Podcast Interview: Rodrigo Cámara-Leret

PNAS: Welcome to Science Sessions, the podcast of the Proceedings of the National Academy of Sciences, where we connect you with Academy members, researchers, and policymakers. Join us as we explore the stories behind the science. I'm Sarah Dargen, and I'm speaking with Rodrigo Cámara-Leret of the University of Zurich, Switzerland. In a recent PNAS article, Rodrigo and co-author Jordi Bascompte examined 12,495 services of plant species used by indigenous groups from North America, northwest Amazonia, and New Guinea. The team found that these uses are closely tied to the indigenous language and culture of each region. However, many of these languages are at risk of extinction. First, Rodrigo explains why he studied medicinal and plant knowledge within these languages, and how he chose which regions to study.

Cámara-Leret: In this case, we thought that a large-scale comparative effort would really benefit if we focused on something like plant medicines. So that was one reason. And another one was my admiration for the figure of Richard Schultes, who published a really monumental piece of work on the ethnobotany of Northwestern South America, where he detailed the uses of more than 1,000 plant species used for medicinal and toxic properties. So we chose the northwest Amazon because of the work that had been done there by Richard Schultes, who spent almost half a century in the region living amongst the indigenous cultures and documenting the uses of medicinal plants. And he published this information in his book, The Healing Forest. At the same time, there has been a very good effort to document the knowledge of Native American groups, which is synthesized in an online database. On the other side of the world in New Guinea, the efforts by ethnobotanists are fewer. But still, we have a relatively good understanding of what exists today, thanks to a literature review that compiled information from 500 bibliographic references and herbarium specimens. So it wasn't planned a priori; we started with New Guinea, which is the region I had been working on. And then I was excited to explore what would happen if we add another region, such as the northwest Amazon. We then thought, well, what happens if we add another region that has a bit of a different flora, such as North America, and that's when the idea of looking at these three regions just crystallized.

PNAS: You say in your study that medicinal knowledge exhibits a pattern of linguistic uniqueness. What does that mean?

Cámara-Leret: The idea of linguistic uniqueness is simply that information is only known to a single language, in this case, medicinal knowledge. So we compiled information from 236 languages in these three regions of the world and found that more than 75% of all the medicinal services here—defined as the combination of a plant species and a medicinal subcategory, for example, infections and infestations—so 75% of those medicinal services were only known by a single language. And this is what we call linguistically unique knowledge.

PNAS: Can you share some examples of plant uses you learned?

Cámara-Leret: Yes, well, there are many; there are almost 13,000 uses, but for example, the Siona Indians of the Colombia Ecuador region, they use the latex of species in the Euphorbiaceae family to treat fungal infections, which are really common in wet tropical forests. There are many records also of the use of different lianas or barks of trees to harvest fish, in the sense of stunning fish because of their toxic properties, which inhibit the respiration of fishes and cause them to emerge to the surface. There are also records of plants that are used as poisons for hunting, which are the famous curare poisons. And then many examples of leaves and fruits used to prepare beverages that facilitate digestion. The list is very extensive.
PNAS: You also found that most of the plant species are not threatened, but that many of the languages are. What does that suggest?

Cámara-Leret: Yes, that was an interesting finding because, you know, the current debate focuses a lot on the extinction of biodiversity, rightly so. Because, as we see, we are having a really large impact on our surrounding ecosystems. But a more neglected component is the erosion of culture and the extinction of languages. And what we found is that most of the linguistically unique knowledge is more strongly associated to threatened languages than to threatened plants. In fact, less than 5% of the plants in our study are considered threatened. So, in other words, this means that traditional knowledge about surrounding ecosystems is much more threatened by the loss of indigenous languages than the loss of plants themselves. It's as if we consider that information about nature could be encoded in a Rosetta Stone, right, as that allows us to read the landscape, but the writing in the stone is slowly fading, and at some point, we won't have the ability to read the landscape. Unless of course, the information is preserved in writing.

PNAS: What causes language extinction?

Cámara-Leret: For language to be threatened there has to be a really low number of speakers. And that language has the property that it is often not being taught in formal schooling. And also very often that it is not written. For example, in North America there are 192 approximately endangered languages. Now there's a big challenge ahead as to what to do to preserve them because, you know, it's just like biodiversity; you can't put a fence around culture to protect it, culture is very dynamic, and it's very challenging to preserve. So, of course, the way to conserve languages is to promote the transmission from parents to their offspring. And this relates in turn to the education that is being promoted by the government, for example, if bilingual schooling is being promoted, and this in turn relates to what funding is being destined to support Native American language schooling. As far as I know, the figure is quite low. If we consider that, I think in 2019, there was the Esther Martinez Native American Language Preservation Act, which was updated to increase funding up to $13 million to promote funding of language in Native American schools. However, this figure might seem high, but it is much lower than, for example, the amount of money that is being used to preserve the California condor. So I think this already tells us that maybe there has been not sufficient attention to valuing our cultural heritage.

PNAS: Your study mentions that the United Nations has named 2022 to 2032 the International Decade of Indigenous Languages. What is the significance of this?

Cámara-Leret: I feel like this next decade could really have an important impact on how society at large comes to understand cultural heritage, because we know that over 30% of the world's languages may no longer be spoken by the end of the century, and many of them are just right on the brink of extinction. So it's not like we can just wait a few more decades to start acting, we need to act now. And this also, I think, comes in a good time with all the realization of, you know, diversity, equity, and inclusion in our field in academia, of course, but I would say more broadly in society as we try to break down the barriers and the historical discrimination that have persisted until this day and which perhaps language extinction is the most visible aspect of that discrimination, because it is the result of displacement from motherlands and it is the result of being forced to speak another language—not necessarily directly, although history has shown us that in many places the situation was that of just by sheer force and violence, but it's also often through indirect effects. All of this, I think, is in the spirit of the International Decade of Indigenous Languages. And I think it's a beautiful idea to try to bring together efforts to preserve these endangered languages.
PNAS: What can we do to prevent language loss?

Cámara-Leret: You know, if we want to salvage endangered languages, we need to document them and that requires descriptive, on-the-ground work. On the other hand, there has to be more support to Native American peoples to develop their systems of education in their own languages. In my experience in northwestern South America, I've seen that there are also some creative approaches to promote minority or endangered languages, which is through indigenous radios. And I think that's a beautiful way to put languages on the same level of importance as the dominant languages. And it facilitates the exposure of their culture to the younger generation, which otherwise may not be so exposed. Especially in these places, where I'm working in tropical regions, such as New Guinea or the Amazon, which is just like species need to have their habitat preserved in good conditions to, you know, persist, so do different cultures. And that goes by having land rights. And unfortunately, in many of these regions, indigenous cultures’ lands are not being fully respected; they're being, in fact, invaded, be it for gold mining, as we see now in Brazil by the lands of the Yanomami people, or being invaded for harvesting legal woods. Even in the United States, the situation is not as it should be. Indigenous people in the United States have 2% of the land nowadays, when they used to have all of it. So I think there has to be more education to the general public about the importance of each country's cultural heritage. And that, of course, requires better education about the history of colonization.

PNAS: For this episode, we were lucky to receive recordings from two of Rodrigo’s friends that he has worked with in the past. The first is from Uldarico Matapí. He is the last shaman of the higher lineage of the Matapí people of the Colombian Amazon. The language of the Matapí people is Upichia, but it is no longer spoken on a daily basis. Only a few elders know it, and the language is largely used for shamanic rituals. Uldarico is one of the last guardians of Upichia. Here, he is speaking in Spanish:

Uldarico: Tenemos que luchar por mantenerlo [conocimiento tradicional] analizando el tema; la forma de curaciones indígenas estarán más amenazadas que nunca porque donde cambiamos la forma de vida el manejo chamánico y las propiedades de las plantas ya no funcionarán. Ya no darán efecto porque esto requiere una forma de vida especial, con alimentos apropiados y nada de contaminaciones de otros tipos de alimentos. Porque las plantas medicinales están muy bien asociadas y relacionadas con el cuerpo para poder dar efecto. Por eso es sugerente buscar hasta encontrar caminos de recuperación para ir caminando en un nuevo diálogo de saberes, recogiendo conocimiento de la naturaleza y no detener en qué usar sino cómo usar lo que estamos recuperando. Tenemos que saber manejarlo para tener respuesta a todo lo que necesitamos. Y entonces todo esto es muy preocupante y entonces yo simplemente hago una voz de aliento para que mantengamos y podamos devolver conjuntamente la tranquilidad a la naturaleza que en este momento lo necesita.

PNAS voiceover: The gist of what Uldarico said is roughly translated as follows: "We have to fight to maintain traditional knowledge by discussing the current situation: The form of indigenous healings will be more threatened than ever because where we change the way of life, the shamanic management and the properties of the plants will no longer work. They will no longer work because this requires a special way of life, with appropriate food and no contamination from other types of food. That is why it is important to search for ways of recovery to move toward a new dialogue of knowledge, gathering knowledge of nature and not stopping at what to use but how to use what we are recovering. We must know how to manage it to have an answer to everything we need. All of this is very worrying and so I simply voice my encouragement for us to all maintain and return the tranquility to nature that is needed at this moment."
PNAS: Next, we have Jailer Macuna explaining why indigenous languages matter. His native Macuna language is currently threatened. Much of the medicinal plants and traditional knowledge of the Macuna is documented in the book Rodrigo mentioned earlier, *The Healing Forest*, by Richard Schultes. Here, Jailer is speaking in his native Macuna.

Jailer: [audio in Macuna, no transcription]

**PNAS voiceover:** And here’s the gist of what Jailer said as a rough translation: “For me it is important to preserve and conserve the Macuna language that the Creator taught us and gave all of us through our ancestors. That is why through the language, our wise and traditional elders teach us by showing the sacred Yuruparí as a baptism. For the indigenous child, baptism is when the Yuruparí is shown to him for the first time. With language, our elders transmit to us their wisdom and knowledge, traditional cultural dances, and knowledge of traditional prayers. Also everything sacred: the meaning of the sun, the stars, the moon, the day, the night, the jungle, rivers, animals, fish. All of this they transmit to us; our elders teach us their knowledge, for us to teach our children and our grandchildren. That is why it is very important for the Macuna indigenous people to preserve our language. Through the Yuruparí they also teach us the importance of medicinal and toxic plants. Also animals: which animals can be eaten, which animals cannot be eaten, which animals are sacred. The vines, palms: what their importance is. The elders teach us all of that through language. So that's why it is extremely important for the Macuna indigenous people to preserve our language. It is the legacy that our god and our ancestors left us, and that teaching follows the transcendence that we carry from our sages, or ‘tradicionales’ as we call them. So that's why our elders stress to us not to forget the culture, the language. We have to preserve it for a lifetime.”

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