How Ethnobotanical Documentation Can Sustain Linguistic, Cultural and Botanical Diversity and Knowledge

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Figure 1. Perez-Baez (blue) explains to VanDamme (gray) which part of the plant is crushed to make a shampoo while Funk (Aloha) and Velasco-Gutierrez (red) listen. Photo taken by Jim DiLoreto. 2015.

Figure 2. Location of La Ventosa, Oaxaca, Mexico. Google Maps. 2015.

Figure 11. *Gliricidia sepium* **is in the Fabaceae family and guie' niza is its Zapotec name. The flowers and leaves of this tree are used to wrap cheese, giving the** *queso* **a pleasant smell and flavor (Fernando Sanchez Lopez, 2015).**

Introduction

This interdisciplinary project is a case study that took place in the Zapotec (Didxaza) speaking community of La Ventosa in Oaxaca, Mexico. Zapotec is the language spoken indigenously in and around the municipality of Juchitán de Zaragoza in the southern coast of the Isthmus of Tehuantepec (Figure 2). While the speaker base is one of the largest among indigenous languages in Mexico, the language is by no means immune to the pressure to shift to Spanish. Children are no longer learning Zapotec and the youngest speakers are now over the age of 20. The language endangerment parallels the ecological degradation and loss of traditional ecological knowledge (TEK). A change in lifestyle that lacks an engagement with nature has taken place rapidly exemplifying the impacts of globalization and modernization (Perez-Baez, Velasco-Gutierrez and Cata, 2015). Adults in their 50's who engaged with nature as children have raised their own children as Spanish speakers and the institutional school system has been the dominant source of knowledge over intergenerational transmission. The team, which included a group of local knowledge bearers, over a 14 month period, collected 1383 samples from 225 locations around La Ventosa. Around 2,000 professional photographs were taken of the botanical specimens, and 190 high quality audio recordings were collected. The specimens have been professionally pressed, mounted, labeled and are part of the U.S. National Herbarium at the Smithsonian National Museum of Natural History, Mexican National Herbarium (MEXU), SERO and Jardin Ethnobotanico de Oaxaca (JEBOT).

Hypothesis

Ethnobotanical documentation can help sustain the linguistic, cultural and botanical diversity and knowledge of a community.

Methods

When the data were gathered in the field, the Zapotec name was linked to the use of the plant, therefore all samples with the same Zapotec name automatically have the same use. In this study the initial database was pruned to include only those specimens that were identified at least to genus and has a Zapotec name, and a culturally relevant use resulting in a total of 686 specimens. The remaining data were further reduced using two assumptions: 1) All samples with the identical matching criteria were considered to have the same information and were reduced to one entry, and 2) If all information on two entries is identical (Zapotec name, use, family and genus) and one is identified to species and the other is not, then they are considered to be the same species, which totaled to 288 specimens. The Spanish descriptions of the plants given by the local knowledge bearer were translated into English and then simplified into fourteen categories of uses (Figures 4 and 5). The data were manipulated in Access and Microsoft Excel to create a query, and graphs. Interviews were conducted with Gabriela Perez-Baez, Kenia Velasco-Gutierrez and Victor Cata, to gain insight on motivation, participation, work being done, and hopes for the future with the La Ventosa Ethnobotany project.

Human and Environment Interactions

What is the most useful plant family and why? Fabaceae- Legumes

There are 288 species that have a Zapotec name and a culturally relevant use. Out of the 288 species, 43 of them are in the Fabaceae family, commonly known as the legumes. The next largest family is Euphorbiaceae, with a mere 15 species (Figure 3).There are 14 categories of uses (Figure 4). The species within the Fabaceae have 13 out of the 14 uses exemplifying their diversity in use, and importance to the La Ventosa community (Figure 5).

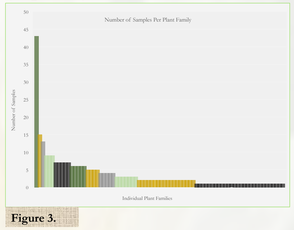

Figure 3.

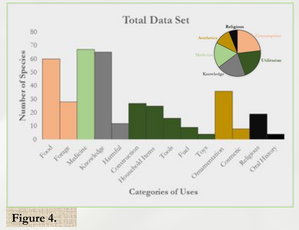

Figure 4.

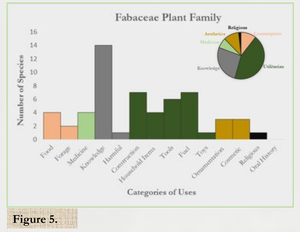

Figure 5.

Legumes have been used by humans in a multitude of ways, consumed, and cultivated for millennia, and through this study have proven to be of major importance to the Zapotec speaking community. Some 3 to 5 million metric tons of nitrogen are fixed by legumes in natural ecosystems annually (Lewis et. al, 2005). Due to this availability of nitrogen, the family has evolved both protein rich seeds and numerous chemical compounds related to defense. Paradoxically, it is these chemical compounds which are often exploited by humans for medicine, pesticides, poison, and other uses (Lewis et. al, 2005). Legumes have showy flowers and fruits making them attractive to the consumer-human or animal. In addition, they take on many different growth forms, from small beans, annuals that can be cultivated easily, to trees and vines. Since they grow in numerous diverse forms, the potential for their variety of uses is vast.

Linguistics

When analyzing the data, a few patterns became evident that illustrate the relationship between the local taxonomic system and the Linnaean system. 1) The same species can have different Zapotec names (Table 1): three samples, all the same species, but with different names, for example in Zapotec beñe equals mud and dani* equals mountain. Here the name reflects the differences in an element of the information about the plant, in this case the geographic place. So the indigenous community has assigned a different name, despite it having the same Linnaean name. 2) There is a frequent pattern of samples that have the same Zapotec name yet are different species. There are even some examples of groups of three or more (Tables 2 and 3) that are found in different genera or even different families. In the case of the plant yaga biquiiche quichi' there are species in five different genera with this name. The photos (Figs. 6-8) demonstrate the similarities in the leaves, branches and fruit (bean) that the plant produces. They are all used for tools and are similar in appearance so the local taxonomic community has given all of them the same name. In the case of la'sa yu (Figs. 9 and 10) species from five different families have the same Zapotec name. The flowers, color of the stems and other features are different yet the specimens have received the same Zapotec name possibly because they all have the same use.

Table 1.

Zapotec Name	Family	Genus	Species	Use
biadxi	Anacardiaceae	Spondias	purpurea	Food; Medicine
biadxi beñe	Anacardiaceae	Spondias	purpurea	Food
biadxi dani*	Anacardiaceae	Spondias	purpurea	Food

Table 2.

Zapotec Name	Family	Genus	Species	Use
yaga biquiiche quichi'	Fabaceae	Acacia		Tools
yaga biquiiche quichi'	Fabaceae	Guinetia	tehuantepecensis	Tools
yaga biquiiche quichi'	Fabaceae	Havardia		Tools
yaga biquiiche quichi'	Fabaceae	Mimosa		Tools
yaga biquiiche quichi'	Fabaceae	Pithecellobium		Tools

Table 3.

Zapotec Name	Family	Genus	Species	Use
la'sa yu	Euphorbiaceae	Ditaxis		Medicine
la'sa yu	Sterculiaceae	Melochia	pyramidata	Medicine
la'sa yu	Sterculiaceae	Melochia	tomentosa	Medicine
la'sa yu	Tiliaceae	Corchorus	aestuans	Medicine
la'sa yu	Tiliaceae	Corchorus	trilocularis	Medicine
la'sa yu	Turneraceae	Turnera		Medicine

Figure 6.

Figure 7.

Figure 8.

Figure 9.

Figure 10.

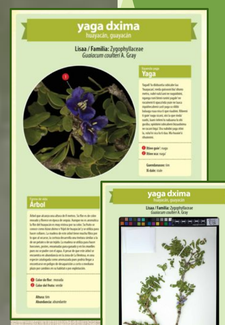

Figure 12. One of the infographic sheets for local distribution

Figure 13.

Figure 14.

Figure 15.

Outreach

A. Creating a virtual National Ethnobotanical Herbarium Online (NEHO) pilot designed by IT, linguists and botanists to host the multimedia, scanned specimen, and cultural information for the La Ventosa collection available to the public. Stay tuned! (naturalhistory.si.edu/neho/laventosa)
B. Bingo game and matching game for community
C. Children's workshops for learning culturally relevant uses of plants (Figure 13) and Zapotec (Figs. 14-15).
D. Local ecology, art and environmental awareness workshop series
E. Set of informational plant fact cards to distribute to local schools and educational institutions (Figure 12)
F. A picture book with professional photos and collection information for distribution to local households
G. An educational and promotional poster on the Fabaceae family will be made

Conclusion

There is a persistent negative connotation in certain arenas of society in Mexico towards indigenous languages. Through this ethnobotanical documentation project it allows the team to exhibit how robust and systematic the language and knowledge can be. Through a common vision there is a powerful blending across disciplines of art, anthropology, linguistics and botany to help sustain linguistic, cultural and botanical diversity and knowledge. Due to the impacts of pressure to speak Spanish, environmental degradation, and modernization that Perez-Baez, Velasco-Guiterrez, and Cata see in La Ventosa, this project is hope for future generations to have their indigenous language and knowledge documented. A main goal of the project as stated by Perez-Baez is for the outreach efforts and retention of results to inspire stewardship internally in the community, for the members of the community to say, "this is important and we need to take charge of the revitalization process." It is difficult to dispute that plants are important. There is a general appreciation for plants and local knowledge about plants. Yet, that level of appreciation does not necessarily exist for the Zapotec language. The children were excited about the plants. They observed plants being collected, pressed and desired to know about their uses. When a project pairs up plant knowledge with language knowledge the excitement can be rechanneled towards an indigenous language, which is incredible. Through ethnobotany, conservation, not only in biodiversity, but language diversity is at work.

Acknowledgements

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References

Lewis, G. P. *Legumes of the World*. Richmond, UK: Royal Botanic Gardens, Kew, 2005. N. pag. Print
Perez-Baez, G., Velasco-Gutierrez, K., & Cata, V. (2015, June 18). La Ventosa Ethnobotany Project. (O. VanDamme, Interviewer)

The poster background is a water lily (Photo taken by Gibran Morales Carranza). It is one of the few cultural stories about plants in Zapotec. The name is derived from **nuda** *meaning "button" and* **bina** *to "weep." The story goes that two flowers were in love with each other but their love was impossible because one flower opened during the day and the other at night.*