Valuing linguistic diversity and language ecology: perspectives from the "field".

Chris Rogers

ABSTRACT

Language structure reflects a negotiation of interactions between humans within an ecolinguistic context. The diverse consequences of these interactions are uniquely transmitted, diffused, and accepted as authentic by, within and across individuals and generations, creating the world's staggering linguistic diversity. Valuing linguistic diversity entails not only understanding the mechanics of a language's structure but also exploring the adaptive advantage that such structure provides language users, learners, and communities generally. However, in a global language-learning market that favors test scores and proficiency levels, this ecological context is often absent - in effect overlooking the value of linguistic diversity. In this presentation, I report on collaborative fieldwork with speakers of two indigenous languages–Xinkan (Isolate: Guatemala) and Wao Tededo (Isolate: Ecuador)–and look at some of the structural properties of each from an ecological perspective. The conclusion is that these languages - while having some crosslinguistically rare structural properties - are highly valued for their reflections of human creativity and uniqueness. This perspective on valuing linguistic diversity is essential for creating greater intercultural competence, stronger communities, and individual identities.

1 Forward

I am excited to give this presentation today. I am completing a three-year tenure as a Fellow in the Humanities Center. It has been a positive experience for me as I have learned about the types of scholarship others produce and about how my own scholarship fits within the College of Humanities at BYU. I'm excited to take my turn to contribute in this dialogue.

Similarly, I am excited because I always look forward to talking about field linguistics and the ideas that really motivate my professional and personal pursuits. However, I have felt a certain amount of trepidation also. In some ways linguistic scholarship – especially *field* linguistic scholarship – is unlike other research typically presented at these colloquia. In giving a presentation on my research I have not been entirely confident that I knew what type of audience

I should direct my presentation to today. I haven't been sure which aspect of my research would most beneficial to those present. I hope that you will help me out by asking the questions that will be most helpful.

I'm not too worried about it though and I hope what I talk about today can lead to positive discussions.

2 Introduction

The world is full of a staggering amount of language diversity. This is a cause for celebration. It will never change; there will always be language diversity. Nevertheless, the political and social commentary based on the increase in conceptions of nationality since the late 19th-century–which favors monolingualism and transactional perspectives on language–has intensified the misunderstandings around language diversity. Because of this, more than ever-before, there is a need for individuals to understand and experience this diversity–not for its transactional value, or its utilitarian outcomes, but for its universal transformational potential. I believe this readjustment in perspectives on valuing linguistic diversity is essential for creating greater intercultural competence, stronger communities, and individual identities.

As a field linguist, I am trained and work toward exploring, understanding, analyzing, preserving, and championing language diversity. This is the sense of the word "field" I have included in the subtitle. However in the last few years I have had something of a professional existential crisis involving these activities. The hobbyist and casual use of the term *linguist*, a growing misunderstanding of the nature of language–especially in light of recent discussions about so-called "artificial intelligence" and "large language models"–and an ongoing shift in the semantics of the word *diversity* has led to a sort of disciplinary amnesia. The consequence of which has been that discussions about language diversity and the value of language study

generally have reverted to themes that were deemed “antiquated” a generation ago (Sapir 1970). In response to this personal crisis, I have come to realize that perhaps the phrase *language diversity* is partially at fault–perhaps it is too vague a concept. Questions such as ‘What does language diversity mean exactly?’, ‘What does language diversity look like?’, and ‘What is the value of language diversity?’ need to be ansewered. Contributing to the answers of these foundational questions is the goal for today.

2.1 Diversity

Diversity is a technical term involving comparison. It sometimes is used with a quantitative sense - diversity suggests, in this meaning, a large quantity of something. This is not what linguists like me think. It is about quantity at the surface but is also about the intricacies of something much more individual and uncountable. My comments today reflect this non-quantitative and ecological perspective on linguistic diversity through a discussion of how language structure is a consequence of its use as experienced in two language communities I work with.

2.2 Language

Language is a complex and integrated symbolic system created by each individual in order to communicate, express, and locate themselves within an infinite number of nested communities. Language is created in this way for individual and collective adaptation through cognitive responses to a fluid ecology of influences. This of course means, perhaps famously, that there is no single language organ, device, or single biological function in any human and that the system is secondarily spread over a vast cognitive network. The created system can be observed and recorded only through careful examination of its use–making it difficult to

distinguish language and behavior.[1] The inseparable connection between symbol and experience in developing the linguistic system is, in so far as is known, an aspect of our divine inheritance and more than just a mechanical tool of communication. It is what helps and hinders us in the exploration of our individual life's experiences.

The creation of this system follows the universal cognitive processes of perception, organization, categorization, reference, predication, modification, and hierarchy (among many others), all used symbolically. Collectively these symbolic processes are termed the grammar, or structure, of a language and includes all aspects of a language's use. Thus it is not hard to see two important facts which are generally accepted in linguistic thinking. First, surface patterns of language reveal a cognitive system that is unobservable except through inference. Second, that language structure is inextricably tied to its abstract context of use–its ecosystem.

Unfortunately, language study is a multi-billion-dollar industry where the goal is merely language as a tool of communication–a mechanical algorithm that can convert one human identity into any other simply be learning the "correct" words or structures. This is unfortunate because it ignores the individual creativity of language use, it hides the ecological factors of language creation, and it focuses too much on transactional possibilities while ignoring the true transformational power of language.

3 Language Ecologies

Let me begin with what is meant by language ecology. The concept of a language ecology is very old in descriptive field linguistics. While perhaps not called that then, the features of an ecosystem as we understand it today were discussed by Sapir (1912; 1921; 1970), Boas (1917) and Bloomfield (1923). More contemporaneously, it has become a way to talk about

[1] That is, there is an interdependency of symbol and experience in creating this system–making it quite distinct from mathematical, logical or computer symbolic systems.

the explanation for the diversity of language use and individual language structure (Fill & Penz 2022; Fill & Muhlhausler 2006; Thomason 2011; Fishman 1991; Dixon 2010). Skutnabb-Kangas & Harmon (2022: 11) provided the best definition: it is a perspective that "considers the complex web of relationships that exist between the environment, languages, and their speakers". From this perspective language use (the observable behaviors) and language structure (the unobservable grammar) are consequences of the functional needs of individuals to adapt to their life's experiences. Language diversity provides an advantage to humans (individually and collectively) to negotiate their responsibilities, identities, and individuality and to create connections to the past and the future of accepted/authentic responses to life.

Importantly, for field linguists dealing with language documentation and description, this is not a metaphor borrowed from biology but a recognition that languages are not static, algorithmic, stochastic, or deterministic. It suggests that while an integral part of a language ecosystem, humans are not the central figures in them. Rather, it suggests that humans are participants in a network of connectedness to humans and non-humans and where they have choices, responsibilities, and feel the consequences as individuals through the whole. Understanding an individual's place within their unique language ecosystem eschews labels such as "fluent", "native", or "correct" (among others) since these reflect a procrustean definition on language use. In their place, the effect of the ecosystem as a whole on the linguistic behaviors of an individual, or a community of speakers, results in fluid and indeterminate descriptions of language use.

Within this perspective, the infinite set of cognitive processes (i.e., forms and functions) used to negotiate a place within a language ecosystem is called *language structure*. Understanding the interconnectedness, and perhaps symbiosis, of linguistic structure and the

language ecosystem is the primary goal of the three distinct specialties of language documentation, linguistic description, and linguistic fieldwork. These in turn lead to more general inferences about language structure and ecology in both diachronic linguistics and typology.

3.1 General Overview of a Language Ecosystem

Every language ecosystem is comprised of four basic components (represented in the whimsical and overly simplistic diagram in Figure 1).

1. Intergenerational transmission
2. Diffusion (with two potential types)
3. Ecological Context
4. Individual adaptation through collective social feedback

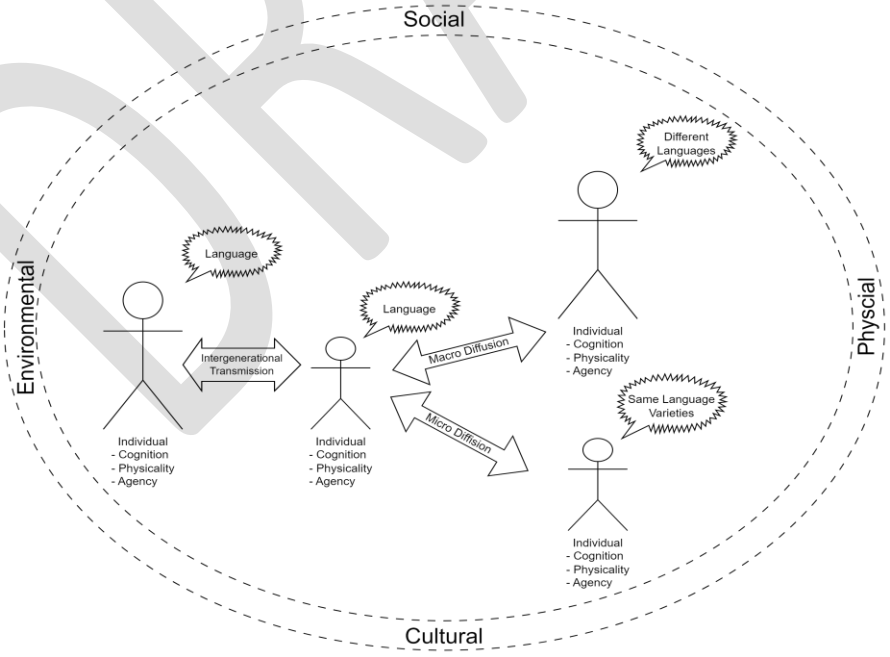

Figure 1. Language Ecosystem

Intergenerational transmission refers to the passing of linguistic behaviors from one generation to the next in an uninterrupted chain. Parents, without any overt training transmit their language behaviors to their children; or children without any overt training follow the language behaviors of their parents.[2] Inherent in this transmission is a gradual drift of language behaviors for perception, articulation, and cognitive reasons that I will mention in a bit more detail below (see Sapir (1970) for a definition of "drift").

However, from the ecological or cognitive perspective transmission is not the only influence on linguistic behaviors. Human beings are social and live with myriad types of social interactions outside of their nuclear families (i.e., parents or caregivers and siblings). Diffusion refers to the passing of linguistic behaviors from a non-transmission source to an individual. Two broad types of diffusion are generally acknowledged: micro-diffusion and macro-diffusion. The difference refers to the amount of shared linguistic behaviors with the individual in the source. In the clearest cases, dialect diffusion is micro-diffusion while crosslinguistic diffusion is macro-diffusion. Though admittedly reality is typically much more complex than these labels indicate. The consequence of diffusion (of either type) is that linguistic behaviors not transmitted across generations enter into the language behavior of the individual (e.g, loanwords, borrowed constructions, or domains of use, etc.).

Like biological ecosystems the balance of transmission and diffusion in an ecosystem is determined by the adaptive needs of the whole. In some ecologies diffusion or transmission is more "active" but neither is entirely absent. There is no such thing as a monolingual ecosystem or culture.

[2] For detailed foundational treatments of these concepts see Thomason (2011), Fishman (1991), Sapir (1912), Fill & Muhlhausler (2006), Fill & Penz (2022), and Dixon (2010).

Individuals and their language behaviors, whether transmitted or diffused, do not exist independent of the ecosystem of which they are a member. A collection of individuals interacting in an ecosystem must learn to negotiate communicative functions and linguistic identities together. Individuals adapt to the community of individuals within their linguistic ecosystems. This adaptation can be conscious but is most often subconscious. Particular behaviors can be determined to be more "authentic" for an individual in a particular ecosystem and adherence to that authenticity determines authoritative feedback on linguistic behaviors in a community. For example, knowing the jargon of a particular friend group, or authentic ways of swearing in a community are covertly followed for continued membership in that particular community.

Language ecosystems do not consist of a single community - and therefore there is never one version of authenticity or authority for the entire community. Rather, multiple communities are possible depending on different amounts of transmission, diffusion, and changing social factors, environmental contexts, and the variation in individual human cognition. Thus, within a language ecosystem an individual is constantly and dynamically negotiating their own interconnectedness and determining which communities they belong to and what language behaviors are appropriate for each. This social feedback on authentic language behaviors is accumulated over a lifetime and shift along with the shifting interactions of individuals within a single ecosystem.

The most salient idea for my remarks today is that language structure is not static nor is it pre-determined or endowed. Rather it is dynamically created as a unique representation of an individual's interaction, values, and adaptive needs within a particular language ecosystem.[3]

3.2 Diversity and imbalance

From this ecological perspective, the definition and the value of language diversity becomes obvious. Language diversity is the cumulation of ecological influences on a community's language use and structure. Language diversity represents an adaptive advantage for individuals and communities within any language ecosystem. It represents humanity at its finest - individuals and societies negotiating existence in a completely individual and unique way.

As mentioned in some language ecosystems transmission or diffusion can be given greater emphasis in the adaptive feedback speakers receive. This almost always leads to what I refer to as "shifting ecologies" (often called "language endangerment") - an imbalanced ecosystem. While my specific remarks are not specifically about language endangerment today, this is a serious issue that is affecting millions of people. The consequences of shifting ecologies include loss in local community cohesion, self-devaluation, human rights violations, genocide, and the devaluing of the family as the central unit of society.[4]

[3] I might also add that there are hints about language ecosystems in the account of the creation in Genesis (and later during Enoch's time); while in the Tower of Babel episode (and then later during 1 Nephi 1) we can see the consequences of an imbalanced language ecology, that accurately foreshadow modernity.

[4] I use the terms "children" and "parents" as neutral terms to avoid the much more clumsy and problematic "primary social and cultural caregivers" and "social and cultural wards", respectively. A single cultural interpretation of neither parenthood nor childhood is intended.

3.3 Language structure and fieldwork

The concept of language structure is so ubiquitous that it likely needs no careful definition. However, this concept can be used slightly differently by specialists and layman, and so a brief characterization is necessary. Language structure refers to the formal and functional traits of the total set of possible utterances as used within a specific language community. It is unlikely that we will ever witness all such utterances, but the structure of these utterances is recurrent and representative of the means of communicative adaptation. Language structure is the cognitively determined processes of symbolizing experience within an ecology into an integrated system. Professional linguists are especially trained to study, analyze, describe, and explain language structure.

Field linguists focus their attention on language structure in places where the language is actually used (away from any sort of lab or library). We are principally concerned with using a set of methods to understand language ecology (broadly called *language documentation*), empirical properties of language structure (broadly called *language description*), and the inferences for the crosslinguistic value of both (broadly called *typology* and *historical linguistics*).

Despite some theoretical assumptions that structure and ecology were distinct (see all generative frameworks), recent thinking has reshown that these are mutually dependent (Fill & Penz 2022). The presentation today follows in that line of thinking and suggests connections between structural properties of two languages and their respective ecologies of use. The subtitle of this talk reflects that I my discussion and conclusions are based on field methods as a primary way of knowing.

4 Two case studies on the ecological influences on language structure

4.1 Xinkan

The Xinkan languages are a group of languages once spoken in what is today southeastern Guatemala. Four languages are documented and hints at a few others mentioned in a few resources. These languages comprise a shallow, and isolated, language family. There is ample linguistic and archeological evidence that suggests that these languages were spoken in this region likely before the Mayan expansion around 600 CE, though we know nothing of their culture until after European colonization. It is likely that the Xinkas always lived in a balanced but shifting ecology. In this context they were never at the center of sociopolitical control and were likely one of the many periphery cultures ecologically supporting the great Mesoamerican civilizations.

Figure 2. Locations of Xinkan Languages

I will focus my remarks on Guazacapán Xinka (GX) since this is the language with the most robust documentary record. The last speaker of this language, Carlos Mendez, died in 2009.

I worked with him to study his language structure; at the time any language ecology had been decimated by colonization and years of genocidal civil war in Guatemala.

The structural properties of GX are interesting, since in some ways they follow the "template" of languages in the Mesoamerican Cultural and Linguistic Areas while in other ways they do not (Campbell, Kaufman & Smith-Stark 1986; Rogers 2016; Rogers 2014; Rogers & Hamp 2020). Some of the less common features of GX language structure include a rare instance of static vowel harmony, a robust glottalic/pulmonic consonant symmetry, non-case determined semantic alignment, information structure dependent syntactic ordering, and lexical precategoriality. Today, I want to focus on the latter from an ecological perspective.

4.1.1 Xinkan Precategoriality

Formal word class distinctions are less important in the GX structure and words are organized loosely according to potential functions of use. So, POS tags, such as *noun* or *verb* are not a part of the lexical orgaization of words. Rather a lexeme is coupled with an abstract meaning and the communicative functions of *reference* or *predication* (typically correlated with noun and verb in Indoeuropean languages, respectively) can be determined only through context. The basic structural propertities for two representative lexemes are represented in Tables 1 and 2.

Table 1. Functional uses of ||nawu|| 'birth/rear'.

Form	Meaning	Salience & Completeness	POS
nawu	'to give birth/rear'	NEUTRAL, COMPLETE	TV
naw'u	'child'	NEUTRAL, INCOMPLETE	VN
a-nawu	'She is birthing/rearing'	ACTOR, INCOMPLETE	ACT.IV
nawu-ła?	'She is birthing/rearing'	ACTOR, COMPLETE	ACT.IV
a-nawu-?	'S/he is being birthed/reared' or 'pregnant'	UNDERGOER, INCOMPLETE	UG.IV
na:wu-?	'S/he was birthed/reared'	UNDERGOER, COMPLETE	UG.IV
nawu-k'i	'birthing/rearing'	PREDICATE	IV.PRED
nawu-uła	'one who births' or 'pregnant woman'	ACTOR	AGT.NOM
nawu-wa	'the thing birth'; 'fetus' or 'newborn'	UNDERGOER	PNT.NOM
nawu-k	'the thing used in birthing'	INSTRUMENT	INSTR.NOM

Table 2. Functional uses of ||waya|| ‘work in the cornfield’.

Form	Meaning	Salience & Completeness	POS
waja	‘to work in the cornfield’	NEUTRAL, COMPLETE	TV
waj’a	‘the cornfield working’ or ‘work’	NEUTRAL, INCOMPLETE	VN
a-waja	‘He is working in the cornfield’	ACTOR, INCOMPLETE	ACT.IV
waja-ła?	‘He worked in the cornfield’	ACTOR, COMPLETE	ACT.IV
a-waja-?	‘It is worked in the cornfield’ or ‘the cornfield’	UNDERGOER, INCOMPLETE	UG.IV
waːja-?	‘It was worked in the cornfield’ or ‘the previous years’ cornfield’	UNDERGOER, COMPLETE	UG.IV
waja-k’i	‘cornfield working’	PREDICATE	IV.PRED
waja-ała	‘one who works in the cornfield’ (Spanish milpero)	ACTOR	AGT.NOM
waja-wa	‘the thing worked in the cornfield’ or ‘the cornfield’	UNDERGOER	PNT.NOM
waja-k	‘the thing used in working in the cornfield’	INSTRUMENT	INST.NOM

The lexical grouping of “words” is not predetermined to include prescriptive concepts such as “noun” or “verb”. Rather any lexeme indicates a broad semantic concept like ‘work in the cornfield’ and then this concept *functions* like what a “noun” or “verb” does in other languages based on phonological and morphosyntactic patterns. This means the derivation of one lexeme from one lexical class to another is not easily differentiated from inflection categories, and is likely happening outside of the “lexicon” (however we articulate that fuzzy concept). There is no clear distinction between inflection and derivation in these languages. This is a robust and productive organizational strategy for all the Xinkan languages and evidence for it exists in every resource ever recorded for, in, and about these languages; encompassing all speaker types, proficiencies, and domains of use (Maldonado de Matos 1770; Lehmann 1920; Sachse 2010; Rogers 2019; Rogers to appear). With this evidence it can be inferred that this was

a transmitted element from one generation of Xinkan speakers to the next. This organizational scheme is not typologically common among languages - though it appears to be slightly more common for languages spoken in the Americas (Hieber 2021).

Xinkan speakers have borrowed words from many Mesoamerican languages and from Spanish after European colonialization. Many of these words have been adapted into the precategorial structure discussed above. For example, ||waya|| in Table 2 is an early Eastern Mayan loanword (< **wah* 'food' Sachse (2010) and Kaufman (2003)) with a precategorial structure in GX despite the same not being true for the original language. Similarly, Table 3 is a loanword from Spanish (< *chichi* 'feces') with a precategorial structure in GX despite Spanish have morphosyntactically determined lexical classes.

Please excuse the sensitivity of the next two examples, loanwords are by definition incomplete in their grammatical adaptation into a language. This example is the most productive of the Spanish loans in any of the Xinkan languages. Others show only partial adaptation to the Xinkan grammatical system.[5]

Table 3. Functional uses of ||tʃitʃi|| 'defecate'.

Form	Meaning	Salience & Completeness	POS
tʃìtʃi	'defecate'	NEUTRAL, COMPLETE	TV
tʃitʃ'i	'defecation'	NEUTRAL, INCOMPLETE	VN
tʃi:tʃi-ʔ	'feces'	UNDERGOER	UG.IV
tʃìtʃ'i-iła	'one who defecates'	ACTOR	AGT.NOM
tʃìtʃi-k	'toilet'	INSTRUMENT	INSTR.NOM

[5] The structural properties of all the Xinkan languages, as far as they are documented and understood, are identical. Only a few phonological differences and some morphosyntactic reanalyses allow for their separation into distinct languages. Speakers of these languages, however, claimed mutual unintelligibility and social identity was built on geographic language community. For this reason they are treated as individual languages in the Xinkan descriptive literature.

This in parallel to the native word for the same function in Table X.

Table 4. Functional uses of ||ǂina|| ‘defecate’.

Form	Meaning	Salience & Completeness	POS
ǂːna	‘defecate’	NEUTRAL, COMPLETE	TV
ǂːn’a	‘defecation’	NEUTRAL, INCOMPLETE	VN
ǂːna-ʔ	‘feces’	UNDERGOER	UG.IV
ǂːna-ɬaʔ	‘defecate’	ACTOR	ACT.IV
ǂːna-k’i	‘defecate’	PREDICATE	IV.PRED
ǂːn’a-ała	‘one who defecates’	ACTOR	AGT.NOM
ǂːna-k	‘toilet’	INSTRUMENT	INSTR.NOM

I do not know of any research suggesting the typological patterns of precategoriality, though Hieber (2021) is the best place to start. Nevertheless, anecdotally, this is not uncommon to English precategoriality. The difference being that word class categories in English are only functionally distringuished, while here they are both functionally and formally distinguished. This suggests at least two types of precategoriality in languages. Morever, it does seem unusual from the perspective of most PIE languages to not have a clear distinction between inflection and derivation. Figuring out this type of typology would be a monumental task which I suggest for future research.

From an ecological perspective, then, GX speakers used both transmission and diffusion sources to create their unique adaptive responses to their changing social and cultural conditions. They borrowed new lexical items through diffusion and transmitted across generations a productive precategorial system of lexical organization.

However, instead of simply using the words as they were used in the source languages, we can infer that some source of authority and authenticity on GX use influenced the adaptation of these words to the transmitted structure. GX users influenced each other to preserve the transmitted structure while simultaneously adopting new lexical items. But note that the opposite

is not true. Few evidences of lexical borrowings from the Xinkan languages into any other language exist and no structural properties do. This is a tell-tale sign that Xinkan users created their language structure while occupying a subordinate place in the larger language ecosystem.

It is interesting to note that the Xinkas were animists and tended to see the world in terms of the impacts of their environment on humans. Each of the three core linguistic functions of reference, predication, and modification are understood in their language through a salience of "acting" (things one can control), "being acted upon" (things beyond one's control), "completion" and "non-completion" (the permanence of a state of affairs). This suggests hints of how Xinkas experienced life in their linguistic ecosystems. Moreover, it points to some of the cognitive underpinnings for the creation of language structure: cause and consequence. This is a universal human experience that has been used symbolically to build GX grammar. More than knowing how to conjugate, this suggests aspects of the nature of what it meant to be Xinkan.

It wasn't until the ecosystem became unbalanced that complete shift to Spanish occurred. Though descendants of the Xinkan speakers are in the process of trying to recuperate their ecological system. This is what a healthy language ecosystem looks like. There is balance and a give and take of influences. Linguistic diversity focuses on the use and structural outcomes of this diversity, celebrating the unique ways that humans have adapted to their social, environmental, and cognitive conditions. Learning languages is fun and good. But learning why a language does what it does is a central component of multicultural competence. We learn to value others and other possibilities of human adaptation. If we explore the unobserved created system we gain a glimpse into a different perspective on life.

4.2 Wao Tededo

Wao Tededo is a language isolate spoken on the Western border of the Amazon rainforest in eastern Ecuador. Being an isolate refers to its diachronic connections–there is no evidence linking it to other distinct language systems through time–not its ecological connections. This language also belongs to a complex system of transmission and diffusion influences where individual and collective identities are created. Wao Tededo goes by a lot of names, but this is the autonym for their language: *wao* 'person' + *tededo* 'language'. Other names are Waorani (lit. wao people) or Auca (lit. tapir and currently understood to be pejorative and racist). I refer to the language by the autonym or as Wao (following community use).

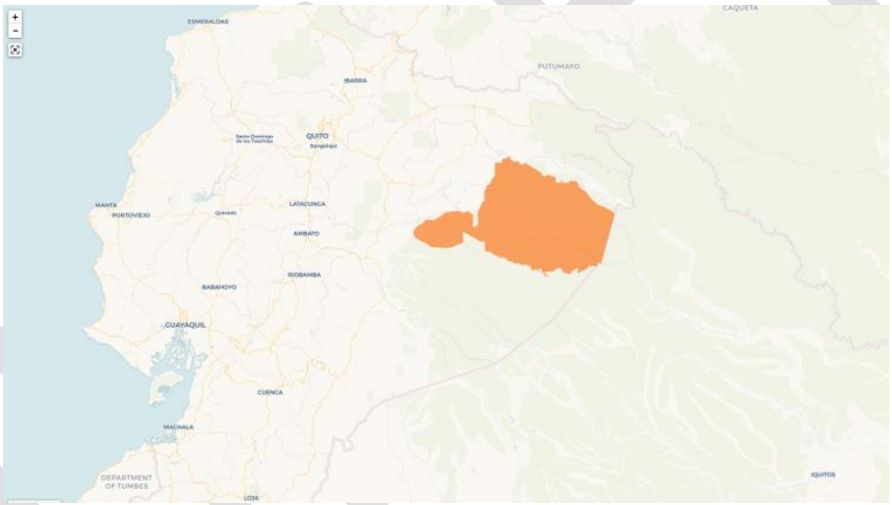

Figure 3. Location of Wao Tededo Speakers

I have only begun collaborating with speakers of this language relatively recently, but there are few reliable resources on either the specifics of the language ecosystem or only some resources about the structure of the language (though this is starting to change). Wao Tededo speakers have only been in purposeful contact with mainstream cultures since the 1950s.

Speakers suggest some intelligibility with some of the languages spoken by uncontacted tribes in the region (deeper in the Amazon).

Wao Tededo structure, as currently understood, has some typologically interesting traits: nasal-oral consonant neutralization, information packaging influenced word order, ambifixes, pronominal paradigms which reflect the informational nature of the anaphor as well as the linguistic function of participants in communication. Today I will focus on the nasalization, spirantization, and literacy influences.

4.2.1 Nasalization

Tables 4 and 5 provide the consonant and vowel inventories for Wao Tededo, respectively.

Table 4. Wao Tededo consonant inventory

	bilabial	alveolar	palatal	velar
voiceless	p	t		k
voiced	b	d		g
nasal	m	n		
approximant	w		j	

Table 5. Wao Tededo vowel inventory

	front	central	back
high	i, iː, ĩ, ĩː		u, uː, ũ, ũː
mid	e, eː, ẽ, eː		o, oː, õ, õ
low		a, aː, ã, ãː	

For typologically oriented linguists, these inventories are immediately enticing. We have an asymmetrical consonant-to-vowel ratio of .5, while the average suggested in Maddieson

(2013) is 4.25. Usually languages have more vowels than consonants.[6] This makes Wao Tededo a "low symmetry" type of language (in Maddieson's terminology) which is not common. This type occurs for 58/564 (1%) of languages in Maddieson (2013). Wao Tededo which was represented in the original sample, but classified as a "moderately low" language - language with a symmetry score between 2 and 2.75.[7]

As seen, one phonological feature of this language is that oral and nasal stops are contrastive. However, this contrast is neutralized after a nasal vowel. The resulting alternations are represented in these standard rules below followed by some representative words in (1).

1. [p,t,k] → [ᵐp, ⁿt, ᵑk] / Ṽ __
2. [b,d,g] → [m, n, ŋ] / Ṽ __

(1) Voiced stops after nasal vowels

a. botö
bo-tõ
1SG-PRON
'I'

b. ïĩbo
ĩ̈-mo
COP-1SG
'I am…'

[6] Most loans are nouns. Verbs are typically loaned using a construction common for Mesoamerican languages "AUX + SPANISH INFINTIVE VERB". In the Guazacapán Xinka languages the auxiliary *uka* 'do, be' in the undergoer focused intransitive form is used for this type of borrowing. For example *uuka' comer* or *uuka' proclamar*, see Rogers (2019) for early example and Rogers (2016) for examples from the last speakers.

[7] There are some difficulties with this comparison since Maddieson (2013) only works with primary distinctions of vowel quality. This would exclude the long vowels and possibly the nasal vowels in Wao. If calculated in this way the result would be a score of 2. However, the Wao consonant inventory in Table 1 is a bit misleading, all of these consonants are contrastive but the stops are allophonically related in most contexts. This suggests that we reduce the unique consonant qualities also, to 7. This would give a symmetry score of 1.4, still well below the tendency for languages. In any case Wao Tededo belongs to the "Low symmetry" type in Maddieson (2013).

c. godä
go-dã̈
go-3SG.F
‘She goes.’

d. ïïdä
ĩ̈ː-nã̈
COP-3SG.F
‘She’

e. gokä
go-kã̈
go-3SG.M
‘He goes.’

f. ïïkä
ĩ̈ː-ŋã̈
COP-3SG.M
‘He’

(2) Oral stops after nasal vowels
a. wëpo
we^{m}po
father
‘father’

b. këtabopa
kẽ-^{n}ta-bo-pa
eat-PST-1SG-REAL
‘I eat it’

c. tamökï
tamõ-^{n}gĩ̈
hit-INF
‘to hit’

These alternations are not a problem really, except that the careful phonologist will see that this type of nasalization is usually written as a vowel change. Here it is a consonant target triggered by an adjacent vowel. This points to some interested potential inferences about the nature of phonological syntagmatic constraints. I don’t know of anybody who has explored typologically similar ends resulting from different means, though Optimality Theory with its

focus on general syntagmatic processes instead of a distinction between its subtypes could easily represent it. For the typologists though this cannot lead to a quantification of the universal constraints on language dealing with nasalization. So it is a place ready for future research.

Wao Tededo vowel nasality is subtle (for English ears). Acoustically it is very difficult to measure (this is true for nasality generally) and I have collected initial data on airflow dynamics using the methods described in Kohlberger (2017) and Meakins, Green & Turpin (2018: 113–114). I have only preliminarily analyzed this data but here is a picture and some basic thoughts for the word /botõ/ 'I'.

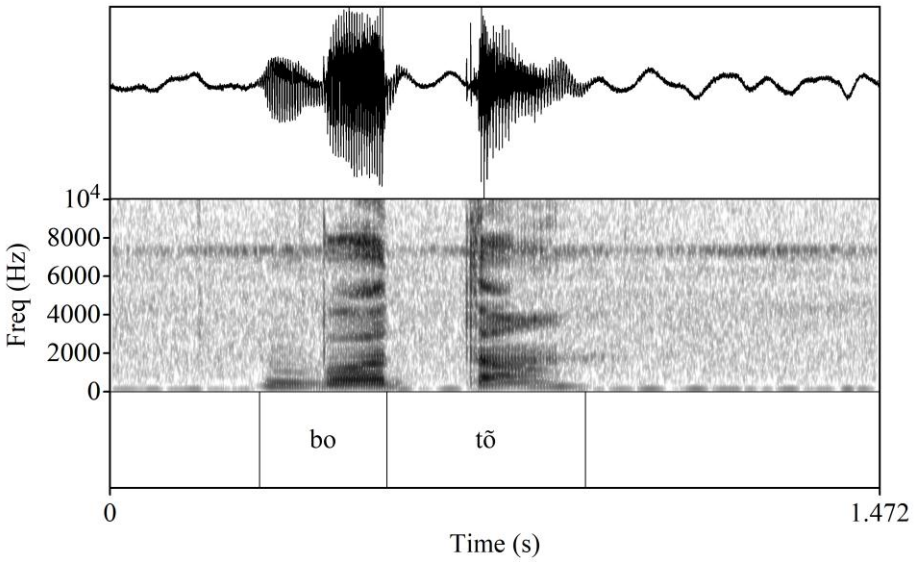

Figure 4. [botõ] Oral Acoustics

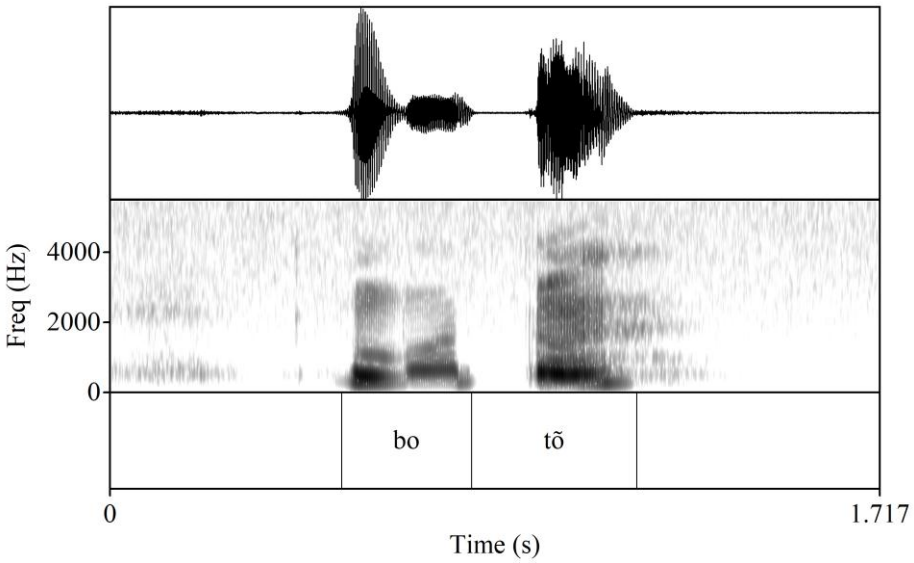

Figure 5. [botõ] Nasal acoustics

The oral properties of nasality are not that unexpected–higher resonance around the vowels than the consonants; slight formant lowering for the nasal vowels; and nasal anti-formant splits (especially around F1 and F2). It is interesting, however, that formants are observable at such high frequencies. The nasal properties of nasality show an increased airflow for the nasal vowels as well as more defined nasal harmonics. These harmonics occur at comparably lower frequencies (probably a consequence of the shape and size of the resonating chamber). This is a project waiting to be finished, but the ecological conclusions seem obvious. A cognitive process of minute perception was co-opted for the symbolism necessary for creating this language's structure. This suggests that despite their differences in culture, the Waorani are just like everyone else, but they have a unique way of being themselves.

If we treat language learning transactionally we would miss he nuance of human expression and possibility that is a unique "Wao". An ecological perspective, however, suggests that this is not just a mechanical process but a response to ecological influences. No other

language spoken in this ecosystem, that I am aware of, has nasality behaviors that are identical to Wao Tededo. It is one way that language expresses Wao identity.

4.2.2 Spirantization of Stops

Another allophonic change in Wao Tededo involves the spirantization of stops between vowels. Ecologically salient is the spirantization of /d/. Intervocalically this sound is allophonically [ɾ], as in the following examples.

(3) Spirantization of stops

	Gloss	Phonemic	Pronounciation
a.	people	/wao-dã-di/	[wao-ɾa-ni]
b.	ant	/bode/	[boɾe]
c.	cat	/kidi/	[kiɾi]

These patterns are productive and accurate for all speakers of Wao Tededo. However, based on my limited fieldwork with adult and minor speakers there is a current consonant shift in progress affecting perception and production of consonants. The causes of this shift are the shifting nature of the Wao language ecology with the introduction of Spanish, literacy, and the disruption of traditional ways of living. The created structure is moving from /d/ : [ɾ], to a split /d/ : [d] :: /r/ : [ɾ]. This change is a direct consequence of ecological influences.

4.2.3 Literacy influences

This is ecologically interesting because of literacy development among the Waorani. Wao literacy is relatively new and is not a skill most people have. Grandparents are unlikely to have any literacy, parents have basic literacy, and children have literacy in Spanish with no formal training for Wao. This shift toward literacy as an element of social authority and authenticity determination is tipping the ecology away from transmission.

(4) Literacy influences on phonemic contrasts

	Gloss	older generations	standard written form	learned written form	younger generations
a.	see	/akĩ/, [akĩ]	akï	aki	/aki/, [aki]
b.	care for	/a:kĩ/, [a:kĩ]	aakï	aki	/aki/, [aki]
c.	say	/ãkĩ/, [ãŋĩ]	äkï	aki	/aki/, [aki]
d.	bathe	/ã:kĩ/, [ã:ŋĩ]	ääkï	aki	/aki/, [aki]
e.	people	/wao-dã-di/ [waoɾãni]	waoräni, huaorani	huaorani	/waorani/, [waorani]

The grammatical organization of the younger generations is different than the older generations because of literacy and other social influences. This creates a lot of concern, confusion, and division. I have witnessed at least two family arguments about this issue. The ecology is changing and with the added pressure of English it is not difficult to conclude that Wao Tededo is being used in a shifting ecology that is affecting families.

5 Conclusions

Based on these and other communities a few concluding remarks on language diversity are in order.

1. We can't just focus on structure to be "fluent". A language is the ecology is the language.
2. This perspective on valuing linguistic diversity is essential for creating greater intercultural competence, stronger communities, and individual identities
3. some elements of transmission are never completely lost
4. One-size fits all to language learning and use is not valid

We can't just set arbitrary standards for a language. Nor can we assume that what is occurring in our own language ecologies is necessary for other language ecologies. Of course, everyone has the right to choose.

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