There is no significant typological difference between hunter-gatherer and other languages

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1. Introduction

It has long seemed plausible that the languages of hunter-gatherer societies might be systematically different from those of food producers. Compared to food-producing societies, hunter-gatherer societies are usually smaller and less complex, with lower population density. They are often based on kinship as a main organizing factor and usually lack large-scale sociopolitical organization with its concomitant traits such as language standardization. (See, however, Donohue & Nichols 2011, other discussion in the same volume, and Moran et al. 2012 for evidence against a correlation of population size with structural complexity in phonology, and Nichols 2009 for grammatical complexity more generally.) Many hunter-gatherer languages may have existed in long-standing conditions of considerable sociolinguistic isolation, a factor known to favor increased structural complexity (Trudgill 2011).[1] Despite the various uncertainties and the changing nature of our understanding of linguistic complexity, it remains worthwhile to raise and test the hypothesis that languages spoken by hunter-gatherer societies are systematically different from those of food producers.

If that could be demonstrated, the consequences for linguistic typology and historical linguistics would be profound. Much cross-linguistic work would need to be redone, and received view on distributions, favored and disfavored feature combinations, and perhaps even constraints and defaults could change. Any linguistic explanation of macroareal skewings of typological variables might be precluded, since continents had (say in 1491) different proportions of hunter-gatherer and non-hunter-gatherer populations, with different and perhaps unknowable demographies and interactions between the types of societies, which means that comparisons of gross frequencies of typological variables across continents would be invalidated in principle. The entire possibility of universals would be called into question.

The vocabularies of hunter-gatherer societies are likely to differ systematically from those of food producers. Their everyday and – especially – technical vocabularies, as well as ritual and poetic language, can be expected to have more and finer distinctions in the realm of activities, entities, species, etc. salient in their specific economies, finer

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[1] It is true that in the only large area where all societies were hunter-gatherer at contact, namely Australia, there was intense contact and areality; but much of the contact involved language learning by bilingual children and not the absorption of large numbers of adult learners that simplifies grammars. And in any event the areality is arguably due not to economy or social structure but to the fact that Australia is a closed spread zone [Nichols in press].

and differently organized terminologies for wild species and their life phases, behavior, etc., terms for kinds of hunting equipment and their production, and so on, just as their food-producing neighbors will have finer taxonomies for domestic breeds and varieties, processing activities, farm implements, etc. Some constellation of such differences probably does systematically divide hunter-gatherer from food-producing languages, just as some constellation of such differences probably systematically divides the languages of any two cultural or economic types of society, but we are not sure whether such vocabulary differences are better viewed as linguistic or as cultural.[2]. More interestingly, as shown by Brown, this volume, there may be systematic differences in the very types of nomenclatural systems between hunter-gatherer and food-producing societies. This must, as he notes, have important implications for cognition. We do not know whether differences in terminologies can be expected to have implications for grammar more generally; much work remains to be done, obviously, in this new area. Meanwhile, for present purposes, it is the questions of pure structural type – do the phonetic, phonological, morphological, syntactic, lexical, discourse-structural, pragmatic, etc. typologies of hunter-gather languages differ systematically from those of food producers? – that will have profound, even disturbing, implications for grammatical theory and typology if they turn out to be answerable in the affirmative.

Therefore it is important to shed whatever possible light on typological differences (or lack of same) between hunter-gatherer and food-producing societies. Here we use a large database of typological variables to test whether there are such differences.

2. Data

We set out to test for differences by looking at frequencies of all available typological variables across all languages for which we had both typological data and information about the dominant food procurement of their speakers' societies. We extracted from the AUTOTYP and WALS databases (Bickel & Nichols 2002ff., Haspelmath et al. 2005, respectively) all variables for which we had enough responses across languages (at least 150) and a small enough set of possible responses per variable (between 2 and 4) to make statistical testing straightforward. There are 228 such variables in total. Most of these cover data from between 150 to 694 languages, but a few (22) variables code constructions that can occur more than once per language (e.g. overtly case-marked vs. unmarked agents of transitive verbs, which can occur independently in several different paradigms, subparadigms, and/or constructions per language) and thus have more datapoints, up to over 13,000. Variables surveyed came from across the entire structural grammar, e.g. phonological and prosodic properties, degrees of fusion of morphemes, positions of morphemes, alignment of various subparadigms, head/dependent marking of various paradigms, number of alienable and inalienable possessive classes, presence and types of inclusive/exclusive oppositions,

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[2] See Trudgill (2011:xvii-xxv) for a survey of work on the relation of lexicosemantic properties to cultural and ecological environment.

word order in various phrase types, and others. Since we had no specific expectations of whether food procurement type would leave signals in binary or n-ary typological variables, we included multiple versions in the database (e.g. a 6-way breakdown of basic word order as well as a binary recoding.)

In order to control for family and/or geographical bias we also coded languages for language family and area. Specifically, we coded for whether or not languages are spoken inside inside or outside of the Trans-Pacific macroarea (the Americas, the Pacific coast of Asia, and the Pacific excluding island Southeast Asia) because in previous work (Nichols 1992, Bickel & Nichols 2006) and ongoing work we have found this macroarea to be a distinctive population with its own distinctive profile of frequencies of many variables. Since this macroarea includes a good number of the surviving hunter-gatherer societies we expect this to be a competing cause affecting the modern distribution of a signficant number of typological variables.

Determination as to whether a language was traditionally spoken by hunter-gatherers or food-producers was based on Güldemann et al. MS with some additional information drawn from the Human Relations Area Files (`www.yale.edu/hraf`), published ethnographic works, consultation with experts, and our own knowledge of some of the cultures.[3]

Fig 1. shows our coding of languages for food procurement and macroareal location.

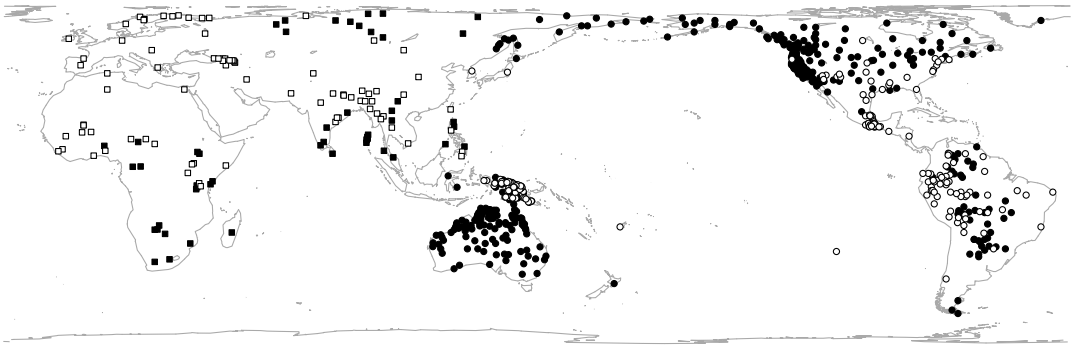

Figure 1 Languages in the sample. Black = hunter-gatherers, white = food producers; circle = Trans-Pacific (Americas, Pacific, North Asian Pacific coast), square = elsewhere (Africa, most of Eurasia)

3. Methods

We tested each typological variable against the null hypothesis that the type of food procurement has no effect on the distribution of the relevant typology, independently of macroareal location. Statistical testing was performed by step-down comparison of the fit between loglinear models, using a likelihood ratio χ^2 tests with a 5% rejection level

[3] We are grateful to Tom Güldemann for making Güldemann et al. available to us in an early form.

(using the `anova.glm` function in R, R Development Core Team 2011). Specifically, we first compared models including three-way interactions (typology × food procurement × macroarea) vs. models including only two-way interactions (typology × food procurement and, independently from this, typology × macroarea). If the difference in fit between the three-way and the two-way models was not significant, any possible two-way interaction would be independent of the other. In these cases, we then tested whether a model that includes a two-way interaction (i.e. a statistical association) between typology and food procurement fits the data significantly better than a model without this interaction. If this is the case, it suggests that food procurement significantly affects typology independently of macroareal location, i.e. this would constitute statistical evidence for a typological difference between hunter-gatherer and other languages.

A perennial concern in typology is possible confounding effects from the membership of languages in families. In response to this concern, we ran our tests not on raw datapoints (languages or constructions within languages) but on either of two methodological strategies, depending on the amount of data we had a for a given typological variable.

First strategy: When there were between 150 and 250 languages, we applied the controlled genealogical sampling algorithm of Bickel (2008) in order to weed out possible multiplications of the same structures (values of a typological variable) that could plausibly result from shared inheritance instead of from effects from either food procurement type or macro-areal location.[4] The algorithm follows the same basic assumptions as Dryer's (1989) and Nichols' (1992) strategy of sampling each family equally, but it is sensitive to the actual distribution of values within families that contain more than one member. We applied the loglinear analysis to the subsample languages suggested by the sampling algorithm.

Second strategy: The genealogical sampling approach is the only one available if the vast majority of families are represented by one language to begin with, and this is necessarily the case with datasets containing fewer than 250 languages. But the approach of taking one language per family can be criticized for always assuming that shared features reflect shared inheritance and that this then would not reflect the effect of some external factor such subsistence type. But shared features can just as well reflect an innovation (early or late but parallel), and furthermore, when they reflect shared inheritance, this can reflect pressure from that favors persistence of a specific feature. When there are more than 250 languages in the data and families are sampled densily, alternative methods can be applied that overcome this problem. In these cases, we used the Family Bias Method of Bickel 2011, in press.[5] The method estimates statistical signals for diachronic biases from

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[4] The algorithm is implemented in R (R Development Core Team 2011) and available at `http://www.spw.uzh.ch/software`. We thank Lukas Wiget for help running our code.

[5] The method is implemented in R (R Development Core Team 2011) and available at http://www.spw.uzh.ch/software

their expected synchronic results: if a structure S outnumbers non-S significantly (under binomial or multinomial testing) in a family, a change toward S in this family was more likely than a change away from it (either because S was present in the protolanguage and then was subsequently almost never lost, or because S was not present but was innovated early or often in the family). If there is no significant synchronic preference, by contrast, no signal can be inferred because in this case either there was no diachronic bias toward any structure, or the difference in biases was too small to leave a signal, or the family is too young for a signal to have formed. Using extrapolation methods, signals for diachronic biases can also be estimated for isolates and small families. The loglinear analysis was then applied to the estimates of families being biased toward a given structure in relation to the food procurement type and macroareal location of the family. If a family subsumed diverse food procurement types and macroareal locations, it was split into smaller groups that were homogenous in these regards.

3. Results

For over 98% of the variables there was no significant difference ($p < .05$) between hunter-gatherer and other languages; only for 4 of the 228 variables (1.7%) is there a significant difference. Table 1 shows the four significant variables: two phonological properties, one morphological one, and one syntactic one, none with known major implicational correlations with other variables. Table 2 is a representative selection of non-significant variables, to give a sense of the kinds of properties we tested.

Source	**Variable**	**HG dominant value**	**HG *p***	***N***
WALS	Velar nasal	present	0.013	205
Autotyp	Phonologically isolated NEG particle	present	0.032	151
WALS	Polar question particle	present	0.035	262
WALS	Uvular consonants	absent	0.046	219

Table 1. The 4 variables (our of 228) that reached significance in the difference between hunter-gatherer and other languages. They all happen to be binary presence/absence variables or variables that were recoded as such. HG dominant value = the value of that variable that was dominant in hunter-gatherer languages. HG *p* = significance level for that value (HG vs. non-HG languages). *N* = the number of languages or correlations tested for that value.

Source	Variable	HG dominant value	HG *p*	*N*
WALS	Person marking on adpositions	Absent	0.071	173
WALS	Lateral Consonants	Absent	0.082	219
WALS	Tone	Atonal	0.138	205
WALS	Ditransitive 'give'	Secondary object	0.155	154
WALS	Syllable structure	Moderately complex	0.160	188
Autotyp	Numeral classifiers	Absent	0.204	159
WALS	'Hand' and 'arm'	Different words	0.250	256
WALS	Reduplication	Productive full and partial	0.317	179
Autotyp	Basic locus of marking of S	Head marking	0.384	177
WALS	Order of subject and verb	SV	0.435	371
WALS	Order of object and verb	OV	0.496	419
WALS	Passive Constructions	Absent	0.530	171
Autotyp	Dominant head/dependent type	Dependent marking	0.594	931
Autotyp	Minimal/augmented number system	Absent	0.668	213
WALS	Coding of nominal plurality	Some plural marking	0.731	281
Autotyp	Overt possessive classes	Present	0.856	163
Autotyp	Obligatory multiple agreement	Present	0.927	200
WALS	Expression of pronominal subjects	pro-drop	0.975	213
Autotyp	Overt marking of A	Unmarked	0.997	13105
Autotyp	Noun incorporation	Absent	1.000	173

Table 2. Selected other variables. lllustrative list of variables that were not significantly different for hunter-gatherer languages, chosen for good representation and wide distribution over the kinds of variables tested.

Given the 5% rejection level we assumed, the total of four significant cases is fully within the range of expected statistical error, so the null hypothesis of no typological difference between hunter-gatherer and other languages is not refuted.

4. Conclusions

In practical terms, our finding means that the languages of hunter-gatherers and food producers can safely be assumed to be, and to have long been, of the same grammatical ilk. That is, the grammatical typology of languages today is not different from what it was in the Paleolithic, and this in turn means that typological work taking no account of whether the languages surveyed are spoken by hunter-gatherers or not is still valid. More generally, typological generalizations drawn from modern languages can be assumed to be valid for all of the history and prehistory of language (or at least of modern language as we know it, which following Nichols 2011 we are inclined to assume has existed for at least as long as anatomically modern humans, i.e. well over 100,000 years).

On the other hand, there are macroareal distributions which have grown, geographically and demographically, mostly in post-Paleolithic times, including much of the human expansion into the Americas and the Pacific. This means that frequencies and distributions, but not principles or defaults or constraints, have changed since the Paleolithic.

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