Chapter 4

On the distribution and complexity of gender and numeral classifiers

Kaius Sinnemäki

University of Helsinki

This paper surveys the occurrence of gender and numeral classifiers in the languages of the world and evaluates statistically whether there is a complexity trade-off between these two linguistic patterns. Complexity is measured as overt coding of the pattern in a language, an approach that has been shown earlier to provide a reliable first estimate for possible trade-offs between typological variables. The data come from a genealogically and areally stratified sample of 360 languages. The relationship between gender and numeral classifiers in this data was researched by constructing Generalized Linear Mixed Models. According to the results a significant inverse relationship occurs between the variables independently of genealogical affiliation and geographical areas. The distributions are explained functionally by economy, that is, the tendency to avoid using multiple patterns in the same functional domain.

Keywords: gender, numeral classifiers, language universals, complexity trade-off, description-based complexity, mixed effects modeling, economy, distinctness, language contact.

1 Introduction

In the past 35 years there has been an increasing amount of cross-linguistic research on gender, and more broadly on noun classification (e.g., Dixon 1982; Corbett 1991; Aikhenvald 2000; Audring 2009; Kilarski 2013; Di Garbo 2014). However, much of this research has been qualitative and not many researchers have focused on noun classification from a statistical typological perspective.

Earlier work on noun classification systems suggested that languages might not have both classifiers and gender as separate categories (e.g., Dixon 1982).

Later work has revisited these claims and more languages have been found which use both gender and classifier systems (e.g., Aikhenvald 2000). For instance, Palikur (Arawakan) has gender and additionally five different classifier systems, including numeral classifiers. The examples in (1) illustrate the co-occurrence of gender and numeral classifiers in noun phrases.

(1) Palikur (Arawakan; Aikhenvald & Green 2011: 411)

    a. *paha-p-ru*   *tino*
       one-NUM.CLF:ANIM-F woman
       'one woman'

    b. *paha-p-ri*   *awayg*
       one-NUM.CLF:ANIM-M man
       'one man'

However, while the co-occurrence of both gender and classifiers is possible in languages, it is relatively rare for a language to have both types of noun classification (Corbett 2013). It seems therefore possible that classifiers and gender occur in roughly complementary distribution across languages. If so, such complementary distribution would amount to evidence on a possible complexity trade-off in the domain of noun classification. While complexity trade-offs have been researched and discussed recently in various grammatical domains, the results have mostly proven to be negative: trade-offs occur far less often than has been thought earlier (e.g., Shosted 2006; Miestamo 2009; Nichols 2009; Sinnemäki 2008; 2011; 2014a,c).

My aim in this paper is to research the relationship between gender and classifiers to find out whether they interact in particular ways across languages in terms of complexity. For the purpose of this paper I sample numeral classifiers because they are the most common type of classifier system in the languages of the world (Aikhenvald 2000: Ch. 4). Data is drawn from a genealogically and areally stratified sample of 360 languages. The data comes partly from the databases of Gil (2013), Corbett (2013), and Nichols (1992) and is supplemented by my own extensive data collection and analysis. To assess statistical tendencies in the data I use generalized mixed effects modeling (see Jaeger et al. 2011 and Bentz & Winter 2013 for recent applications to typological data). Mixed effects modeling provides a way of modeling the effects of genealogical inheritance and areal diffusion as random factors and so doing justice to the observation (e.g. Nichols 2003) that rates of language change may vary across language families and geographical areas.

The rest of the paper is organized as follows. §2 presents my approach to language complexity. §3 describes the analysis of gender and numeral classifiers (§3.1), the statistical methods (§3.2), and the data (§3.3). §4 presents preliminary results (§4.1) as well as the results of the main hypothesis testing (§4.2). §5 discusses explanations and §6 concludes the paper. Appendix 1 and 2 at the end of the paper provide additional information about statistical modeling and about the data and sources.

2 On language complexity

A critical question in language complexity research is what approach should be taken to complexity.[1] In recent cross-linguistic research language complexity has been approached in basically two different ways that are briefly introduced here.

First, it has been argued, most notably by Kusters (2003; 2008), that the notion of complexity should be tied with language usage, hence usage complexity, or difficulty. In this approach the complexity of different structures, such as the agreement classes of gender, are based on their on-line difficulty in language use or possibly on the time it takes to acquire them in first or second language acquisition (Kusters 2003).

Second, many scholars have argued instead that complexity should be kept separate from difficulty (Dahl 2004; Miestamo 2008; Sinnemäki 2011). In this approach, the formulation of complexity is based on the number and variety of the parts of the grammatical description and the interactions between these parts. The main reason for this delimitation of complexity from difficulty is that usage complexity inevitably raises the context-sensitive question "difficult to whom" and the different user-based criteria do not necessarily lead to the same complexity measurement. The speaker, the hearer, the first language acquirer, and the second language learner do not all find the same linguistic patterns easy or difficult (see Miestamo 2008; Sinnemäki 2011 for details). As in my earlier writings in this area, I maintain that a typological approach to complexity is most feasibly done from this perspective, which I call description-based complexity (Sinnemäki 2014b). Description-based complexity should also be applied to local domains instead of attempting to measure overall complexity of language (Sinnemäki 2011).

There are different pros and cons in these two approaches and I refer the reader to Miestamo (2008), Kusters (2008), and Sinnemäki (2011) for earlier debate. One

---

[1]This section is largely based on Sinnemäki (2014b: Section 9.2).

further issue, however, deserves mention here. It has been pointed out that these approaches have not been well-connected to complex systems theory and have rather focused on the enumeration of complexity in terms of constituents or rules (Andrason 2014). What actually makes a system complex in complex systems theory is not the number of parts or rules but a number of different aspects of the system: that it is open, non-linear, emergent and adaptive, to name a few (see Kretzschmar 2015 for further details). My aim in this paper is not the enumeration of complexity as such but to use the notion of linguistic complexity to evaluate what is a central goal in language typology, namely, to find the ways in which linguistic patterns may interact with each other (Bickel 2007). This interaction may be seen as an adaptive process of different linguistic patterns (see §5). In this sense, my approach combines aspects of the complex systems theory with description-based complexity.

Although my aim here is not the enumeration of complexity, it is necessary to say a few words about the basis of measuring complexity. I follow here Gell-Mann and Lloyd's (2004: 387) proposal that complexity be defined as effective complexity of an entity, that is, "the length of a highly compressed description of its regularities" (see also Dahl 2004 for an application of effective complexity to linguistics). Effective complexity is a way of focusing on the set of regularities of a system, that is, on the minimal description of its structure. In other words, complexity may be measured as the compressibility of the system's regularities. When applied to grammatical systems this means that the more patterns a linguistic entity contains, the longer (or the less compressible) description is required to capture these regularities, and hence, the greater is the complexity of that system.

As an example, compare the numeral classifier system in Pnar (Khasian; Austroasiatic) with that of Thai (Kam-Tai; Tai-Kadai). Pnar has three general classifiers used when enumerating count nouns: *ŋut* for classifying people (2a), *tḷli* for classifying non-humans (2b), and *ta* for classifying weeks (2c) (Ring 2015: 124–125, 361–362).[2]

(2)   Pnar (Khasian; Austroasiatic; Ring 2015: 362)

    a.   *ki=ni   tɔʔ ki san ŋut   ki=kʰɔn jɔŋ ka*
       PL=PROX be 3PL five CLF.HUM PL=child GEN 3SG.F
       'these were her five children'

---

[2]Note that Pnar has gender as well, while Thai does not (see Appendix 2).

b. *ɛm ŋɲiaw tḷli   ki=kʰlo kṇtaŋ   ha ʤwaj*
   have seven CLF.NHUM PL=forest special/holy LOC Jowai
   'there are seven sacred groves here in Jowai'

c. *ar ta   jaw ha-den ka tʰɔʔ ja tɛ   ka*
   two CLF.WK week LOC-back 3SG.F write BEN NVIS 3SG.F
   'after two weeks (we) sign it (the agreement)'

A grammatical description of Pnar numeral classifiers and their usage takes no more than a couple of pages including examples. In Thai, however, there are about 80–90 numeral classifiers (although some of them are archaic) (Iwasaki & Ingkaphirom 2005: 74) and much research has been done on their semantics, structure, and acquisition (e.g., Hundius & Kölver 1983; Gandour et al. 1984; Inglis 2003). In addition, numeral classifiers in Thai express a range of functions, namely, individuation, singulative, definiteness, and contrast (Bisang 2009). This kind of interaction between different linguistic systems certainly increases description length, and thus also complexity (Sinnemäki 2014b). In Pnar, no evidence has yet been presented of this type of complexity in the system of numeral classifiers (Ring 2015: 360–368).

From the viewpoint of complexity, it is thus clear that the system of numeral classifiers requires greater length – and is consequently more complex – in Thai as compared to Pnar. Effective complexity can thus be applied to estimating grammatical complexity yet without using compression algorithms but instead linguists' descriptive tools, as in the discussion of numeral classifiers in Pnar and Thai above (see also Miestamo 2008; Sinnemäki 2014b).

In Sinnemäki (2011) I argued that the notion of complexity can be broken down into various types (see also Good 2012). In Sinnemäki (2014b) I further suggested that focusing on the number of parts, or even the sheer presence vs. absence of a linguistic pattern in a language, is a feasible starting point for studying whether particular typological variables may interact with one another in terms of complexity. In that paper I showed that there is an inverse statistical relationship between rigid word order and case marking in core argument marking. In this paper I apply the same approach to the domain of noun classification. My hypothesis is that to determine whether there is a complexity trade-off between gender and numeral classifiers, the most productive place to start from is to analyze the presence vs. absence of these variables in a language.[3] I call this approach

---

[3]Note that when focusing on overt coding the differences between usage complexity and the description-based complexity practically disappear: compared to the presence of a distinction the absence of a distinction is both simpler from the perspective of grammar description and easier from the perspective of the user as well (Sinnemäki 2009: 127–128).

"complexity as overt coding" (Sinnemäki 2014b). I assume that overt coding is more complex than its absence, since overt coding requires a longer minimal description than its absence. To count the number of genders or numeral classifiers would demand more effort and data, but the result might not add much new information concerning their interaction compared to binomial coding of the variables.

3 Method and data

3.1 Definitions

Gender and classifiers are generally considered different types of noun classification. A typical way has been to treat them as opposite ideal types on a continuum, gender being the more grammaticalized, more rule-governed and less semantic in nature, while classifiers have been considered as less grammaticalized, less governed by grammatical rules, and more semantic in nature (Dixon 1982; Serzisko 1982; Corbett 1991; Aikhenvald 2000; Passer 2016b). However, intermediate cases have always existed which are difficult to classify as either classifier or gender systems. Languages such as Miraña (Boran) are particularly striking examples, their noun classification system showing properties of both gender and classifier systems (Seifart 2005). For these reasons the dichotomy between gender and classifiers has been rejected especially in the canonical typology approach (e.g., Corbett & Fedden 2016), which rather uses a variety of factors for defining one canonical type and then determines the ways in which for instance gender and classifiers may conform to or deviate from this canonical type according to various factors. However, rejecting the typological distinction between gender and classifiers may be unnecessary, since intermediate cases can be analyzed as deviations from prototypical ideals for gender and classifiers, the prototypes being different endpoints of the same continuum of grammaticalization (Passer 2016b). In this view, languages like Miraña can be analyzed as similar to the noun class systems in Niger-Congo languages albeit at an earlier or intermediate stage of grammaticalization (Grinevald & Seifart 2004).

For the current purpose I treat gender and numeral classifiers as two separate linguistic patterns and analyze the borderline instances on a case by case basis. As for gender I follow the general tendency in the literature to define it as an agreement class, that is, a language has a gender system only if agreement on other syntactic constituents reflects nouns of different types (e.g., Corbett 1991: 4–5; Nichols 1992: 124–125). This formulation subsumes under gender two broad

types of phenomena. First, it includes the Romance-type gender, as in (3), that has only a handful of distinctions in the gender system, most commonly masculine (3a) and feminine (3b).

(3)   French (Romance; Indo-European; author)

    a. *un   garçon*
       INDF.M boy
       'a boy'

    b. *une   fille*
       INDF.F girl
       'a girl'

Second, gender here also includes systems of noun classification found in many African and some Papuan languages, often called noun classes. Noun class systems are here defined as a subtype of gender systems that have four or more agreement classes instead of the common two or three based on sex or and/or animacy. These systems may have more than a dozen agreement classes, not always clearly motivated semantically. In Mufian (Torricelli), for instance, different suffixes on the noun and adjective as well as prefixes on the verb reflect the noun class of different types, as in Table 1 (Alungum et al. 1978). Different sets of affixes exist for singular and plural.

Table 1: A set of noun classes in Mufian (Alungum et al. 1978: 93)

Class	Example (sg)	Gloss	noun suffix	adjective suffix	verb prefix
1	*bol*	'pig'	*-l*	*-si*	*l-*
2	*éngél*	'name'	*-ngél*	*-ngili*	*g-*
3	*nalof*	'tooth'	*-f*	*-fi*	*f-*
5	*batéwin*	'child'	*-n*	*-ni*	*n-*
…					
17	*kos*	'course'	*-s*	*-si*	*s-*

A language may also express gender-like distinctions on just the noun but not on any other constituent. For instance, in Petalcingo Tzeltal (Mayan) some nouns may be marked with different noun prefixes, *x-* and *j-* which appear in complementary distribution and if used for person's names, *x-* is used for women's

names (4a) and *j-* for men's names (4b) (Shklovsky 2005: 20).[4] Because there is no agreement marking on syntactic constituents reflecting the different noun types, this pattern in Petalcingo Tzeltal and similar instances in other languages (whether the markers are affixes, clitics, or isolating formatives) were not counted as examples of grammatical gender and were left outside of this research.

(4) Petalcingo Tzeltal (Mayan; Shklovsky 2005: 20)

    a. *me x-Martaj-e   ch^a way   nax   x-k^ot*
       DET x-Marta-CLT two   sleep only ICMP-arrive

       'Marta only stayed two nights.'

    b. *ta   s-pat   s-nah   te j-Laloj-e*
       PREP POSS:3-back POSS:3-house DET j-Lalo-CLT

       'At the back of Lalo's house.'

As for numeral classifiers, I define them following Gil (2013), which is my main data source on numeral classifiers. Almost all languages use additional linguistic items to assist enumerating nouns of low countability, as in English *two **pints** of beer*, *three **glasses** of water*, or *five **pounds** of sand*. These additional items are often called mensural classifiers or measure words (e.g., Grinevald 2002: 260–261; Her 2012). Many languages, however, use such additional linguistic items even when enumerating nouns of high countability, such as books, fingers, bananas or the like. Such items are classified as numeral classifiers if they occur with countable nouns when enumerated using numerals. The function of the classifier is then to "divide the inventory of count nouns into semantic classes, each of which is associated with a different classifier" (Gil 2013). An example is given below from Mandarin (Sinitic; Sino-Tibetan). The enumeration of the noun *rén* 'person' in (5a) is obligatorily accompanied by an additional item *ge*, while the enumeration of the noun *fēijī* 'airplane' is accompanied by another additional item, namely *jià* (5b) (Li & Thompson 1981: 104). These items are here called numeral classifiers.[5] Quite typically these items can also occur in constructions with demonstratives, as in (5c), but it seems to be somewhat rarer for them to occur with other constituents (see Aikhenvald 2000: 206–220).

---

[4]The marker *-e* at the end of many noun phrases in Petalcingo Tzeltal is a determiner enclitic (Shklovsky 2012: 127) that apparently participates in marking the definiteness of the noun phrase. Glossing (e.g., of the *x-* and *j-* prefixes) follows the sources. Note that in the source the hat symbol (^) marks the preceding consonant as an ejective.

[5]Her (2012) proposes a mathematical criterion to distinguish numeral classifiers from measure words. A numeral classifier necessarily has value 1, while a measure word does not.

(5) Mandarin (Sinitic; Sino-Tibetan; Li & Thompson 1981: 104–105)

    a. *sān ge rén*
       three CLF person
       'three people'

    b. *wǔ jià fēijī*
       five CLF airplane
       'five airplanes'

    c. *nèi tiáo niú*
       that CLF cow
       'that cow'

Two further issues need to be mentioned in analyzing numeral classifier languages (see Gil 2013). First, not all languages with numeral classifiers use them with all numerals. For instance, the numeral classifiers in Pnar are used only for numerals above one, as can be seen by comparing the examples in (2) above and (6) below (Ring 2015: 108).

(6) Pnar (Khasian; Austroasiatic; Ring 2015: 108)
    ɛm jap ka=wi ka=kn̩tʰaj tm̩mɛn
    have die F=one F=female old
    'there is one old woman (who) died'

In Abau (Upper Sepik; Sepik) numeral classifiers are used only for a small set of lower numerals from one to three (Lock 2011: 56–57).[6] These kinds of limitations do not make a difference to the analysis here: all languages in which numeral classifiers are limited to low numerals or do not occur with low numerals are analyzed as having a numeral classifier system.

Second, in some languages the set of classifiers is very limited. Marathi (Indo-European), for instance, has one numeral classifier *jaṇ*, which is used with nouns denoting persons. A similar system occurs in some Hindi dialects and in Nepali (Indic; Indo-European; Emeneau 1956: 11–12). Since these languages have only one numeral classifier, they were not analyzed as having a numeral classifier system. In this I follow, for instance, Nichols (1992) and the *Autotyp* database (Bickel et al. 2017).

Following Nichols (1992: 129, 132) and Corbett (1991: 4–5) my main criterion for distinguishing numeral classifiers and gender from one another was agreement. The defining criterion for gender is that gender classes are marked by agreement

---

[6]Note that higher numerals do not exist in Abau at all.

on other syntactic constituents – and importantly that gender marking is not limited to numeral constructions, whereas classifiers are not marked by agreement and numeral classifiers in particular may exist only in conjunction with numerals. However, there are some borderline instances that may be in transition or there may be multiple systems of noun classification in a language. Three such borderline examples are discussed briefly.

The noun classification system in Luganda (Bantoid; Niger-Congo) has more than 12 classes and some are based on shape, much like in typical numeral classifier systems. The classes are further marked on numerals, as in numeral classifier systems. However, "there is agreement, multiple marking in the sentence, marking elsewhere than on or with numerals, and sufficient lexical fixation to justify regarding these systems as noun classes" (Nichols 1992: 136). This system therefore has many properties of gender but also some properties of typical numeral classifier systems. Following Nichols (1992) and Corbett (2013), I analyze such systems as gender.

Some languages use a single set of class markers for multiple purposes. These systems have been accordingly analyzed in different ways. For instance, according to Derbyshire & Payne (1990: 261) Mundurukú (Tupian) has verb-incorporated classifiers, as in (7a). However, in their definition of verb-incorporated classifiers they specifically state that such classifiers "do not occur in noun phrases and do not express concord in the generally accepted sense" (Derbyshire & Payne 1990: 245). These classifiers in Mundurukú occur, nevertheless, also on numerals (7b) and demonstratives (7c), wherefore Mundurukú has been classified as a multiple classifier system (Aikhenvald 2000; Passer 2016a). Derbyshire & Payne (1990) consider this system as verb-incorporated because of its historical origins, but because these classifiers in Mundurukú are used in environments outside the predicate as well, it is less desirable to analyze this system primarily as a verb-incorporated classifier system. Passer (2016a) analyzes these classifiers originally as nominal classifiers that have spread to an additional host, namely to predicates. Since it is not uncommon for numeral classifiers to attach to demonstratives as well, as in Mandarin (see example 5c), it seems justified to analyze Mundurukú as a numeral classifier language.[7]

(7)   Mundurukú (Tupian; Derbyshire & Payne 1990: 261)

a.   *bekitkit ako-ba   o'-su-ba-dobuxik*
     child   banana-CLF 3-REF-CLF-find
     'The child found the banana.'

---

[7]Gil (2013) analyzes Mundurukú as not having numeral classifiers based on data from Derbyshire & Payne (1990). Here I follow the more recent data and analyses of Passer (2016a).

b. *xepxep-ʾa wexik-ʾa*
   two-CLF   potato-CLF
   'two potatoes'

c. *ija-ba   ako-ba*
   this-CLF banana-CLF
   'this banana'

Yagua (Pega-Yaguan) is similar to Mundurukú in that it has a single set of classifiers that can be used in multiple environments, namely, with predicates, demonstratives and numerals (Payne 2007). However, these classifiers also attach to nominal modifiers, such as adjectives and have sometimes been thought of as marking agreement (Aikhenvald 2000: 217). In line with these analyses, Yagua has sometimes been analyzed as having both numeral classifiers and gender (Nichols 1992: 136–137). However, according to Payne (2007) these constructions do not exhibit syntactic agreement, at best semantic agreement "between nouns that are in apposition" as in example (8a). Example (8b) illustrates a construction with a numeral and the same classifier *-nų* as in (8a). For this reason, I analyze Yagua as having numeral classifiers (following Gil 2013) but no gender (following Payne 2007).

(8)   Yagua (Peba-Yaguan; Payne 2007: 461)

   a. *wánų wásíyąa-nų   hą́ámu-kii-nų*
      man   fat-CLF.ANIM.SG big-long-CLF.ANIM.SG
      'big fat man' (or 'man, a fat animate one, a big long animate one')

   b. *Hásiy sa=wichą́-ą́siy   ádnų-nų-hųy   kiiwą́.*
      there 3SG.ANIM=be-PROX1 two-CLF.ANIM.SG-two fish
      'There were two fish.'

The noun classification systems in the sample languages were analyzed following the above criteria. My main hypothesis, based on earlier literature, is that there is an inverse relationship between gender and numeral classifiers. Some preliminary indication for this relationship was provided by Sinnemäki (2014c: 188–189) on the basis of the data in the *World atlas of language structures* (henceforth, *WALS*, Dryer & Haspelmath 2013), but here this hypothesis is approached with a much larger sample and with more rigorous methods (using generalized mixed effects modeling instead of ordinal correlation). The null hypothesis is that there is no relationship between gender and numeral classifiers. In the next section I describe the statistical methods used in this research.

3.2 On statistical methods

One of the central interests in language typology is the interactions among linguistic patterns across languages (Bickel 2007). However, the distribution of linguistic patterns, such as gender or numeral classifiers, can be affected by a number of factors that may be difficult to delineate from one another. It has been customary in language typology to treat such factors, especially inheritance and borrowing, as nuisance factors. Their confounding effects on the typological distributions have been tried to eliminate primarily through (stratified) sampling to draw conclusions on the actual relationship between the structural factors, usually with association or correlation tests. In recent years more advanced multifactorial methods have been applied to typological data as well which allow genealogical and areal factors to be built as factors into the models themselves so that their effects can be tested rather than simply controlled away. Genealogical and areal factors have been modeled as fixed effects using generalized linear modeling (e.g., Cysouw 2010; Sinnemäki 2010) or as random factors using mixed effects modeling (e.g., Bentz & Winter 2013).

Yet it has proven difficult to model particularly the effect of genealogical inheritance on typological distributions because of the large number of small families and language isolates. Isolates are not genealogically related to any known languages. In effect they are language families with just one member; yet such families may constitute roughly one third of the world's language families (Campbell 2016). This high proportion of isolates means that if language family is built into the research design, the number of parameters in the model increases so much that reliable estimates are no longer possible (cf. Sinnemäki 2010: 877–880). Four approaches have been used in recent research to address this issue.

In one of the earlier approaches genealogical inheritance is controlled by restricting the way datapoints are counted. One such way is to group languages into genera – genealogical groups of languages that have approximately the same time-depth to the branches of Indo-European – and then count as datapoints not languages but different values in genera (Dryer 1992; 2000). If three languages are sampled from the same genus, all without gender, then this genus contributes one datapoint to the calculations. If four languages are sampled from another genus in which all but one have gender, then this genus contributes two datapoints (= one with gender and one without gender). While this method is rather crude, it enables the controlling of genealogical inheritance to some degree but it may also leave out important variation at some other level of taxonomic classification than the one chosen (see Bickel 2008).

Another, more recent approach evaluates whether a particular linguistic pattern is statistically preferred in languages within families (Bickel 2013). In case of a binomial variable (e.g., presence vs. absence of gender) a family is either biased towards presence of gender, towards absence of gender, or they are indifferent: in any event a family always contributes just one datapoint to the calculations. This method is related to the controlled genealogical sampling of Dryer (1992; 2000) but it tests biases within families statistically. However, biases can only be estimated when the families are large enough, usually requiring at least five sampled languages from a family. The preferences in large families can then be extrapolated to smaller families and isolates (see Bickel 2013 for details). While this method enables a dynamic approach to language universals, it requires very large samples – the typical samples have contained roughly 400 languages (e.g., Bickel 2013; Bickel et al. 2014).

Linguists have also adapted methods from biology to model correlated changes in genealogical lineages. In this approach lexical data is first used to build a family tree and to estimate branch lengths within the tree. Then typological feature-values are mapped on the trees and finally it is estimated whether a change in one typological feature is correlated with a change in another feature in a particular lineage (e.g., Dunn et al. 2011; Levinson et al. 2011). While this phylogenetic approach is promising, it has been criticized especially for lack of statistical power (e.g., Cysouw 2011).

Researchers have also applied (Generalized) Linear Mixed Models (or GLMM) to typological data (e.g., Cysouw 2010; Jaeger et al. 2011; Bentz & Winter 2013).[8] The idea in mixed effects modeling is that the value of the dependent variable is predicted based on the independent variables and using a particular grouping structure (that is, random structure) in the modeling to adjust the variables of interest. The distributions are therefore affected by both the independent variables (the fixed factors) and random factors. In typological research fixed effects are typically the structural factors, such as numeral classifiers, while language families and geographical areas can be modeled as random factors. Once the effect of the random factors is accounted for, the impact of the fixed factors can be established. Mixed models offer efficient and flexible ways of modeling group level structure both within groups and across groups and they are also suitable for small samples which are typical in typological data (Jaeger et al. 2011: 289–290). For these reasons I use here Generalized Mixed Effects Modeling to construct a

---

[8]Winter (2013) provides a tutorial on mixed effects modeling that was helpful in learning more about mixed effects modeling also in typology. See Breslow & Clayton (1993) and Gelman & Hill (2007) for general introductions to GLMM.

model that statistically evaluates the relationship between gender and numeral classifiers across the languages of the world.[9]

The first step in using GLMMs is to plan the model design and to decide which variable is the response or the dependent variable and which variable is the predictor. The dependent is the variable whose distributions are modeled with the predictor variable(s) and the random structure. When choosing the dependent variable it is not theoretically completely clear whether gender or numeral classifiers should be chosen as the dependent. One argument for choosing gender as the dependent is the fact that classifiers are often thought as the most common source of gender in languages (see Corbett 1991: 136; Seifart 2010: 727–728; Luraghi 2011: 450–452 and references). Greenberg (1978: 78–79) suggests that gender develops from classifying demonstratives which in turn often develop from numeral classifiers (see Harris & Campbell 1995: 341–342 for further evidence for the development of gender from demonstratives). Although he does not present any actual reconstructions, Greenberg (1972: 35–36) suggests that there seems to be a synchronic universal that if a numeral classifier system spreads within a language, it will spread to demonstratives (and often only to them), as seems to have happened in Mandarin (see example 5).

Luraghi (2011: 451) presents the general stages in the development of gender as in (9). While some gender systems develop from classifiers others may develop from case and number agreement (Luraghi 2011: 452). In addition, it may be more likely that gender develops not from numeral classifiers but from an earlier noun classifier system, as has happened in some Australian languages (Plaster & Polinsky 2007).

(9)   Generic nouns > classifiers > pronominal demonstratives > attributive demonstratives > determiners > agreement markers

There is thus clear theoretical reason to choose gender as the dependent variable. Diachronically the opposite grammaticalization path, that is, numeral classifiers developing directly from gender has not been attested. However, there are examples such as Bengali which lost its gender and number marking but developed numeral classifiers partly recycling the same morphological material that was used for gender and number earlier (see Aikhenvald 2000: 379 and references). This data suggests that it is possible but rare for a numeral classifier

---

[9]All statistical computing and graphs were done in the R programming environment (R Core Team 2017) using the packages `lme4` (Bates, Maechler, et al. 2015), `ggplot2` (Wickham 2009), `vcd` (Meyer et al. 2006; 2015; Zeileis et al. 2007), and `pbkrtest` (Halekoh & Højsgaard 2014). The maps were generated with a mapping tool developed by Hans-Jörg Bibiko for the *WALS*.

system to arise from an earlier gender system. For these reasons, I model gender as the dependent and numeral classifiers as the independent factor in my main model, but I also used a competing model in which I modeled numeral classifiers as the dependent and gender as the independent variable.

The equation showing the structure of mixed logistic regression is presented in (10) (cf. Gelman & Hill 2007: 279; Bentz & Winter 2013: 8).

(10) $P(y_i = 1) = \text{logit}^{-1}(\alpha_{j,k[i]} + \beta_{j,k[i]} x_i)$

The term α is the intercept for each ith datapoint (= language) and the β is the regression coefficient (the slope) for the predictor (x). In (mixed) logistic regression the intercept is the logarithm of the odds for the dependent variable given the default level of the predictor(s), which in R are chosen alphabetically (Arppe 2008: 128). In my models gender is the dependent variable with two values "absence" and "presence" and its default level is "absence". The predictor in my model is numeral classifiers which has two values "absence" and "presence" and with a default value "absence". The intercept in my model, therefore, is the log odds of gender for languages that have no numeral classifiers. In (mixed) logistic regression the slope for a binary variable is the difference in the log odds of the dependent variable between the different levels of the predictor variable. Here this means that the slope is the difference in log odds for having gender in a language that has numeral classifiers compared to a language that has no numeral classifiers.

In (mixed) logistic regression the dependent variable is categorical and its expected response, the odds $1/(1 - p)$, is transformed via natural logarithm to yield logarithm of the odds. In my model design this means $\log(1/(1 - p))$ for observing gender vs. not observing gender. Alternatively, to obtain predicted *probabilities* for observing gender vs. observing no gender in a language the predictor is transformed via inverse logit function, as in (10). In this equation, $P(y_i = 1)$ is the predicted probability that we observe gender (presence of gender = 1) for each item i and the subindices j and k represent the adjustments of the intercept and slope for each grouping factor (here area and family, see below).

This possibility to adjust the intercept and the slope through each grouping factor is probably the most powerful property of mixed effects modeling. I use geographical area and language family as grouping factors and I let both the intercept and the slope vary between the levels of these grouping factors. A random intercept for family means that each family is allowed to have different intercepts to account for the family-related variability in the distribution of gender. A random slope for the family, on the other hand, means that numeral classifiers

are allowed to have a different effect on gender in each family to account for the family-related variability in how numeral classifiers affect gender. The random effects for area work analogously. In addition, the models include a correlation term between the intercepts and slopes of a particular random effect. This correlation term accounts for the variation that may arise from families (or areas) with large adjustment for the intercept (= gender) having also a large coefficient for the slope (= numeral classifiers).

The grouping factors language family and area were coded as follows. For language families I used the highest level of classification in the genealogical taxonomy of the *WALS*. For geographical area I used the ten continents of the *Autotyp* (Bickel et al. 2017), illustrated in Figure 1 with the 2949 languages of the *Autotyp* database.[10]
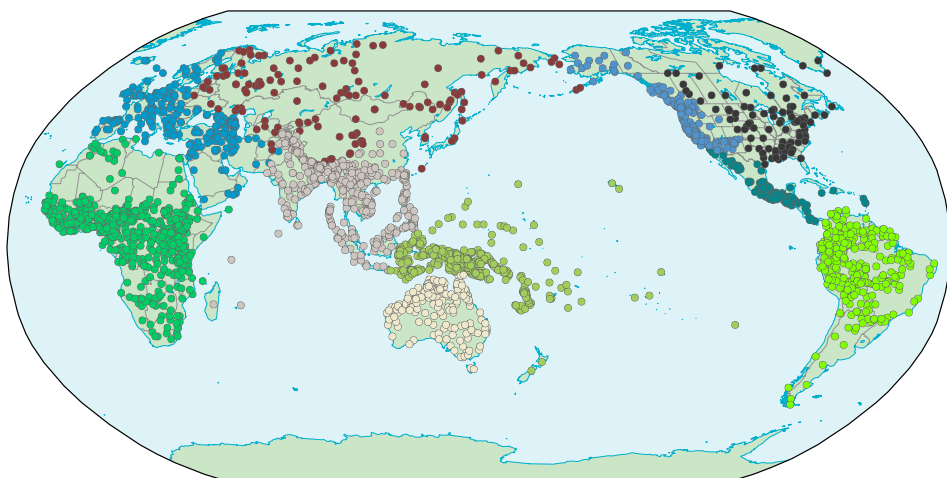
Figure 1: The ten continents of the Autotyp on a world map (Bickel et al. 2017)

For mixed models p-values can be derived by using maximum likelihood ratio tests. This was done by comparing the likelihood ratio of a model with the variable of interest to that of a simpler model without the variable of interest (e.g., Baayen et al. 2008; Barr et al. 2013).

---

[10]The ten continents are: Africa, West and Southwest Eurasia, North-Central Asia, South/Southeast Asia, New Guinea and Oceania, Australia, West North America, East North America, Central America, and South America. The database has information on 2950 languages, but there are no latitudes or longitudes provided for International Sign Language.

3.3 Sampling and data

The main data sources were two chapters in the *WALS*, Corbett (2013) on "Number of genders" and Gil (2013) on "Numeral classifiers". Corbett (2013) has data on 257 languages and Gil (2013) on 400 languages. The cross-section of their data, however, is "only" 133 languages (from 106 genera), which is a relatively small proportion of the two samples and not really adequate for modeling the effect of areal and genealogical factors statistically. Moreover, the languages of Eurasia are overrepresented in the cross-section of the samples: the coverage of genealogical diversity (the share of sampled genera from all genera in a macroarea) is 2–3 times greater in Eurasia than in the other five macroareas.

For these reasons, I analyzed more data based on the same principles as in the two main sources in an attempt to increase the sample sizes especially outside Eurasia. I also reanalyzed Corbett's (2013) data, since he included pronominal gender in his data, whereas I focus solely on noun gender. By pronominal gender I mean pronouns that reflect gender, such as the English third person pronouns *he* and *she*, which as anaphoric pronouns are often analyzed as part of agreement (Corbett 2013). In the minimal case, pronominal gender can provide the only evidence for a gender system in a language, as was done by Corbett (2013). In this paper pronominal gender is excluded in order to make gender and numeral classifiers more comparable to one another, because numeral classifiers co-occur with nouns but not usually (or possibly at all) with pronouns. The main data sources for my own data collection were grammar descriptions, scholarly articles (e.g., Derbyshire & Payne 1990), Nichols' (1992) database on gender and numeral classifiers, and general works on linguistic areas and language families (e.g., Mithun 2001; Janhunen 2003).

The sample contains 360 languages from 252 genera (see Appendix for more information), which is significantly larger compared to what the *WALS* can offer with regard to these variables. I have also attempted to ensure that especially areas that are often less well sampled, such as South America and New Guinea would be sampled to a reasonable degree; in the current paper languages are sampled from roughly 40% of all the genera in those areas. Table 2 provides more detailed information about the sample composition by macroarea. Note that the coverage of genealogical diversity of macroareas outside Eurasia is now much better than in the cross-section of the *WALS* chapters: genealogical coverage of Eurasia is not more than 1.2–1.4 times greater than in the other areas.

Table 2: Number of sampled languages, number of genera, and the genealogical coverage (share of genera sampled) in each macroarea

	Afr.	Eur.	Papunes.	Austr.	N. Am.	S. Am.	Total[a]
Languages	52	69	99	23	58	59	360
Genera (sample/total)	34/81	49/87	61/139	18/44	49/102	43/108	252/544
Genealogical coverage	42%	56%	44%	41%	48%	40%	46%

[a]In Table 2 the total number of genera in the *WALS* are not sums of the macroarea-wise counts, because languages from one genus can be spoken in multiple macroareas and thus be counted multiple times. The total is the total of all genera without macroareal partition.

4 Results

4.1 Preliminary results

The data come from 360 languages (see Appendix 2). Based on the raw numbers there were 122 languages (34%) that had only gender, 81 languages (23%) that had only numeral classifiers, 22 languages (6%) with both gender and numeral classifiers and 135 languages (38%) with neither.[11] All in all, 144 languages had gender (40%) and 103 languages (29%) had numeral classifiers. The geographical distribution of the sample languages on the world map is shown in Figure 2. The three smaller maps in Figure 2 zoom into three areas where gender and/or numeral classifiers are particularly frequent: 1. Central Africa, 2. Southeast Asia, New Guinea, and North Australia, and 3. South America (see also the discussion below on the areal distribution of gender and numeral classifiers). When counting distinct values in genera, gender occurred in 38% of genera and numeral classifiers in 28% of genera. These shares suggest that gender is globally more common than numeral classifiers. In the *WALS*-data, the shares for genera that had gender or numeral classifiers were 40% and 29%, respectively (Corbett 2013; Gil 2013). The differences to my data (38% and 28%, respectively) are very small, and the 2% difference in terms of gender can be explained to some extent by the fact that I sampled only noun gender, whereas Corbett (2013) included pronominal gender in his research.

Aikhenvald (2000: 1) estimates that "[a]lmost all languages have some grammatical means for the linguistic categorization of nouns and nominals". While

---

[11]Note that the frequency of languages that had both gender and numeral classifiers (6%; counting genera) is similar to the frequency of languages with dominant object-subject word order (6%; counting genera; Dryer 2013) which is usually considered to be typologically very rare.
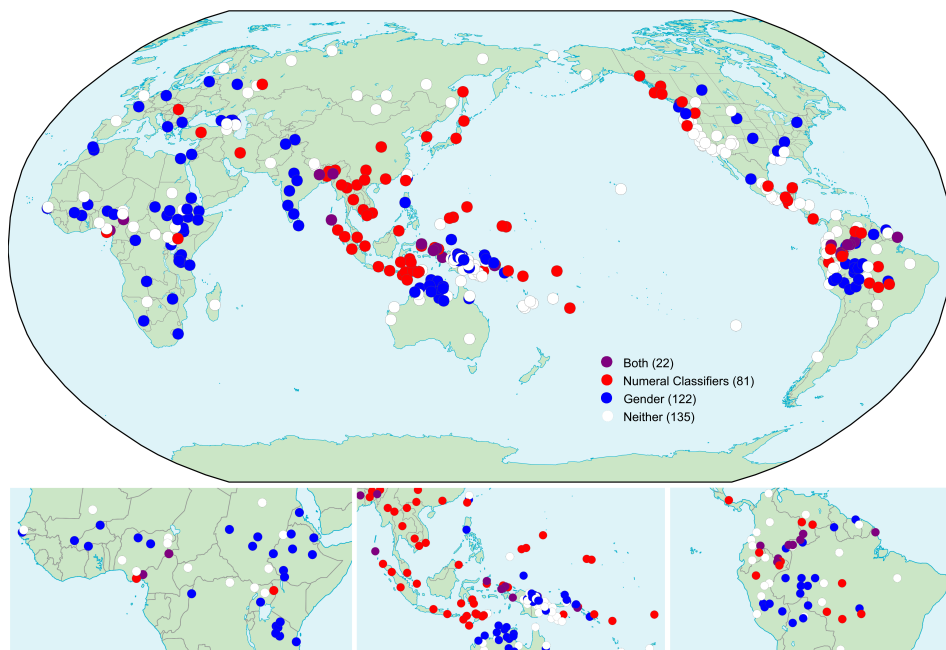
Figure 2: Sample languages on a world map. The three smaller maps at the bottom zoom into central Africa on the left, Southeast Asia and New Guinea in the middle, and the Northern half of South America on the right.

here my focus is not on all types of noun classification, it is worth noting that 63% of the sample languages (n = 225) had either gender or numeral classifiers or both and this may suggest an overall preference for languages to develop some type of noun classification (but since 38% of my sample languages had neither gender nor numeral classifiers, the estimation that almost all languages have some type of noun classification is too strong). If we count how many genera had languages with either type of noun classification, roughly 58% of genera (n = 152) had either gender or numeral classifiers or both, while 42% of genera (n = 111) had neither gender nor numeral classifiers. According to exact binomial test, this distribution is statistically significant (one-tailed p = 0.0067). This result provides evidence that languages prefer to develop either gender or numeral classifiers or both rather than not to develop any type of noun classification. Since my counts do not include possessive classifiers and noun classifiers, it is plausible that if those other types of classifiers had been included, the preference would have been even stronger.

A heatmap of the distribution of gender and numeral classifiers is shown in Figure 3 (counts in genera). If we count distinct values in genera, and perform Fisher's Exact test to the data, then there is a statistically significant inverse dependence between gender and numeral classifiers (p = 0.005). According to this distribution, gender is 2.3 times less likely in genera that have languages with numeral classifiers than in those that lack numeral classifiers. However, counting genera is a crude way of controlling for genealogical inheritance (cf. §3.2) and this test also does not take into account possible areal diffusion. Those issues will be more properly dealt with in the next section using generalized mixed logistic regression.
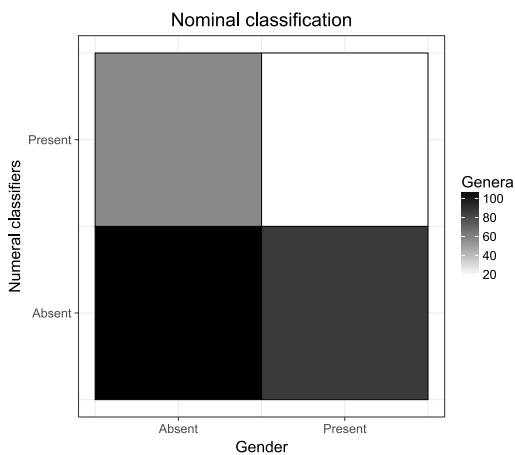
Figure 3: Heatmap of the distribution of gender and numeral classifiers (counts in genera).

The data also allows to estimate genus-internal diversity and stability of gender and numeral classifiers. There were altogether 56 genera with more than one sampled language and in 12 of these (21%) there was diversity in terms of gender (that is, some languages with gender and some without gender). This means that 79% of genera were uniform in either having gender or not having gender and this distribution is statistically significant (exact binomial test; two-tailed p = 0.00002). As for numeral classifiers, there was diversity in 11 genera (20%). This means that 80% of genera were uniform in either having numeral classifiers or not having them and this distribution is statistically significant (exact binomial test; two-tailed; p = 0.000005). If we take these figures as a proxy for the stability of gender and numeral classifiers within genera, both features seem to be relatively stable

(see Bickel 2013: 433–434 for similar conclusions for pronominal gender; also Dahl 2004: 196–202).

A few words can also be said concerning the areal distributions of gender and numeral classifiers. As for numeral classifiers, it has been noted by Johanna Nichols and colleagues that they cluster in languages spoken around the Pacific Ocean (e.g., Nichols 1992: 132–133; Nichols & Peterson 1996: 366–367; Nichols 2003: 299). On the basis of the distributions in Figure 2, this claim seems largely true, although some languages in Africa, Europe and Central Asia also have numeral classifiers, while no language in Australia has them (Aikhenvald 2000: 121–124).[12] Here I use GLMM to evaluate Nichols' claim whereby numeral classifiers are more likely to occur in languages spoken in the Circum-Pacific. Following Bickel & Nichols (2006) I define Circum-Pacific as encompassing the Americas, Oceania (including New Guinea and Australia), Southeast Asia, and the Northeastern Coast of Asia. Following Nichols (2003), I include mainland and island Southeast Asia in this area. I then compare the distribution of numeral classifiers in this large area against the rest of the world (that is, Africa and Eurasia except for Southeast Asia and Northeastern Coast of Asia). Figure 4 presents the sample languages inside and outside the Circum-Pacific area on a world map. An association plot of the distribution of numeral classifiers inside and outside the Circum-Pacific area is shown in the left panel of Figure 5.

I modeled numeral classifiers as the dependent, area as a binomial predictor (whether a language is spoken inside or outside the Circum-Pacific area), and the *WALS* families as a random intercept. According to the mixed logistic regression, languages spoken in the Circum-Pacific area were significantly more likely to have numeral classifiers than languages spoken outside this area (logit estimates: 2.2 ± 1.0 (standard errors); χ^2 (1) = 5.7; p = 0.02). As an alternative approach I used stocks (the highest level of genealogical classification in the *Autotyp*) as a random intercept. According to this model design, languages spoken in the Circum-Pacific area were again significantly more likely to have numeral classi-

---

[12]The observation that there are no numeral classifiers in Australian languages may be related to their numeral systems in general. The existence of numeral classifiers presupposes that a language has a numeral system (Aikhenvald 2000: 99). However, many Australian languages have numbers only for the low numerals (e.g., from one to three), but these do not necessarily form a separate part of speech (see Aikhenvald 2000: 100 and references there). The reason why there are no numeral classifiers in Australia may thus be related to the fact that in many languages in this area numerals either do not exist at all as a separate part of speech or numbers are expressed through other larger parts of speech. However, other types of classifiers, such as noun classifiers, are common in Australian languages (Aikhenvald 2000: 82; see also Plaster & Polinsky 2007).

fiers than languages spoken outside this area (logit estimates: 3.3 ± 1.5 (standard errors); χ^2 (1) = 8.3; p = 0.004). When interpreting the coefficients as odds ratios in this model, languages spoken in the Circum-Pacific region were 27 times more likely to have numeral classifiers than languages spoken outside this region.
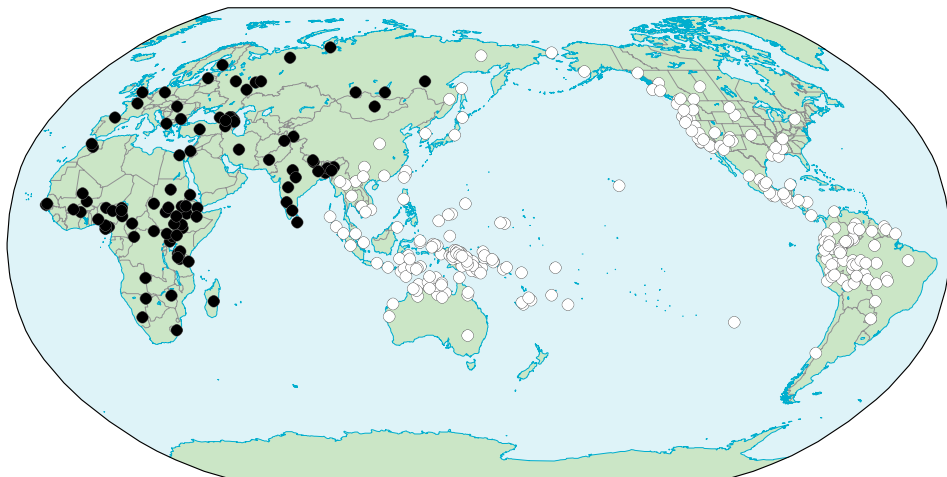
Figure 4: Sample languages on a world map according to area (white = Circum-Pacific area, black = the rest)

The areal distribution of gender has not been in focus very often, but what has been said about it in the literature (simplifying a little) is that gender is not too frequent in the Americas and in the Austronesian languages, whereas it tends to cluster especially in Africa, Europe, Caucasus and the Indian Peninsula as well as in Australia (Corbett 1991: 1–2; Nichols 1992: 130–132; Corbett 2013).[13] This distribution sounds like the opposite to that of numeral classifiers. I therefore compared the distribution of gender in the Circum-Pacific area against the rest of the world as above in the case of numeral classifiers, first modeling *WALS*-family as random intercept. An association plot of this distribution is shown in the right panel of Figure 5.

According to the mixed logistic regression, languages spoken in the Circum-Pacific area were less likely to have gender than languages spoken outside this area (logit estimates: −1.2 ± 0.6 (standard errors); χ^2 (1) = 5.3; p = 0.02). As an

---

[13]Nichols (1992: 130–132) proposes that most gender-languages occur in hotbeds, that is, areas in which gender occurs in most languages of the area, but they come from diverse families and occur in diverse forms. Because my focus is not on the formal aspects of gender marking, her proposal cannot be statistically tested in this paper.

Figure 5: Association plots of the distribution of numeral classifiers (left panel) and gender (right panel) inside and outside the Circum-Pacific. Positive Pearson residuals (blue color) indicate that the cell values were greater than expected and negative Pearson residuals (red) indicate that the cell values were smaller than expected.

alternative approach I used stocks (the highest level of genealogical classification in the *Autotyp*) as a random intercept. According to this model design, languages spoken in the Circum-Pacific area were significantly more likely to hav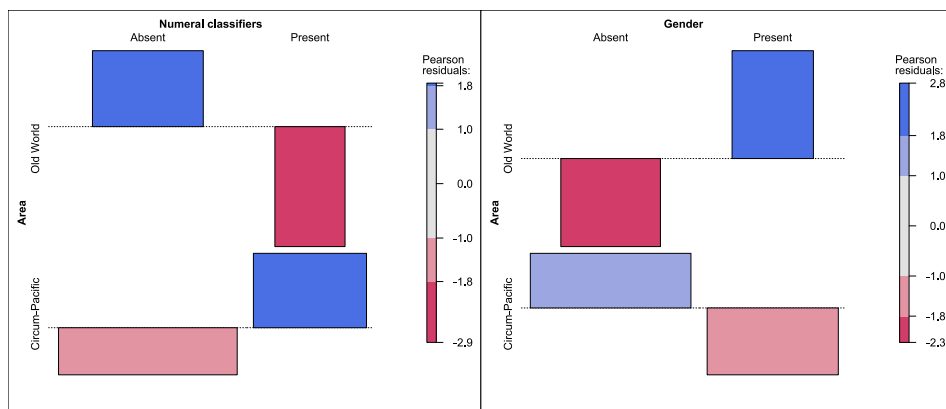e numeral classifiers than languages spoken outside this area (logit estimates: −1.6 ± 0.6 (standard errors); χ^2 (1) = 8.8; p = 0.003). When interpreting the coefficients as odds ratios in this model, languages spoken in the Circum-Pacific were about five times less likely to have gender than languages spoken outside this region.

The conclusion from these distributions is that there is an inverse relationship between gender and numeral classifiers in the languages of the world. On the other hand, there is a roughly complementary areal distribution of gender and numeral classifiers so that numeral classifiers are more likely to occur in the Circum-Pacific region than outside it, whereas gender has the opposite distribution. One consequence of these results could be that the inverse relationship between gender and numeral classifiers is simply an outcome of their biased areal distributions. However, as will be shown in the following section, gender has this inverse relationship to numeral classifiers independently of geographical areas.

4.2 Testing the main hypothesis

The hypothesis that an inverse relationship exists between gender and numeral classifiers was tested with generalized mixed effects models. I constructed a model using the *WALS* families as a grouping factor for genealogical affiliation and the

ten continents from the *Autotyp* as the grouping factor for areas. This is my main model and it is also a maximal model that has all the theoretically motivated random intercepts and slopes included. In recent research, it has been suggested that maximal models are preferred in mixed models and especially that models without random slopes may produce spurious results (Schielzeth & Forstmeier 2009; Barr et al. 2013).

According to the mixed logistic regression, languages with numeral classifiers were significantly less likely to have gender than those with no numeral classifiers (logit estimates: −2.1 ± 1.1 (standard errors); χ^2 (1) = 7.7; p = 0.0056). The negative coefficient and the highly significant p-value suggest that the hypothesis is confirmed. A closer inspection of the random effects in Table 3 confirms that the random structure is feasible: the correlation terms between the random intercept and the random slopes for both family and continent are not too large (0.41 and −0.09, respectively).

Table 3: Random effects for the maximal model

Groups	Name	Variance	Std. Dev.	Corr
family	(Intercept)	2.35	1.53	
	classifiers=present	1.48	1.22	0.41
continent	(Intercept)	0.63	0.80	
	classifiers=present	0.53	0.73	−0.09

I further tested the validity of the result with a parametric bootstrap method (Halekoh & Højsgaard 2014). This method returns the fraction of those simulated likelihood ratio test values that are larger or equal to the observed likelihood ratio test value. Using 2 000 simulations the parametric bootstrap derived p-value was 0.0398. Although this p-value is larger than the one derived from the χ^2-distribution (p = 0.0056), it still confirms that the inverse relationship between gender and numeral classifiers is significant and holds independent of geographical area and language families. When interpreting the coefficients as odds ratios, we can conclude that gender is about eight times less likely to occur in a language when that language already has a numeral classifier compared to languages without numeral classifiers. To put it in another way, there is a statistical implicational universal in languages that if a language has numeral classifiers, then it is likely not to have gender but if a language does not have numeral classifiers then it is likely to have gender. The results were then tested by using an alternative genealogical classification and three alternative areal configurations.

These tests and their results are presented in Appendix 1. In all these additional models the result was the same as here: an inverse and significant relationship occurred between gender and numeral classifiers.

I then fitted a competing model choosing numeral classifiers as the dependent and gender as the predictor. I modeled the random structure as in the model above. *WALS*-families were used to model genealogical affiliation and the ten *Autotyp* continents were used to model geographical areas. According to the mixed logistic regression, languages with gender were *more* likely to have numeral classifiers than languages with no gender (logit estimates: 1.0 ± 2.2 (standard errors), but this relationship was not statistically significant (χ^2 (1) = 0.21; p = 0.64). But the random structure of this competing model suggests that the model may be too complex to fit to the data. The correlation between the random intercepts and slopes for both family and continent are −1.0 and the variances for family are extremely large (93 for the random intercept and 21 for the random slope). These problems with the random structure may explain why the relationship between numeral classifiers and gender was positive and not negative as expected (cf. Appendix 1). To further double-check this I refitted the competing model but using the six macroareas of the *WALS* as the geographical area-factor (see Appendix 1 for the distribution of these macroareas on a map). According to this model, languages with gender were *less* likely to have numeral classifiers than languages with no gender (logit estimates: -1.8 ± 2.5 (standard errors), but this inverse relationship was not statistically significant (χ^2 (1) = 0.0; p = 1.0). I then refitted the competing model using the 24 areas of the *Autotyp* as the geographical area-factor (see Appendix 1 for the distribution of the 24 areas on a map). According to this model, languages with gender were again less likely to have numeral classifiers than languages with no gender (logit estimates: -4.0 ± 3.4 (standard errors) and this inverse relationship was statistically significant (χ^2 (1) = 4.8; p = 0.028).

All in all the results of the competing models were very variable and depended on the areal configuration used, whereas the results of the main model (and the additional models in Appendix 1) were consistent regardless of how genealogical affiliation and geographical areas were coded. I interpret these results to mean that numeral classifiers are more likely to have an effect on gender rather than the other way round, which is exactly what has been suggested in the literature (§3.2).

The results of the mixed effects logistic models suggest that there is a statistically significant complexity trade-off between gender and numeral classifiers. This result was also independent of how geographical area and language family

were coded. However, because the data contained many counterexamples against the trade-off the generalization is not an absolute universal. Many languages, for instance, had neither gender nor numeral classifiers, and therefore the generalization must be understood as a probabilistic universal.[14]

5 Discussion

The distribution of gender and numeral classifiers and the complexity trade-off between them raise questions that require explanations. Three issues in particular require attention. Why is there a trade-off between gender and numeral classifiers? Why are their areal distributions so biased? Why are languages more likely to have some noun classification system rather than no noun classification at all? Within the limits of this paper I confine myself to providing some preliminary thoughts on possible explanations.

The central question here is why there is a complexity trade-off between gender and numeral classifiers. Two relevant issues are discussed here. First, from a functional point of view gender and numeral classifiers tread the same functional domain, that is, they encode semantically-pragmatically closely related functions across languages (Miestamo 2007: 293). These functions have to do primarily with individuation and reference-identification (or "reference-tracking"), although other functions are also shared across gender and numeral classifier systems (Contini-Morava & Kilarski 2013: 293–294). Because gender and numeral classifier systems share these similar functions, the inverse correlation between these variables can be explained functionally by economy and distinctness. The rationale for this explanation is the following. Economy and distinctness are functional motivations that relate to the amount of linguistic structure, economy for keeping it minimal, and distinctness for preserving distinctions in linguistic structure. Now, if a language has already developed a system of noun classification (e.g., gender), it is inefficient and redundant for that language to develop another type of nominal classification (e.g., numeral classifiers) to serve a similar set of functions (e.g., Hawkins 2004; Sinnemäki 2014b). The small likelihood of developing multiple systems of noun classification is, therefore, a matter of the Zipfian principle of least effort or economy and its interaction with distinctness: linguistic structures are kept minimal without losing distinctness.

---

[14]For instance, all or almost all languages in Quechuan, Otomanguean, Uto-Aztecan, and Trans-New Guinea language families had neither gender nor numeral classifiers, whereas some languages in the Arawakan, Tucanoan, and West Papuan families had both gender and numeral classifiers (e.g., Palikur in (1)).

The second issue is diachronic in nature. If a language loses its noun classification system, it may redevelop another type via reanalysis. For instance, gender markers have been lost in many Iranian and Indic languages, but many of these languages have developed numeral classifiers. In Bengali this resulted in reinterpreting the old feminine forms in terms of numeral classifiers. In Africa, Ogonoid (also called Kegboid) languages, such as Kana (Ogonoid; Niger-Congo), lost their noun class system and instead developed numeral classifiers, which are very rare in Africa. Overall, noun classification may thus be a rather stable feature in language although the particular classification system may be lost. (See Aikhenvald 2000: 379–381 and references.)

While multiple systems of noun classification are possible, they are rare (see §4.1). One reason for languages to develop more than one system of noun classification is language contact. For instance, Santali (Munda; Austroasiatic) has two gender systems as well as numeral classifiers. One gender system is native to Santali and it distinguishes animate from inanimate, while the other system is borrowed from Indo-Aryan and it distinguishes male from non-male (Ghosh 2008: 39). In (11), the noun *Kali-idol* triggers object gender agreement on the verb, which is marked by the third person object clitic *-e* that is reserved for animate beings, but it also requires the use of the a numeral classifier *-taŋ*.

(11) Santali (Austroasiatic; Ghosh 2008: 39)
      uni   mit'-taŋ kəli-boŋga benao-akad-e-a-e
      3SG.M one-CLF Kali-idol   make-PRF.A-3SG.OBJ-FIN-3SG.SBJ
      'He has made a Kali idol.'

Numeral classifier systems can also be borrowed, as seems to have happened in Malto (Dravidian). Malto presumably borrowed numeral classifiers from Magahi (Indic; Indo-European) and elaborated the system subsequently (Emeneau 1980: 117–118). Besides the numeral classifier system Magahi also has a gender system (Steever 1998). These are illustrated in (12).

(12) Malto (Dravidian; Steever 1998: 363, 372)

      a. *tīni   jen maler*
         three CLF man.PL
         'Three men'

      b. *rājah   awḍah*
         king.M.NOM say.PST.3SG.M
         'The king said'

Kaius Sinnemäki

Language contact is also one reason for why multiple systems of noun classi-
fication get reduced. For instance, Retuara (Tucanoan) has lost its classifier sys-
tem and retained only a gender system because of language contact with Yucuna
(Arawakan; see Aikhenvald 2000: 386 and references).

The kinds of "compensating" mechanisms discussed above, motivated by econ-
omy and distinctness and manifest in diachronic change, may be found in other
areas of grammar as well (e.g., Sinnemäki 2014b). Ultimately economy and dis-
tinctness are grounded in language processing and are like the two sides of
the same coin. As a processing principle economy is a matter of 'minimize all
you can', which means that all unnecessary distinctions can be dispensed so
that distinctness is not lost (Bornkessel-Schlesewsky & Schlesewsky 2009). In
terms of language change, complexity trade-offs may be seen as adaptive pro-
cesses where linguistic structure adapts to preferences in language processing
(Sinnemäki 2014a; Bickel et al. 2015). In noun classification this adaptation shows
up in the fact that while the majority of the world's languages have a system of
noun classification (§4.1), there is a tendency in languages not to develop more
than one such system.

This leads us to another important question raised by the results, namely, why
the presence of noun classification is preferred over its absence across languages
(§4.1). One relevant issue in this regard is the discussion on language complexity
that has taken place during the past 15 years. Many researchers have argued that
gender is relatively devoid of meaning (not marking real-world categories), adds
unnecessary complexity to language, and therefore tends to be lost in situations
that involve heavy language contact by adult learners (e.g., McWhorter 2001: 129;
Kusters 2003: 25; Trudgill 2011: 155–166). It has also been claimed that classifier
systems are at a corresponding level of complexity compared to gender systems
(Riddle 2008: 136–141, 147–148). Although numeral classifiers tend to mark real-
world categories – and in this sense are more semantically based – they have
been analyzed in the same way as gender, adding unnecessary complexity to
language (e.g., McWhorter 2007: 22). Some quantitative evidence for the loss of
gender complexity comes from pidgins, which tend to lose especially agreement
categories, such as gender (Roberts & Bresnan 2008). Against this background
it is surprising that there seems to be a preference for languages to develop this
kind of grammatical marking, be it gender or numeral classifiers, if it really is
unnecessary for human communication.

One possibility for this preference may be functional. The shared functions of
gender and numeral classifiers deal primarily with individuation and reference-
identification, but gender shares further functions with other types of classifiers

as well, including the derivational expansion of the lexicon (Contini-Morava & Kilarski 2013; see also Riddle 2008: 136–141). These functions may be central enough in communication that there is a general preference in languages to develop some type of noun classification to serve these functions. On the contrary, especially gender marking may sometimes lead to tracking failure and ambiguity and there are also grounds to believe that the referential functions of gender (and possibly also those of classifiers) are important only in languages which have many classes in their noun classification system (Trudgill 2011: 158–159). In this sense it is unclear whether the above functions of noun classification are important enough to attract and sustain noun classification in languages.

Another possible explanation is based on the simple fact that noun classification groups nouns into classes. Even languages that do not have noun classification may have some other forms of grouping nouns into subcategories. One such example is declensional type (or inflectional class), which is a way of classifying nouns into groups depending on how they inflect for grammatical categories such as number and case (e.g., Kramer 2015: 67–68). Dahl (2000: 583–584) makes the strong point that sometimes inflectional classes actually look like gender distinctions and some of them could be analyzed as gender. Thus, noun classification and inflectional classes share the fact that they group nouns into subcategories. This leads me to the following preliminary conclusion for why there is a preference to develop noun classification in the languages of the world: languages prefer to classify nouns into subcategories and languages reach this goal in different ways by using gender, classifiers, inflectional classes, or some other means.

The third question that the results raised is why the areal distributions of gender and numeral classifiers were so biased. Since the origin and/or distribution of gender and classifiers have been discussed in multiple publications (e.g., Corbett 1991, Corbett 2013; Nichols 1992, Nichols 2003; Aikhenvald 2000; Luraghi 2011; Gil 2013; Passer 2016b), I will only provide some observations here.

There is increasing evidence suggesting that classifiers spread through language contact more easily than gender does and therefore serve as strong areal markers (Seifart 2010: 730). In addition, what tends to diffuse is often the pattern of classifiers and not the actual markers (in terms of Matras 2009: 234–237); it is rather the native words that are employed for the purpose of an incipient classifier system. Gender systems do not spread so easily because agreement systems are less easily borrowed, although parts of the systems may be borrowed (Aikhenvald 2000: 386–388). Since the pattern of numeral classifiers may be relatively easy to spread, whereas the pattern of gender tends not to spread easily, it is probably no coincidence that gender is considered more stable (that is, more

likely to be genealogically inherited) than numeral classifiers (e.g., Nichols 2003: 299–303). This observation is confirmed by Dediu & Cysouw (2013) who compared eight stability metrics recently developed for estimating the stability of typological parameters. Based on their comparisons, gender (more specifically number of gender; data from the *WALS*) appears to be more stable than numeral classifiers according to the metrics (p. 13, Table 7).

On the other hand, the greater diffusability and instability of numeral classifiers may be related to the way noun classification systems develop. Numeral classifiers tend to develop ultimately from lexical sources, from generic nouns, such as 'man' and 'woman', whereas gender tends to develop either from an earlier classifier system or from a morphosyntactic source, namely, case or number agreement (Luraghi 2011). In other words, when a language begins to develop noun classification, it most commonly starts with a classifier system that may then, in some cases, further develop into a noun class or a gender system. The latter systems require longer time and more steps in their development and are, therefore, more "mature" in terms of Dahl (2004). The fact that gender does not spread so easily is probably related to its greater dependence on the language-specific agreement system, whereas the idea of classifiers can spread much more easily from one language to another, possibly regardless of the language-specific system.

This last point leads us to consider the macroareal distributions of gender and numeral classifiers. As was observed in §4.1, numeral classifiers cluster in the Circum-Pacific, while gender clusters in the Old World.

However, if we focus on the frequency distribution of gender and numeral classifiers separately inside and outside the Circum-Pacific, a different picture emerges. The barplot in Figure 6 shows that the frequency distributions of these two types of noun classification are almost identical in the Circum-Pacific. In the Old World, on the contrary, gender is much more frequent than numeral classifiers. In other words, what stands out in the frequency distributions is the smaller than expected frequency of numeral classifiers in the Old World and the higher than expected frequency of gender in the Old World. Thus, if we focus on the distributions of noun classification overall, there is evidence that it is the distributions in the Old World that are biased rather than those in the Circum-Pacific.

Here I can only speculate possible reasons for these distributions. One possible explanation for the greater frequency of gender in the Old World is the following. As was discussed above, gender can develop from classifiers or from case or number agreement. If we assume that there has been a roughly equal probability

of developing gender from classifiers in both the Circum-Pacific and in the Old World, then the higher frequency of gender must be explained by gender having developed in the Old World more probably from case or number agreement compared to the Circum-Pacific. However, this explanation cannot really account for why the frequency of numeral classifiers is so much lower than expected in the Old World. If gender would develop more likely from case or number agreement than from classifiers in the Old World, this may explain the higher frequency of gender in that area, but not the lower than expected frequency of numeral classifiers.

Figure 6: Barplots of gender (on the left) and numeral classifiers (on the right) inside and outside the Circum-Pacific region (counts in genera)

Another possibility is to assume that the probability of developing gender from case or number agreement was roughly similar in the Circum-Pacific and in the Old World. The higher frequency of gender in the Old World could then only be explained by gender being developed more likely from classifiers in the Old World compared to the Circum-Pacific. This explanation could account for the higher than expected frequency of gender in the Old World and also the lower than expected frequency of numeral classifiers in the Old World – provided that we assume that when a numeral classifiers system changes into gender that change is complete and the old system of numeral classifiers is practically lost.

This possibility crucially depends on the hypothesized grammaticalization path from classifiers to gender (see §3.2). Although many researchers have suggested this path as one possibility for gender to develop, Passer (2016b: 346) found no evidence for this process in his in-depth study. He suggests that the reason for the lack of evidence may be the following: when a classifier system turns into a gen-

der system, this change requires large changes in the grammar of the language that go beyond noun classification, including the development of obligatory inflectional agreement. Such large changes in grammars would require that many languages change their morphological type in the process. Numeral classifiers tend to occur especially in analytic languages, but changing morphological type to synthetic is unlikely and rare in the languages of the world. The reasons for the biased areal distributions must, therefore, be sought from elsewhere. (Passer 2016b.)

Another reason for the biased areal distributions of gender and numeral classifiers may be related to structural stability (cf. §4.1 and Dahl 2004: 196–202). Gender and numeral classifiers may simply be stable over very long periods of time, numeral classifiers being further reinforced by neighboring languages in the Circum-Pacific area and gender being reinforced by neighboring languages outside this area. This may be part of the story, since these variables are not the only ones that mark off Circum-Pacific area from the rest of the world. Bickel & Nichols (2006) show that this area is typologically marked off from the rest of the world by about 40% of the 86 linguistic variables they surveyed. In addition, Dediu & Cysouw (2013: 13) observed that both gender and numeral classifiers are among the more stable features when compared to the other selected *WALS* features. This stability may be related to language type, as was implied above: although the morphological type of languages may sometimes change, it is unlikely that so extensive changes would be mere epiphenomena of changes in noun classification. Languages are more likely to stick to their morphological type and change some aspects of their linguistic patterns or lose those patterns but not change those patterns completely from one type to another (Passer 2016b: 346). It is more cautious but probably more to the point to say that the kind of noun classification attracted by analytic/isolating languages is (numeral) classifiers and those attracted by languages with inflection is gender (cf. Corbett 1991: 137).

6 Conclusion

In this paper I have researched the interaction between gender and numeral classifiers in a representative sample of the world's languages. The data suggested that there is a strong inverse relationship between gender and numeral classifiers.

This interaction adds to our knowledge of statistical language universals and bespeaks for the existence of complexity trade-offs in well-circumscribed areas of grammar. Previous research has not revealed many instances of complexity

trade-offs (e.g., Shosted 2006; Maddieson 2006; Miestamo 2009). Those that have been found, such as the one between case marking and rigid word order (Siewierska 1998; Sinnemäki 2008, Sinnemäki 2011, Sinnemäki 2014b), have overwhelmingly occurred between functionally related variables that, for instance, tread the same functional domain (such as argument marking). It is possible that new complexity trade-offs will be found among typological variables, but my contention is that they will be found among variables that are functionally related and may therefore also be diachronically connected to one another.

Although the current data suggests a new complexity trade-off this result does not provide evidence for the claim that all languages are equally complex. As I have demonstrated elsewhere (Sinnemäki 2014c) correlational evidence based on typological feature-data cannot either validate or falsify this claim.

I have said very little about the typological distribution of noun classifiers and possessive classifiers. Numeral classifiers are just one subtype of classifiers, so to form a more precise picture of how gender interacts with classifiers in general it would be necessary to survey at least these two types of classifiers in the future as well.

Acknowledgments

Special abbreviations

The following abbreviations are not found in the Leipzig Glossing Rules:

A	active	HUM	human	POSS	possessor marking
ANIM	animate	ICMP	incomplete	PREP	preposition
CLF	classifier	NHUM	non-human	PRF	perfect
CLT	clitic	NUM	numeral	REF	referential
FIN	finite	NVIS	non-visible	WK	week

Appendix 1: Supporting material about mixed effects modeling

The results of the mixed effect modeling indicated that gender correlated inversely with numeral classifiers irrespective of variation related to language families and geographical areas. Here I discuss the model specifications in greater detail and present also a few additional tests that replicate the results.

One important issue that often surfaces in relation to generalized mixed effects modeling is the convergence of models. A common problem in fitting the models is that they do not always converge. In generalized linear mixed effects modeling an iterative algorithm is used to produce the model parameters. This iteration stops when the difference between successive iterations is smaller than a predetermined tolerance. If so, the model is said to converge, otherwise it is said not to converge. In R the tolerance is set to 1e−8 by default, which means that in practice the model fit cannot be improved with further iterations. See Hardin & Hilbe (2007: 2, 9, 10, 31) and Kimball et al. (submitted: 3–4) for more details and references to more technical papers.

When the model does not converge, there are three options available: simplify the models, increase the number of iterations, or use a different optimizer. Based on my experience with generalized linear mixed models using binomial response factors it is hardly ever the case that increasing the number of iterations leads to convergence. The most common alternative in linguistics has been to simplify the models and remove one or more of the random slopes (or the correlation parameters between the random intercept and random slope for some effect). However, there is ongoing debate among researchers whether it is justified to leave out any aspect of the random structure. The simulations of Barr et al. (2013) suggest that it is best to work with maximal models, whereas, for instance, Baayen (2008), Baayen et al. (2008: 395), Bates, Kliegl, et al. (2015), and Gries (2015) argue that it is fully justified to ask whether all of the random structure is necessary. The statistical literature, on the other hand, suggests that estimating random effects with likelihood ratio test (anova) is not a valid approach for building mixed effects models (see Kimball et al. submitted: 8 and references there). For this latter reason I did not use model simplification for the purpose of improving convergence. (Kimball et al. submitted.)

However, there are situations that may be somewhat problematic if maximal random structure is used. Sometimes the correlation parameter between the random intercept and the random slope for a particular effect is close to or even equals ±1.0. This circumstance means that there is not enough data to fit both a

random intercept and a random slope for a particular effect (Baayen et al. 2008; Bates, Kliegl, et al. 2015). In these situations I followed the recommendations of Barr et al. (2013) and chose to keep the maximal model. There are two reasons for this. First, simplifying the models by removing the correlation between random effects or by removing a random slope usually only increases the likelihood ratio of the fixed term (here numeral classifiers) and makes its p-value smaller. In all the models below, the fixed effect was significant even with the maximal model, so simplifying the models would not have changed the situation. Second, since languages change at different rates across families and areas (cf. Nichols 2003), it is crucial to include random slopes for both families and areas. Yet owing to the high number of families it may not be usually possible to include more than one random factor for genealogical affiliation especially in Generalized Linear Mixed Models. For instance, Atkinson (2011) modeled both genera and families as random factors but only as random intercepts not as random slopes (or as nested factors, which could have been done). Thus mixed models may not be able to account for the internal structure of language families for which other approaches are called for, such as the Family Bias Theory of Bickel (2013) or phylogenetic regression (e.g., Dunn et al. 2011).

Convergence can be improved also by using a different optimizer. The R package lme4 (Bates, Maechler, et al. 2015) uses two optimizers, BOBYQA and Nelder-Mead, to estimate the random effects in generalized linear mixed effects modeling. My models did not always converge with the default settings, that is, when using both these optimizers. My solution was to use only one optimizer at a time. I used BOBYQA for most of the models (it is also faster in practice) and Nelder-Mead only when using BOBYQA did not work: these choices resulted in model convergence in all situations. A more general solution to the convergence error is offered by Bayesian mixed effects modeling (see e.g. Kimball et al. submitted), but I chose to use the frequentist approach here because of its greater familiarity in linguistics.

In the mixed effects modeling I let the intercepts and the slopes vary between the *WALS* families and between the continents as defined in the *Autotyp*. But there are other genealogical classifications that could have been used and the world can also be divided into geographical areas based on different criteria. The classifications I chose capture variation at one particular level of configuration, so it is informative to try out alternative configurations as well. For instance, the ten continents used in the *Autotyp* may conceal variation that occurs in finer-grained areas or in larger macro-areas. For this reason I retested the hypothesis by using an alternative genealogical classification as well as two alternative
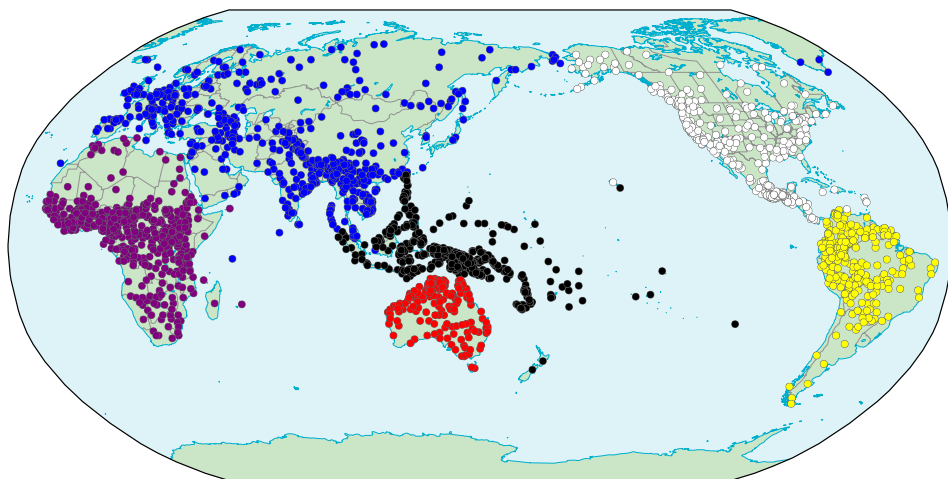
Figure 7: Six macroareas of the *WALS* on the world map

areal configurations. As an alternative genealogical classification I used stocks, the highest level of classification in the *Autotyp* database (Bickel et al. 2017). As alternative areal configurations I used the six macroareas in the *WALS* and the 24 areas in the *Autotyp*. The six macroareas of the *WALS* are illustrated on a world map in Figure 7 (using the 2679 languages of that database) and the 24 areas of the *Autotyp* are illustrated in Figure 8 (using 2949 languages of that database).[15] These combinations of the genealogical and areal classifications produced five additional models listed in Table 4.

The results of these additional models are summarized in Table 4. As the fourth column suggests, in all the additional models there was an inverse relationship between gender and numeral classifiers. As the rightmost column suggests, this relationship was significant in all the models. These results further replicate those reported in §4.2.

---

[15]See Hammarström & Donohue (2014) for a macroareal definition that is different from those used in the *WALS*. Most areal breakdowns in language typology are based on geography, but it would be possible to use also areal breakdowns based on other criteria, such as social structure (Burton et al. 1996). However, typological research has yet to discuss and employ such approaches.
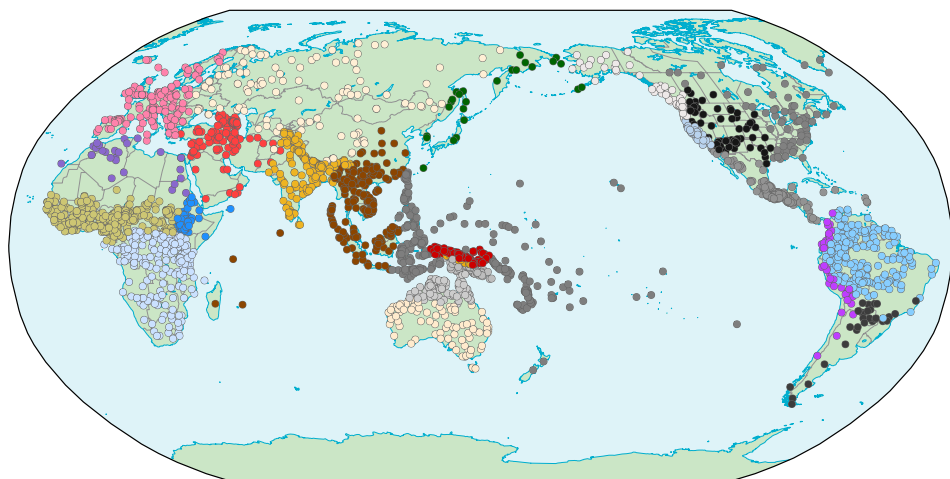
Figure 8: The 24 areas of the *Autotyp* on a world map

Table 4: Five additional models, the design of their random effect structure, and the results of the mixed effects modeling

Model	Areal configuration	Genealogical classification	logit estimates + std. error	$\chi^2(1)$	p-value
W24	24 areas	*WALS*-families	−2.1 ± 1.1	9.3	0.002
W6	6 macroareas	*WALS*-families	−1.9 ± 0.9	4.1	0.042
A10	10 continents	*Autotyp*-stocks	−3.4 ± 2.4	8.3	0.004
A24	24 areas	*Autotyp*-stocks	−3.1 ± 2.3	9.2	0.002
A6	6 macroareas	*Autotyp*-stocks	−3.1 ± 1.9	4.7	0.030

Appendix 2: The sample and sources

The table below provides information about the 360 sample languages, including genealogical classification, macroareal classification, the data on numeral classifiers and gender, and sources. A more detailed database on noun gender is in preparation to *Journal of Cross-Linguistic Databases*.

Table 5

Macroarea	Family	Genus	Language	Cl	Gd	Sources (classifiers)	Sources (gender)
Africa	Afro-Asiatic	Berber	Berber (Middle Atlas)	–	+	Penchoen 1973: 24–25	Penchoen 1973: 12–13, 21–22, 25–27, 39–40, 54–55
Africa	Afro-Asiatic	Biu-Mandara	Margi	–	–	Gil 2013	Hoffman 1963: 46, 72–75, 85–87
Africa	Afro-Asiatic	Central Cushitic	Kemant	–	+	Appleyard 1975: 329, passim	Appleyard 1975: 319–322, 332–333
Africa	Afro-Asiatic	Dizoid	Dizi	–	+	Gil 2013	Corbett 2013; Nichols 1992: 295
Africa	Afro-Asiatic	E. Cushitic	Arbore	–	+	Gil 2013	Corbett 2013; Hayward 1984: 131–132
Africa	Afro-Asiatic	E. Cushitic	Oromo (Harar)	–	+	Gil 2013	Corbett 2013; Owens 1985: 65
Africa	Afro-Asiatic	E. Cushitic	Qafar	–	+	Bliese 1981: 185–186	Bliese 1981: 180–182, 186–188
Africa	Afro-Asiatic	S. Cushitic	Alagwa	–	+	Gil 2013	Corbett 2013; Mous 2008: 147–149
Africa	Afro-Asiatic	S. Cushitic	Iraqw	–	+	Gil 2013	Corbett 2013; Mous 1992: 41
Africa	Afro-Asiatic	Semitic	Amharic	–	+	Gil 2013	Corbett 2013; Leslau 1995: 33–34
Africa	Afro-Asiatic	Semitic	Arabic (Egyptian)	–	+	Gil 2013	Corbett 2013; Hanna 1967: 12–18
Africa	Afro-Asiatic	Semitic	Arabic (Moroccan)	–	+	Gil 2013	Harrell 1962: 40, 45–46, 95–97
Africa	Afro-Asiatic	Semitic	Tigré	–	+	Elias 2005: 110–112	Corbett 2013; Elias 2005: 210–216
Africa	Afro-Asiatic	W. Chadic	Hausa	–	+	Gil 2013	Corbett 2013; Schuh 1976: 47
Africa	Afro-Asiatic	W. Chadic	Miya	–	+	Gil 2013	Corbett 2013; Schuh 1989: 171–173
Africa	Austronesian	Barito	Malagasy	–	–	Gil 2013	Corbett 2013
Africa	Central Sudanic	Moru-Ma'di	Lugbara	–	–	Gil 2013	Nichols 1992: 295
Africa	Eastern Sudanic	Kuliak	So	+	–	Gil 2013	Carlin 1993: 73
Africa	Eastern Sudanic	Nilotic	Datooga	–	–	Gil 2013	Kiessling 2007: passim
Africa	Eastern Sudanic	Nilotic	Lango	–	–	Gil 2013	Corbett 2013
Africa	Eastern Sudanic	Nilotic	Maasai	–	+	Gil 2013	Payne 1998: 160
Africa	Eastern Sudanic	Nubian	Nubian (Dongolese)	–	–	Gil 2013	Corbett 2013
Africa	Eastern Sudanic	Surmic	Murle	–	+	Arensen 1982: 100	Corbett 2013
Africa	Fur	Fur	Fur	–	+	Gil 2013	Jakobi 1990: 84, 99–115
Africa	Gumuz	Gumuz	Gumuz	–	–	Ahland 2012: 131–135	Ahland 2012: 95–96
Africa	Hadza	Hadza	Hadza	–	+	Edenmyr 2004: passim	Sands 2013: 108–110
Africa	Kadu	Kadugli	Krongo	–	+	Reh 1985: 309–310	Reh 1985: 126–127
Africa	Khoe-Kwadi	Khoe-Kwadi	Khoekhoe	–	+	Gil 2013	Corbett 2013; Hagman 1973: 81–88
Africa	Koman	Koman	Uduk	–	+	Killian 2015: 129–132	Killian 2015: 67–68
Africa	Kordofanian	Rashad	Orig	–	–	Gil 2013	Nichols 1992: 295
Africa	Kx'a	Ju Kung	Juǀ'hoan	–	–	Gil 2013	Corbett 2013; Dickens 1992: 12–16
Africa	Mande	W. Mande	Mandinka (Gambian)	–	–	Nichols 1992: 295	Nichols 1992: 295
Africa	Niger-Congo	Bantoid	Ejagham	+	+	Watters 1981: 309–313	Watters 1981: 291–293, 318–321, 328–331, 434–440
Africa	Niger-Congo	Bantoid	Lingala	–	+	Meeuwis 1998: 23–24	Corbett 2013; Kamwangamalu 1989: 110–111
Africa	Niger-Congo	Bantoid	Luganda	–	+	Gil 2013	Nichols 1992: 295
Africa	Niger-Congo	Bantoid	Luvale	–	+	Horton 1949: 36–37, 166–167	Horton 1949: 36–37, 166–167
Africa	Niger-Congo	Bantoid	Shona	–	+	Fortune 1985: 108–109, 127	Corbett 2013; Fortune 1985: 107–126
Africa	Niger-Congo	Bantoid	Swahili	–	+	Gil 2013	Corbett 2013; own knowledge
Africa	Niger-Congo	Bantoid	Zulu	–	+	Gil 2013	Corbett 2013; Canonici 1995: 21
Africa	Niger-Congo	Cross River	Kana	+	–	Gil 2013	Aikhenvald 2000: 110–111
Africa	Niger-Congo	Defoid	Yoruba	–	–	Gil 2013	Corbett 2013

Macroarea	Family	Genus	Language	Cl	Gd	Sources (classifiers)	Sources (gender)
Africa	Niger-Congo	Gbaya-Manza-Ngbaka	Gbeya Bossangoa	–	–	Gil 2013	Samarin 1966: 98
Africa	Niger-Congo	Gur	Dagaare	–	+	Gil 2013	Grimm 2012: 45–48
Africa	Niger-Congo	Gur	Koromfe	–	+	Gil 2013	Corbett 2013; Rennison 1997: 206–233
Africa	Niger-Congo	Gur	Supyire	–	+	Gil 2013	Corbett 2013; Carlson 1994: 75
Africa	Niger-Congo	Igboid	Igbo	+	–	Gil 2013	Corbett 2013
Africa	Niger-Congo	N. Atlantic	Diola-Fogny	–	+	Sapir 1965: 74	Sapir 1965: 24–25, 61–62
Africa	Niger-Congo	N. Atlantic	Fula (Cameroonian)	–	+	Nichols 1992: 295	Nichols 1992: 295
Africa	Niger-Congo	Ubangi	Zande	–	+	Gore 1926: 42–45	Corbett 2013; Gore 1926: 20–23
Africa	Saharan	W. Saharan	Kanuri	–	–	Gil 2013	Corbett 2013
Africa	Sandawe	Sandawe	Sandawe	–	+	Gil 2013	Nichols 1992: 295; Eaton 2010: 14–17
Africa	Songhay	Songhay	Koyra Chiini	–	–	Gil 2013	Heath 1999: 55
Australia	Bunuban	Bunuban	Gooniyandi	–	–	Gil 2013	Corbett 2013
Australia	Gaagudju	Gaagudju	Gaagudju	–	+	Gil 2013	Harvey 2002: 144–157
Australia	Garrwan	Garrwan	Garrwa	–	–	Gil 2013	Mushin 2012: 38, 190
Australia	Gunwinyguan	Nunggubuyu	Nunggubuyu	–	+	Gil 2013	Corbett 2013; Heath 1983: 131–132
Australia	Iwaidjan	Iwaidjan	Mawng	–	+	Gil 2013	Corbett 2013; Capell & Hinch 1970: 73–77
Australia	Mangarrayi-Maran	Alawa	Alawa	–	+	Sharpe 1972: passim	Sharpe 1972: 66, 79–80
Australia	Mangarrayi-Maran	Mangarrayi	Mangarrayi	–	+	Gil 2013	Corbett 2013; Nichols 1992: 297
Australia	Mangarrayi-Maran	Warndarang	Warndarang	–	+	Gil 2013	Nichols 1992: 299; Heath 1980: 22–23
Australia	Mirndi	Djingili	Djingili	–	+	Gil 2013	Pensalfini 1997: 247–248, 253–259
Australia	Mirndi	Jaminjungan	Jaminjung	–	–	Gil 2013	Schultze-Berndt 2000: passim
Australia	Mirndi	Wambayan	Wambaya	–	+	Nordlinger 1998: 72–80	Nordlinger 1998: 59–70
Australia	N. Daly	N. Daly	Malakmalak	–	+	Gil 2013	Birk 1976: 30–31
Australia	Pama-Nyungan	N. Pama-Nyungan	Dyirbal	–	+	Gil 2013	Corbett 2013; Dixon 1972: 44
Australia	Pama-Nyungan	N. Pama-Nyungan	Uradhi	–	+	Gil 2013	Corbett 2013
Australia	Pama-Nyungan	N. Pama-Nyungan	Yidiny	–	+	Gil 2013	Corbett 2013
Australia	Pama-Nyungan	S.-E. Pama-Nyungan	Ngiyambaa	–	+	Gil 2013	Corbett 2013
Australia	Pama-Nyungan	W. Pama-Nyungan	Martuthunira	–	+	Gil 2013	Corbett 2013
Australia	Pama-Nyungan	W. Pama-Nyungan	Yingkarta	–	–	Gil 2013	Dench 1998: 20
Australia	Tiwian	Tiwian	Tiwi	–	+	Gil 2013	Corbett 2013; Osborne 1974: 51–52
Australia	Worrorran	Worrorran	Gunin	–	+	Gil 2013	McGregor 2004: 146–149
Australia	Worrorran	Worrorran	Ungarinjin	–	+	Gil 2013	Nichols 1992: 299
Australia	Worrorran	Worrorran	Worora	–	+	Gil 2013	Clendon 2000: 95
Australia	Yangmanic	Yangmanic	Wardaman	–	+	Merlan 1994: 120	Corbett 2013; Merlan 1994: 61–63, 241–242
Eurasia	Afro-Asiatic	Semitic	Hebrew (Modern)	–	+	Gil 2013	Corbett 2013; Glinert 1989: 51–52, 91, 104, 117–120, 185–198
Eurasia	Ainu	Ainu	Ainu	+	–	Gil 2013	Corbett 2013
Eurasia	Altaic	Mongolic	Buriat	–	–	Gil 2013	Skribnik 2003: 110–111, 117–120
Eurasia	Altaic	Mongolic	Khalkha	–	–	Gil 2013	Corbett 2013
Eurasia	Altaic	Tungusic	Evenki	–	–	Gil 2013	Corbett 2013
Eurasia	Altaic	Tungusic	Nanai	–	–	Gil 2013	Nichols 1992: 297
Eurasia	Altaic	Turkic	Chuvash	+	–	Gil 2013	Corbett 2013
Eurasia	Altaic	Turkic	Tatar	+	–	Gil 2013	Corbett 2013
Eurasia	Altaic	Turkic	Turkish	–	–	Gil 2013	Poppe 1968: 29–57
Eurasia	Altaic	Turkic	Tuvan	–	–	Gil 2013	Nichols 1992: 297
Eurasia	Austroasiatic	Aslian	Semelai	+	–	Gil 2013	Corbett 2013

171

Macroarea	Family	Genus	Language	Cl	Gd	Sources (classifiers)	Sources (gender)
Eurasia	Austroasiatic	Khasian	Pnar	+	+	Ring 2015: 124–125, 357–369	Ring 2015: 101, 107–108
Eurasia	Austroasiatic	Khmer	Khmer	+	–	Gil 2013	Corbett 2013
Eurasia	Austroasiatic	Munda	Korku	+	+	Gil 2013	Bhattacharya 1976: passim
Eurasia	Austroasiatic	Munda	Santali	+	+	Gil 2013	Ghosh 2008: 11–12, 32–33, 39–40, 44–45
Eurasia	Austroasiatic	Nicobarese	Nicobarese (Car)	+	+	Gil 2013	Corbett 2013: Braine 1970: 103–108
Eurasia	Austroasiatic	Palaung-Khmuic	Khmu'	+	–	Gil 2013	Corbett 2013; Premsrirat 1987: 30, 32–33
Eurasia	Austroasiatic	Viet-Muong	Vietnamese	+	–	Gil 2013	Corbett 2013
Eurasia	Austronesian	Malayo-Sumbawan	Acehnese	+	–	Durie 1985: 137–139	Durie 1985: 29
Eurasia	Austronesian	Malayo-Sumbawan	Cham (E.)	+	–	Gil 2013	Thurgood 2005: passim
Eurasia	Basque	Basque	Basque	–	–	Gil 2013	Corbett 2013
Eurasia	Burushaski	Burushaski	Burushaski	–	+	Gil 2013	Corbett 2013; Munshi 2006: 161–167
Eurasia	Chukotko-Kamchatkan	N. Chukotko-Kamchatkan	Chukchi	–	–	Gil 2013	Corbett 2013
Eurasia	Dravidian	N. Dravidian	Brahui	–	+	Gil 2013	Corbett 2013
Eurasia	Dravidian	S. Dravidian	Kannada	–	+	Gil 2013	Corbett 2013; Sridhar 1990: 221–222
Eurasia	Dravidian	S. Dravidian	Tamil	–	+	Schiffman 1999: 48–50	Corbett 2013; Schiffman 1999: 57–58
Eurasia	Hmong-Mien	Hmong-Mien	Hmong Daw	+	–	Gil 2013	Nichols 1992: 297
Eurasia	Indo-European	Albanian	Albanian	–	+	Gil 2013	Corbett 2013
Eurasia	Indo-European	Armenian	Armenian (E.)	–	–	Gil 2013	Matasović 2012: 17, 18, 29
Eurasia	Indo-European	Baltic	Latvian	–	+	Gil 2013	Corbett 2013; Kalnača 2014: 66–73
Eurasia	Indo-European	Germanic	English	–	–	Gil 2013	Corbett 2013; own knowledge
Eurasia	Indo-European	Germanic	German	–	+	Gil 2013	Corbett 2013; own knowledge
Eurasia	Indo-European	Indic	Assamese	+	–	Gil 2013	Goswami & Tamuli 2003: 415
Eurasia	Indo-European	Indic	Bengali	+	–	Gil 2013	Klaiman 2009: 425
Eurasia	Indo-European	Indic	Hindi	–	+	Gil 2013	Corbett 2013; McGregor 1986: 1–22
Eurasia	Indo-European	Indic	Marathi	–	+	Gil 2013	Corbett 2013; Pandharipande 2003: 702–707
Eurasia	Indo-European	Indic	Sinhala	–	+	Gil 2013	Henadeerage 2002: passim; Chandralai 2010: 79–82, 228–229
Eurasia	Indo-European	Indic	Waigali	–	+	Gil 2013	Nichols 1992: 297
Eurasia	Indo-European	Iranian	Persian	–	–	Gil 2013	Corbett 2013
Eurasia	Indo-European	Romance	French	–	+	Gil 2013	Corbett 2013; own knowledge
Eurasia	Indo-European	Slavic	Bulgarian	–	+	Gil 2013	Nicolova 2017: 86–89
Eurasia	Indo-European	Slavic	Russian	–	+	Gil 2013	Corbett 2013; Wade 2011: 54
Eurasia	Japanese	Japanese	Japanese	+	–	Gil 2013	Kaiser et al. 2001: passim
Eurasia	Kartvelian	Kartvelian	Georgian	–	–	Gil 2013	Corbett 2013
Eurasia	Korean	Korean	Korean	+	–	Gil 2013	Nichols 1992: 297
Eurasia	Nakh-Daghestanian	Avar-Andic-Tsezic	Avar	–	+	Gil 2013	Charachidzé 1981: 29–30; van den Berg 2005:155–156
Eurasia	Nakh-Daghestanian	Avar-Andic-Tsezic	Bagvalal	–	+	Gil 2013	Corbett 2006: 749–750
Eurasia	Nakh-Daghestanian	Avar-Andic-Tsezic	Hunzib	–	+	Gil 2013	Corbett 2013; van den Berg 2004: 1367
Eurasia	Nakh-Daghestanian	Lak-Dargwa	Dargwa	–	+	Gil 2013	van den Berg 2005: 156–158
Eurasia	Nakh-Daghestanian	Lezgic	Lezgian	–	–	Gil 2013	Corbett 2013
Eurasia	Nakh-Daghestanian	Nakh	Chechen	–	+	Gil 2013	Nichols 1994: 37
Eurasia	Nakh-Daghestanian	Nakh	Ingush	–	+	Gil 2013	Corbett 2013; Nichols 2011: 141–142
Eurasia	Nivkh	Nivkh	Nivkh	+	–	Gil 2013	Corbett 2013
Eurasia	NW Caucasian	NW Caucasian	Abkhaz	–	+	Gil 2013	Corbett 2013; Spruit 1986: 108
Eurasia	Sino-Tibetan	Bodic	Gurung	+	–	Nichols 1992: 297	Nichols 1992: 297
Eurasia	Sino-Tibetan	Bodo-Garo	Garo	+	–	Gil 2013	Burling 1961: passim

Macroarea	Family	Genus	Language	Cl	Gd	Sources (classifiers)	Sources (gender)
Eurasia	Sino-Tibetan	Burmese-Lolo	Burmese	+	–	Gil 2013	Corbett 2013
Eurasia	Sino-Tibetan	Burmese-Lolo	Lahu	+	–	Gil 2013	Corbett 2013
Eurasia	Sino-Tibetan	Chinese	Cantonese	+	–	Gil 2013	Corbett 2013
Eurasia	Sino-Tibetan	Chinese	Mandarin	+	–	Gil 2013	Corbett 2013
Eurasia	Sino-Tibetan	Mahakiranti	Chepang	–	–	Gil 2013	Caughley 1982: 42, 50, 51, 55
Eurasia	Tai-Kadai	Kadai	Lachi	+	–	Gil 2013	Kosaka 2000: 68–77
Eurasia	Tai-Kadai	Kam-Tai	Thai	+	–	Gil 2013	Corbett 2013
Eurasia	Uralic	Finnic	Finnish	–	–	Gil 2013	Corbett 2013
Eurasia	Uralic	Mordvin	Mordvin (Erzya)	–	–	Gil 2013	Zaicz 1998: 191–197
Eurasia	Uralic	Permic	Komi-Zyrian	–	–	Gil 2013	Nichols 1992: 295
Eurasia	Uralic	Samoyedic	Nenets	–	–	Gil 2013	Corbett 2013
Eurasia	Uralic	Ugric	Hungarian	–	–	Gil 2013	Corbett 2013
Eurasia	Yukaghir	Yukaghir	Yukaghir (Kolyma)	–	–	Gil 2013	Corbett 2013
N. America	Algic	Algonquian	Cree (Plains)	–	+	Gil 2013	Corbett 2013; Wolfart 1973: 20–24, 33–38
N. America	Algic	Yurok	Yurok	+	–	Nichols 1992: 299	Corbett 2013
N. America	Atakapa	Atakapa	Atakapa	+	–	Gil 2013	Swanton 1929: 125, 136–140
N. America	Chibchan	Talamanca	Teribe	+	–	Gil 2013	Quesada & Skopeteas 2010: passim
N. America	Chimakuan	Chimakuan	Quileute	–	+	Gil 2013	Nichols 1992: 299
N. America	Chitimacha	Chitimacha	Chitimacha	–	–	Gil 2013	Granberry 2004: 52–53, 78–85
N. America	Chumash	Chumash	Chumash (Barbareño)	–	–	Gil 2013	Wash 2001: passim
N. America	Chumash	Chumash	Chumash (Ineseño)	–	–	Gil 2013	Applegate 1972: passim
N. America	Eskimo-Aleut	Eskimo	Yup'ik (C.)	–	–	Reed et al. 1977: 201–207	Corbett 2013
N. America	Haida	Haida	Haida	+	–	Gil 2013	Corbett 2013
N. America	Hokan	Chimariko	Chimariko	–	–	Gil 2013	Corbett 2013
N. America	Hokan	Yuman	Diegueño (Mesa Grande)	–	–	Gil 2013	Nichols 1992: 299
N. America	Hokan	Yuman	Maricopa	–	–	Gil 2013	Corbett 2013
N. America	Iroquoian	N. Iroquoian	Seneca	–	+	Gil 2013	Corbett 2013; Chafe 1967: 13–22
N. America	Karok	Karok	Karok	–	–	Gil 2013	Corbett 2013
N. America	Keresan	Keresan	Acoma	–	–	Gil 2013	Corbett 2013
N. America	Kiowa-Tanoan	Kiowa-Tanoan	Kiowa	–	+	Gil 2013	Sutton 2010: 59–67
N. America	Kutenai	Kutenai	Kutenai	–	–	Gil 2013	Corbett 2013
N. America	Mayan	Mayan	Jacaltec	+	–	Gil 2013; Craig 1986: 244	Day 1973: passim
N. America	Mayan	Mayan	Tzeltal	+	–	Gil 2013	Kaufman 1963: 171–172
N. America	Mayan	Mayan	Tzutujil	+	–	Gil 2013	Nichols 1992: 301
N. America	Mayan	Mayan	Yucatec	–	–	Nichols 1992: 301	Brody 2004: 66, 69
N. America	Misumalpan	Misumalpan	Miskito	–	–	Gil 2013	Heath 1913: 56
N. America	Muskogean	Muskogean	Choctaw	–	–	Gil 2013	Davies 1986: passim
N. America	Na-Dene	Athapaskan	Navajo	–	–	Gil 2013	Nichols 1992: 299
N. America	Na-Dene	Tlingit	Tlingit	+	–	Gil 2013	Boas 1917: passim
N. America	Oregon Coast	Coosan	Coos (Hanis)	–	–	Gil 2013	Corbett 2013
N. America	Otomanguean	Chichimec	Chichimeca-Jonaz	–	–	Gil 2013	de Suárez 1984: 23–30
N. America	Otomanguean	Mixtecan	Mixtec (Chalcatongo)	–	–	Gil 2013	Corbett 2013; Macaulay 1996: 81–85
N. America	Otomanguean	Otomian	Otomí (Mezquital)	–	–	Hess 1968: passim	Hess 1968: passim
N. America	Otomanguean	Zapotecan	Zapotec (Coatlán)	–	–	Beam de Azcona 2004: passim	Beam de Azcona 2004: passim
N. America	Penutian	Chinookan	Chinook (Upper)	–	+	Gil 2013	Hymes 1955: 72–75, 214
N. America	Penutian	Klamath-Modoc	Klamath	–	–	Gil 2013	Mithun 2001: 448–451
N. America	Penutian	Maiduan	Maidu (NE)	–	–	Gil 2013	Nichols 1992: 299

Macroarea	Family	Genus	Language	Cl	Gd	Sources (classifiers)	Sources (gender)
N. America	Penutian	Miwok	Miwok (S. Sierra)	–	–	Gil 2013	Corbett 2013
N. America	Penutian	Sahaptian	Sahaptin (Umatilla)	+	–	Nichols 1992: 299	Nichols 1992: 299
N. America	Penutian	Tsimshianic	Gitksan	+	–	Nichols 1992: 299	Hunt 1993: passim
N. America	Penutian	Tsimshianic	Tsimshian (Coast)	+	–	Gil 2013	Corbett 2013
N. America	Penutian	Yokuts	Yawelmani	–	–	Gil 2013	Nichols 1992: 299
N. America	Salinan	Salinan	Salinan	–	–	Gil 2013	Nichols 1992: 299
N. America	Salishan	Central Salish	Halkomelem (Island)	+	+	Gerdts & Hinkson 2004: 254–266	Gerdts 2013: 417–418; Gerdts 2010: 176–177
N. America	Salishan	Interior Salish	Thompson	+	–	Gil 2013	Corbett 2013
N. America	Siouan	Core Siouan	Lakhota	–	+	Gil 2013	Van Valin 1977: 36–37
N. America	Siouan	Core Siouan	Mandan	–	–	Gil 2013	Kennard 1936: passim
N. America	Takelma	Takelma	Takelma	–	–	Gil 2013	Nichols 1992: 299
N. America	Tequistlatecan	Tequistlatecan	Chontal (Huamelultec Oaxaca)	–	–	Nichols 1992: 301	Waterhouse 1967: 356–358
N. America	Tol	Tol	Tol	–	–	Gil 2013	Corbett 2013
N. America	Totonacan	Totonacan	Tepehua (Tlachichilco)	+	–	Nichols 1992: 301	Nichols 1992: 301
N. America	Tunica	Tunica	Tunica	–	+	Gil 2013	Corbett 2013; Haas 1940: 36–38, 62, 64–65, 102–110
N. America	Uto-Aztecan	Aztecan	Nahuatl (Tetelcingo)	–	–	Gil 2013	Corbett 2013
N. America	Uto-Aztecan	Aztecan	Pipil	–	–	Gil 2013	Corbett 2013
N. America	Uto-Aztecan	California Uto-Aztecan	Luiseño	–	–	Gil 2013	Elliott 1999: 23–28
N. America	Uto-Aztecan	Numic	Paiute (S.)	–	–	Gil 2013	Nichols 1992: 299
N. America	Uto-Aztecan	Tepiman	O'odham	–	–	Gil 2013	Nichols 1992: 299
N. America	Uto-Aztecan	Tepiman	Tepehuan (SE)	–	+	Gil 2013	Willett 1991: 83–84
N. America	Wappo-Yukian	Wappo	Wappo	–	–	Gil 2013	Nichols 1992: 299
N. America	Yuchi	Yuchi	Yuchi	–	+	Gil 2013	Nichols 1992: 301
N. America	Zuni	Zuni	Zuni	–	–	Gil 2013	Corbett 2013
Papunesia	Austronesian	Atayalic	Atayal	+	–	Gil 2013	Rau 1992: passim
Papunesia	Austronesian	C. Malayo-Polynesian	Kambera	–	–	Gil 2013	Corbett 2013
Papunesia	Austronesian	C. Malayo-Polynesian	Ke'o	+	–	Gil 2013	Baird 2002: passim
Papunesia	Austronesian	C. Malayo-Polynesian	Leti	–	–	Gil 2013	van Engelenhoven & Williams-van Klinken 2005: passim
Papunesia	Austronesian	C. Malayo-Polynesian	Sawu	+	–	Gil 2013	Corbett 2013
Papunesia	Austronesian	C. Malayo-Polynesian	Tetun	+	–	Gil 2013	Morris 1984:xiv
Papunesia	Austronesian	Celebic	Tukang Besi	+	–	Gil 2013	Corbett 2013
Papunesia	Austronesian	Chamorro	Chamorro	+	–	Nichols 1992: 137, 299; Topping 1973: 164–166	Topping 1973: passim; Nichols 1992: 299
Papunesia	Austronesian	E. Formosan	Amis	–	+	Gil 2013	Wu 2006: 79
Papunesia	Austronesian	Greater C. Philippine	Tagalog	–	+	Gil 2013	Corbett 2013; Schachter & Otanes 1972: 197–198
Papunesia	Austronesian	Javanese	Javanese	+	–	Gil 2013	Oakes 2009: passim
Papunesia	Austronesian	Malayo-Sumbawan	Balinese	+	–	Gil 2013	Artawa 2013: passim
Papunesia	Austronesian	Malayo-Sumbawan	Indonesian	+	–	Gil 2013	Corbett 2013
Papunesia	Austronesian	Malayo-Sumbawan	Minangkabau	+	–	Gil 2013	Crouch 2009: 60–63
Papunesia	Austronesian	N. Borneo	Begak-Ida'an	–	–	Gil 2013	Goudswaard 2005: 88, 101–102
Papunesia	Austronesian	NW Sumatra-Barrier Islands	Batak (Karo)	+	–	Gil 2013	Corbett 2013
Papunesia	Austronesian	Oceanic	Drehu	–	–	Gil 2013	Nichols 1992: 299
Papunesia	Austronesian	Oceanic	Erromangan	–	–	Gil 2013	Corbett 2013

Macroarea	Family	Genus	Language	Cl	Gd	Sources (classifiers)	Sources (gender)
Papunesia	Austronesian	Oceanic	Fijian	−	−	Gil 2013	Corbett 2013
Papunesia	Austronesian	Oceanic	Futuna-Aniwa	−	−	Gil 2013	Dougherty 1983: passim
Papunesia	Austronesian	Oceanic	Hawaiian	−	−	Gil 2013	Corbett 2013
Papunesia	Austronesian	Oceanic	Iaai	−	−	Gil 2013	Corbett 2013
Papunesia	Austronesian	Oceanic	Kilivila	+	−	Gil 2013	Corbett 2013
Papunesia	Austronesian	Oceanic	Mokilese	+	−	Gil 2013	Corbett 2013
Papunesia	Austronesian	Oceanic	Pileni	+	−	Gil 2013	Corbett 2013
Papunesia	Austronesian	Oceanic	Pohnpeian	+	−	Gil 2013	Rehg & Sohl 1981: passim; Nichols 1992: 299
Papunesia	Austronesian	Oceanic	Rapanui	−	−	Gil 2013	Corbett 2013
Papunesia	Austronesian	Oceanic	Tawala	−	−	Gil 2013	Nichols 1992: 297
Papunesia	Austronesian	Oceanic	Teop	+	+	Mosel & Spriggs 2000: 328–329	Svärd 2019 [in Volume I]
Papunesia	Austronesian	Oceanic	Tongan	+	−	Gil 2013	Otsuka 2000: 49
Papunesia	Austronesian	Oceanic	Toqabaqita	+	−	Gil 2013	Lichtenberk 2008: passim
Papunesia	Austronesian	Oceanic	Tuvaluan	+	−	Gil 2013	Corbett 2013
Papunesia	Austronesian	Oceanic	Ulithian	+	−	Lynch 2002: passim	Lynch 2002: passim
Papunesia	Austronesian	Paiwan	Paiwan	+	−	Tang 2004: 380–382	Corbett 2013
Papunesia	Austronesian	Palauan	Palauan	+	−	Georgopoulos 1985: passim	Georgopoulos 1985: passim
Papunesia	Austronesian	S. Halmahera - W. New Guinea	Taba	+	−	Gil 2013	Corbett 2013
Papunesia	Austronesian	S. Sulawesi	Makassar	+	−	Gil 2013; Jukes 2006: 205	Jukes 2006: passim
Papunesia	Austronesian	Sama-Bajaw	Bajau (Sama)	+	−	Jun 2005: 387	Jun 2005: 387
Papunesia	Austronesian	Yapese	Yapese	+	−	Gil 2013	Jensen 1977: passim
Papunesia	Baining-Taulil	Baining	Mali	−	+	Gil 2013	Stebbins & Tayul 2012: 12–15
Papunesia	Baining-Taulil	Taulil	Taulil	−	+	Gil 2013	Terrill 2002: 69–70
Papunesia	Border	Border	Imonda	−	−	Gil 2013	Corbett 2013
Papunesia	Dagan	Dagan	Daga	−	−	Murane 1974: 75–81, 91	Corbett 2013
Papunesia	E. Bougainville	E. Bougainville	Motuna	+	+	Terrill 2002: 74–75	Terrill 2002: 74–75
Papunesia	E. Bougainville	E. Bougainville	Nasioi	+	−	Nichols 1992: 299; Foley 1986: 83–85	Nichols 1992: 299; Terrill 2002: 75–76; Hurd & Hurd 1966: passim
Papunesia	Kiwaian	Kiwaian	Kiwai	−	−	Gil 2013	Brown 2009: 14
Papunesia	Kuot	Kuot	Kuot	−	+	Lindström 2002: 132, 200	Lindström 2002: 130, 176–177
Papunesia	Left May	Left May	Ama	−	−	Ärsjö 1999: 79	Svärd 2019 [in Volume I]
Papunesia	Lower Sepik-Ramu	Lower Sepik	Yimas	−	+	Gil 2013	Corbett 2013; Phillips 1993: 175–178
Papunesia	Sentani	Sentani	Sentani	−	−	Gil 2013	Corbett 2013
Papunesia	Sepik	Middle Sepik	Ambulas	−	+	Gil 2013	Wilson 1980: 53, 63, 67
Papunesia	Sepik	Middle Sepik	Iatmul	−	+	Jendraschek 2012: 137–140	Jendraschek 2012: 124–128
Papunesia	Sepik	Ram	Awtuw	−	+	Gil 2013	Feldman 1986: 41, 45, 108–109
Papunesia	Sepik	Sepik Hill	Alamblak	−	−	Gil 2013	Corbett 2013; Bruce 1984: 74–75, 81, 96–98, 149
Papunesia	Sepik	Tama Sepik	Yessan-Mayo	−	−	Gil 2013	Foreman 1974: 27–28, 34–42, 56
Papunesia	Sepik	Upper Sepik	Abau	+	+	Lock 2011: 56–59	Lock 2011: 85–89
Papunesia	Sepik	Upper Sepik	Iwam	−	+	Laycock & Z'graggen 1975: 742–743	Laycock & Z'graggen 1975: 742–743
Papunesia	Skou	W. Skou	Dumo	−	+	Gil 2013	Ross 1980: 83–86, 94
Papunesia	Skou	Warapu	Barupu	−	−	Corris 2005: 115–116	Svärd 2019 [in Volume I]
Papunesia	Solomons E. Papuan	Lavukaleve	Lavukaleve	−	+	Terrill 2003: passim	Corbett 2013; Terrill 2003: 53–56, 243
Papunesia	Sulka	Sulka	Sulka	−	−	Gil 2013	Tharp 1996: 79, 85, 90
Papunesia	Timor-Alor-Pantar	Greater Alor	Adang	+	−	Haan 2001: 292–304	Haan 2001: passim

Macroarea	Family	Genus	Language	Cl	Gd	Sources (classifiers)	Sources (gender)
Papunesia	Timor-Alor-Pantar	Greater Alor	Klon	+	–	Baird 2008: 62–64	Baird 2008: 62–64
Papunesia	Timor-Alor-Pantar	Greater Alor	Teiwa	+	–	Klamer 2017: 36	Klamer 2017: 33
Papunesia	Timor-Alor-Pantar	Makasae-Fataluku-Oirata	Makasae	+	–	Huber 2008: 13, 23–24	Huber 2008: 13, 23–24
Papunesia	Tor-Orya	Tor	Berik	–	+	Westrum 1988: 139, 155–156, passim	Westrum 1988: 150, 153
Papunesia	Torricelli	Kombio-Arapesh	Arapesh (Mountain)	+	–	Nichols 1992: 297	Nichols 1992: 297
Papunesia	Torricelli	Kombio-Arapesh	Mufian	–	+	Alungum et al. 1978: 104	Alungum et al. 1978: 92–93
Papunesia	Torricelli	Urim	Urim	–	+	Hemmilä & Luoma 1987: 82–84, 139–140	Hemmilä & Luoma 1987: passim
Papunesia	Torricelli	Wapei-Palei	Olo	–	+	Staley 2007: 17, 19	Staley 2007: 9–10, 17–18
Papunesia	Torricelli	Wapei-Palei	Au	–	+	Scorza 1985: 231–232, 238–239, 259	Svärd 2019 [in Volume I]
Papunesia	Trans-New Guinea	Angan	Tainae	–	+	Carlson 1991: 7, 116–118	Carlson 1991: 7, 23–34
Papunesia	Trans-New Guinea	Awju-Dumut	Kombai	–	–	Gil 2013	de Vries 1993: 21, 34–42
Papunesia	Trans-New Guinea	Binanderean	Korafe	–	–	Gil 2013	Farr 1993: passim
Papunesia	Trans-New Guinea	Binanderean	Suena	–	–	Gil 2013	Corbett 2013
Papunesia	Trans-New Guinea	Dani	Dani (Lower Grand Valley)	–	–	Bromley 1981: passim	Bromley 1981: passim
Papunesia	Trans-New Guinea	E. Highlands	Hua	–	–	Gil 2013	Haiman 1980: 47, 219
Papunesia	Trans-New Guinea	Engan	Huli	–	–	Lomas 1988: 196–197	Lomas 1988: 184–185
Papunesia	Trans-New Guinea	Engan	Kewa	–	–	Gil 2013	Corbett 2013
Papunesia	Trans-New Guinea	Finisterre-Huon	Awara	–	–	Quigley 2016: 16–19; Aikhenvald 2000: 124	Quigley 2016: passim
Papunesia	Trans-New Guinea	Finisterre-Huon	Käte	–	–	Gil 2013	Nichols 1992: 297
Papunesia	Trans-New Guinea	Koiarian	Koiari	–	–	Gil 2013	Dutton 1996: 39–41
Papunesia	Trans-New Guinea	Madang	Amele	–	–	Gil 2013	Corbett 2013
Papunesia	Trans-New Guinea	Madang	Kobon	–	–	Gil 2013	Corbett 2013
Papunesia	Trans-New Guinea	Madang	Usan	–	–	Reesink 1987: passim	Reesink 1987: passim
Papunesia	Trans-New Guinea	Mek	Nalca	–	+	Svärd 2003: 31–33	Svärd 2019 [in Volume I]
Papunesia	Trans-New Guinea	Mek	Una	–	–	Louwerse 1988: 77–78	Corbett 2013
Papunesia	Trans-New Guinea	Ok	Mian	–	+	Fedden 2011: 144–148	Fedden 2011: 169–171
Papunesia	Trans-New Guinea	Ok	Telefol	–	–	Gil 2013	Nichols 1992: 299
Papunesia	Trans-New Guinea	Wissel Lakes-Kemandoga	Ekari	+	–	Doble 1987: 75	Doble 1987: 89, 94
Papunesia	W. Bougainville	W. Bougainville	Konua	+	+	Gil 2013	Müller 1954: 14, 21–25
Papunesia	W. Bougainville	W. Bougainville	Rotokas	–	+	Robinson 2011: 125–127	Svärd 2019 [in Volume I]
Papunesia	W. Papuan	Hatam	Hatam	–	–	Gil 2013	Corbett 2013
Papunesia	W. Papuan	Kebar	Mpur	+	+	Klamer 2014: 109–110; Reesink 1996: 10	Reesink 1996: 2–3
Papunesia	W. Papuan	N. Halmaheran	Tidore	+	+	Gil 2013	Corbett 2013: van van Staden 2006: passim
Papunesia	W. Papuan	N-C. Bird's Head	Abun	+	–	Gil 2013	Berry & Berry 2000: passim
Papunesia	W. Papuan	N-C. Bird's Head	Maybrat	+	+	Gil 2013	Corbett 2013; Dol 1999: 68, 98
Papunesia	W. Papuan	W. Bird's Head	Tehit	+	+	Gil 2013	Hesse 2000: 25–26
Papunesia	Yale	Yale	Nagatman	–	+	Campbell & Campbell 1987: 14	Campbell & Campbell 1987: 18–22, 44–49
S. America	Arauan	Arauan	Culina	–	+	Gil 2013	Derbyshire & Payne 1990: 249–251
S. America	Arauan	Arauan	Deni	–	+	Gil 2013; Derbyshire & Payne 1990: 249–252	Moran & Moran 1977: 40–41
S. America	Arauan	Arauan	Jamamadi	–	+	Gil 2013; Derbyshire & Payne 1990: 249–250	Campbell 1985: 1
S. America	Arauan	Arauan	Jarawara	–	+	Aikhenvald 2000: passim	Dixon 1995: 264–265
S. America	Arauan	Arauan	Paumari	–	+	Gil 2013	Corbett 2013; Aikhenvald 2010: 237

Macroarea	Family	Genus	Language	Cl	Gd	Sources (classifiers)	Sources (gender)
S. America	Araucanian	Araucanian	Mapudungun	-	-	Gil 2013	Corbett 2013
S. America	Arawakan	Alto-Orinoco	Baniwa	+	+	Aikhenvald 2007: 479–487	Aikhenvald 2007: 476–479
S. America	Arawakan	Bolivia-Parana	Teréna	-	-	Gil 2013	Derbyshire & Payne 1990: 252
S. America	Arawakan	C. Arawakan	Parecis	+	-	Gil 2013	Brandao 2014: 4
S. America	Arawakan	C. Arawakan	Waurá	+	-	Gil 2013	Payne 1991: 377
S. America	Arawakan	Caribbean Arawakan	Arawak	-	+	Gil 2013	Pet 1987: 23, 28–29
S. America	Arawakan	E. Arawakan	Palikur	+	+	Gil 2013; Aikhenvald 2000: 192–198	Derbyshire & Payne 1990: 262–263; Aikhenvald 2000: 192–198
S. America	Arawakan	Inland Northern Arawakan	Baré	-	+	Gil 2013	Aikhenvald 2007: 850–852
S. America	Arawakan	Inland Northern Arawakan	Warekena	+	+	Gil 2013	Aikhenvald & Dixon 1998: 298–299
S. America	Arawakan	Pre-Andine Arawakan	Ashéninka Perené	-	-	Mihas 2010: 184–185	Mihas 2010: 121–122
S. America	Arawakan	Pre-Andine Arawakan	Nomatsiguenga	-	-	Derbyshire & Payne 1990: 262	Derbyshire & Payne 1990: 262
S. America	Arawakan	Purus	Apurinã	-	+	Gil 2013	Corbett 2013; da Silva Facundes 2000: 145–148, 222–232, 348–349
S. America	Arawakan	Purus	Piro	-	+	Gil 2013	Derbyshire & Payne 1990: 248
S. America	Aymaran	Aymaran	Jaqaru	-	-	Gil 2013	Corbett 2013
S. America	Barbacoan	Barbacoan	Awa Pit	-	-	Curnow 1997: 86, 93–94	Corbett 2013
S. America	Cahuapanan	Cahuapanan	Chayahuita	+	-	Gil 2013	Hart 1988: 258–272
S. America	Cariban	Cariban	Hixkaryana	-	-	Gil 2013	Corbett 2013; Derbyshire 1985: 6–7
S. America	Cariban	Cariban	Macushi	-	+	Abbott 1991: 89	Abbott 1991: 105
S. America	Cariban	Panare	Panare	-	-	Gil 2013	Derbyshire & Payne 1990: 263–264
S. America	Cayuvava	Cayuvava	Cayuvava	-	-	Gil 2013	Corbett 2013
S. America	Chapacura-Wanham	Chapacura-Wanham	Wari'	-	+	Gil 2013	Corbett 2013; Everett & Kern 1997: 2–3
S. America	Chibchan	Arhuacic	Ika	-	+	Gil 2013	Corbett 2013
S. America	Chibchan	Chibcha-Duit	Muisca	-	-	Gil 2013	Adelaar & Muysken 2004: 81–108
S. America	Choco	Choco	Epena Pedee	-	-	Gil 2013	Corbett 2013
S. America	Harakmbet	Harakmbet	Amarakaeri	-	-	Gil 2013	Tripp 1995: 213
S. America	Huitotoan	Boran	Bora	+	+	Gil 2013	Thiesen 1996: 27, 33, 36–37, 46–47
S. America	Huitotoan	Boran	Ocaina	+	-	Gil 2013	Derbyshire & Payne 1990: 257
S. America	Jivaroan	Jivaro	Jivaro	-	-	Gil 2013	Saad 2014: 32
S. America	Kwaza	Kwaza	Kwazá	+	-	Gil 2013	van der Voort 2004: 24, 105
S. America	Macro-Ge	Ge-Kaingang	Canela-Krahô	-	-	Gil 2013	Corbett 2013
S. America	Máku	Máku	Máku	-	-	Gil 2013	Aikhenvald & Dixon 1999: 362
S. America	Mosetenan	Mosetenan	Mosetén	-	+	Gil 2013	Corbett 2013; Sakel 2002: 288–302
S. America	Movima	Movima	Movima	-	-	Gil 2013	Haude 2006: 148–149
S. America	Mura	Mura	Pirahã	-	-	Haude 2006: 10, 113–114	Corbett 2013; Everett 1986: 281
S. America	Nadahup	Nadahup	Hup	+	-	Gil 2013	Epps 2008: 191–195, 241–244
S. America	other	Creoles & Pidgins	Ndyuka	-	-	Gil 2013	Corbett 2013
S. America	Panoan	Panoan	Capanahua	-	-	Gil 2013	Loos 1969: passim
S. America	Panoan	Panoan	Shipibo-Konibo	-	-	Gil 2013	Corbett 2013
S. America	Peba-Yaguan	Peba-Yaguan	Yagua	+	-	Gil 2013	Payne 2007: 457, 460–462
S. America	Quechuan	Quechuan	Quechua (Huallaga)	-	-	Gil 2013	Weber 1989: passim
S. America	Quechuan	Quechuan	Quechua (Imbabura)	-	-	Gil 2013	Corbett 2013
S. America	Sáliban	Piaroa	Piaroa	+	-	Gil 2013	Krute 1989: passim
S. America	Trumai	Trumai	Trumai	-	+	Gil 2013	Guirardello 1999: 48–55
S. America	Tucanoan	Tucanoan	Barasano	-	+	Guirardello 1999: 68–75	Jones & Jones 1991: 31, 73–75
S. America	Tucanoan	Tucanoan	Orejón	+	+	Jones & Jones 1991: 49–50, 59–60	Velie 1975: 24–27
S. America	Tucanoan	Tucanoan	Siona	+	+	Gil 2013; Derbyshire & Payne 1990: 256	Wheeler 1970: 2, 91–95, 140–141; Derbyshire & Payne 1990: 256

Macroarea	Family	Genus	Language	Cl	Gd	Sources (classifiers)	Sources (gender)
S. America	Tucanoan	Tucanoan	Tucano	+	+	Gil 2013	Derbyshire & Payne 1990: 255–256; Ramírez 1997: 207–208
S. America	Tucanoan	Tucanoan	Tuyuca	+	+	Gil 2013; Derbyshire & Payne 1990: 354	Bowles 2008: 19, 21–22
S. America	Tupian	Monde	Gavião	-	-	Gil 2013; Derbyshire & Payne 1990: 246, 248	Moore 1984: passim
S. America	Tupian	Munduruku	Munduruku	+	-	Passer 2016a: passim; Gil 2013	Passer 2016a: passim; Derbyshire & Payne 1990: 261
S. America	Tupian	Tupi-Guarani	Guaraní	-	-	Gil 2013	Corbett 2013
S. America	Waorani	Waorani	Waorani	+	-	Gil 2013	Derbyshire & Payne 1990: 259; Peeke 1973: 125–128
S. America	Yanomam	Yanomam	Sanuma	+	-	Gil 2013; Derbyshire & Payne 1990: 246–248	Borgman 1990: 144–149, 197–198
S. America	Zaparoan	Zaparoan	Arabela	-	-	Gil 2013; Derbyshire & Payne 1990: 256–257	Rich 1999: 22–23, 35–36

References

Abbott, Miriam. 1991. Macushi. In Desmond C. Derbyshire & Geoffrey K. Pullum (eds.), *Handbook of Amazonian languages*, vol. 3, 23–160. Berlin: Mouton de Gruyter.

Adelaar, Willem F. H. & Pieter C. Muysken. 2004. *The languages of the Andes.* Cambridge: Cambridge University Press.

Ahland, Colleen Anne. 2012. *A grammar of Northern and Southern Gumuz.* University of Oregon. (Doctoral dissertation).

Aikhenvald, Alexandra Y. 2000. *Classifiers: A typology of noun categorization devices.* Oxford: Oxford University Press.

Aikhenvald, Alexandra Y. 2007. Reciprocals and reflexives in North-Arawak languages of the Upper Rio Negro. In Vladimir. P. Nedjalkov, Emma Š. Geniušienė & Zlatka Guentchéva (eds.), *Reciprocal constructions*, 845–855. Amsterdam: John Benjamins.

Aikhenvald, Alexandra Y. 2010. Gender, noun class and language obsolescence: The case of Paumarí. In Eithne B. Carlin & Simon van de Kerke (eds.), *Linguistics and archaeology in the Americas: The historization of language and society*, 235–252. Leiden: Brill.

Aikhenvald, Alexandra Y. & Robert M. W. Dixon. 1998. Dependencies between grammatical systems. *Language* 74(1). 56–80.

Aikhenvald, Alexandra Y. & Robert M. W. Dixon. 1999. Other small families and isolates. In R. M. W. Dixon & Alexandra Y. Aikhenvald (eds.), *The Amazonian languages*, 341–384. Cambridge: Cambridge University Press.

Aikhenvald, Alexandra Y. & Diana Green. 2011. Palikur and the typology of classifiers. In Alexandra Y. Aikhenvald & Robert M. W. Dixon (eds.), *Language at large: Essays on syntax and semantics*, 394–450. Leiden: Brill.

Alungum, John, Robert J. Conrad & Joshua Lukas. 1978. Some Muhiang grammatical notes. In Richard Loving (ed.), *Miscellaneous papers on Dobu and Arapesh* (Workpapers in Papua New Guinea Languages 25), 89–130. Ukarumpa: Summer Institute of Linguistics.

Andrason, Alexander. 2014. Language complexity: An insight from complexsystem theory. *International Journal of Language and Linguistics* 2(2). 74–89.

Applegate, Richard B. 1972. *Ineseño Chumash grammar.* University of California, Berkeley. (Doctoral dissertation).

Appleyard, David L. 1975. A descriptive outline of Kemant. *Bulletin of the School of Oriental and African Studies* 38. 316–350.

Arensen, Jonathan E. 1982. *Murle grammar* (Occasional papers in the study of Sudanese languages 2). Juba: Summer Institute of Linguistics & University of Juba.

Arppe, Antti. 2008. *Univariate, bivariate, and multivariate methods in corpus-based lexicography: A study of synonymy.* University of Helsinki. (Doctoral dissertation).

Årsjö, Britten. 1999. *Words in Ama.* Uppsala: Uppsala University. (MA thesis).

Artawa, Ketut. 2013. The basic verb construction in Balinese. In Alexander Adelaar (ed.), *Voice variation in Austronesian languages of Indonesia* (NUSA 54), 5–27. Jakarta: Atma Jaya Catholic University of Indonesia.

Atkinson, Quentin D. 2011. Phonemic diversity supports a serial founder effect model of language expansion from Africa. *Science* 332(6027). 346–349.

Audring, Jenny. 2009. *Reinventing pronoun gender.* Vrije Universiteit, Amsterdam. (Doctoral dissertation).

Baayen, R. Harald. 2008. *Analyzing linguistic data: A practical introduction to statistics using R.* Cambridge: Cambridge University Press.

Baayen, R. Harald, Doug J. Davidson & Douglas M. Bates. 2008. Mixed-effects modeling with crossed random effects for subjects and items. *Journal of Memory and Language* 59(4). 390–412.

Baird, Louise. 2002. *A grammar of Kéo: An Austronesian language of Eastern Nusantara.* Australian National University. (Doctoral dissertation).

Baird, Louise. 2008. *A grammar of Klon: A non-Austronesian language of Alor, Indonesia* (Pacific Linguistics 596). Canberra: Australian National University.

Barr, Dale J., Roger Levy, Christoph Scheepers & Harry J. Tily. 2013. Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of Memory and Language* 68(3). 255–278.

Bates, Douglas, Reinhold Kliegl, Shravan Vasishth & R. Harald Baayen. 2015. Parsimonious mixed models. arXiv:1506.04967.

Bates, Douglas, Martin Maechler, Ben Bolker & Steve Walker. 2015. Fitting linear mixed-effects models using lme4. *Journal of Statistical Software* 67(1). 1–48.

Beam de Azcona, Rosemary Grace. 2004. *A Coatlan-Loxicha Zapotec grammar (Mexico).* University of California, Berkeley. (Doctoral dissertation).

Bentz, Christian & Bodo Winter. 2013. Languages with more second language learners tend to lose nominal case. *Language Dynamics and Change* 3. 1–27.

Berry, Keith & Christine Berry. 2000. Abun. In Ger P. Reesink (ed.), *Studies in Irian languages, Part II* (NUSA 47), 35–44. Jakarta: Universitas Katolik Indonesia Atma Jaya.

Bhattacharya, Sudhibhushan. 1976. Gender in the Munda languages. In Philip N. Jenner, Laurence C. Thompson & Stanley Starosta (eds.), *Austroasiatic studies, part I* (Oceanic Linguistics Special Publications 13), 189–211. Honolulu: University of Hawaii Press.

Bickel, Balthasar. 2007. Typology in the 21st century: Major current developments. *Linguistic Typology* 11(1). 239–251.

Bickel, Balthasar. 2008. A refined sampling procedure for genealogical control. *Language Typology and Universals* 61(3). 221–233.

Bickel, Balthasar. 2013. Distributional biases in language families. In Balthasar Bickel, Lenore A. Grenoble, David A. Peterson & Alan Timberlake (eds.), *Language typology and historical contingency: In honor of Johanna Nichols*, 415–444. Amsterdam: John Benjamins.

Bickel, Balthasar & Johanna Nichols. 2006. Oceania, the Pacific Rim, and the theory of linguistic areas. In *Proceedings of the 32nd annual meeting of the Berkeley Linguistics Society*, vol. 32, 3–15. Berkeley: Berkeley Linguistics Society. http://journals.linguisticsociety.org/proceedings/index.php/BLS/issue/view/120.

Bickel, Balthasar, Johanna Nichols, Taras Zakharko, Alena Witzlack-Makarevich, Kristine Hildebrandt, Michael Rießler, Lennart Bierkandt, Fernando Zúñiga & John B. Lowe. 2017. *The AUTOTYP typological databases.* https://github.com/autotyp/autotyp-data/tree/0.1.0. Version 0.1.0.

Bickel, Balthasar, Alena Witzlack-Makarevich, Kamal K. Choudhary, Matthias Schlesewsky & Ina Bornkessel-Schlesewsky. 2015. The neurophysiology of language processing shapes the evolution of grammar: Evidence from case marking. *PLoS ONE* 10(8). e0132819.

Bickel, Balthasar, Alena Witzlack-Makarevich & Taras Zakharko. 2014. Typological evidence against universal effects of referential scales on case alignment. In Ina Bornkessel-Schlesewsky, Andrej Malchukov & Marc Richards (eds.), *Scales and hierarchies: A cross-disciplinary perspective on referential hierarchies*, 7–44. Berlin: Mouton De Gruyter.

Birk, David B. W. 1976. *The Malakmalak language, Daly River (Western Arnhem Land)* (Pacific Linguistics B 45). Canberra: Australian National University.

Bisang, Walter. 2009. On the evolution of complexity: Sometimes less is more in East and mainland Southeast Asia. In Geoffrey Sampson, David Gil & Peter Trudgill (eds.), *Language complexity as an evolving variable*, 34–49. Oxford: Oxford University Press.

Bliese, Loren F. 1981. *A generative grammar of Afar* (Summer Institute of Linguistics Publications 65). Dallas, TX: The Summer Institute of Linguistics & the University of Texas at Arlington.

Boas, Franz. 1917. *Grammatical notes on the language of the Tlingit Indians* (University of Pennsylvania University Museum Anthropological Publications 8.1). Philadelphia: University of Pennsylvania.

Borgman, Donald M. 1990. Sanuma. In Desmond C. Derbyshire & Geoffrey K. Pullum (eds.), *Handbook of Amazonian languages*, vol. 2, 15–248. Berlin: Mouton de Gruyter.

Bornkessel-Schlesewsky, Ina & Matthias Schlesewsky. 2009. Minimality as vacuous distinctness: Evidence from cross-linguistic sentence comprehension. *Lingua* 119(10). 1541–1559.

Bowles, Joshua Wayne. 2008. *Agreement in Tuyuca*. University of Utah. (MA thesis).

Braine, Jean Critchfield. 1970. *Nicobarese grammar (Car dialect)*. University of California, Berkeley. (Doctoral dissertation).

Brandao, Ana. 2014. *A reference grammar of Paresi-Haliti (Arawak)*. University of Texas at Austin. (Doctoral dissertation).

Breslow, Norman E. & David G. Clayton. 1993. Approximate inference in generalized linear mixed models. *Journal of the American Statistical Association* 88(421). 9–25.

Brody, Michal. 2004. *The fixed word, the moving tongue: Variation in written Yucatec Maya and the meandering evolution toward unified norms*. University of Texas at Austin. (Doctoral dissertation).

Bromley, H. Myron. 1981. *A grammar of Lower Grand Valley Dani* (Pacific Linguistics C 63). Canberra: Australian National University.

Brown, Jessica. 2009. *A brief sketch of Urama grammar with special consideration of particles marking agency, aspect and modality*. University of North Dakota. (MA thesis).

Bruce, Leslie P. 1984. *The Alamblak language of Papua New Guinea (East Sepik)* (Pacific Linguistics C 81). Canberra: Department of Linguistics, Research School of Pacific Studies, Australian National University.

Burling, Robbins. 1961. *A Garo grammar* (Deccan College Monograph Series 25). Pune: Deccan College Postgraduate & Research Institute.

Burton, Michael L., Carmella C. Moore, John W. M. Whiting & A. Kimball Romney. 1996. Regions based on social structure. *Current Anthropology* 37(1). 87–123.

Campbell, Barbara. 1985. Jamamadi noun phrase. In David Lee Fortune (ed.), *Porto Velho workpapers*, 130–165. Barsília: Summer Institute of Linguistics.

Campbell, Carl & Judy Campbell. 1987. Yade grammar essentials. Unpublished Manuscript.

Campbell, Lyle. 2016. Language isolates and their history, or, what's weird, anyway? In *Proceedings of the 36th annual meeting of the Berkeley Linguistics Society*, vol. 36, 16–31. Berkeley: Berkeley Linguistics Society. http://escholarship. org/uc/item/79c9q87s.

Canonici, Noverino N. 1995. *Zulu grammatical structure*. Durban: Zulu language & literature, University of Natal.

Capell, Arthur & Heather H. Hinch. 1970. *Maung grammar: Texts and vocabulary*. The Hague: Mouton.

Carlin, Eithne. 1993. *The So language*. Cologne: Institut für Afrikanistik, Universität zu Köln.

Carlson, Robert. 1994. *A grammar of Supyire*. Berlin: Mouton de Gruyter.

Carlson, Terry. 1991. Tainae grammar essentials. Ukarumpa. Unpublished Manuscript.

Caughley, Ross Charles. 1982. *The syntax and morphology of the verb in Chepang* (Pacific Linguistics B 84). Canberra: Australian National University.

Chafe, Wallace. 1967. *Seneca morphology and dictionary*. Washington: Smithsonian Press.

Chandralai, Dileep. 2010. *Sinhala*. Amsterdam: John Benjamins.

Charachidzé, Georges. 1981. *Grammaire de la langue avar (langue du Caucase Nord-Est)* (Documents de linguistique quantitative 38). Paris: Farvard.

Clendon, Mark. 2000. *Topics in Worora grammar*. University of Adeleide. (Doctoral dissertation).

Contini-Morava, Ellen & Marcin Kilarski. 2013. Functions of nominal classification. *Language Sciences* 40. 263–299.

Corbett, Greville G. 1991. *Gender*. Cambridge: Cambridge University Press.

Corbett, Greville G. 2006. *Agreement*. Cambridge: Cambridge University Press.

Corbett, Greville G. 2013. Number of genders. In Matthew S. Dryer & Martin Haspelmath (eds.), *The world atlas of language structures online*. Leipzig: Max Planck Institute for Evolutionary Anthropology. http://wals.info/chapter/30.

Corbett, Greville G. & Sebastian Fedden. 2016. Canonical gender. *Journal of Linguistics* 52(3). 495–531.

Corris, Miriam. 2005. *A grammar of Barupu: A language of Papua New Guinea*. Sydney: University of Sydney. (Doctoral dissertation).

Craig, Colette. 1986. Jacaltec noun classifiers: A study in language and culture. In Colette Craig (ed.), *Noun classes and categorization*, 263–293. Amsterdam: John Benjamins.

Crouch, Sophie Elizabeth. 2009. *Voice and verb morphology in Minangkabau, a language of West Sumatra, Indonesia.* The University of Western Australia. (MA thesis).

Curnow, Timothy J. 1997. *A grammar of Awa Pit (Cuaiquer): An indigenous language of South-western Colombia.* Australian National University. (Doctoral dissertation).

Cysouw, Michael. 2010. Dealing with diversity: Towards an explanation of NP-internal word order frequencies. *Linguistic Typology* 14(2-3). 253–286.

Cysouw, Michael. 2011. Understanding transition probabilities. *Linguistic Typology* 15(2). 415–431.

da Silva Facundes, Sidney. 2000. *The language of the Apurinã people of Brazil (Maipure/Arawak).* State University of New York, Buffalo. (Doctoral dissertation).

Dahl, Östen. 2000. Elementary gender distinctions. In Matti Rissanen, Terttu Nevalainen & Mirja Saari (eds.), *Gender in grammar and cognition.* Vol. 2: *Elementary gender distinctions: Manifestations of gender* (Trends in Linguistics. Studies and Monographs 124), 577–593. Berlin: de Gruyter.

Dahl, Östen. 2004. *The growth and maintenance of linguistic complexity.* Amsterdam: John Benjamins.

Davies, William D. 1986. *Choctaw verb agreement and universal grammar.* Dordrecht: Reidel.

Day, Christopher. 1973. *The Jacaltec language* (Language Science Monographs 12). Bloomington: Indiana University Press.

de Suárez, Yolanda Lastra. 1984. Chichimeco Jonaz. In Munro S. Edmonson (ed.), *Supplement to the handbook of Middle American Indians: Linguistics*, vol. 2, 20–42. Austin: University of Texas Press.

de Vries, Lourens. 1993. *Forms and functions in Kombai, an Awyu language of Irian Jaya* (Pacific linguistics B 108). Canberra: Australian National University.

Dediu, Dan & Michael Cysouw. 2013. Some structural aspects of language are more stable than others: A comparison of seven methods. *PLoS ONE* 8(1). https://doi.org/10.1371/journal.pone.0055009.

Dench, Alan. 1998. *Yingkarta.* Munich: Lincom.

Derbyshire, Desmond C. 1985. *Hixkaryana and linguistic typology.* Dallas: Summer Institute of Linguistics.

Derbyshire, Desmond C. & Doris L. Payne. 1990. Noun classification systems of Amazonian languages. In Doris L. Payne (ed.), *Amazonian linguistics: Studies in Lowland South American languages*, 243–272. Austin: University of Texas Press.

Di Garbo, Francesca. 2014. *Gender and its interaction with number and evaluative morphology: An intra- and intergenealogical typological survey of Africa*. Stockholm University. (Doctoral dissertation).

Dickens, Patrick. 1992. Ju|'hoan grammar. Unpublished manuscript.

Dixon, Robert M. W. 1972. *The Dyirbal language of North Queensland*. Cambridge: Cambridge University Press.

Dixon, Robert M. W. 1982. *'Where Have all the adjectives gone?' and other essays in semantics and syntax*. Berlin: Mouton de Gruyter.

Dixon, Robert M. W. 1995. Fusional development of gender marking in Jarawara possessed nouns. *International Journal of American Linguistics* 61(3). 263–294.

Doble, Marion. 1987. A description of some features of Ekari language structure. *Oceanic Linguistics* 26. 55–113.

Dol, Philomena. 1999. *A grammar of Maybrat: A language of the Bird's Head, Irian Jaya, Indonesia*. University of Leiden. (Doctoral dissertation).

Dougherty, Janet W. D. 1983. *Futuna-Aniwa: An introduction to a Polynesian outlier language*. Berkeley: University of California Press.

Dryer, Matthew S. 1992. The Greenbergian word order correlations. *Language* 68(1). 81–138.

Dryer, Matthew S. 2000. Counting genera vs. counting languages. *Linguistic Typology* 4(3). 334–356.

Dryer, Matthew S. 2013. Order of subject, object and verb. In Matthew S. Dryer & Martin Haspelmath (eds.), *The world atlas of language structures online*. Leipzig: Max Planck Institute for Evolutionary Anthropology. https : / / wals . info / chapter/81.

Dryer, Matthew S. & Martin Haspelmath (eds.). 2013. *The world atlas of language structures online*. Leipzig: Max Planck Institute for Evolutionary Anthropology. http://wals.info/.

Dunn, Michael, Simon J. Greenhill, Stephen C. Levinson & Russell D. Gray. 2011. Evolved structure of language shows lineage-specific trends in word-order universals. *Nature* 473(7345). 79–82.

Durie, Mark. 1985. *A grammar of Acehnese on the basis of a dialect of North Aceh* (Verhandelingen van het Koninklijk Institut voor Taal-, Land- en Volkenkunde 112). Dordrecht & Cinnaminson: Foris Publications.

Dutton, Tom E. 1996. *Koiari*. Munich: Lincom Europa.

Eaton, Helen. 2010. *A Sandawe grammar*. Dallas, TX: SIL International.

Edenmyr, Niklas. 2004. The semantics of Hadza gender assignment: A few notes on the field. *Africa & Asia: Göteborg working papers on Asian and African languages and literatures* 4. 3–19.

Elias, David Lyndon. 2005. *Tigre of Habab: Short grammar and texts from the Rigbat people*. Harvard University. (Doctoral dissertation).

Elliott, Eric Bryant. 1999. *Dictionary of Rincón Luiseño*. University of California, San Diego. (Doctoral dissertation).

Emeneau, Murray B. 1956. India as a linguistic area. *Language* 32(1). 3–16.

Emeneau, Murray B. 1980. *Language and linguistic area: Essays*. Stanford: Stanford University Press.

Epps, Patience. 2008. *A grammar of Hup*. Berlin: Mouton de Gruyter.

Everett, Daniel L. 1986. Pirahã. In Desmond C. Derbyshire & Geoffrey K. Pullum (eds.), *Handbook of Amazonian languages*, vol. 1, 200–325. Berlin: Mouton de Gruyter.

Everett, Daniel L. & Barbara Kern. 1997. *Wari'*. London: Routledge.

Farr, Cynthia. 1993. The switch-reference clause chaining phenomenon from a Korafe perspective. *Language and Linguistics in Melanesia* 24. 159–190.

Fedden, Sebastian. 2011. *A grammar of Mian*. Berlin: Mouton de Gruyter.

Feldman, Harry. 1986. *A grammar of Awtuw* (Pacific linguistics B 94). Canberra: Australian National University.

Foley, William A. 1986. *The Papuan languages of New Guinea*. Cambridge: Cambridge University Press.

Foreman, Velma. 1974. *Grammar of Yessan-Mayo* (Language Data, Asian-Pacific Series 4). Ukarumpa: Summer Institute of Linguistics.

Fortune, George. 1985. *Shona grammatical constructions*. Harare: Mercury Press.

Gandour, Jack, Soranee Holasuit Petty, Rochana Dardarananda, Sumalee Dechongkit & Sunee Mukngoen. 1984. The acquisition of numeral classifiers in Thai. *Linguistics* 22(4). 455–479.

Gell-Mann, Murray & Seth Lloyd. 2004. Effective complexity. In Murray Gell-Mann & Constantino Tsallis (eds.), *Nonextensive entropy: Interdisciplinary applications*, 387–398. Oxford: Oxford University Press.

Gelman, Andrew & Jennifer Hill. 2007. *Data analysis using regression and multilevel/hierarchical models*. Cambridge: Cambridge University Press.

Georgopoulos, Carol Perkins. 1985. *The syntax of variable binding in Palauan*. University of California, San Diego. (Doctoral dissertation).

Gerdts, Donna B. 2010. Agreement in Halkomelem complex auxiliaries. In *Papers for the Forty-fourth and Forty-fifth International Conferences on Salish and Neighbouring Languages* (UBCWPL 27), 175–189.

Gerdts, Donna B. 2013. The purview effect: Feminine gender on inanimates in Halkomelem Salish. In Chundra Cathcart, I-Hsuan Chen, Greg Finley, Shinae Kang, Clare S. Sandy & Elise Stickles (eds.), *Proceedings of the 37th annual meet-*

ing of the Berkeley Linguistics Society, 417–426. Berkeley: Berkeley Linguistics Society.

Gerdts, Donna B. & Mercedes O. Hinkson. 2004. Salish numeral classifiers: A lexical means to a grammatical end. *STUF – Language Typology and Universals* 57(2-3). 247–279.

Ghosh, Arun. 2008. Santali. In Gregory S. Anderson (ed.), *The Munda languages*, 11–98. Abingdon: Routledge.

Gil, David. 2013. Numeral classifiers. In Matthew S. Dryer & Martin Haspelmath (eds.), *The world atlas of language structures online*. Leipzig: Max Planck Institute for Evolutionary Anthropology. http://wals.info/chapter/55.

Glinert, Lewis. 1989. *The grammar of modern Hebrew*. Cambridge: Cambridge University Press.

Good, Jeff. 2012. Typologizing grammatical complexities, or: Why creoles may be paradigmatically simple but syntagmatically average. *Journal of Pidgin and Creole Languages* 27(1). 1–47.

Gore, Edward Cline. 1926. *A Zande grammar*. London: Sheldon Press.

Goswami, G. C. & Jyotiprakash Tamuli. 2003. Asamiya. In George Cardona & Dhanesh Jain (eds.), *The Indo-Aryan languages*, 391–443. London: Routledge.

Goudswaard, Nelleke Elisabeth. 2005. *The Begak (Ida'an) language of Sabah*. Free University of Amsterdam. (Doctoral dissertation).

Granberry, Julian. 2004. *Modern Chitimacha (Sitimaxa)*. Munich: Lincom Europa.

Greenberg, Joseph H. 1972. Numeral classifiers and substantival number: Problems in the genesis of a linguistic type. In *Working papers on language universals*, vol. 9, 1–39. Stanford: Stanford University, California Committee on Linguistics.

Greenberg, Joseph H. 1978. How does a language acquire gender markers? In Joseph H. Greenberg, Charles Ferguson & Edith Moravcsik (eds.), *Universals of human language.* Vol. 3: *How does a language acquire gender markers?: Word structure*, 47–82. Stanford: Stanford University Press.

Gries, Stefan Th. 2015. The most under-used statistical method in corpus linguistics: Multi-level (and mixed-effects) models. *Corpora* 10(1). 95–125.

Grimm, Scott. 2012. *Number and individuation*. Stanford University. (Doctoral dissertation).

Grinevald, Colette. 2002. Making sense of nominal classification systems: Noun classifiers and the grammaticalization variable. In Ilse Wischer & Gabriele Diewald (eds.), *New reflections on grammaticalization*, 259–275. Amsterdam: John Benjamins.

Grinevald, Colette & Frank Seifart. 2004. Noun classes in African and Amazonian languages: Towards a comparison. *Linguistic Typology* 8(2). 243–285.

Guirardello, Raquel. 1999. *A reference grammar of Trumai.* Rice University. (Doctoral dissertation).

Haan, Johnson Welem. 2001. *The grammar of Adang: A Papuan language spoken on the Island of Alor East Nusa Tenggara, Indonesia.* University of Sydney. (Doctoral dissertation).

Haas, Mary R. 1940. Tunica. In *Handbook of American Indian Languages,* vol. 4, 1–143. New York: Augustin.

Hagman, Roy Stephen. 1973. *Nama Hottentot grammar.* Columbia University. (Doctoral dissertation).

Haiman, John. 1980. *Hua: A Papuan language of the Eastern Highlands of New Guinea.* Amsterdam: John Benjamins.

Halekoh, Ulrich & Søren Højsgaard. 2014. A Kenward-Roger approximation and parametric bootstrap methods for tests in linear mixed models: The R package pbkrtest. *Journal of Statistical Software* 58(10). 1–30.

Hammarström, Harald & Mark Donohue. 2014. Some principles on the use of macro-areas in typological comparison. *Language Dynamics and Change* 4(1). 167–187.

Hanna, H. Morcos. 1967. *The phrase structure of Egyptian Colloquial Arabic.* The Hague: Mouton.

Hardin, James W. & Joseph W. Hilbe. 2007. *Generalized linear models and extensions.* 2nd edn. College Station, TX: Stata Press.

Harrell, Richard S. 1962. *A short reference grammar of Moroccan Arabic.* Washington: Georgetown University Press.

Harris, Alice C. & Lyle Campbell. 1995. *Historical syntax in cross-linguistic perspective.* Cambridge: Cambridge University Press.

Hart, Helen. 1988. *Diccionario Chayahuita-Castellano.* Yarinacocha: Instituto Lingüístico de Verano.

Harvey, Mark. 2002. *A grammar of Gaagudju.* Berlin: Mouton de Gruyter.

Haude, Katharina. 2006. *A grammar of Movima.* Nijmegen University. (Doctoral dissertation).

Hawkins, John A. 2004. *Efficiency and complexity in grammars.* Oxford: Oxford University Press.

Hayward, Dick. 1984. *The Arbore language: A first investigation (including a vocabulary).* Hamburg: Helmut Buske Verlag.

Heath, G. R. 1913. Notes on Miskuto grammar and on other Indian languages of Eastern Nicaragua. *American Anthropologist* 15(1). 48–62.

Heath, Jeffrey. 1980. *Basic materials in Warndarang: Grammar, texts and dictionary* (Pacific linguistics B 72). Canberra: Australian National University.

Heath, Jeffrey. 1983. Referential tracking in Nunggubuyu (Australia). In John Haiman & Pamela Munro (eds.), *Switch reference and universal grammar*, 129–149. Amsterdam: John Benjamins.

Heath, Jeffrey. 1999. *A grammar of Koyra Chiini: The Songhay of Timbuktu*. Berlin: Mouton de Gruyter.

Hemmilä, Ritva & Pirkko Luoma. 1987. Urim grammar. Ukarumpa. Unpublished manuscript.

Henadeerage, Deepthi Kumara. 2002. *Topics in Sinhala syntax*. Australian National University. (Doctoral dissertation).

Her, One-Soon. 2012. Distinguishing classifiers and measure words: A mathematical perspective and implications. *Lingua* 122(14). 1668–1691.

Hess, H. Harwood. 1968. *The syntactic structure of Mezquital Otomi*. The Hague: Mouton.

Hesse, Ronald. 2000. Tehit. In Ger P. Reesink (ed.), *Studies in Irian languages, part II* (NUSA 47), 25–33. Jakarta: Universitas Katolik Indonesia Atma Jaya.

Hoffman, Carl. 1963. *A grammar of the Margi language*. London: Oxford University Press.

Horton, A. E. 1949. *A grammar of Luvale*. Johannesburg: Witwatersrand University Press.

Huber, Juliette. 2008. *First steps towards a grammar of Makasae*. Munich: Lincom.

Hundius, Harald & Ulrike Kölver. 1983. Syntax and semantics of numeral classifiers in Thai. *Studies in Language* 7(2). 165–214.

Hunt, Katharine Dorothy. 1993. *Clause structure, agreement and case in Gitksan*. The University of British Columbia. (Doctoral dissertation).

Hurd, Conrad & Phyllis W. Hurd. 1966. *Nasioi language course*. Port Moresby: Summer Institute of Linguistics, Department of Information & Extension Services.

Hymes, Dell Hathaway. 1955. *The language of the Kathlamet Chinook*. Indiana University. (Doctoral dissertation).

Inglis, Douglas. 2003. Conceptual structure of numeral classifiers in Thai. In Eugene H. Casad & Gary B. Palmer (eds.), *Cognitive linguistics and non-Indo-European languages*, 223–246. Berlin: Mouton De Gruyter.

Iwasaki, Shoichi & Preeya Ingkaphirom. 2005. *A reference grammar of Thai*. Cambridge: Cambridge University Press.

Jaeger, T. Florian, Peter Graff, William Croft & Daniel Pontillo. 2011. Mixed effect models for genetic and areal dependencies in linguistic typology. *Linguistic Typology* 15(2). 281–319.

Jakobi, Angelika. 1990. *A Fur grammar: Phonology, morphophonology, and morphology*. Hamburg: Helmut Buske Verlag.

Janhunen, Juha (ed.). 2003. *The Mongolic languages*. London: Routledge.

Jendraschek, Gerd. 2012. *A grammar of Iatmul*. Regensburg: Universtiy of Regensburg. (Habilitation).

Jensen, John Thayer. 1977. *Yapese reference grammar*. Honolulu: University Press of Hawaii.

Jones, Wendell & Paula Jones. 1991. *Barasano syntax* (Publications in Linguistics 101). Dallas: Summer Institute of Linguistics & The University of Texas at Arlington.

Jukes, Anthony. 2006. *Makassarese (basa Mangkasara'): A description of an Austronesian language of South Sulawesi*. University of Melbourne. (Doctoral dissertation).

Jun, Akamine. 2005. Sama (Bajau). In Alexander Adelaar & Nikolaus P. Himmelmann (eds.), *The Austronesian languages of Asia and Madagascar*, 377–396. London: Routledge.

Kaiser, Stefan, Yasuko Ichikawa, Noriko Kobayashi & Hilofumi Yamamoto. 2001. *Japanese: A comprehensive grammar*. London: Routledge.

Kalnača, Anna. 2014. *A typological perspective on Latvian grammar*. Berlin: Mouton de Gruyter.

Kamwangamalu, Nkonko Mudipanu. 1989. *Code-mixing across languages: Structure, functions, and constraints*. University of Illinois at Urbana-Champaign. (Doctoral dissertation).

Kaufman, Terrence S. 1963. *Tzeltal grammar*. University of California, Berkeley. (Doctoral dissertation).

Kennard, Edward. 1936. Mandan grammar. *International Journal of American Linguistics* 9(1). 1–43.

Kiessling, Roland. 2007. The "marked nominative" in Datooga. *Journal of African Languages and Linguistics* 28(2). 149–191.

Kilarski, Marcin. 2013. *Nominal classification: A history of its study from the classical period to the present*. Amsterdam: John Benjamins.

Killian, Don. 2015. *Topics in Uduk phonology and morphosyntax*. University of Helsinki. (Doctoral dissertation).

Kimball, Amelia E., Kailen Shantz, Christopher Eager & Joseph Roy. submitted. Beyond maximal random effects for logistic regression: Moving past conver-

gence problems. Submitted manuscript. Available at https://arxiv.org/pdf/1611.00083.pdf.

Klaiman, M. H. 2009. Bengali. In Bernard Comrie (ed.), *The world's major languages*, 2nd edn., 417–436. London: Routledge.

Klamer, Marian. 2014. Numeral classifiers in the Papuan languages of Alor and Pantar: A comparative perspective. In Marian Klamer & František Kratochvíl (eds.), *Number and quantity in East Nusantara*, 103–122. Canberra: Pacific Linguistics.

Klamer, Marian. 2017. The Alor-Pantar languages: Linguistic context, history and typology. In Marian Klamer (ed.), *The Alor-Pantar languages: History and typology*, 2nd edn. (Studies in Linguistic Diversity 3), 1–48. Berlin: Language Science Press.

Kosaka, Ryuichi. 2000. *A descriptive study of the Lachi language: Syntactic description, historical reconstruction and genetic relation.* Tokyo University of Foreign Studies. (Doctoral dissertation).

Kramer, Ruth. 2015. *The Morphosyntax of gender.* Oxford: Oxford University Press.

Kretzschmar, William A., Jr. 2015. *Language and complex systems.* Cambridge: Cambridge University Press.

Krute, Laurence Dana. 1989. *Piaroa nominal morphosemantics.* Columbia University. (Doctoral dissertation).

Kusters, Wouter. 2003. *Linguistic complexity: The influence of social change on verbal inflections.* University of Leiden. (Doctoral dissertation). Utrecht: LOT.

Kusters, Wouter. 2008. Complexity in linguistic theory, language learning and language change. In Matti Miestamo, Kaius Sinnemäki & Fred Karlsson (eds.), *Language complexity: Typology, contact, change*, 3–22. Amsterdam: John Benjamins.

Laycock, Donald C. & John Z'graggen. 1975. The Sepik-Ramu phylum. In Stephen A. Wurm (ed.), *Papuan languages and the New Guinea linguistic scene*, vol. 1, 731–763. Canberra: Australian National University.

Leslau, Wolf. 1995. *Reference grammar of Amharic.* Wiesbaden: Harassowitz.

Levinson, Stephen C., Simon J. Greenhill, Russell D. Gray & Michael Dunn. 2011. Universal typological dependencies should be detectable in the history of language families. *Linguistic Typology* 15(2). 509–534.

Li, Charles N. & Sandra A. Thompson. 1981. *Mandarin Chinese: A functional reference grammar.* Berkeley: University of California Press.

Lichtenberk, Frantisek. 2008. *A grammar of Toqabaqita.* Vol. 1. Berlin: Mouton de Gruyter.

Lindström, Eva. 2002. *Topics in the grammar of Kuot: A non-Austronesian language of New Ireland, Papua New Guinea.* Stockholm: Stockholm University. (Doctoral dissertation).

Lock, Arjen. 2011. *Abau grammar* (Data Papers on Papua New Guinea Languages 57). Ukarumpa: SIL-PNG Academic Publications.

Lomas, G. C. J. 1988. *The Huli language of Papua New Guinea.* Macquarie University. (Doctoral dissertation).

Loos, Eugene. 1969. *The phonology of Capanahua and its grammatical basis.* Norman: University of Oklahoma.

Louwerse, John. 1988. *The Morphosyntax of Una in relation to discourse structure* (Pacific linguistics B 100). Canberra: Australian National University.

Luraghi, Silvia. 2011. The origin of the Proto-Indo-European gender system: Typological considerations. *Folia Linguistica* 45(2). 435–464.

Lynch, John. 2002. Ulithian. In John Lynch, Malcolm Ross & Terry Crowley (eds.), *The Oceanic languages*, 792–803. Richmond: Curzon.

Macaulay, Monica. 1996. *A grammar of Chalcatongo Mixtec* (University of California Publications in Linguistics 127). Berkeley: University of California Press.

Maddieson, Ian. 2006. Correlating phonological complexity: Data and validation. *Linguistic Typology* 10(1). 106–123.

Matasović, Ranko. 2012. A grammatical sketch of Albanian for students of Indo-European. http://mudrac.ffzg.unizg.hr/~rmatasov/Albanian.pdf. Unpublished manuscript.

Matras, Yaron. 2009. *Language contact.* Cambridge: Cambridge University Press.

McGregor, Ronald S. 1986. *Outline of Hindi grammar, with exercises.* 3rd edn. Oxford: Oxford University Press.

McGregor, William B. 2004. *The languages of the Kimberley, Western Australia.* Abingdon: Routledge.

McWhorter, John. 2001. The world's simplest grammars are creole grammars. *Linguistic Typology* 5(2-3). 125–166.

McWhorter, John. 2007. *Language interrupted: Signs of non-native acquisition in standard language grammars.* New York: Oxford University Press.

Meeuwis, Michael. 1998. *Lingala.* Munich: Lincom.

Merlan, Francesca C. 1994. *A grammar of Wardaman, a language of the Northern Territory of Australia.* Berlin: Mouton de Gruyter.

Meyer, David, Achim Zeileis & Kurt Hornik. 2006. The strucplot framework: Visualizing multi-way contingency tables with vcd. *Journal of Statistical Software* 17(3). 1–48.

Meyer, David, Achim Zeileis & Kurt Hornik. 2015. *vcd: Visualizing categorical data*. R package version 1.4-1.

Miestamo, Matti. 2007. Symmetric and asymmetric encoding of functional domains, with remarks on typological markedness. In Matti Miestamo & Bernhard Wälchli (eds.), *New challenges in typology: Broadening the horizons and redefining the foundations*, 293–314. Berlin: Mouton De Gruyter.

Miestamo, Matti. 2008. Grammatical complexity in a cross-linguistic perspective. In Matti Miestamo, Kaius Sinnemäki & Fred Karlsson (eds.), *Language complexity: Typology, contact, change*, 23–41. Amsterdam: John Benjamins.

Miestamo, Matti. 2009. Implicational hierarchies and grammatical complexity. In Geoffrey Sampson, David Gil & Peter Trudgill (eds.), *Language complexity as an evolving variable*, 80–97. Oxford: Oxford University Press.

Mihas, Elena. 2010. *Essentials of Ashéninka Perené grammar*. The University of Wisconsin-Milwaukee. (Doctoral dissertation).

Mithun, Marianne. 2001. *The languages of native North America*. Cambridge: Cambridge University Press.

Moore, Denny. 1984. *Syntax of the language of the Gavião Indians of Rondônia, Brazil*. The City University of New York. (Doctoral dissertation).

Moran, Paul & Dorothy Moran. 1977. Notas sobre morfología verbal dení. *Serie Lingüística* 7. 29–71.

Morris, Cliff. 1984. *Tetun-English dictionary* (Pacific linguistics C 83). Canberra: Australian National University.

Mosel, Ulrike & Ruth Spriggs. 2000. Gender in Teop (Bougainville, Papua New Guinea). In Barbara Unterbeck (ed.), *Gender in grammar and cognition I: Approaches to gender* (Trends in Linguistics. Studies and Monographs 124), 321–349. Berlin: Mouton de Gruyter.

Mous, Maarten. 1992. *A grammar of Iraqw*. Rijksuniversiteit Leiden. (Doctoral dissertation).

Mous, Maarten. 2008. Number as an exponent of gender in Cushitic. In Zygmunt Frajzyngier & Erin Shay (eds.), *Interaction of morphology and syntax: Case studies in Afroasiatic*, 137–160. Amsterdam: John Benjamins.

Müller, Adam. 1954. *Grammar and vocabulary of the Konua language* (Microbibliotheca Anthropos 12). Fosieux: Anthropos.

Munshi, Sadaf. 2006. *Jammu and Kashmir Burushaski: Language, language contact, and change*. University of Texas at Austin. (Doctoral dissertation).

Murane, Elizabeth. 1974. *Daga grammar, from morpheme to discourse*. Norman: Summer Institute of Linguistics of the University of Oklahoma.

Mushin, Ilona. 2012. *A grammar of (Western) Garrwa*. Berlin: Mouton de Gruyter.

Nichols, Johanna. 1992. *Linguistic diversity in space and time.* Chicago: University of Chicago Press.

Nichols, Johanna. 1994. Chechen. In Rieks Smeets (ed.), *The indigenous languages of the Caucasus*, 1–77. Delmar: Caravan Books.

Nichols, Johanna. 2003. Diversity and stability in language. In Brian D. Joseph & Richard D. Janda (eds.), *The handbook of historical linguistics*, 283–310. Oxford: Blackwell.

Nichols, Johanna. 2009. Linguistic complexity: A comprehensive definition and survey. In Geoffrey Sampson, David Gil & Peter Trudgill (eds.), *Language complexity as an evolving variable*, 110–125. Oxford: Oxford University Press.

Nichols, Johanna. 2011. *Ingush grammar.* Berkeley: University of California Press.

Nichols, Johanna & David A. Peterson. 1996. The Amerind personal pronoun. *Language* 72(2). 336–371.

Nicolova, Ruselina. 2017. *Bulgarian grammar.* Berlin: Frank & Timme. Translated by Christo Stamenov.

Nordlinger, Rachel. 1998. *A grammar of Wambaya, Northern Territory (Australia)* (Pacific linguistics C 140). Canberra: Australian National University.

Oakes, Michael P. 2009. Javanese. In Bernard Comrie (ed.), *The world's major languages*, 819–832. London: Routledge.

Osborne, C. R. 1974. *The Tiwi language: Grammar, myths and dictionary of the Tiwi language spoken on Melville and Bathurst Islands, Northern Australia.* Canberra: Australian Institute of Aboriginal Studies.

Otsuka, Yuko. 2000. *Ergativity in Tongan.* University of Oxford. (Doctoral dissertation).

Owens, Jonathan. 1985. *A grammar of Harar Oromo (Northeastern Ethiopia)* (Kuschitische Sprachstudien 4). Hamburg: Helmut Buske Verlag.

Pandharipande, Rajeshwari. 2003. Marathi. In George Cordona & Dhanesh Jain (eds.), *The Indo-Aryan languages*, 698–728. London: Routledge.

Passer, Matthias Benjamin. 2016a. (What) do verb classifiers classify? *Lingua* 174(1). 16–44.

Passer, Matthias Benjamin. 2016b. *The typology and diachrony of nominal classification.* Utrecht: University of Amsterdam. (Doctoral dissertation).

Payne, David L. 1991. A classification of Maipuran (Arawakan) languages based on shared lexical retentions. In Desmond C. Derbyshire & Geoffrey K. Pullum (eds.), *Handbook of Amazonian languages*, vol. 3, 355–500. Berlin: Mouton de Gruyter.

Payne, Doris L. 1998. Maasai gender in typological perspective. *Studies in African Linguistics* 27(2). 159–175.

Payne, Doris L. 2007. Source of the Yagua nominal classification system. *International Journal of American Linguistics* 73(4). 447–474.

Peeke, M. Catherine. 1973. *Preliminary grammar of Auca.* Norman: Summer Institute of Linguistics.

Penchoen, Thomas. 1973. *Tamazight of the Ayt Ndhir* (Afroasiatic Dialects 1). Los Angeles: Undena Publishing.

Pensalfini, Robert. 1997. *Jingulu grammar, dictionary, and texts.* Massachusetts Institute of Technology. (Doctoral dissertation).

Pet, Willen Jan Agricola. 1987. *Lokono Dian, the Arawak language of Suriname: A sketch of its grammatical structure and lexicon.* Cornell University. (Doctoral dissertation).

Phillips, Colin. 1993. Conditions on agreement in Yimas. In Jonathan D. Bobaljik & Colin Phillips (eds.), *Papers on case & agreement I* (MIT Working Papers in Linguistics 18), 173–213. Cambridge: MIT.

Plaster, Keith & Maria Polinsky. 2007. Women are not dangerous things: Gender and categorization. *Harvard Working Papers in Linguistics* 12. 1–44.

Poppe, Nicholas. 1968. *Tatar manual: Descriptive grammar and texts with Tatar-English-glossary.* Bloomington: Indiana University Press.

Premsrirat, Suwilai. 1987. *A Khmu grammar* (Pacific Linguistics A 75). Canberra: Australian National University.

Quesada, J. Diego & Stavros Skopeteas. 2010. The discourse function of inverse voice: An experimental study in Teribe (Chibchan). *Journal of Pragmatics* 42(9). 2579–2600.

Quigley, Susan R. 2016. *The Awara verbal system.* University of North Dakota. (MA thesis).

R Core Team. 2017. *R: A language and environment for statistical computing.* R Foundation for Statistical Computing. Vienna. http://www.R-project.org/.

Ramirez, Henri. 1997. *A fala tukano dos Ye'pâ-Masa, tomo I: Gramática.* Manaus: CEDEM.

Rau, Der-Hwa Victoria. 1992. *A grammar of Atayal.* Cornell University. (Doctoral dissertation).

Reed, Irene, Osahito Miyaoka, Steven Jacobson, Paschal Afcan & Michael Krauss. 1977. *Yup'ik Eskimo grammar.* Fairbanks: Alaska Native Language Center, University of Alaska.

Reesink, Ger P. 1987. *Structures and their functions in Usan: A Papuan language of Papua New Guinea.* Amsterdam: John Benjamins.

Reesink, Ger P. 1996. Morpho-syntactic features of the Bird's Head languages. In Ger P. Reesink (ed.), *Studies in Irian languages* (NUSA 40), 1–20. Jakarta: Universitas Katolik Indonesia Atma Jaya.

Reh, Mechthild. 1985. *Die Krongo-Sprache (Nìinò Mó-Dì): Beschreibung, Texte, Wörterverzeichnis.* Vol. 12. Berlin: Reimer.

Rehg, Kenneth L. & Damian G. Sohl. 1981. *Ponapean reference grammar.* Honolulu: University of Hawaii Press.

Rennison, John R. 1997. *Koromfe.* London: Routledge.

Rich, Rolland G. 1999. *Diccionario arabela-castellano.* Peru: Instituto Lingüístico de Verano.

Riddle, Elizabeth M. 2008. Complexity in isolating languages: Lexical elaboration versus grammatical economy. In Matti Miestamo, Kaius Sinnemäki & Fred Karlsson (eds.), *Language complexity: Typology, contact, change*, 133–151. Amsterdam: John Benjamins.

Ring, Hiram. 2015. *A grammar of Pnar.* Singapore: Nanyang Technological University. (Doctoral dissertation).

Roberts, Sarah J. & Joan Bresnan. 2008. Retained inflectional morphology in Pidgins: A typological study. *Linguistic Typology* 12(2). 269–302.

Robinson, Stuart Payton. 2011. *Split intransitivity in Rotokas, a Papuan language of Bougainville.* Nijmegen: Radboud Universiteit. (Doctoral dissertation).

Ross, Malcolm. 1980. Some elements of Vanimo, a New Guinea tone language. In *Papers in New Guinea linguistics 20* (Pacific Linguistics A 56), 77–109. Canberra: Australian National University.

Saad, George. 2014. *A grammar sketch of Shuar: With a focus on the verb phrase.* Radbound University Nijmegen. (MA thesis).

Sakel, Jeanette. 2002. Gender agreement in Mosetén. In Mily Crevels, Simon van de Kerke, Sérgio Meira & Hein van der Voort (eds.), *Current studies on South American languages*, 287–305. Leiden: Research School of Asian, African, & Amerindian Studies (CNWS).

Samarin, William J. 1966. *The Gbeya language: Grammar, texts, and vocabularies* (Publications in linguistics 44). Berkeley: University of California Press.

Sands, Bonny. 2013. Morphology: Hadza. In Rainer Vossen (ed.), *The Khoesan languages*, 107–123. London: Routledge.

Sapir, J. David. 1965. *A grammar of Diola-Fogny: A language spoken in the Basse-Casamance region of Senegal.* Vol. 3. Ibadan: Cambridge University Press in association with The West African Languages Survey & The Institute of African Studies.

Schachter, Paul & Fe T. Otanes. 1972. *Tagalog reference grammar.* Berkeley: University of California Press. Reprinted in 1983.

Schielzeth, Holger & Wolfang Forstmeier. 2009. Conclusions beyond support: Overconfident estimates in mixed models. *Behavioral Ecology* 20(2). 416–420.

Schiffman, Harold F. 1999. *A reference grammar of spoken Tamil.* Cambridge: Cambridge University Press.

Schuh, Russell G. 1976. *Spoken Hausa.* Ithaca: Spoken Language Services.

Schuh, Russell G. 1989. Gender and number in Miya. In Zygmunt Frajzyngier (ed.), *Current progress in Chadic linguistics*, 171–181. Amsterdam: John Benjamins.

Schultze-Berndt, Eva. 2000. *Simple and complex verbs in Jaminjung: A study of event categorization in an Australian language.* Katholieke Universiteit Nijmegen. (Doctoral dissertation).

Scorza, David. 1985. A sketch of Au morphology and syntax. In *Papers in New Guinea linguistics 22* (Pacific Linguistics A 63), 215–273. Canberra: Australian National University.

Seifart, Frank. 2005. *The structure and use of shape-based noun classes in Miraña.* Nijmegen: Radboud Universiteit Nijmegen. (Doctoral dissertation).

Seifart, Frank. 2010. Nominal classification. *Language and Linguistics Compass* 4(8). 719–736.

Serzisko, Fritz. 1982. Gender, noun class and numeral classification: A scale of classificatory techniques. In René Dirven & Günter Radden (eds.), *Issues in the theory of universal grammar*, 95–123. Tübingen: Narr.

Sharpe, Margaret C. 1972. *Alawa phonology and grammar.* Canberra: Australian Institute of Aboriginal Studies.

Shklovsky, Kirill. 2005. Person marking in Petalcingo Tzeltal. Reed College BA thesis.

Shklovsky, Kirill. 2012. *Tseltal clause structure.* Massachusetts Institute of Technology. (Doctoral dissertation). https://dspace.mit.edu/handle/1721.1/77801.

Shosted, Ryan K. 2006. Correlating complexity: A typological approach. *Linguistic Typology* 10(1). 1–40.

Siewierska, Anna. 1998. Variation in major constituent order: A global and a European perspective. In Anna Siewierska (ed.), *Constituent order in the languages of Europe*, 475–551. Berlin: Mouton De Gruyter.

Sinnemäki, Kaius. 2008. Complexity trade-offs in core argument marking. In Matti Miestamo, Kaius Sinnemäki & Fred Karlsson (eds.), *Language complexity: Typology, contact, change*, 67–88. Amsterdam: John Benjamins.

Sinnemäki, Kaius. 2009. Complexity in core argument marking and population size. In Geoffrey Sampson, David Gil & Peter Trudgill (eds.), *Language complexity as an evolving variable*, 126–140. Oxford: Oxford University Press.

Sinnemäki, Kaius. 2010. Word order in zero-marking languages. *Studies in Language* 34(4). 869–912.

Sinnemäki, Kaius. 2014a. Cognitive processing, language typology, and variation. *WIREs Cognitive Science* 5(4). 477–487.

Sinnemäki, Kaius. 2014b. Complexity trade-offs: A case study. In Frederick J. Newmeyer & Laurel B. Preston (eds.), *Measuring grammatical complexity*, 179–201. Oxford: Oxford University Press.

Sinnemäki, Kaius. 2014c. Global optimization and complexity trade-offs. *Poznan Studies in Contemporary Linguistics* 50(2). 179–195.

Sinnemäki, Kaius. 2011. *Language universals and linguistic complexity*. University of Helsinki. (Doctoral dissertation).

Skribnik, Elena. 2003. Buryat. In Juha Janhunen (ed.), *The Mongolic languages*, 102–128. London: Routledge.

Spruit, Arie. 1986. *Abkhaz studies*. Rijksuniversiteit Leiden. (Doctoral dissertation).

Sridhar, Shikaripur N. 1990. *Kannada*. London: Routledge.

Staley, William E. 2007. *Reference management in Olo: A cognitive perspective* (SIL e-Books 5). SIL International.

Stebbins, Tonya & Julius Tayul. 2012. *Mali (Baining) dictionary*. Canberra: Australian National University.

Steever, Sanford B. 1998. Malto. In Sanford B. Steever (ed.), *The Dravidian languages*, 359–387. London: Routledge.

Sutton, Logan. 2010. Noun class and number in Kiowa-Tanoan: Comparative-historical research and respecting speakers' rights in fieldwork. In Andrea L. Berez, Jean Mulder & Daisy Rosenblum (eds.), *Fieldwork and linguistic analysis in indigenous languages of the Americas*, 57–89. Honolulu: University of Hawaii Press.

Svärd, Erik. 2013. *Selected topics in the grammar of Nalca*. Stockholm University. (BA-thesis). http://www.diva-portal.org/smash/get/diva2:631006/FULLTEXT02.pdf, accessed 2013-11-9.

Svärd, Erik. 2019. Gender in New Guinea. In Francesca Di Garbo, Bruno Olsson & Bernhard Wälchli (eds.), *Grammatical gender and linguistic complexity: Volume I: General issues and specific studies*, 225–276. Berlin: Language Science Press. DOI:10.5281/zenodo.3462770

Swanton, John R. 1929. A sketch of the Atakapa language. *International Journal of American Linguistics* 5(2-4). 121–149.

Tang, Chih-Chen Jane. 2004. Two types of classifier languages: A typological study of classification markers in Paiwan noun phrases. *Language and Linguistics* 5(2). 377–407.

Terrill, Angela. 2002. Systems of nominal classification in East Papuan languages. *Oceanic Linguistics* 41(1). 63–88.

Terrill, Angela. 2003. *A grammar of Lavukaleve.* Berlin: Mouton de Gruyter.

Tharp, Doug. 1996. Sulka grammar essentials. In John M. Clifton (ed.), *Two non-Austronesian grammars from the islands*, 77–179. Ukarumpa: Summer Institute of Linguistics.

Thiesen, Wesley. 1996. *Gramatica del idioma bora* (Serie Lingüistica Peruana 38). Yarinacocha: Instituto Lingüístico de Verano.

Thurgood, Graham. 2005. Phan Rang Cham. In Alexander Adelaar & Nikolaus P. Himmelmann (eds.), *The Austronesian languages of Asia and Madagascar*, 489–512. London: Routledge.

Topping, Donald M. 1973. *Chamorro reference grammar.* Honolulu: The University Press of Hawaii.

Tripp, Robert. 1995. *Diccionario amarakaeri-castellano.* Yarinacocha: Ministerio de Educación & Instituto Lingüístico de Verano.

Trudgill, Peter. 2011. *Sociolinguistic typology: Social determinants of linguistic complexity.* New York: Oxford University Press.

van den Berg, Helma. 2004. Hunzib (North-East Caucasian). In Geert Booij, Christian Lehmann, Joachim Mugdan & Stavros Skopeteas (eds.), *Morphology: An international handbook on inflection and word-formation*, vol. 2, 1367–1375. Berlin: Walter de Gruyter.

van den Berg, Helma. 2005. The East Caucasian language family. *Lingua* 115. 147–190.

van der Voort, Hein. 2004. *A grammar of Kwaza.* Berlin: De Gruyter.

Van Valin, Robert D. 1977. *Aspects of Lakhota syntax: A study of Lakhota (Teton Dakota) syntax and its implications for universal grammar.* University of California, Berkeley. (Doctoral dissertation).

van Engelenhoven, Aone & Catharina Williams-van Klinken. 2005. Tetun and Leti. In Alexander Adelaar & Nikolaus P. Himmelmann (eds.), *The Austronesian languages of Asia and Madagascar*, 735–768. London: Routledge.

van Staden, Miriam. 2006. The body and its parts in Tidore, a Papuan language of Eastern Indonesia. *Language Sciences* 28. 323–343.

Velie, Daniel. 1975. *Bosquejo de la fonologia y gramatica del idioma orejon (coto)*. Lima: Instituto Lingüístico de Verano.

Wade, Terence. 2011. *A comprehensive Russian grammar*. 3rd edn. Oxford: Wiley-Blackwell.

Wash, Suzanne. 2001. *Adverbial clauses: Barbareño Chumash narrative discourse*. University of California, Santa Barbara. (Doctoral dissertation).

Waterhouse, Viola. 1967. Huamelultec Chontal. In Robert Wauchope (ed.), *Handbook of Middle American Indians*, 349–367. London: University of Texas Press.

Watters, John Robert. 1981. *A phonology and morphology of Ejagham – with notes on dialect variation*. University of California, Los Angeles. (Doctoral dissertation).

Weber, David John. 1989. *A grammar of Huallaga (Huánaco) Quechua* (University of California publications in linguistics 112). Berkeley: University of California Press.

Westrum, Peter N. 1988. A grammatical sketch of Berik. *Irian: Bulletin of Irian Jaya* 16. 133–181.

Wheeler, Alva Lee. 1970. *Grammar of the Siona language, Colombia, South America*. University of California, Berkeley. (Doctoral dissertation).

Wickham, H. 2009. *Ggplot2: Elegant graphics for data analysis*. New York: Springer-Verlag.

Willett, Thomas Leslie. 1991. *A reference grammar of Southeastern Tepehuan*. Dallas: Summer Institute of Linguistics & The University of Texas at Arlington.

Wilson, Particia R. 1980. *Ambulas grammar* (Workpapers in Papua New Guinea Languages 26). Ukarumpa: Summer Institute of Linguistics.

Winter, Bodo. 2013. Linear models and linear mixed effects models in R with linguistic applications. http://arxiv.org/pdf/1308.5499.pdf. arXiv:1308.5499.

Wolfart, H. Christoph. 1973. *Plains Cree: A grammatical study* (Transactions of the American Philosophical Society, New Series 63.5). Philadelphia: American Philosophical Society.

Wu, Jing-Ian Joy. 2006. *Verb classification, case marking, and grammatical relations in Amis*. Buffalo State University of New York. (Doctoral dissertation).

Zaicz, Gábor. 1998. Mordva. In Daniel Abondolo (ed.), *The Uralic languages*, 184–218. London: Routledge.

Zeileis, Achim, David Meyer & Kurt Hornik. 2007. Residual-based shadings for visualizing (conditional) independence. *Journal of Computational and Graphical Statistics* 16(3). 507–525.