, u- and r-stems, *m remains non-syllabic (PIE -im, -um, -rm).10

Even in contexts where *m is the only conceivable candidate for vocalization, we see cases in which it does not do so. Stang’s Law forms like **d(i)i̯eum > *d(i)i̯ėm ‘sky-god’ (Ved. dyá̄m) provide one example of this; absent application of this rule, the expected form would have been †di̯eum. In addition, Schindler (1977) cites the disappearance of *m in men-stem sequences of shape /CmnV/ (type Ved. áśman-: áśnaḥ), as well as the apparent permissibility in word-initial position of sequences of *m followed by another sonorant followed by a vowel (e.g. *mleţi̯h₂- pres. > Vedic bravīti ‘says’ [LIV 446–447]). Forms like *mléu̯h₂- run counter to our expectation for a sonorant in this particular position: though examples are difficult to come by,11 the second sonorant, being vowel-adjacent, should function as a consonant, hence the initial sonorant should function as a vowel.12 Still, as this property also holds of the glide *u (e.g. *ul-ėh₁- fient. > Gk. (ϝ)αλῆναι ‘pushes’ [LIV 674]), what may be relevant here is an idiosyncratic property of labial place of articulation.13

10 In this context Schindler also mentions the nasal-infix presents: we see forms like *jun-genti ‘they yoke’ (> Ved. yuṇjánti) over expected †iũngenti. Elsewhere (Cooper 2012a) we have tentatively concluded that this phenomenon is best analyzed as analogical in nature (cf. singular *iũnégti > Ved. yuṇákti); but see e.g. Byrd 2010 for another approach. In any case, despite the violation of directionality held in common here, the nasal-infix presents must constitute a separate phenomenon, as the nasal involved, *n, otherwise participates in right-hand vocalization (see the data in (12)).

11 In Cooper 2012a we found no relevant data in the verbal domain, but this should not be surprising, considering PIE morphophonology.

12 The capability of *m to function as the initial consonant in a complex onset (as it does word-initially in the example cited here) has also been invoked as part of an explanation for another quirk in this sonorant’s behavior: namely its inability to trigger Osthoff’s Law in Greek (see Bernabé 1990, Miller 1994, and, for an appraisal, Simkin 2004). Potentially also relevant in this context is the fact that Celtic *r and *l become *r̥ and *l̥ before stops and *m, but otherwise become *ar and *al (Schumacher 2004: 125–126).

13 Elsewhere (Cooper 2012a) we have essentially proposed a language-specific sonority hierarchy for PIE—non-high vowels */i, u, r, l, n > m > obstruents—to account for the apparent
2.8 Summary

As we have shown in the preceding subsections, the limitations on PIE syllabic sonorants are generally rather loose in nature: provided the right environment (essentially, not being adjacent to a vowel), the syllabic counterparts of PIE *m, *n, *l, *r, *i̯ and *u̯, can, like consonants in general, occur in all positions in the word, in all types of morphemes. Furthermore, little different than ‘true’ vowels, syllabic sonorants can host syllables of varying complexity, and, as evidenced by a limited number of forms, can even be accented. Syllabic sonorants in PIE can also show active morphophonological alternation with their non-syllabic counterparts. Lastly, while sonority appears to drive syllabicity from a paradigmatic standpoint (as sonorants can be syllabic, but obstruents cannot be), it can be overridden by directionality at the syntagmatic level (of two sonorants in a syllabic context, the right-hand one will consistently vocalize).

All these facets of the PIE system, combined with the apparently idiosyncratic behavior of the labial nasal *m, are worth evaluating from a typological standpoint, the exercise we turn to now.

3 Typological Assessment of PIE Sonorant Syllabicity

Having presented the properties of the PIE syllabic sonorants, we now take up the matter of the system’s typological plausibility. Again, if we assume PIE to be a real language, it would be a welcome development if its reconstruction happened to find parallels in actually attested languages. In this section we will take steps towards more explicitly situating the system within a cross-linguistic typology, examining syllabic consonants in other languages both in general and along dimensions relevant for PIE. We will consider all the properties introduced in the preceding section: the existence of syllabic consonants in the first place; the inventory of syllabic consonants; the inventory of syllabic consonants vis-à-vis the inventory of sonorant consonants; the distribution of syllabic consonants within the word; the margins of syllabic consonant-based syllables; the distribution of syllabic consonants across morphemes; the prosodic properties of syllabic consonants; the morphophonological alternation of syllabic consonants with their non-syllabic counterparts; and the phenomenon of right-hand vocalization. For the first four of these issues, we will compare PIE with a broad survey of languages with syllabic consonants; for the last four of these, given a

Idiosyncrasy of *m. A similar position has been maintained for Sanskrit by Steriade (1988: 98).
general paucity of information in source materials of languages in the survey, we will simply focus on whether any languages have been identified as bearing the same or similar properties. In discussing each property, we will also provide data from representative language(s); given the nature of this exercise, we will make a point of selecting samples from outside the Indo-European family (even if an Indo-European language in the survey matches PIE in some respect entirely independent of inheritance).

3.1 A Survey of Syllabic Consonants

Our survey of syllabic consonants\(^\text{14}\) aims to be a comprehensive update of Bell’s (1978) survey of 85 languages with syllabic consonants, which, given the theoretical perspective of the day, is outdated in some significant respects.\(^\text{15}\) Using a reevaluation of Bell’s survey as a starting point, augmented with information from Gordon’s (2004) survey of syllable weight in approximately 400 languages (which includes information on syllabic nasals in particular), Dryer and Haspelmath’s (2011) core inventory of 200 (actually 202) languages, and much independent research, the survey currently consists of 169 members, of which we will focus on 131.\(^\text{16}\)

For all languages contained in the survey, we recorded primary geographic area of usage and genetic affiliation, in the interests of establishing an explicit sense of balance along these two dimensions. Additionally, we have recorded for each language, in so far as the source materials provide, the following information: the set of syllabic consonants; the set of sonorant consonants; the distribution of syllabic consonants in the word; and the permitted margins of syllabic consonants. With respect to participation in prosodic phenomena, distribution across morphemes, morphophonological alternation, and directionality, we have recorded relevant information as it has been provided. Again, though, given the limited nature of such information across all the languages in the survey, we have decided not to consider these properties from the same global perspective. Complete information for all of the languages examined can be found in the appendix.

In the pilot phase of this project, the minimal criterion for inclusion in the survey has been a descriptive statement of consonant syllabicity in the

\(^{14}\) Part of an ongoing collaboration with Draga Zec (Cornell University).

\(^{15}\) For example, Bell does not seem to make a distinction between moraicty and syllabicity, such that Japanese is identified as having syllabic nasals.

\(^{16}\) As context, the survey presented in Cooper 2012b consisted of only 78 languages, from 46 genera belonging to 21 families (see below for the genetic breadth of the current sample).
source material. Moving forward, we expect that it will be important to apply a more rigorous set of diagnostics to confirm such a determination for cases of particular interest.\textsuperscript{17}

3.2 Preliminary Findings

3.2.1 Geographic Breadth

The 131 languages are spoken (chiefly) in 55 countries across six continental regions. Table 1 breaks down each region by country. Note that in the ‘Continental Region’ column on the left, there are two numbers contained in parentheses—the first of these refers to the number of countries in this region, and the second to the number of languages.

\textbf{Table 1} \hspace{1cm} \textit{Geographic distribution of survey languages, by continental region}

| Continental region | Country (where primarily spoken) | Languages |
|--------------------|----------------------------------|-----------|
| 1. Africa (25; 50) | a. Benin                         | 1         |
|                    | b. Botswana                       | 2         |
|                    | c. Burkina Faso                   | 1         |
|                    | d. Cameroon                       | 5         |
|                    | e. Central African Republic       | 1         |
|                    | f. Chad                           | 1         |
|                    | g. Côte d’Ivoire                 | 2         |
|                    | h. Democratic Republic of the Congo | 3     |
|                    | i. Ethiopia                       | 2         |
|                    | j. Ghana                          | 3         |
|                    | k. Guinea                         | 1         |
|                    | l. Lesotho                        | 1         |
|                    | m. Liberia                        | 1         |
|                    | n. Morocco                        | 1         |
|                    | o. Mozambique                     | 1         |
|                    | p. Namibia                        | 1         |
|                    | q. Nigeria                        | 10        |
|                    | r. Senegal                        | 1         |
|                    | s. Sierra Leone                   | 1         |
|                    | t. South Africa                   | 2         |
|                    | u. Sudan                          | 4         |

\textsuperscript{17} For potential examples of such diagnostics, see Ridouane 2008 on Tashlhiyt Berber, a language we briefly examine in subsection 3.3 below.
| Continental region | Country (where primarily spoken) | Languages |
|--------------------|----------------------------------|-----------|
| v. Suriname        |                                  | 1         |
| w. Tanzania        |                                  | 2         |
| x. Togo            |                                  | 1         |
| y. Uganda          |                                  | 1         |
| 2. Asia (16; 41)   | a. China                         | 6         |
|                    | b. India                         | 5         |
|                    | c. Indonesia                     | 2         |
|                    | d. Iran                          | 1         |
|                    | e. Iraq                          | 1         |
|                    | f. Kiribati                      | 1         |
|                    | g. Malaysia                      | 2         |
|                    | h. Micronesia                    | 1         |
|                    | i. Myanmar                       | 3         |
|                    | j. Nepal                         | 6         |
|                    | k. Palau                         | 1         |
|                    | l. Papua New Guinea              | 7         |
|                    | m. Russia                        | 1         |
|                    | n. Taiwan                        | 1         |
|                    | o. Thailand                      | 1         |
|                    | p. Vanuatu                       | 1         |
|                    | q. Vietnam                       | 1         |
| 3. Australia (1; 3)|                                  | 3         |
| 4. Europe (4 (5); 4 (5)) | a. Czech Republic | 1         |
|                    | b. England                       | 1         |
|                    | (c. Russia)                      | 1         |
|                    | d. Serbia                        | 1         |
|                    | e. Slovak Republic               | 1         |
| 5. North America (4; 27) | a. Canada | 9         |
|                    | b. Honduras                      | 1         |
|                    | c. Mexico                        | 4         |
|                    | d. United States                 | 13        |
As can be seen, among the continental regions of the world, Africa and Asia dominate: 41 of the 55 countries (74.55%) in which the languages of the survey are primarily spoken are found in one of these two regions. Furthermore, they are also home to a majority of the survey languages: 91 out of 131, or 69.47%.

### 3.2.2 Genetic Breadth

Turning to the genetic affiliation of the languages in the survey, the 131 languages come from 67 genera belonging to 35 families. Table 2 breaks down each family by genus; parenthetical numbers in the 'Family' column refer first to number of genera, then to number of languages.

| Continental region     | Country (where primarily spoken) | Languages |
|------------------------|----------------------------------|-----------|
| 6. South America (5; 6)| a. Argentina                     | 2         |
|                        | b. Bolivia                        | 1         |
|                        | c. Brazil                         | 1         |
|                        | d. Colombia                       | 1         |
|                        | e. Peru                           | 1         |

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#### Table 2 Genetic distribution of survey languages

| Family                  | (Subfamily) Genus | Languages |
|-------------------------|-------------------|-----------|
| 1. Afro-Asiatic (6; 9)  | a. Berber         | 1         |
|                         | b. Semitic        | 2         |
|                         | c. (Chadic) Biu-Mandara | 1     |
|                         | d. (Chadic) East Chadic | 1     |
|                         | e. (Chadic) West Chadic | 2     |
|                         | f. (Omotic) North Omotic | 2     |
| 2. Algic (2; 4)         | a. Algonquian     | 3         |
|                         | b. Yurok          | 1         |

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18 Information on genetic affiliation is generally in accord with WALS Online (Dryer and Haspelmath 2011).
| Family            | (Subfamily) Genus          | Languages |
|-------------------|---------------------------|-----------|
| 3. Arawakan (1; 1) | Southern                  | 1         |
| 4. Australian (3; 3) | a. Ndjébbana             | 1         |
|                   | b. Pama-Nyungan           | 1         |
|                   | c. Tiwian                 | 1         |
| 5. Austro-Asiatic (4; 5) | a. Munda               | 2         |
|                   | b. Bahnaric               | 1         |
|                   | c. (Mon-Khmer) Katuic     | 1         |
|                   | d. (Mon-Khmer) Khasian    | 1         |
| 6. Austronesian (4; 9) | a. Atayalic             | 1         |
|                   | b. Palauan                | 1         |
|                   | c. Sama-Bajow             | 1         |
|                   | d. (Eastern Malayo-Polynesian) Oceanic | 6         |
| 7. Caddoan (1; 1)  | Northern                  | 1         |
| 8. Chitimacha (n/a; 1) |                       | 1         |
| 9. Creole (n/a; 2)  |                          | 2         |
| 10. Guaicuruan (1; 1) | Southern               | 1         |
| 11. Hokan (2; 4)   | a. Pomoan                 | 1         |
|                   | b. Yuman                  | 3         |
| 12. Huarpe (n/a; 1) |                          | 1         |
| 13. Indo-European (3; 5) | a. Germanic            | 1         |
|                   | b. Indic                  | 1         |
|                   | c. Slavic                 | 3         |
| 14. Kadugli (n/a; 1) |                          | 1         |
| Family                  | (Subfamily) Genus            | Languages |
|------------------------|------------------------------|-----------|
| 15. Khoisan (1; 1)     | Central Khoisan              | 1         |
| 16. Na-Dené (1; 5)     | Athabaskan                   | 5         |
| 17. Niger-Congo (14; 36) | a. Gur                      | 4         |
|                        | b. Ijoid                      | 1         |
|                        | c. Kwa                        | 3         |
|                        | d. (Atlantic) Northern Atlantic | 1        |
|                        | e. (Atlantic) Southern Atlantic | 2        |
|                        | f. (Benue-Congo) Bantoid      | 15        |
|                        | g. (Benue-Congo) Cross River  | 3         |
|                        | h. (Benue-Congo) Idomoid      | 1         |
|                        | i. (Benue-Congo) Igboi        | 1         |
|                        | j. (Benue-Congo) Jukunoid     | 1         |
|                        | k. (Benue-Congo) Nupoid       | 1         |
|                        | l. (Kordofanian) Katla-Tima   | 1         |
|                        | m. (Mande) Eastern Mande      | 1         |
|                        | n. (Mande) Western Mande      | 1         |
| 18. Nilo-Saharan (3; 4) | a. (Central Sudanic) Bongo-Bagirmi | 1         |
|                        | b. (Central Sudanic) Lendu    | 1         |
|                        | c. (Eastern Sudanic) Nyimang  | 2         |
| 19. Oregon Coast (1; 1) | Coosan                       | 1         |
| 20. Oto-Manguean (2; 2) | a. Amuzgoan                  | 1         |
|                        | b. Mixtecan                   | 1         |
| 21. Penutian (1; 1)    | (Peripheral) Northern         | 1         |
| 22. Quechuan (1; 1)    | Chinchay                      | 1         |
| 23. Ramu-Lower Sepik (1; 1) | Lower Sepik              | 1         |
| 24. Salishan (3; 5)    | a. Central Salish             | 2         |
|                        | b. Interior Salish            | 2         |
|                        | c. Tsamosan                   | 1         |
In line with the prominence of Africa and Asia in the geographic breadth of the languages contained in the survey are the two most well represented language families, Niger-Congo and Sino-Tibetan; 51 of the 131 languages (38.93%) belong to one of these two families.

| Family | (Subfamily) Genus | Languages |
|--------|-------------------|-----------|
| 25. Seri (n/a; 1) | | 1 |
| 26. Sino-Tibetan (7; 15) | a. Chinese | 2 |
| | b. (Tibeto-Burman) Bodic | 6 |
| | c. (Tibeto-Burman) Burmese-Lolo | 3 |
| | d. (Tibeto-Burman) Jinghpo | 1 |
| | e. (Tibeto-Burman) Kuki-Chin | 1 |
| | f. (Tibeto-Burman) Nungish | 1 |
| | g. (Tibeto-Burman) Qiangic | 1 |
| 27. South Bougainville (2; 2) | a. Buin | 1 |
| | b. Nasioi | 1 |
| 28. Tai-Kadai (1; 1) | Kam-Sui | 1 |
| 29. Tol (n/a; 1) | | 1 |
| 30. Tonkawa (n/a; 1) | | 1 |
| 31. Trans-New Guinea (1; 1) | Angan | 1 |
| 32. Uru-Chipaya (n/a; 1) | | 1 |
| 33. West Papuan (2; 2) | a. Hatam | 1 |
| | b. Kebar | 1 |
| 34. Yanomam (n/a; 1) | | 1 |
| 35. Yeniseian (n/a; 1) | | 1 |
3.2.3 Set of Syllabic Sonsonants

Which consonants can be syllabic? In the sample, a clear majority of languages—87—permit only a single manner class of consonants—rhotic, lateral, nasal, or fricative—to be syllabic. The breakdown by class is given below in Table 3.

Table 3: Breakdown of single manner class syllabicity

| Rhotics | Laterals | Nasals | Fricatives |
|---------|----------|--------|------------|
| 4       | 1        | 77     | 5          |

Note for this discussion, and the one below in section 3.2.4, we omit from consideration the class of glides, given their idiosyncratic behavior as compared to other consonants with respect to the property of syllabicity. That being said, we of course recognize that PIE has been reconstructed with phonemic glides possessing vocalic allophones (a situation shared with the Trans-New Guinea language Kalam, as analyzed by Pawley 1966; see also Foley 1986).

The remaining 44 languages allow multiple manner classes to be syllabic, in the combinations indicated by ‘×’ in Table 4. In this sample nasals are by far the most commonly occurring syllabic consonants, and the most commonly occurring sole syllabic segments. This runs counter to the expectation that lower sonority syllabic segments imply higher sonority syllabic segments (Blevins 1995, Zec 1995)—though it should be noted that this distribution was already recognized by Bell in his study.

Table 4: Breakdown of multiple manner class syllabicity

| Languages | Rhotics | Laterals | Nasals | Fricatives | Stops |
|-----------|---------|----------|--------|------------|-------|
| 1         | ×       | ×        | ×      | ×          | ×     |
| 3         | ×       | ×        | ×      | ×          |       |
| 9         | ×       | ×        |        | ×          |       |
| 3         | ×       | ×        |        |            |       |
| 4         | ×       |          | ×      |            |       |
| 1         | ×       |          |        |            | ×     |
| 15        | ×       |          |        | ×          |       |
Based on these findings, the PIE system, in which *r, *l, *n, *m (and glides) are syllabic, would appear to be in the minority, but not alone; the eight non-Indo-European languages in table 5 show the same distribution (as does English, which is also in the survey).

As a brief case study, we consider data from the Semitic language Neo-Mandaic. As analyzed by Häberl (2009), sonorants in this language become syllabic to allow for syllabification of otherwise unsyllabifiable strings of segments, such as a word-initial sonorant followed by a consonant, or, as shown below in (13), a word-final sonorant preceded by a consonant.\(^{19}\)

\(^{19}\) The treatment of word-medial sonorants is not as clear: sonorants in CSC clusters do not seem to become syllabic, but rather a general rule of epenthesis, in which schwa is inserted between the first and second consonant of a CCC sequence, seems to apply. This determination is based on Häberl’s transcription of the form w-ǝl-Masiḥi ‘and not
Syllabic sonorants in Neo-Mandaic (Häberl 2009)

a. eššəm [ˈɛʃ.ʃ̩m] ‘name (contextual)’

b. qəmabḡeṣṣən [qə.mab.ˈʁɜs.s̩n̩] ‘I will stop (contextual)’

c. šekəl-da [ˈʃɛk.k̩.da] ‘her appearance’

d. ohhər [ˈoh.h̩r] ‘road (contextual)’

It is worth noting that despite the orthographic transcription, Häberl is quite clear in his phonetic analysis: “the syllabic status of the phoneme is confirmed by the absence of the usual anaptyctic /ə/ to break up the consonant cluster, as in (2.7), or the prothetic /ə/ before the initial consonant, as in (2.8)” (p. 50). His data points 2.7 and 2.8 are given below in (14a–b.), along with his preferred transcription (14c.):

(14) a. ×məbašqer [mə.ˈbαʃ.qɛɹ] ‘knowing’

b. ×əmbašqer [ɛm.ˈbαʃ.qɛɹ] id.

c. ḭambašqer [m.ˈbαʃ.qɛɹ] id.

Additionally, though making any claim about the typological (im)plausibility of the idiosyncratic behavior of PIE *m in view of a single other language is less than ideal, nevertheless at this stage we can point out that there is at least one case, the Austronesian language Kilivila (also known as Kiriwina), in which the only consonant that can be syllabic is m. Examples of the syllabic nasal in word-initial position can be found in the forms in (15).

(15) Syllabic /m/ in Kilivila (Lawton 1993)

a. m.ˈpa.na ‘that (piece)’

b. m.bʷəl.ˈli.la ‘his loved item’

c. m.do.ˈwa.li ‘housefly’

d. m.ki.ˈu.ta a fish type

e. m.ˈlo.pu ‘cave’

f. ˈm.na ‘er …’ (hesitation in speech)

Christian’ as [ˌwɛl.mæ.ˈsi.ʃi], in which the conjunction w- and the negative morpheme lá- are appended to a consonant-initial noun (p. 71). But cf. šekəl-da [ʃək.kl.da] ‘her appearance’, in which the medial lateral is syllabic. In any case, again, the relevant aspect of the Neo-Mandaic system here is the fact that, paradigmatically speaking, the same classes of consonant that can be syllabic in Proto-Indo-European can also be so in this language.

20 Note we generally transcribe linguistic data according to the source authors’ conventions (and will provide clarification as appropriate). This may include use of the IPA diacritic for syllabicity (⊘), as here.
Kilivila presents a counterexample to sonority-driven syllabicity from a paradigmatic standpoint, in that $m$ and only $m$ can be syllabic of the sonorant consonants in this language (which also include $m^w$, $n$, $r$, $l$, $w$, $j$).\(^{21,22}\)

### 3.2.4 Set of Sonorant Consonants

In PIE, all sonorants may be syllabic; in other words, syllabicity is paradigmatically sonority-driven. How does the set of syllabic consonants compare with the set of sonorant consonants in the languages in the survey? In spite of the strikingly large number of languages with syllabic nasals alone, syllabicity could still be analyzed as sonority-governed—as in PIE—and Blevins’ (1995) and Zec’s (1995) implication could be maintained, if nasals happened to be the only sonorants in these languages.

In fact, this hypothesis is not borne out, as table 6 (following page) demonstrates. Each row in this table corresponds to an attested set of syllabic consonants, while each column corresponds to a possible inventory of sonorants (key: Rhotic, Lateral, Nasal, Fricative, Stop). Non-zero integers indicate the

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\(^{21}\) Interestingly, in this language, not only is $m$ the only consonant that can be syllabic, it is also the only consonant that can occur in coda position.

\(^{22}\) While it does not provide an exact counterexample to Kilivila—nor a direct parallel to PIE—it may also be worth mentioning at this point the Afro-Asiatic language Kera, in which $m$ behaves differently than the other nasals do with respect to syllabicity. In this language, $n$ and $ŋ$ may be syllabic word-finally following a homorganic consonant, provided the word is polysyllabic: e.g. $kāasń$ ’my hand’ (cf. $kaasam$ your [masc. sg.] hand, with stem vowel -$a$-) and $duugŋ$ ’at night’ (Ebert 1979: 55). But when $m$ is found in this same position, it remains consonantal: e.g. $hāmām$ ’you (masc. sg.) eat’, with stem vowel -$a$ -. While consonant syllabicity cannot be neatly analyzed as paradigmatically sonority-driven in Kera (it also has liquids $l$, $r$, which cannot function as syllable nuclei), nevertheless we apparently have in this language another case, like that of PIE, in which $m$ does not play by the same rules as other members of its manner class. (However, to fully embrace the example of Kera in this context, a number of potentially confounding factors remain to be evaluated, including lexical type [note $kāasń$ is a noun form, while $hāmām$ is a verb form, though both utilize the same set of endings] and word-shape [note $kāasń$ has a long vowel in the initial syllable, while $hāmām$ has a short one]; but unfortunately Ebert’s data are such that more direct comparison involving such factors is not possible. We can at least say that an identical preceding consonant does not appear to be relevant to conditioning syllabicity, as indicated by the form $sēenń$ ’my brother.’)
number of languages with a given combination of syllabic and sonorant consonants. A value of ‘0’ indicates the absence of languages with a given combination of syllabic and sonorant consonants, while ‘–’ indicates a logically impossible combination of syllabic and sonorant consonants. Lastly, numbers in bold indicate a combination of syllabic and sonorant consonants in line with predictions based on sonority (see below).

For languages in which only nasals may be syllabic, nearly all (72/77 = 93.51%) also possess at least one other type of sonorant. There are only two types of syllabic consonant distributions in which a majority of the relevant languages have co-extensive sets of sonorants: first, obviously, when rhotics, laterals, and nasals may be syllabic (9/9 = 100%); and second, when both laterals and nasals may be syllabic (11/15 = 73.33%).

| Table 6 | Survey language syllabic consonant inventory versus sonorant inventory |
|---------|----------------------------------------------------------------------------|
|         | Sonorant Inventory                                                                 |
|         | R  | L  | N  | R, L | R, N | L, N | R, L, N | Total |
| Syllabic | R  |    |    |      |      |      |         |       |
| Consonant | R, F |    |    |      |      |      |         |       |
| Inventory | L  |    |    |      |      |      |         |       |
|          | N  |    |    |      |      |      |         |       |
|          | R, L |    |    |      |      |      |         |       |
|          | R, N |    |    |      |      |      |         |       |
|          | L, N |    |    |      |      |      |         |       |
|          | R, L, N |    |    |      |      |      |         |       |
|          | R, L, N |    |    |      |      |      |         |       |
|          | L, N, F |    |    |      |      |      |         |       |
|          | L, N, F |    |    |      |      |      |         |       |
|          | N, F |    |    |      |      |      |         |       |
|          | N, F, S |    |    |      |      |      |         |       |
|          | R, L, N, F |    |    |      |      |      |         |       |
|          | R, L, N, F, S |    |    |      |      |      |         |       |
|          | F   |    |    |      |      |      |         |       |
| Total    | 1   | 0  | 7  | 0    | 9    | 42   | 72      | 131   |
By and large, the majority of cases of syllabic consonants, when considered in the context of sonorant inventories, defy Blevin's (1995) and Zec's (1995) prediction. Again, in each row, the numbers in bold indicate those cases in which an appeal to sonority can straightforwardly account for those consonants that are syllabic. Counting up the languages in these cells, only 42 of 131 (32.06%) are amenable to explanation via sonority alone; PIE would also fall within this category. In languages in which sonority does not appear to be (the only factor) relevant, perceptibility (Wright 2001, 2004; Henke, Kaisse, and Wright 2012) may be crucial; in a perceptibility hierarchy, nasals and (sibilant) fricatives can outrank liquids.

Of these 42 languages, 26 match PIE in having co-extensive sets of syllabic and sonorant consonants. We have already presented the subset of these languages in which rhotics, laterals, and nasals can be syllabic in table 5 above. Table 7 lists the remaining cases that display this property, albeit with smaller sets of sonorants.

| Sonorant set | Language             | Family (Subfamily) | Genus        | Reference            |
|--------------|----------------------|--------------------|--------------|----------------------|
| N            | Apache (San Carlos)  | Na-Dené            | Athabaskan   | de Reuse 2006        |
|              | Chitimacha           | Chitimacha         | Chitimacha   | Swadesh 1934         |
|              | Hamtai [Kapau]       | Trans-New Guinea   | Angan        | Healey 1981          |
|              | Mpur                 | West Papuan        | Kebar        | Odé 2002             |
|              | Naasioi              | South Bougainville | Nasiol       | Hurd and Hurd 1970   |
| R, N         | Akan                 | Niger-Congo        | Kwa          | Dolphyne 1988        |
| L, N         | Chehalis (Upper)     | Salishan           | Tsamosan     | Kinkade 1963         |
|              | Coos [Hanis]         | Oregon Coast       | Coosan       | Frachtenberg 1922    |
|              | Eton                 | Niger-Congo (Benue-Congo) | Bantoid | Van de Velde 2008    |
|              | Idoma\(^{23}\)       | Niger-Congo (Benue-Congo) | Idomoid | Abraham 1967         |
|              | Micmac               | Algic              | Algonquian   | Hewson 1985          |
|              | Nooksack             | Salishan           | Central Salish | Galloway 1984     |
|              | Pomo (Southeastern)  | Hokan              | Pomoan       | Moshinsky 1974       |

\(^{23}\) This language possesses a single liquid with rhotic and lateral allophones; the lateral phonemic analysis is after Hyman (1985 [2003]: 49). Of course the crucial point here stands regardless of the phonemic status of this liquid.
3.2.5 Distribution
Do syllabic consonants occur word-initially, word-medially, and/or word-finally? Based on source descriptions, there are 114 clear determinations, and 17 unclear determinations. For the 114 clear determinations, the breakdown is given in table 8 (‘×’ indicates permitted distribution and a blank cell indicates non-permitted distribution).

| Word position | Languages | Initial | Medial | Final |
|---------------|-----------|---------|--------|-------|
|               | 47        | ×       |        |       |
|               | 6         |         | ×      |       |
|               | 8         |         | ×      |       |
|               | 10        | ×       | ×      |       |
|               | 9         | ×       | ×      |       |
|               | 10        | ×       | ×      |       |
|               | 24        | ×       | ×      | ×     |

The breakdown for the 17 unclear determinations is given in table 9 (again, ‘×’ indicates permitted distribution and a blank cell indicates non-permitted distribution; a question mark indicates the position(s) for which source materials were unclear).
### Table 9  Breakdown of distribution by word-position (unclear determinations)

| Languages | Word position | Initial | Medial | Final |
|-----------|---------------|---------|--------|-------|
| 2         |               | ×       |        | ?     |
| 1         |               | ?       | ×      |       |
| 1         |               | ?       | ×      | ×     |
| 1         |               | ×       | ×      |       |
| 3         |               | ×       | ?      | ?     |
| 6         |               | ×       | ?      | ×     |
| 1         |               | ?       | ?      | ×     |
| 2         |               | ?       | ?      | ?     |

In this sample syllabic consonants are predominantly either restricted to initial position (47 out of 114, 41.23%), or permitted in all three environments (23 out of 114, 20.18%).

The PIE distribution of syllabic consonants at both word-edges and internally falls within expectations based on these findings; the twenty-two non-Indo-European languages in table 10 (following page) also display this property (as does, again, English, as well as Sanskrit, which is also in the survey). As a case study, we consider data from the Coast Tsimshian language (also known as Sm’algyax). In this language, the sonorants m, n, l (with glottalized counterparts) can be syllabic, and in such a state can occur in all positions in the word. The data in (16) present at least one instance each of syllabic m, n, l occurring word-initially, word-medially, and word-finally.

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24 The Tsimshianic languages have alternatively been classified as part of the Penutian language family (Sapir 1921, 1929; recently revisited by Tarpent 1997), or, in view of problematic evidence (as evaluated by Hymes 1957, 1964 and Silverstein 1969, 1979), treated as an isolate.
| Language          | Family (subfamily)                     | Genus         | Reference                      |
|-------------------|----------------------------------------|---------------|--------------------------------|
| Afitti            | Nilo-Saharan (Eastern Sudanic)         | Nyimang       | de Voogt 2009                  |
| Anong             | Sino-Tibetan (Tibeto-Burman)           | Nungish       | Sun and Liu 2009               |
| Anufo [Chakost]   | Niger-Congo                            | Kwa           | Adjekum, Holman, and Holman 1993 |
| Apache (San Carlos) | Na-Déné                                | Athabaskan    | de Reuse 2006                  |
| Buin [Terei]      | South Bougainville                     | Buin          | Griffin 1996                   |
| Chipaya           | Uru-Chipaya                            | Uru-Chipaya   | Olson 1967                     |
| Dizi              | Afro-Asiatic (Omoctic)                 | North Omotic  | Allan 1976                     |
| Hamtaï [Kapau]    | Trans-New Guinea                       | Angan         | Healey 1981                    |
| Idoma             | Niger-Congo (Benue-Congo)              | Idomoid       | Abraham 1967                   |
| Kilivila [Kiriwina] | Austro-nesian (Eastern Malay-Polynesian) | Oceanic   | Lawton 1993                    |
| Lendu             | Nilo-Saharan (Central Sudanic)         | Lendu         | Tucker 1967                    |
| Liangshan Yi [Nuosu] | Sino-Tibetan (Tibeto-Burman)           | Burmese-Lolo  | Eatough 1997                   |
| Maonan            | Tai-Kadai                              | Kam-Sui       | Lu 2008                        |
| Micmac            | Algic                                  | Algonquian    | Hewson 1985                    |
| Navajo            | Na-Déné                                | Athabaskan    | Sapir and Hoijer 1967          |
| Neo-Mandaic25      | Afro-Asiatic                           | Semitic       | Häberl 2009                    |
| Qhalaxarzi [Kgalagadi] | Niger-Congo (Benue-Congo)           | Bantoid       | Dickens 1987                   |
| Senoufo [Senadi]  | Niger-Congo                            | Gur           | Mills 1984                     |
| Tashliyut Berber  | Afro-Asiatic                           | Berber        | Dell and Elmedlaoui 1985       |
| Thompson          | Salishan                               | Interior Salish | Thompson and Thompson 1992   |
| Tsimshian (Coast) | Penutian [Tsimshianic]                 | Tsimshianic   | Dunn 1978 [1995]               |
| Xhosa             | Niger-Congo (Benue-Congo)              | Bantoid       | Jordan 1966                    |

25 Given a form like šekol-da [ʃe.kol-da] 'her appearance'; see fn. 19.
Syllabic consonants in Tsimshian (Coast) (Dunn 1978 [1995])

a. akslsgmmaad [ʔəkslsgmɑ́ːd] 'sleet'
b. gynitg [ɡˈɛnɪtɡ] 'wake up'
c. kstnsool [kstnɔ́ːl] 'five (of humans)'
d. llooksmgangan [lɛ̝-kɔ̃ɡ̣ɑ̃/nɔ̃/n] 'driftwood'
e. mmah [mɔ́/h] 'kiss (esp. a child)'
f. ndzo[k [n̥də̝q̣h] 'edge'
g. stuʔp[l [stuʔpʰl] 'back of house; rear of house'

It is interesting to observe that, based on a preliminary examination of the data in Dunn (1978 [1995]), the alveolar nasal has a wider distribution in word-initial position than do either the bilabial nasal or lateral. As suggested by the data presented here, the latter two sonorants can apparently only occur before an identical consonant (in which case they are perhaps to be analyzed as the first part of a geminate, though consonantal length does not seem to be distinctive in Coast Tsimshian), while the alveolar nasal can occur before any homorganic consonant (Dunn's data show examples with following [d, ɗ, l, ɬ, n, t, t’, t̚, t̚], the remaining alveolars in the language are [s, t̚, ’n, ’l]).

If this generalization is indeed valid, what we have in Coast Tsimshian is a potentially striking parallel to the situation in PIE, in which, as we have already discussed, *m is idiosyncratic in its distribution and syllabicity. If the behavior of PIE *m is to be explained by language-specific sonority ranking, whereby *m is less sonorous than the remaining sonorants, including its fellow nasal *n (as Steriade 1988: 98 has proposed for Sanskrit; see fn. 13), then perhaps Coast Tsimshian offers a case in which the opposite ranking holds: n being less sonorous than m and l. Such a ranking could play a role in understanding why a sequence such as initial nt is phonotactically licit in Coast Tsimshian, while one such as lt is not; the sonority reversal in the case of the former would

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26 Some notes on the data: [’] and [’] indicate primary and secondary stress, respectively; [·] indicates length; [ʔp>'] (corresponding to orthographic ⟨’p⟩) is pronounced with a consonantal closure preceded by closure of the vocal cords, which is unreleased. Further, it is unclear whether [q] and [ɡ] (corresponding to orthographic ⟨k⟩ and ⟨g⟩) are to be interpreted as backed velars, or true uvulars; Dunn states that they are “pronounced by pulling the back of the tongue back against the uvula” (1979 [1995]: 1); Mulder (1994) treats them as the latter.

27 Dunn transcribes this form with [ʒ] in its dictionary entry (1978 [1995]: 80); the adjustment here is given his statement in the grammar that ⟨dz⟩ represents an affricate pronounced as in adze (1979 [1995]: 2).
be less dramatic than that of the latter. (At the same time sonority could still be analyzed as relevant for the paradigmatic determination of syllabicity, the cut-off point being between \( n \) and obstruents.)

More generally, recognition of the fact that individual members within classes of potentially syllabic consonants in a language need not necessarily behave in a uniform manner highlights the need to determine to a more comprehensive extent the parameters of such variation within and across the languages of the survey, and for that matter, within PIE itself.

3.2.6 Margins

Do syllabic consonants have onsets and/or codas? Based on source descriptions, there are 117 clear determinations, and 14 unclear determinations. Note we do not make a distinction here as to whether such marginal structure is obligatory or merely optional; recall in PIE that either is optional, though minimally syllables headed by syllabic consonants usually have either an onset or a coda.

For the 117 clear determinations, the breakdown is given in table 11 (‘×’ indicates permitted syllable structure and blank cells indicate unpermitted syllable structure). For each case, we also include the corresponding maximal shape allowed for a syllable headed by a syllabic consonant.

| Languages | Onset | Coda | Maximal shape of \( C \) syllable |
|-----------|-------|------|----------------------------------|
| 21        | ×     |      | \( C \)                           |
| 3         |       | ×    | \( C \)                           |
| 12        | ×     | ×    | \( C \)                           |
| 81        |       |      | \( C \)                           |

For the 14 unclear determinations, the breakdown is given in table 12 (again, ‘×’ indicates permitted distribution, and blank cells indicate unpermitted distribution; a question mark indicates the position(s) for which source materials were unclear).
In this sample syllabic consonants are predominantly alone in the syllables they head (81 out of 117 cases, 69.23%). In the remaining 36 clear cases, CV syllables are clearly favored (in 21 cases, 58.33%; 17.95% of the 117 total clear cases), in agreement with the cross-linguistically robust generalization that onsets are preferred over codas.

The complexity of PIE syllables headed by syllabic consonants, which allow for both onsets and codas, is a minority feature based on these findings (12 out of 117 clear cases, or 10.26%). But as with the case of segment type examined above, PIE is not alone: the seven non-Indo-European languages in table 13 also display this property (as do, again, English and Sanskrit, as well as Czech, Serbian, and Slovak, which are also in the survey).

| Language          | Family (subfamily) | Genus           | Reference                      |
|-------------------|--------------------|-----------------|--------------------------------|
| Bench             | Afro-Asiatic (Omotic) | North Omotic    | Breeze 1990                    |
| Blackfoot         | Algic              | Algonquian      | Derrick 2007                   |
| Kuuk Thaayorre    | Australian         | Pama-Nyungan    | Gaby 2006                      |
| Tashlhiyt Berber  | Afro-Asiatic       | Berber          | Dell and Elmedlaoui 1985       |
| Thompson          | Salishan           | Interior Salish | Thompson and Thompson 1992     |
| Tsimshian (Coast) | Penutian [Tsimshianic] | Tsimshianic    | Dunn 1978 [1995]               |
| Yurok             | Algic              | Yurok           | Blevins 2003                   |
To elaborate on the comparison, we focus on data from one of these languages, Kuuk Thaayorre, as analyzed by Gaby (2006). As was already observed in subsection 3.2.3, this language permits nasals, laterals, and rhotics (specifically \(m, n, \eta, l, r, \mathfrak{r}\)) to be syllabic.\(^{28}\) Examples of these syllabic consonants heading syllables of varying shapes are given in (17).

\[ (17) \text{ Syllabic consonants in Kuuk Thaayorre (Gaby 2006: 51) } \]

- a. \(\text{CC}_C, \text{C}_C:\) \(\text{we}_\mathfrak{r}.k\text{r}_\mathfrak{r}\) ‘rubbed each other’
- b. \(\text{CC}_C:\) \(\text{mi}_\eta.\text{n}_\mathfrak{r}\) ‘take fright’
- c. \(\text{CC}_C:\) \(\text{ke}_\mathfrak{r}.m\text{p}_\mathfrak{r}\) ‘corella’
- d. \(\text{C}_C\text{C}_C:\) \(\text{jo}.\text{kun}.\text{ma}.\text{n}_\mathfrak{r}\text{p}\) ‘same way’

We see here forms in which a syllabic consonant heads a syllable lacking an onset or coda (17a.); one having an onset but no coda (17a.–c.); and one having both an onset and a coda (17d.). What is not apparently found in Kuuk Thaayorre are syllables of shape \(\text{C}_C\). This may be due largely to the fact that syllabic consonants in this language are restricted to non-initial positions; but as the form in (17a.) shows, non-initial onsetless syllables are not impossible, so there may be other factors at play.\(^{29}\)

3.3 Remaining Properties of PIE Syllabic Sonorants

In addition to these results, we can also examine in a more preliminary capacity the remaining properties of PIE syllabic sonorants identified above in section 2, involving morphological distribution, prosody, alternation, and directionality. Again, the limited nature of these findings is due chiefly to the paucity of relevant information contained in survey source materials.

\(^{28}\) With one exception, as Gaby notes (2006: 51 fn. 38): the emphatic pragmatic suffix -\(t\), consisting of a dental oral stop, which appears syllabic when suffixed to the addressee-proximate demonstrative \(ulp\).

\(^{29}\) In fact Gaby entertains two approaches to syllabification in Kuuk Thaayorre: a CV analysis privileging onsets over codas versus a VC analysis privileging codas over onsets; the syllabifications presented in (17) follow from the former. Under the latter, a syllable of shape \(\text{CC}_C\) would be found in the form given in (17d.), syllabified \(\text{jo}.\text{kun}.\text{ma}.\text{r}_\mathfrak{r}\text{p}\), while the ideophone \(prk\) ‘breaking sound’ is Gaby’s example of a \(\text{C}_C\text{C}_C\) syllable. Regardless of which analysis one maintains, it remains the case that Kuuk Thaayorre, like PIE, permits syllables headed by syllabic consonants to have onsets and/or codas.
3.3.1 Morphological Distribution

As concerns the distribution of syllabic consonants according to morphological class, the current findings of the survey are particularly preliminary in nature. However, a few interesting observations can be made at this stage.

We begin by summarizing in Table 14 the patterns in the distribution of syllabic consonants by morpheme type attested in the survey. For each pattern we also provide an example of a language (not necessarily the only one in the survey) that instantiates it.

| Morpheme type | Prefix | Root | Suffix | Language | Family (subfamily) | Genus | Reference |
|---------------|--------|------|--------|----------|-------------------|-------|-----------|
| ×             | Chingoni | Niger-Congo (Benue-Congo) | Bantoid | Ngonyani 2003 |
| ×             | Hatam | West Papuan | Hatam | Reesink 1999 |
| ×             | Ket | Yeniseian | Yeniseian | Vajda 2000 |
| × ×           | Koromfe | Niger-Congo | Gur | Rennison 1997 |
| × ×           | Kabba | Nilo-Saharan (Central Sudanic) | Bongo-Bagirmi | Moser 2004 |
| × ×           | no examples | | | |
| × × ×         | Qhalaxarzi | Niger-Congo (Benue-Congo) | Bantoid | Dickens 1987 |
| n/a           | Khoekhoe | Khoisan | Central Khoisan | Brugman 2009 |
| n/a           | Bench | Afro-Asiatic (Omotic) | North Omotic | Breeze 1990 |

As can be seen, multiple languages in the survey, exemplified here by Chingoni, Hatam, Ket, Koromfe, and Kabba, are like PIE in possessing roots, prefixes, and suffixes, while others such as Khoekhoe and Bench have only a subset of these morpheme types. Both cases show variation in the permitted distribution of syllabic consonants by morpheme type. For the PIE-like languages, nearly every logically possible distributional pattern is attested in the survey, except for one: the situation in which roots and suffixes can possess syllabic consonants, but prefixes cannot. As for those languages with smaller inventories of morpheme types—specifically, here, languages lacking prefixes—we see at least two patterns: syllabic consonants permitted in both roots and suffixes (Bench), versus syllabic consonants permitted only in suffixes (Khoekhoe).30 We will now present representative data from Qhalaxarzi and Bench,

30 More properly, syllabic consonants in Khoekhoe are found in enclitics marking person,
the two languages listed in table 14 permitting syllabic consonants across their respective full range of morpheme types.

The Bantoid language Qhalarxarzi—already introduced in table 10 above as permitting syllabic consonants in initial, medial, and final positions in the word—has a syllabic nasal segment that constitutes both the first person singular object prefix and the locative suffix, and can also occur in roots with no particular morphological significance (Dickens 1987). Examples of all three of these cases are given below in (18).

\[(18)\] **Syllabic nasals in Qhalaxarzi (Dickens 1987)**

a. As first person singular object prefix

i. \(m\)-p\(ô\)na 'see me!'
ii. \(n\)-t\(h\)abá 'slaughter me!'
iii. \(n\)-ts\(h\)ebá 'slander me!'
iv. \(n\)-e\(h\)úca 'teach me!'
v. \(n\)-k\(h\)úmísa 'enrich me!'
vi. \(n\)-q\(h\)áca 'trample me!'

b. As locative suffix

i. m\(p\)-pižé-\(n\) 'in the pot'
ii. m\(o\)-šéc\(h\)-\(n\) 'in the dish'

c. In roots

i. m\(h\)ó 'head of cattle'
ii. j\(t\)šó 'nose'
iii. sé\(j\)ka 'look!'
iv. l\(e\)bé\(j\)tele 'shop'
v. bož\(w\)áŋ̩́ 'grass'

number, and gender (Brugman 2009: 95), but we group these morphemes with suffixes given their shared orientation vis-à-vis the root.

31 A few notes on Dickens' transcription system: high tone is indicated by an acute accent, while syllables with low tone are unmarked; \([\acute{s}], [\acute{z}] = \text{IPA } [\acute{f}], [\acute{z}].\)

32 While these data might point to an analysis whereby the syllabic nasal is instead simply a moraic coda, introducing codas of any kind complicates a system which otherwise seems only to permit (based on Dickens' data—he does not explicitly discuss syllabification) syllables of shapes N̩ and CV. (Dickens does give three examples with an apparent Cw onset—\(nts\(w\)ela 'tell me!', \(ž\)\(w\)ela 'tell!', bož\(w\)áŋ̩́ 'grass'—but the status of w is unclear; glides are not included in his phonemic inventory for the language, nor does he discuss them anywhere else. As all three of these forms involve alveopalatal sounds, perhaps some low-level phonetic phenomenon may be at work, though Dickens does generally transcribe in / /.)
Importantly, while syllabic consonants are permitted in multiple types of morpheme in Qhalaxarzi, they are, based on Dickens’ analysis, highly restricted in prefixes and suffixes, to the point of occurring in only a single example of each. Furthermore, Dickens grants the syllabic nasal phonemic status (i.e., /N/, unspecified for place of articulation but with the place-based allophones observed in (18), which are conditioned by the following segment), differentiating this segment at the phonemic level from nonsyllabic nasals, which are shorter and do not bear tone (1987: 301). Together these aspects of the Qhalaxarzi system markedly distinguish it from PIE, in which sonorant syllability is generally predictable, and not so restricted in terms of distribution within morpheme types.

Like Qhalaxarzi and PIE, in the North Omotic language Bench—already introduced in table 13 above as permitting onsets and codas in syllables headed by syllabic consonants—members of the full range of attested morpheme types can feature syllabic consonants; yet this range happens to be more limited in lacking prefixes. Syllabic nasals (the only type of syllabic consonant) can be found in both roots and suffixes (Breeze 1990). Examples are given in (19).

(19) Syllabic consonants in Bench roots and suffixes (Breeze 1990)\(^\text{34}\)

\begin{itemize}
  \item[a.] Roots
    \begin{itemize}
      \item[i.] \(_{i}^{3}r_{a}^{3}t_{n}^{3}\) ‘suffer’
      \item[ii.] \(_{u}^{3}k_{n}^{3}\) ‘flower’
      \item[iii.] \(_{s}^{3}b_{m}^{4}b_{a}^{3}\) ‘snake’
    \end{itemize}
  \item[b.] Suffixes
    \begin{itemize}
      \item[i.] \(_{\text{?}}^{3}r_{a}^{4}d-n_{3}^{3}-s_{-}^{3}a_{-}^{3}g-u_{2}^{3}-e_{2}^{3}n_{3}^{3}\) ‘so that he will not enter’
        enter-FUTURE-NEGATIVE-DETERMINER-PURPOSE
      \item[ii.] \(_{a}^{3}n_{3}^{3}-w_{3}^{3}o-t_{n}^{3}-n_{5}^{3}\) ‘and like people’
        person-PLURAL-LIKE-CONNECTOR
      \item[iii.] \(_{k}^{3}a_{y}^{3}s_{-}^{3}-n_{3}^{3}\) ‘having worked’
        work-PRESENT-PERFECT-PARTICIPLE\(^\text{35}\)
    \end{itemize}
\end{itemize}

\(^{33}\) In spite of this contrast at the phonemic level, Dickens does not simply associate the syllabic nasal with the class of vowels, and understandably so; the syllabic nasal patterns with consonants in being able to occur at the left edge of the word (at least given Dickens’ data; cf. fn. 32).

\(^{34}\) A few notes on Breeze’s transcription system: superscript numerals indicate tone; \([\$]\) = IPA \([f]\); \([\$]^{\prime}\) = IPA \([b']\), i.e. an ejective alveolar affricate; \([y]\) = IPA \([j]\) (and likewise superscript \([y]\) indicates palatalization).

\(^{35}\) Strictly speaking, this participial suffix is used when the following verb has a different subject.
While syllabic nasals can occur in both roots and suffixes, as these data demonstrate, nevertheless Breeze does note some restrictions in their distribution (1990: 9–10). Regarding verb roots, syllabic nasals can only occur in word-final position, as in (19a.i.). As for suffixes, it is apparently the case that no more than two of the up to four syllables (for nouns) or five syllables (for verbs) added to roots by suffixation contain a syllabic nasal, though a syllabic nasal can occur in any suffix syllable (it would appear that (19b.ii.) presents a counterexample to the first of these observations).

In short, while a more comprehensive picture of the permitted distribution of syllabic consonants across different morpheme types in the languages of the survey remains to be compiled, nevertheless the preliminary picture developed so far offers no reason not to consider the situation in PIE as anything out of the ordinary.

3.3.2 Prosody

Again, in PIE syllabic consonants share with ‘true’ vowels the capability to bear accent (at least as a limited set of data would indicate), but differ in not showing length contrasts. The preliminary findings of the typological survey suggest that this is not an unusual situation: the participation of syllables headed by syllabic consonants in prosodic phenomena is not unheard of, yet at the same time there are also languages in which these syllables appear not to fully engage in the prosodic domain. Given the current state of evaluation of the languages of the survey, we will focus on two prosodic phenomena in particular, stress and tone; at this time we have been unable to identify clear-cut determinations regarding length.

It would seem that for the purposes of the phenomenon of stress placement, syllables headed by syllabic consonants tend to be invisible; this appears to be the case in, for example, the aforementioned Coast Tsimshian. In this language, it is usually the final syllable that receives (primary) stress, yet there are a number of examples in Dunn’s data showing penultimate stress in forms in which the final syllable is headed by a syllabic consonant:

(20) Stress placement in Coast Tsimshian (Dunn 1978 [1995])

a. aksł̥m̥maad [ʔåksl̥s̥m̥ma·d̥] ‘sleet’

b. éepn [ʔé·ʌp̥h] ‘light (of weight)’

c. gu’plen [ɡú·ʔp̥l̥] ‘two (of abstract objects; of round objects)’

Admittedly, these forms may be exceptional for other reasons; Dunn notes the rule of final stress does not apply when the final syllable is a suffix or connective.
Unfortunately we have been unable to ascertain whether such exceptions are relevant in the data cited here.\footnote{A potential counterexample to this rather tentative generalization comes from Kilivila, already introduced above in 3.2.3. In this language, penultimate stress is generally the rule, unless for instance the final syllable is heavy (closed by m or containing a diphthong), in which case it receives primary stress instead (Lawton 1993: 44–45). As seen in two of the forms introduced in that subsection—’m.na ‘er …’ (hesitation in speech) and ’m.wo, an island name—syllabic m can bear stress according to the general practice (though one wonders as to the significance of the fact the former is not a lexical item and the latter is as we understand it a proper noun).}

At the same time, participation in tonal placement appears to be much more common for syllables headed by syllabic consonants across the languages in the survey. We observe tone-bearing syllabic consonants (typically nasals) as a not uncommon phenomenon in the Afro-Asiatic, Niger-Congo, Nilo-Saharan, and Sino-Tibetan languages in the survey; some representative examples are given below in (21)–(24).

(21) \textit{Tone-bearing syllabic consonants in Afro-Asiatic}
\begin{enumerate}
\item a. Bench (North Omotic): \textipa{u\textsuperscript{3}kn\textsuperscript{3}} ‘flower’ (Breeze 1990 [see (19a.ii.)])
\item b. Kera (East Chadic): \textipa{d\textsuperscript{\hat{y}}\textsuperscript{3}ŋ\textsuperscript{3}} ‘at night’ (Ebert 1979)
\item c. Mina (Biu-Mandara): \textipa{\textipa{\dot{i}v\textipa{\dot{a}}}} ‘excrement’ (Frajzyngier et al. 2005)
\end{enumerate}

(22) \textit{Tone-bearing syllabic consonants in Niger-Congo}
\begin{enumerate}
\item a. Ewondo (Bantoid): \textipa{ŋ\textipa{\check{a}}l\textipa{l}} ‘wife, woman’ (Redden 1979)
\item b. Ibibio (Cross River): \textipa{ŋ\textipa{\ddot{b}}\textipa{\check{a}r\textipa{\check{a}}}} ‘nail’ (Essien 1990)
\item c. Mani (Bullom): \textipa{\textipa{\ddot{n}d\textipa{k}}} ‘hunger’ (Childs 2011)
\end{enumerate}

(23) \textit{Tone-bearing syllabic consonants in Nilo-Saharan}
\begin{enumerate}
\item a. Afitti (Nyimang): \textipa{mb\textipa{\grave{r}o}} ‘walking stick’ (de Voogt 2009)
\item b. Kabba (Bongo-Bagirmi): \textipa{n\textipa{\ddot{g}\textipa{\check{a}r\textipa{\check{a}}}}} ‘he knows’ (Moser 2004)
\item c. Lendu (Lendu): \textipa{s\textipa{\ddot{s}}} ‘shoe’ (Lojenga 1989)
\end{enumerate}

(24) \textit{Tone-bearing syllabic consonants in Sino-Tibetan}
\begin{enumerate}
\item a. Angami (Kuki-Chin): \textipa{mp\textipa{\check{a}k\textipa{\check{e}ts\textipa{\check{e}sh}}} ‘leprosy’ (Giridhar 1990)
\item b. Jinghpo (Jinghpo): \textipa{m\textipa{\tilde{3}p\textipa{\textipa{\check{u}n\textipa{\check{u}}}\textipa{\check{u}}}\textipa{\check{u}}} ‘the wind’ (Qingxia and Diehl 2003)
\item c. Lisu (Shibacha dialect; Burmese-Lolo): \textipa{m\textipa{\tilde{3}p\textipa{\textipa{\check{u}}}\textipa{\check{u}}} ‘not to carry’ (Yu 2007)
\end{enumerate}

In fact, the determination of these segments' syllabic in the first place is often based on their ability to bear tone.
Clearly, further study of the languages in the survey from the prosodic standpoint is necessary. Still, at this time, as we were able to propose with respect to morpheme-based distribution, so it would also appear to be the case that at least the accentability of PIE syllabic consonants is not typologically bizarre. (Though it should be said that further study of the PIE facts themselves constitute a necessary step toward developing a better understanding of this issue.)

### 3.3.3 Alternation

Do consonants alternate between syllabic and non-syllabic in morphologically-related contexts? Active alternation is not well demonstrated across the languages in the survey. Still, the Algonquian language Micmac, as reported by Hewson (1985), has syllabic sonorants \( m, n, l, i, u \) that actively alternate with consonantal counterparts, as shown in (25):

\[
\begin{align*}
\text{(25) } & \text{} \\
\text{a. } m \sim m̥ & \quad \text{temsǝk } [\text{tem̥sǝk}] \quad \text{‘he cuts it off’} \\
& \quad \text{tmse·n } [\text{tmze·n}] \quad \text{‘cut it off!’ impv.} \\
\text{b. } n \sim n̥ & \quad \text{entu } [\text{en̥tu}] \quad \text{‘I lose it’} \\
& \quad \text{ntutes } [\text{ndudes}] \quad \text{‘I will lose it’} \\
\text{c. } l \sim l̥ & \quad \text{kelpilatl } [\text{kel̥piladl̥}] \quad \text{‘he ties him up’} \\
& \quad \text{klpil } [\text{kl̥bil}] \quad \text{‘tie him up!’ impv.} \\
\text{d. } w \sim u & \quad \text{kewčit } [\text{kew̥čit}] \quad \text{‘he is cold’} \\
& \quad \text{ku-čew } [\text{kū-ǰidew}] \quad \text{‘he will be cold’} \\
\text{e. } y \sim i & \quad \text{eyk } [\text{ey̥k}] \quad \text{‘he is’} \\
& \quad \text{i·tew } [\text{i·dew}] \quad \text{‘he will be’}
\end{align*}
\]

As can be seen, the morphologically related pairs in (25a.-e.) show sonorants functioning as syllable margins in the first form and sonorants functioning as syllable nuclei in the second form. In fact Hewson presents these data in the context of a comparison in this regard between Micmac and PIE; yet though the two languages do both appear to exhibit morphophonological alternation, it is important to also note the distinction in their sonorant inventories: in Micmac, which also lacks \( r \), high vowels are considered phonemic, and have non-syllabic allophones, instead of the opposite relationship holding between these segments as reconstructed for PIE.

### 3.3.4 Directionality

Lastly, is directionality relevant in the selection of syllabic consonants? Directionally-determined syllabicity is also not well demonstrated across the languages included in the survey. Still, at least two cases are worthy of comment.
In the Tashlhiyt Berber language, preferences for higher sonority segments to be syllable peaks and for syllables to have onsets together conspire to determine the syllabification of consonants. However, it is sometimes the case that these two priorities alone provide an insufficient basis for determining syllabification. Specifically, when two adjacent segments of like sonority are in a vocalizing environment (e.g. C__C), evidence suggests that it is the left-hand one that is syllabic.

(26) Directional syllabification in Tashlhiyt Berber (Dell and Elmedlaoui 1985)\(^{37}\)

| Manner   | Input   | Syllabification | Alternative |
|----------|---------|-----------------|-------------|
| a. Stop-Stop | /t-ftk-t/ | tF.tKt (*tFt.kT) | ‘you suffered a sprain’\(^{38}\) |
| b. Fric-Fric | /rks-x/ | R.kSx *Rk.sX | ‘hid’ |
| c. Nasal-Nasal | /baN-n/ | ba.yNn *bay.nN | ‘they (m.) appear’ |
| d. Glide-Glide | /I-sUfU-IIt/ | isufuyyt *isufwiyt | ‘let him illuminate’ |
|           | /ldI-III/ | Ldiyyi *Ldyiyi | ‘pull me!’ |

For each word, the preferred syllabification as well as its alternative abide by the general principles of Tashlhiyt syllabification: syllables have relatively highly sonorous nuclei, and these syllables (if they are not in initial position) have onsets.

For a system apparently matching PIE in both having syllabic sonorants, and in vocalizing right-hand sonorants under the appropriate conditions, we point to the Northern Interior Salish language Shuswap, as analyzed by Kuipers (1974, 1989). The inventory of sonorants in Shuswap includes plain m, n, l, y, w, γ, γ̇, γ̓, and glottalized m̓, n̓, l̓, y̓, w̓, γ̓/̓, \([ʕ̓]\), \([ʕ̓˚]\). The distribution of syllabic and non-syllabic sonorants is as follows: all sonorants are consonantal immediately adjacent to a vowel: V_ or _V. Further, sonorants are vocalic

\(^{37}\) Syllabic consonants are given in uppercase.

\(^{38}\) Dell and Elmedlaoui do not include this form in their discussion of the phenomenon in question, but present it elsewhere in the paper. As such the alternative syllabification is our conjecture, based on the syllabification pairings in (b.–d.).

\(^{39}\) “The glides γ/, γ̇ are comparable to voiced prevelar fricatives but are pronounced with a very wide aperture” (1974: 24).

\(^{40}\) “i̇ is close to a voiced uvular fricative or to a weak uvular trill, again with a wide aperture; it sounds somewhat like a pharyngealized back [a], except in the surroundings é-C, é-# (# = word-end), where the combination e’i sounds as long [a:]” (1974: 24).

\(^{41}\) “i̇ sounds like a pharyngealized [ɔ], except in the surroundings û-C, û-#, where [ɔ:] results” (1974: 24).

\(^{42}\) [’i̇] coincides with /ʔ/ (1974: 20).
in the positions C__C (between any two consonants) and C__# (between a consonant and word-final position).

The similarity to the PIE situation emerges in consideration of what happens when multiple adjacent sonorants find themselves in a potentially syllabic environment. For two such sonorants, Kuipers states that the first is consonantal and the second is vocalic—i.e. CRRC, CRR#, #RRC (1974: 24). For three such sonorants (of which the first and third do not adjoin a vowel), Kuipers (1974: 25) states that the second is consonantal and the others are vocalic; furthermore, if the first is word-initial, it is consonantal and the second and third are vocalic—i.e. CRRRC, CRRR# and #RRRC. The final scenario schematized here is seemingly at odds with the basic property of syllabic sonorants in Shuswap, namely that they surface only when not adjacent to another vocalic segment; perhaps in recognition of this dissonance, in his subsequent work Kuipers offers a slight revision: “if T is any obstruent, any resonant [sonorant] adjacent to a vowel (a nonsyllabic, i.e., consonantal position), or word-final pause, then we have TRT, TRRT, TRRRT, word-initially RəT, RRT, RəRRT” (1989: 12–13). In other words, it is the first and third sonorants which are syllabic, just as is the case outside of initial position (on the use of the schwa in Kuipers’ transcription, see below).

Kuipers’ analysis of Shuswap is not without its complications, though, as he seems to employ a two-fold conception of consonant syllabicity. Consider his relevant data for multiple sonorant sequences, presented below in (27)–(32), and organized according to word-position (initial in (27) and (30), medial in (28) and (31), final in (29) and (32)), with relevant sequences underlined and classified according to sonorant type.43

(27) #RRC-
   a. wlmín [wal'mín] ‘a fungus’ (G+L)
   b. ylqínm [yəlqɛ́inəm] ‘coil up’ (G+L)
   c. wycín [wi(:)cín] ‘loud’ DC
   d. ywyuwt [yu(:)yút] ‘slow in acting’ (G+G)
   e. yʕ˚yuʕ˚t [yɔ̂(:)yɔ́ʕ˚t, -ɔ̂:t] ‘intensive’ (G+G)

In addition to these forms, Kuipers also cites pwntes ‘he beats the drum’, featuring a sequence of glide + nasal, with two phonetic transcriptions: [pwantɛ́s] and [pəwəntɛ́s]. The former is the expected outcome, given his rule; the latter shows vocalization of both sonorants, perhaps to avoid a labial consonant cluster.

Forms marked ‘DC’ are from the Deadman’s Creek dialect.
As can be seen from his transcriptions, Kuipers understands a sonorant in “vocalic position” to refer both to situations in which a schwa is inserted before the relevant segment (indicated by his use of the schema [əR] as in e.g. (27a.), (28a.), (29b.), etc.), as well as to situations in which the consonant itself functions as a syllable peak (indicated by his use of the schema [R̥] as in e.g. (28c), (29a.), (30a.), etc.)
(29a.), (30d.), etc.). In fact he summarizes his transcription system for sonorant syllabicity as follows:

### Table 15

**Sonorant transcription in Shuswap (Kuipers 1974: 25)**

| Con. pos. | m | ŋ | n | ň | l | ũ | w | ˘w | y | ˘y | γ | ˘γ | ḷ | ˘ḷ |
|-----------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voc. pos. | əm | ə m | ən | ə n̓ | əl | ə l̓ | əu | ə u | i̯ | ˘i̯ | ˘a | ˘å | ˘ɔ | ˘ɔ̂ |
| Init. | mə- | ـnə- | ـlə- | ـwu- | ـyi- | ˘γ/ə- | ˘a- | ˘ɔ- |

The forms for the nasals and lateral in which syllabicity is indicated by a diacritic (not by schwa) are used in instances in which they follow a homorganic consonant: in this environment they are “characterized by close contact between consonant and vocalic resonant, i.e. by absence of an automatic vowel before the closure of the resonant” (1974: 25). The transcription of the preceding homorganic consonant with capitals in such cases, as in e.g. (29a.) `mom` [mɔ́m LN] ‘I put them down’, is meant to indicate velic or lateral release before a nasal or lateral, respectively. Lastly, with respect to the transcriptional variant for initial position, the presence of the schwa following the sonorant meshes with the apparent dispreference exhibited by Shuswap for vowels to occur at the left edge of the word.

Given this system, Shuswap would seem to provide a match for PIE right-hand vocalization when sequences of shape CRR{C, #} feature homorganic consonants. If directionality were not in effect in the selection of the syllabic sonorant, then for a form like `mom` [mɔ́m LN] we might otherwise expect ×[mόməln], in which the alveolar lateral rather than the nasal fills Kuipers’ conception of vocalic position. But apart from the homorganic idiosyncrasy, it may be the case that right-hand sonorants in Shuswap are not ‘syllabic’ so much as determiners of the position of an epenthetic schwa. If the latter holds, then in these more general cases directionality need not necessarily be invoked in Shuswap, since presumably CRǝR{C, #} can be obtained over CaRR{C, #}

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45 The diacritic ¯ is used to indicate a slight velarization or pharyngealization.
46 Glottalized sonorants occur only after vowels or in vocalic position (1974: 21).
47 Sonorant syllabicity adjacent to a homorganic consonant is also found in Southeastern Pomo, involving word-initial m and l (Moshinsky 1974).
simply by syllable-structural preferences (assuming complex codas are less preferred than complex onsets).48

3.4 Summary

Even in its preliminary form, the typological survey of syllabic consonants shows that the various aspects of PIE syllabic consonants have analogues in other languages of the world. While there is certainly variation in the numbers of languages sharing any given property with PIE, no property appears to be absolutely unparalleled. Given these results, we can arguably be more assured in the plausibility of the reconstructed system.

Our findings concerning the property of right-hand directionality, arguably the subject of the most scrutiny in this area of PIE scholarship, are particularly noteworthy. Not only have we been able to identify a language in the survey in which this property is apparently relevant (Shuswap), but we have also been able to observe the complementary property, left-hand directionality, in play as well (in Tashlhiyt Berber). Taken together these two languages provide us with a satisfying typology and point of comparison for this particular aspect of the reconstructed PIE system.

4 Conclusions and Future Work

Given the established properties of the PIE syllabic sonorants, our goal in this paper was to situate the reconstructed PIE system within a broader typology of languages with syllabic consonants. Indeed the preliminary typological study of syllabic consonants yields a number of robust generalizations (within context), and demonstrates that while no language has been found to exhibit the PIE system of syllabic consonants in every detail, many of its distinct components are at least discernible across multiple, unrelated languages. We maintain

48 In fact perhaps the same could be said of momln-type cases, in which the initial consonant of the three-consonant sequence is itself not homorganic with the following two consonants, if one treats the CVC.CC̆ shape of [mɔ́mL̥] as more preferable than the CV.CVCC shape of ×[mɔ́mL̥n] (assuming heterosyllabification of intervocalic consonant clusters). A critical piece of data which could bear on this issue would be a form with a three-consonant sequence in which all three members were of like place of articulation; in this case one would presumably have to compare potential outputs of shape CVC.CC̆ versus shape CV.CCC̆, a more complicated exercise relying on syllable-structural preferences alone. Unfortunately no such form has as yet been identified in examination of either Kuipers 1974 or 1989.
that engaging in this kind of work makes an important contribution to our understanding of PIE as a ‘real’ language; the fact that we have apparently only confirmed what was already held to be the case—that we have ended where we started, as it were—should by no means minimize its significance.

Moving forward, we envision continuing research in this area along three dimensions, synchronic, diachronic, and typological. First, a comprehensive synchronic account of segment syllabicity in PIE should of course have something to say about the laryngeals; how exactly the behavior of these three segments ought to be integrated into the PIE system remains to be determined. Further, it will be useful to establish a clear inventory of the morphemes in PIE—both verbal and nominal, root and affix—which by virtue of their segmental make-up have the potential to provide the relevant environment for the morphophonological alternation of syllabic and non-syllabic sonorant. Doing so would provide a rich source of data with the potential to allow us not only to confirm (or disconfirm) our understanding of these segments—as a class of sounds and individually—but also to bring to light previously unrecognized properties they may exhibit.

Diachronically, it will be important to explicitly identify the changes that the PIE system has undergone in the various daughter languages, both descriptively and in terms of formal analyses like that of Cooper 2012a. How can the development into, e.g., Vedic Sanskrit, which preserves a syllabic liquid, but shows a for the PIE syllabic nasals, be better understood in this context? More generally, if syllabic consonants are restricted in distribution—if consonants make poor syllabic peaks—how should vowel reduction, which is said to open the door to consonant vocalization (cf. Bell 1978), occur in the first place?

Lastly, in the typological domain, of course it will be important to confirm that the generalizations presented here hold up in consideration of additional languages, preferably with profiles that allow us to increase the genetic and geographic diversity of the survey. Furthermore, it will be interesting to examine whether any correlations can be identified between the multiple individual properties of syllabic consonants considered here; it may be the case that subsets of these properties cluster to a statistically-significant degree. If such higher-level typological implications can be identified, it will be important to evaluate how the constellation of properties of PIE syllabic consonants measures against them. Finally, assuming the thrust of the typological findings holds firm, an interesting question emerges concerning the aforementioned development from PIE into Sanskrit—if nasals are so much more prominently syllabic than liquids in the languages of the world, what conditions must have been in effect to yield the synchronic Sanskrit state of affairs?
Appendix: Survey of Syllabic Consonants

1 Genetic and Geographic Information
Note that in the Language column, alternate names are included in brackets, while dialect information is given in parentheses.

| Language | Family (subfamily) | Genus | Country     |
|----------|--------------------|-------|-------------|
| Abipón   | Guaicuruan         | Southern | Argentina   |
| Afitti   | Nilo-Saharan (Eastern Sudanic) | Nyimang | Sudan       |
| Ahtna Athabaskan | Na-Dené | Athabaskan | United States |
| Akan     | Niger-Congo        | Kwa   | Ghana       |
| Akha     | Sino-Tibetan (Tibeto-Burman) | Burmese-Lolo | Myanmar |
| Allentiac | Huarpe     | Huarpe | Argentina   |
| Amuzgo   | Oto-Manguean      | Amuzgoan | Mexico     |
| Angami   | Sino-Tibetan (Tibeto-Burman) | Kuki-Chin | India      |
| Anong    | Sino-Tibetan (Tibeto-Burman) | Nungish | Myanmar    |
| Anufo [Chakosi] | Niger-Congo | Kwa | Ghana       |
| Apache (San Carlos) | Na-Dené | Athabaskan | United States |
| Bade     | Afro-Asiatic (Chadic) | West Chadic | Nigeria   |
| Bajau (West Coast) | Austronesian | Sama-Bajow | Malaysia   |
| Bariba [Baatonum] | Niger-Congo | Gur | Benin       |
| Belhare  | Sino-Tibetan (Tibeto-Burman) | Bodic | Nepal      |
| Bench    | Afro-Asiatic (Omotic) | North Omotic | Ethiopia   |
| Blackfoot | Algic           | Algonquian | Canada     |
| Bruu (Western) | Austro-Asiatic (Mon-Khmer) | Katuic | Thailand   |
| Buin [Terei] | South Bougainville | Buin | Papua New Guinea |
| Cantonese | Sino-Tibetan      | Chinese  | China       |
| Carrier (Central) | Na-Dené | Athabaskan | Canada     |
| Chehalis (Upper) | Salishan | Tsamosan | United States |
| Chilcotin | Na-Dené          | Athabaskan | Canada     |
| Chingoni [Ngoni] | Niger-Congo (Benue-Congo) | Bantoid | Tanzania   |
| Chipaya  | Uru-Chipaya       | n/a    | Bolivia     |
| Chitimacha | Chitimacha     | n/a    | United States |
| Coos [Hanis] | Oregon Coast | Coosan | United States |
| Cuicatec(o) | Oto-Manguean   | Mixtecan | Mexico      |
| Czech    | Indo-European    | Slavic  | Czech Republic |
| Dhimal   | Sino-Tibetan (Tibeto-Burman) | Bodic | Nepal       |
| Diola-Fogny | Niger-Congo (Atlantic) | Northern Atlantic | Senegal |
| Language             | Family (subfamily)                      | Genus         | Country                      |
|----------------------|----------------------------------------|---------------|------------------------------|
| 32. Dizi             | Afro-Asiatic (Omotic)                  | North Omotic  | Ethiopia                     |
| 33. Dumi             | Sino-Tibetan (Tibeto-Burman)           | Bodic         | Nepal                        |
| 34. English          | Indo-European                          | Germanic      | England                      |
| 35. Eton             | Niger-Congo (Benue-Congo)              | Bantoid       | Cameroon                     |
| 36. Ewondo           | Niger-Congo (Benue-Congo)              | Bantoid       | Cameroon                     |
| 37. Gilbertese [Kiribati] | Austronesian (Eastern Malayo-Polynesian) | Oceanic     | Kiribati                     |
| 38. Goemai           | Afro-Asiatic (Chadic)                  | West Chadic   | Nigeria                      |
| 39. Gonja [Nkonya]   | Niger-Congo                            | Kwa           | Ghana                        |
| 40. Gtaʔ             | Austro-Asiatic                         | Munda         | India                        |
| 41. Hamtai [Kapau]   | Trans-New Guinea                       | Angan         | Papua New Guinea             |
| 42. Hatam            | West Papuan                            | Hatam         | Indonesia                    |
| 43. Ibibio           | Niger-Congo (Benue-Congo)              | Cross River   | Nigeria                      |
| 44. Idoma            | Niger-Congo (Benue-Congo)              | Idomoid       | Nigeria                      |
| 45. Igbo             | Niger-Congo (Benue-Congo)              | Igboid        | Nigeria                      |
| 46. Iko [Kolokuma]   | Niger-Congo                            | Ijoíd         | Nigeria                      |
| 47. Inga             | Quechuan (Peripheral)                  | Northern      | Colombia                     |
| 48. Jabêm [Yabem]    | Austronesian (Eastern Malayo-Polynesian) | Oceanic     | Papua New Guinea             |
| 49. Jilu [Neo-Aramaic] | Afro-Asiatic                          | Semitic       | Iraq                         |
| 50. Jingho           | Sino-Tibetan (Tibeto-Burman)           | Jinghpo       | Myanmar                      |
| 51. Jukun            | Niger-Congo (Benue-Congo)              | Jukunoid      | Cameroon                     |
| 52. Kabba            | Nilo-Saharan (Central Sudanic)         | Bongo-Bagirmi | Central African Republic     |
| 53. Kabiye           | Niger-Congo                            | Gur           | Togo                         |
| 54. Katla            | Niger-Congo (Kordofanian)              | Katla-Tima    | Sudan                        |
| 55. Kera             | Afro-Asiatic (Chadic)                  | East Chadic   | Chad                         |
| 56. Ket              | Yeniseian                              | n/a           | Russia                       |
| 57. Kharía           | Austro-Asiatic                         | Munda         | India                        |
| 58. Khasi            | Austro-Asiatic (Mon-Khmer)             | Khasian       | India                        |
| 59. Khoekhoe [Nama]  | Khoisan                                | Central Khoisan | Namibia                     |
| 60. Kilivila [Kiriwina] | Austronesian (Eastern Malayo-Polynesian) | Oceanic     | Papua New Guinea             |
| 61. Kisi (Southern)  | Niger-Congo (Atlantic)                 | Southern Atlantic | Guinea                     |
| 62. Komo             | Niger-Congo (Benue-Congo)              | Bantoid       | Democratic Republic of the Congo |
| Language              | Family (subfamily)                  | Genus       | Country                                      |
|----------------------|-------------------------------------|-------------|----------------------------------------------|
| Kongo                | Niger-Congo (Benue-Congo)           | Bantoid     | Democratic Republic of the Congo            |
| Koromfe              | Niger-Congo                         | Gur         | Burkina Faso                                 |
| Kristang             | Creole                              | n/a         | Malaysia                                     |
| Krongo               | Kadugli                             | n/a         | Sudan                                        |
| Kulung               | Sino-Tibetan (Tibeto-Burman)        | Bodic       | Nepal                                        |
| Kuuk Thaayorre       | Australian                          | Pama-Nyungan| Australia                                    |
| Lendu                | Nilo-Saharan (Central Sudanic)      | Lendu       | Democratic Republic of the Congo             |
| Liangshan Yi [Nuosu]| Sino-Tibetan (Tibeto-Burman)        | Burmese-Lolo| China                                        |
| Limbu                | Sino-Tibetan (Tibeto-Burman)        | Bodic       | Nepal                                        |
| Lisu (Shibacha dialect) | Sino-Tibetan (Tibeto-Burman)    | Burmese-Lolo| China                                        |
| Machame              | Niger-Congo (Benue-Congo)           | Bantoid     | Tanzania                                     |
| Makwe                | Niger-Congo (Benue-Congo)           | Bantoid     | Mozambique                                   |
| Mani [Bullom So]     | Niger-Congo (Atlantic)              | Southern Atlantic| Sierra Leone                                |
| Maonan               | Tai-Kadai                           | Kam-Sui     | China                                        |
| Maricopa             | Hakan                               | Yuman       | United States                                |
| Mbe                  | Niger-Congo (Benue-Congo)           | Bantoid     | Nigeria                                      |
| Mbili                | Niger-Congo (Benue-Congo)           | Bantoid     | Cameroon                                     |
| Micmac               | Algic                               | Algonquian  | Canada                                       |
| Mina                 | Afro-Asiatic (Chadic)               | Biu-Mandara | Cameroon                                     |
| Mpur                 | West Papuan                         | Kebar       | Indonesia                                    |
| Naasioi              | South Bougainville                  | Nasiöi      | Papua New Guinea                             |
| Navajo               | Na-Dené                             | Athabaskan  | United States                                |
| Ndebele (Northern Transvaal) | Niger-Congo (Benue-Congo)  | Bantoid     | South Africa                                 |
| Ndjębbana [Djeebbana] | Australian                          | Ndjębbana   | Australia                                    |
| Ndyuka               | Creole                              | n/a         | Suriname                                     |
| Neo-Mandaic          | Afro-Asiatic                        | Semitic     | Iran                                         |
| Neve'ei [Vinmavis]   | Austronesian (Eastern Malayo-Polynesian) | Oceanic | Vanuatu                                      |
| Nkore-Kiga           | Niger-Congo (Benue-Congo)           | Bantoid     | Uganda                                       |
| Nooksack             | Salishan                            | Central Salish| United States                                |
| Language       | Family (subfamily)                          | Genus          | Country         |
|----------------|---------------------------------------------|----------------|-----------------|
| 92. Nupe       | Niger-Congo (Benue-Congo)                   | Nupoid         | Nigeria         |
| 93. Nyimang [Ama] | Nilo-Saharan (Eastern Sudanic)              | Nyimang        | Sudan           |
| 94. Obolo [Andoni] | Niger-Congo (Benue-Congo)                   | Cross River    | Nigeria         |
| 95. Palauan    | Austronesian                                | Palauan        | Palau           |
| 96. Passamaquoddy-Maliseet | Algic                                   | Algonquian     | Canada          |
| 97. Pomo (Southeastern) | Hokan                                   | Pomoan         | United States   |
| 98. Ponapean   | Austronesian (Eastern)                      | Oceanic        | Micronesia      |
|                | [Pohnpeian]                                 | Malayo-Polynesian |         |
| 99. Prinmi [Pumi] [Nuozi variety] | Sino-Tibetan (Tibeto-Burman)           | Qiangan        | China           |
| 100. Qhalaxarzi [Kgaladgi] | Niger-Congo (Benue-Congo)                  | Bantoid        | Botswana        |
| 101. Sanskrit   | Indo-European                              | Indic          | India           |
| 102. Seediq     | Austronesian                                | Atayalic       | Taiwan          |
| 103. Senoufo [Senadi] | Niger-Congo                           | Gur            | Côte d’Ivoire   |
| 104. Serbian    | Indo-European                              | Slavic         | Serbia          |
| 105. Seri       | Seri                                        | n/a            | Mexico          |
| 106. Sesotho [Sotho] | Niger-Congo (Benue-Congo)                  | Bantoid        | Lesotho         |
| 107. Shanghai   | Sino-Tibetan                                | Chinese        | China           |
| 108. Shiriana   | Yanomam                                    | n/a            | Brazil          |
| 109. Shuswap    | Salishan                                   | Interior Salish| Canada          |
| 110. Slovak     | Indo-European                              | Slavic         | Slovak Republic |
| 111. Squamish   | Salishan                                   | Central Salish | Canada          |
| 112. Sre        | Austro-Asiatic (Mon-Khmer)                 | Bahnaric       | Vietnam         |
| 113. Tashlhiyt Berber | Afro-Asiatic                          | Berber         | Morocco         |
| 114. Tawala     | Austronesian (Eastern)                      | Oceanic        | Papua New Guinea|
|                | [Malayo-Polynesian]                         |                |                 |
| 115. Thompson   | Salishan                                   | Interior Salish| Canada          |
| 116. Tiipay (Jamul) | Hokan                                   | Yuman          | Mexico          |
| 117. Tiwi       | Australian                                  | Tiwian         | Australia       |
| 118. Tol [Jicaque] | Tol                                     | n/a            | Honduras        |
| 119. Tonkawa    | Tonkawa                                     | n/a            | United States   |
| 120. Tsimshian (Coast) | Penutian [Tsimshianic]               | Tsimshianic    | Canada          |
| 121. Tswana [Setswana] | Niger-Congo (Benue-Congo)                  | Bantoid        | Botswana        |
| 122. Vai        | Niger-Congo (Mande)                         | Western Mande  | Liberia         |
| 123. Walapai [Hualapai] | Hokan                                   | Yuman          | United States   |
(cont.)

| Language       | Family (subfamily)                  | Genus      | Country      |
|----------------|------------------------------------|------------|--------------|
| 124. Wambule    | Sino-Tibetan (Tibeto-Burman)       | Bodic      | Nepal        |
| 125. Wan        | Niger-Congo (Mande)                | Eastern Mande | Côte d’Ivoire |
| 126. Wicha      | Caddoan                            | Northern   | United States |
| 127. Khosa      | Niger-Congo (Benue-Congo)          | Bantoid    | South Africa |
| 128. Yakur [Lokaa] | Niger-Congo (Benue-Congo)       | Cross River | Nigeria      |
| 129. Yimas      | Ramu—Lower Sepik                   | Lower Sepik | Papua New Guinea |
| 130. Yine [Piro]| Arawakan                           | Southern   | Peru         |
| 131. Yurok      | Algic                              | Yurok      | United States |

2. **Set of Syllabic Consonants; Set of Sonorant Consonants; Distribution; Margins**

Notes:

1. Indicates the absence of an explicit statement in the source material, but no evidence in the data to suggest as much.
2. Indicates the absence of codas in the language.
3. Indicates distribution is applicable given a monosyllabic form in the data.
4. Indicates a single liquid with rhotic and lateral allophones.
5. Indicates a syllabic consonant occurs in a ‘minor’ CV syllable at the left edge.
6. Indicates the absence of onsetless syllables in the language.

| Language       | Syll. C | Sonorants | Initial | Medial | Final | Onset | Coda |
|----------------|---------|-----------|---------|--------|-------|-------|------|
| 1. Abipón      | R, L, N, F | R, L, N  | yes     | unclear| yes   | yes   | no   |
| 2. Afitti      | R, L, N  | G, R, L, N | yes (R, N) | yes | yes | yes | no\(^1\) |
| 3. Ahtna Athabaskan | N, F, S | G, L, N | yes | no\(^1\) | no | no\(^1\) | no\(^1\) |
| 4. Akan        | R, N     | G, R, N  | yes     | unclear | yes | no\(^1\) | no\(^1\) |
| 5. Akha        | N        | G, L, N  | no      | yes    | yes | yes | no\(^2\) |
| 6. Allentiac   | L        | G, R, L, N | yes | unclear | unclear | unclear | unclear |
| 7. Amuzgo      | N        | G, R, L, N | yes | no\(^1\) | no | no | no |
| 8. Angami      | N        | G, R, L, N | yes | no | no | no | no |
| 9. Anong       | N        | R, L, N  | yes | yes\(^3\) | yes\(^3\) | no | no |
| 10. Anufo [Chakosi] | N    | G, R, L, N | yes | yes | yes | no | no |
| Language                        | Syll. C | Sonorants | Distribution | Margins |
|--------------------------------|---------|-----------|--------------|---------|
| 11. Apache (San Carlos)        | N       | G, N      | yes          | yes     | yes     | yes | no\(^1\) |
| 12. Bade                       | R, L, N | G, R, L, N| yes          | no      | no      | no  | no       |
| 13. Bajau (West Coast)         | L, N    | G, R, L, N| yes          | no      | no      | no  | no       |
| 14. Bariba [Baatonum]          | N       | G, R, L, N| yes          | unclear | yes     | unclear | no\(^2\) |
| 15. Belhare                    | N       | G, R, L, N| yes          | no      | no      | no  | no       |
| 16. Bench                      | N       | G, R, L, N| no           | yes     | yes     | yes | yes      |
| 17. Blackfoot                  | F       | G, N      | no           | yes     | unclear | yes | yes      |
| 18. Bruu (Western)             | N       | G, R, L, N| yes          | no      | no      | no  | no       |
| 19. Buin [Terei]               | N       | R, N      | yes          | yes     | yes     | no  | no       |
| 20. Cantonese                  | N       | G, L, N   | yes          | no\(^1\) | yes     | unclear | no |
| 21. Carrier (Central)          | N, F    | G, L, N   | yes          | no\(^1\) | no\(^1\) | no\(^1\) | no\(^1\) |
| 22. Chehalis (Upper)           | L, N    | G, L, N   | no           | yes     | yes     | yes | unclear |
| 23. Chichewski                 | F       | G, L, N   | yes          | no\(^1\) | no\(^1\) | no\(^1\) | no\(^1\) |
| 24. Chingoni [Ngoni]           | N       | G, L, N   | yes          | yes     | no      | no  | no       |
| 25. Chipaya                    | F       | G, R, L, N| yes          | yes     | yes     | no  | yes      |
| 26. Chitimacha                 | N       | G, N      | no           | yes     | yes     | yes | no\(^1\) |
| 27. Coos [Hanis]               | L, N    | G, L, N   | yes          | yes     | unclear | no  | no       |
| 28. Cuicatec(o)                | N       | G, R, L, N| yes          | no\(^1\) | no\(^1\) | no\(^1\) | no\(^1\) |
| 29. Czech                      | R, L    | G, R, L, N| no           | yes     | yes     | yes | yes      |
| 30. Dhimal                     | N       | G, R, L, N| yes          | unclear | yes     | unclear | unclear |
| 31. Diola-Fogny                | N       | G, R, L, N| yes          | no      | no      | no  | no       |
| 32. Dizi                       | L, N    | G, R, L, N| yes          | yes     | yes     | yes | no       |
| 33. Dumi                       | N       | G, R, L, N| unclear      | yes     | yes     | yes | no       |
| 34. English                    | R, L, N | G, R, L, N| yes          | yes     | yes     | yes | yes      |
| 35. Eton                       | L, N    | G, L, N   | yes          | no      | no      | no  | no       |
| 36. Ewondo                     | N       | G, L, N   | yes          | no      | no      | no  | no       |
| 37. Gilbertese [Kiribati]      | N       | G, R, N   | yes          | no\(^1\) | no\(^1\) | no  | no       |
| 38. Goemai                     | N       | G, R, L, N| yes          | no      | no      | no  | no       |
| 39. Gonja [Nkonya]             | R, N    | G, R, L, N| yes (N)      | no      | yes (R) | no (N) | no (N) |
| 40. Gta?                       | N       | G, R, L, N| yes          | no      | no      | no  | no       |
| 41. Hamtai [Kapau]             | N       | G, N      | yes          | yes     | yes     | unclear | unclear |
| 42. Hatam                      | N       | G, L\(^4\), N | yes     | no      | no      | no  | no       |
| 43. Ibibio                     | N       | G, R, N   | yes          | no      | no      | no  | no       |
| 44. Idoma                      | L, N    | G, L\(^4\), N | yes (N) | yes (N) | yes (N) | yes (L) | unclear |
| 45. Igbo                       | N       | G, L, R, N| yes          | no\(^1\) | yes     | no  | no       |
| 46. Ijo [Kolokuma]             | N       | G, R, L, N| yes          | no      | no      | no  | no       |
| Language                  | Syll. C | Sonorants | Initial | Medial | Final | Onset | Coda |
|--------------------------|---------|-----------|---------|--------|-------|-------|------|
| Inga                     | R, L, N | yes       | yes     | no     | no    | no    | no   |
| Jabêm [Yabem]            | N       | yes       | yes     | no     | no    | no    | no   |
| Jilu [Neo-Aramaic]       | L, N    | yes (N)   | yes (L) | no     | no    | no    | no   |
| Jinghpo                  | N       | yes       | yes     | no     | no    | no    | no   |
| Jukun                    | N       | yes       | no      | no     | no    | no    | no   |
| Kabba                    | N       | yes       | yes     | no     | no    | no    | no   |
| Kabiýé                   | N       | yes       | no      | yes    | no    | no    | no   |
| Katla                    | R       | no        | yes     | yes    | no    | no    | no   |
| Kera                     | N       | no        | yes     | yes    | no    | no    | no   |
| Ket                       | N       | no        | yes     | unclear| no    | no    | no   |
| Kharia                   | N       | no        | yes     | no     | yes   | no    | no   |
| Khasi                    | R, L, N | yes       | yes     | no     | yes   | no    | no   |
| Khoekhoe [Nama]          | N       | no        | yes     | no     | no    | no    | no   |
| Kilivila [Kiriwina]      | N       | yes       | yes     | yes    | no    | no    | no   |
| Kisi (Southern)          | N       | yes       | no      | yes    | yes   | no    | no   |
| Komu                     | N       | yes       | no      | no     | no    | no    | no   |
| Kristang                 | N       | yes       | no      | no     | no    | no    | no   |
| Kongo                    | N       | yes       | yes     | no     | no    | no    | no   |
| Koromfe                  | N       | yes       | no      | no     | no    | no    | no   |
| Kristang                 | N       | yes       | no      | no     | no    | no    | no   |
| Krongo                   | N       | yes       | yes     | no     | no    | no    | no   |
| Kulung                   | N       | yes       | no      | no     | no    | no    | no   |
| Kuuk Thaayorre           | R, L, N | no        | yes     | yes    | yes   | yes   |
| Lendu                    | R, F    | yes       | yes     | yes    | yes   | yes   |
| Liangshan Yi [Nuosu]    | L, N, F | yes       | yes     | yes    | yes   | no    | no   |
| Limbu                    | N       | yes       | unclear | unclear| unclear| no    | yes |
| Lisu (Shibacha dialect)  | N, F    | yes (N)   | no (N)  | no (N) | no (N)| no (N)| no   |
| Machame                  | L, N, F, S | yes | yes       | no     | no    | no    | no   |
| Makwe                    | N       | yes       | no      | no     | no    | no    | no   |
| Mani [Bullom So]         | N       | yes       | yes     | yes    | no    | no    | no   |
| Maonan                   | N       | yes       | yes     | yes    | no    | no    | no   |
| Maricopa                 | R, L, N | yes       | no      | no     | no    | no    | no   |
| Mbe                      | N       | yes       | no      | no     | no    | no    | no   |
| Mbili                    | N       | yes       | no      | no     | no    | no    | no   |
| Micmac                   | L, N    | yes       | yes     | yes    | yes   | yes   |
| Mina                     | N       | yes       | no      | no     | no    | no    | no   |
| Language                      | Syll. C | Sonorants | Distribution | Margins |
|-------------------------------|---------|-----------|--------------|---------|
|                              |         | Initial   | Medial       | Final   | Onset | Coda |
| 82. Mpur                      | N       | G, N      | yes          | no      | yes   | no   |
| 83. Naasioi                   | N       | N         | yes          | no      | no    | no   |
| 84. Navajo                    | N, F    | G, N      | yes          | yes     | yes   | no   |
| 85. Ndebele (Northern Transvaal)| N    | G, R, L, N| yes          | no<sup>1</sup> | no<sup>1</sup> | no<sup>1</sup> | no<sup>1</sup> |
| 86. Ndèbba [Djeebbana]        | N       | G, R, L, N| yes          | no      | no    | no   |
| 87. Ndyuka                    | N       | G, L, N   | yes          | no      | no    | no   |
| 88. Neo-Mandaic               | R, L, N | G, R, L, N| yes          | yes     | yes   | yes |
| 89. Nevedei [Vinmavis]        | N       | G, R, L, N| no<sup>1</sup> | no<sup>1</sup> | yes | yes |
| 90. Nkore-Kiga                | N       | G, R, N   | yes          | no      | no    | no   |
| 91. Nooksack                  | L, N    | G, L, N   | no           | yes     | yes   | unclear |
| 92. Nupe                      | N       | G, R, L, N| yes          | yes     | no    | no   |
| 93. Nyimang [Ama]             | R       | G, R, L, N| no           | no      | yes   | no<sup>1</sup> |
| 94. Obolo [Andoni]            | N       | G, R, L, N| yes          | no      | no    | no   |
| 95. Palauan                   | R, L, N | G, R, L, N| yes          | no      | no    | no   |
| 96. Passamaquoddy-Maliseet    | N       | G, R, L, N| yes          | no      | no    | no   |
| 97. Pomo (Southeastern)       | L, N    | G, L, N   | yes          | no      | no    | no   |
| 98. Ponapean [Pohnpeian]      | N       | G, R, L, N| yes          | no      | no    | no   |
| 99. Prinmi [Pumi] (Nuozi variety) | F | R, L, N | no | unclear | yes | yes |
| 100. Qhalaxarzi [Kgalagadi]   | N       | R, L, N   | yes          | yes     | yes   | no<sup>1</sup> |
| 101. Sanskrit                  | R, L    | G, R, L, N| yes (R)      | yes     | yes (R) | yes |
| 102. Seediq                   | N       | G, R, L, N| yes          | no      | no    | no   |
| 103. Senoufo [Senadi]         | N       | G, L, N   | yes          | yes     | yes   | no   |
| 104. Serbian                   | R       | G, R, L, N| yes          | yes     | no    | yes |
| 105. Seri                     | N       | G, L, N   | no           | yes     | no    | yes |
| 106. Sesotho [Sotho]          | L, N    | G, R, L, N| yes (N)      | yes     | no    | no |
| 107. Shanghai                 | R, N    | G, R, L, N| yes          | no<sup>3</sup> | yes | yes (R) |
| 108. Shiriana                 | N       | G, R, N   | yes          | unclear | unclear | no |
| 109. Shuswap                   | L, N    | G, L, N   | no<sup>6</sup> | yes | yes<sup>6</sup> | unclear |
| 110. Slovak                   | R, L    | G, R, L, N| no           | yes     | no    | yes |
| 111. Squamish                 | L, N    | G, L, N   | no<sup>6</sup> | yes | unclear | yes<sup>6</sup> |
| 112. Sre [Koho]               | N       | G, R, L, N| yes          | no      | no    | no |
| 113. Tashliyti Berber         | R, L, N, F, S | G, R, L, N| yes | yes | yes | yes |
| 114. Tawala                   | N       | G, L, N   | no           | no      | yes   | no   |
| 115. Thompson                 | L, N, F | G, L, N   | yes          | yes     | yes   | yes |
| 116. Tiipay (Jamul)           | N       | G, R, L, N| yes (n)      | no<sup>1</sup> | yes (m) | yes (m) |
| 117. Tiwi                     | R, N    | G, R, L, N| yes          | unclear | unclear | no<sup>1</sup> |

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Distribution Margins

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118. Tol [Jicaque] N G, L, N yes no no no no
119. Tonkawa L, N G, L, N no no yes unclear no
120. Tsimshian (Coast) L, N G, L, N yes yes yes yes yes
121. Tswana [Setswana] R, L, N G, R, L, N yes yes no no no
122. Vai N G, L, N yes no no no no
123. Walapai [Hualapai] N, F R, N unclear unclear unclear unclear unclear
124. Wambule N G, R, L, N unclear unclear yes no1 no1
125. Wan N G, L4, N yes no no no no
126. Wichita F G, R no yes no yes yes unclear
127. Xhosa N G, L, N yes yes yes no no
128. Yakur [Lokaa] N G, L, N yes no no no no
129. Yimas N G, R, L, N no yes yes yes no
130. Yine [Piro] R, L, N, F G, R, L, N yes yes no2 no no2
131. Yurok R G, R, L, N no6 yes yes yes6 yes

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4. Akan Dolphyne 1988
5. Akha Hansson 2003
6. Allentiac Adelaar 2004
7. Amuzgo Bauernschmidt 1965
8. Angami Giridhar 1980
9. Anong Sun and Liu 2009
10. Anufo [Chakosi] Adjekum, Holman, and Holman 1993
11. Apache (San Carlos) de Reuse 2006
12. Bade Schuh 1978
13. Bajau (West Coast) Miller 2007
14. Bariba [Baatonum] Welmers 1952
| Language                  | Reference                |
|--------------------------|--------------------------|
| 15. Belhare               | Bickel 2003              |
| 16. Bench                 | Breeze 1990              |
| 17. Blackfoot             | Derrick 2007             |
| 18. Bruu (Western)        | Thongkum 1979            |
| 19. Buin [Terei]          | Griffin 1996             |
| 20. Cantonese             | Bauer and Matthews 2003  |
| 21. Carrier (Central)     | Walker 1979              |
| 22. Chehalis (Upper)      | Kinkade 1963             |
| 23. Chilcotin             | King 1979                |
| 24. Chingoni [Ngoni]      | Ngonyani 2003            |
| 25. Chipaya               | Olson 1967               |
| 26. Chitimacha            | Swadesh 1934             |
| 27. Coos [Hanis]          | Frachtenberg 1922        |
| 28. Cuicatec(o)           | Needham and Davis 1946   |
| 29. Czech                 | Kučera 1961              |
| 30. Dhimal                | King 2009                |
| 31. Diola-Fogny           | Sapir 1965               |
| 32. Dizi                  | Allan 1976               |
| 33. Dumi                  | Driem 1993               |
| 34. English               | Hammond 1999             |
| 35. Eton                  | Van de Velde 2008        |
| 36. Ewondo                | Redden 1979              |
| 37. Gilbertese [Kiribati] | Blevins and Harrison 1999|
| 38. Goemai                | Hellwig 2011             |
| 39. Gonja [Nkonya]        | Painter 1970             |
| 40. Gtā?                  | Zide 1976                |
| 41. Hamtai [Kapau]        | Healey 1981              |
| 42. Hatam                 | Reesink 1999             |
| 43. Ibibio                | Essien 1990              |
| 44. Idoma                 | Abraham 1967             |
| 45. Igbo                  | Green and Igwe 1963      |
| 46. Ijo [Kolokuma]        | Williamson 1965          |
| 47. Inga                  | Levinsohn 1976           |
| 48. Jabēm [Yabem]         | Ross 2002                |
| 49. Jilu [Neo-Aramaic]    | Fox 1997                 |
| 50. Jinghpo               | Qingxia and Diehl 2003   |
| 51. Jukun                 | Shimizu 1980             |
| Language                  | Reference                  |
|--------------------------|----------------------------|
| Kabba                    | Moser 2004                 |
| Kabiyyé                  | Delord 1976                |
| Katla                    | Stevenson 1957             |
| Kera                     | Ebert 1979                 |
| Ket                      | Vajda 2000                 |
| Kharia                   | Peterson 2010              |
| Khasi                    | Rabel 1961                 |
| Khoekhoe [Nama]          | Brugman 2009               |
| Kilivila [Kirwina]       | Lawton 1993                |
| Kisi (Southern)          | Childs 1995                |
| Komo                     | Thomas 1992 [2011]         |
| Kongo                    | Lumwamu 1973               |
| Koromfe                  | Rennison 1997              |
| Kristang                 | Baxter 1988                |
| Krongo                   | Reh 1985                   |
| Kulung                   | Tolsma 2006                |
| Kuuk Thaayorre           | Gaby 2006                  |
| Lendu                    | Tucker 1967, Lojenga 1989  |
| Liangshan Yi [Nuosu]    | Eatough 1997               |
| Limbu                    | Driem 1987                 |
| Lisu (Shibacha dialect)  | Yu 2007                    |
| Machame                  | Sharp 1954                 |
| Makwe                    | Devos 2008                 |
| Mani [Bullom So]         | Childs 2011                |
| Maonan                   | Lu 2008                    |
| Maricopa                 | Gordon 1986                |
| Mbe                      | Bamgboše 1967              |
| Mbili                    | Ayuninjam 1998             |
| Micmac                   | Hewson 1985                |
| Mina                     | Frajzyngier and Johnston 2005 |
| Mpur                     | Odé 2002                   |
| Naasioi                  | Hurd and Hurd 1970         |
| Navajo                   | Sapir and Hoijer 1967      |
| Ndebele (Northern Transvaal) | Ziervogel 1959          |
| Ndjébbana [Djeebbana]    | McKay 2000                 |
| Ndyuka                   | Huttar and Huttar 1994     |
| Language                                      | Reference                      |
|----------------------------------------------|--------------------------------|
| 88. Neo-Mandaic                              | Häberl 2009                    |
| 89. Neve’ei [Vinmavis]                       | Musgrave 2007                   |
| 90. Nkore-Kiga                               | Taylor 1985                    |
| 91. Nook'sack                                 | Galloway 1984                   |
| 92. Nupe                                      | Kawu 2002                      |
| 93. Nyimang [Ama]                            | Tucker and Bryan 1966           |
| 94. Obolo [Andoni]                           | Faraclas 1984                   |
| 95. Palauan                                   | Josephs 1975                   |
| 96. Passamaquoddy-Maliseet                    | LeSourd 1993                   |
| 97. Pomo (Southeastern)                      | Moshinsky 1974                 |
| 98. Ponapean [Pohnpeian]                     | Rehg 1984                      |
| 99. Prinmi [Pumi] (Nuozi variety)            | Ding 2003                      |
| 100. Qhalaxarzi [Kgalagadi]                  | Dickens 1987                   |
| 101. Sanskrit                                 | Whitney 1889                   |
| 102. Seediq                                    | Tsukida 2005                   |
| 103. Senoufo [Senadi]                        | Mills 1984                     |
| 104. Serbian                                  | Zec 2000                       |
| 105. Seri                                     | Marlett 1988                   |
| 106. Sesotho [Sotho]                          | Doke and Mofokeng 1974         |
| 107. Shanghai                                 | Zee 2003                      |
| 108. Shiriana                                 | Migliazza and Grimes 1961      |
| 109. Shuswap                                  | Kuipers 1974, 1989             |
| 110. Slovak                                   | Rubach 1991                   |
| 111. Squamish                                 | Kuipers 1967                   |
| 112. Sre [Koho]                               | Manley 1972                   |
| 113. Tashliyit Berber                         | Dell and Elmedlaoui 1985, 1988 |
| 114. Tawala                                   | Ezard 1997                    |
| 115. Thompson                                 | Thompson and Thompson 1992    |
| 116. Tiipay (Jamul)                           | Miller 2001                   |
| 117. Tiwi                                     | Osborne 1974                   |
| 118. Tol [Jicaque]                            | Fleming and Dennis 1977       |
| 119. Tonkawa                                  | Hoijer 1946                   |
| 120. Tsimshian (Coast)                        | Dunn 1995                     |
| 121. Tswana [Setswana]                        | Cole 1955                     |
| 122. Vai                                      | Welmers 1976                  |
| 123. Walapai [Hualapai]                       | Redden 1966                   |
| 124. Wambule                                   | Opgenort 2004                 |
(cont.)

| Language     | Reference               |
|--------------|-------------------------|
| 125. Wan     | Ravenhill 1982          |
| 126. Wichita | Rood 1996               |
| 127. Xhosa   | Jordan 1966             |
| 128. Yakur [Lokaa] | Bendor-Samuel 1969     |
| 129. Yimas   | Foley 1991              |
| 130. Yine [Piro] | Matteson 1965          |
| 131. Yurok   | Blevins 2003            |

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