Contained by a cocoon: Human-animal-environment relationships in Indigenous Mexico

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> "Ejido 5 de Mayo, Sinaloa, Mexico: It is nearly midnight, and the 'alaguásin', the ceremonial host, has ushered the masked dancers and musicians into the 'tree-world' of the ramada, the traditional thatched flat roof that shelters the open space before the house, where the 'fiesta' in honor of a deceased child is now unfolding. They are encircled by grieving family members and neighbors from this agricultural Indigenous community. The ceremonial dancers add an extra sonic layer to the already saturated atmosphere. The gourd and deer hoof rattles, resonant idiophones worn on their bodies, and the soft clatter of leg rattles crafted from moth cocoons filled with pebbles—all merge into a rhythmic soundscape that echoes through the night, deepening the ritual's immersive power." (Helena Simonett)[1]

Several of the Indigenous families I have come to know over the course of my research have lost an infant or a child.[2] During my fieldwork in *Yoreme* communities in rural Northwest Mexico in the state of Sinaloa, spread over the decade of 2004 to 2014, I attended more mortuary rituals for children than any other celebration involving the deer and *pascola* dances described above.[3] Their "ejidos" (communal land) and villages are situated on the fertile land between the mountain-skirts of the Sierra Madre Occidental and the shores of the Gulf of California, a region that underwent significant economic shifts as agriculture became increasingly export-oriented and privatized following Mexico's adoption of neoliberal policies in the 1980s.

The intensified agricultural production draws thousands of seasonal laborers from other parts of Mexico, who join the local workforce, many of them coming from Indigenous communities, both local and migratory. In Sinaloa, it is common to follow large-scale farming practices that rely heavily on inputs such as inorganic fertilizers and agrochemicals.[4] The state boasts the highest proportion of agricultural land equipped with irrigation systems in Mexico. Eighty percent of the region's freshwater resources are allocated to agricultural use. The runoff of pesticides leads to harm in ecosystems and poses risks to human health. Sinaloan toxicologists report that residues of agrochemicals are present in irrigation canals, rivers, and lagoons, as well as in drinking water.[5]

A large percentage of these agrochemicals are produced by companies such as the Swiss-based, Chinese-owned Syngenta and the German multinationals BASF and Bayer.[6] Despite the EU's recent prioritization of climate change and biodiversity protection in its policies, and its commitment to supporting a global transition to sustainable agri-food systems by promoting international standards that encourage sustainable agriculture, EU law still permits the production and export of hazardous pesticides that are banned within the EU to lower- and middle-income countries.[7] This practice of double standards exploits weaker national regulations, with hazardous pesticides often applied in hot climates by unprotected workers. The resulting environmental contamination is leading to an increase in diseases and higher rates of infant and child mortality in local communities and has a devastating impact on biodiversity.[8]

Mexico is one of the major importers of pesticides in the whole of Latin America and worldwide one of the top ten importers of pesticides banned in Europe.[9] Some Indigenous communities from the affected areas have stepped forward to defend their rights: *Yaqui (Yoeme)* tribal leaders, for example, have spoken out against the importation of banned pesticides, describing this practice as a form of "environmental violence" that endangers the health of their Nation.[10]

What do the unsustainable use of land and its environmental degradation have to do with the study of music or musical practices? The connection may not be immediately apparent, yet it is significant for the Indigenous communities living there. Ecological degradation impacts the cultural landscapes from which musical traditions and practices emerge. When the land is overused and degraded, it disrupts these cultural landscapes, leading to the loss of traditional knowledge and practices. Moreover, ecological degradation can lead to social and economic changes that influence musical expression, such as migration, community displacement, and changes in livelihoods. By examining these intersections, I will focus in this article on the *mariposa cuatro espejos (Rothschildia cincta)*, a giant silkworm moth native to the area named after the triangular-oval "mirror" on each of its four wings, and consider the implications of its disappearance for *Yoreme* ceremonies.

In contrast to its vibrant counterpart, the monarch butterfly, which migrates from Canada to winter in Central Mexico, the *cincta* silk moth has not received global recognition, despite its struggle to survive and reproduce in a challenging environment.[11] Even though the vanishing of moths signals an ecosystem in decline,[12] initial blame was directed at Indigenous communities by local media, attributing the decline to their cultural practice of crafting leg rattles from the silkworms' cocoons.[13] The *Yoreme* people feel unfairly blamed for the disappearance of the *mariposa cuatro espejos*, asserting that their ancestral customs have developed from a symbiotic, not a detrimental, relationship to the environment. Their cultural life is deeply intertwined with an ecology that conflicts with the economic dynamics of

an export-driven agricultural sector that, ironically, also provides their livelihoods through employment as agricultural day laborers.

Leg rattles, despite their delicate material, can last a lifetime. The cocoons are harvested from the twigs after the pupae have metamorphosed into adult moths and the moths have hatched. These empty shells are filled with a few small gravel pieces from the nest mounds of the harvester ant *(Pogonomyrmex)*, a stinging ant species common in the desert region. Few *Yoreme* make leg rattles for commercial purposes. Typically, artifacts such as sound-making instruments or masks that have been used in ceremonies are not sold because they are "charged with power/energy"; I will come back to this concept.

Since the material and spiritual worlds of Indigenous peoples are deeply interconnected, leg rattles are not merely viewed as musical or sound-making instruments. Instead, they are integral to complex relationships involving human and non-human, animate and inanimate elements of the environment.

In *Yoreme* sound aesthetics, it is crucial for each pair of cocoons to emit different yet complementary pitches. The *Yoreme* sound worlds are deeply rooted in a specific duality. As I have noted elsewhere, the cocoon embodies the duality of being and becoming – it holds the potential for new life, both as a *mariposa cuatro espejos* and as a sound-making instrument.[14]

I have often pondered consequences of the decline or vanishing of the *mariposa cuatro espejos* on the sustainability of Indigenous musical traditions. Already in the 1980s, the *Yaqui* people in the neighboring state of Sonora could no longer find cocoons to make their leg rattles due to the Mexican government's extensive spraying of the herbicide paraquat to eradicate marijuana crops.[15] It was during fieldwork in 2007 in northern Sinaloa that I first noticed the use of leg rattles made from cut-up plastic water hoses and aluminum beverage cans (Figure 1). Material substitutions are not new; for example, in the *Tarahumara (Rarámuri)* deer dance, a ceremonial dance by a community culturally related to the *Yoreme* and *Yaqui*, deer hooves on the belts were replaced with shell casings or tin foil tubes long ago.[16] Similarly, due to a lack of deer hooves, *Yoreme* deer dancers have substituted them with pig hooves, which are practically indistinguishable in shape and in sound, both aspects being important to *Yoreme* deer dancers. Hoof substitutes, such as those made from beer bottle caps, are only acceptable for uninitiated boy deer dancers.

Figure 1: Pascola dancers with leg rattles of insect- and man-made materials, 2010. Photo by Helena Simonett.

The shortage of silkworm cocoons certainly necessitates inventive strategies, but "cocoons" made from plastic or aluminum noticeably differ in appearance from those made by moths. While the materiality of ceremonial sound-making instruments is important, as previously mentioned, *pascola* dancers are apparently able to convey their traditionally granted knowledge through sound and movement, even when using alternative, man-made materials. Interestingly, the sound produced by these man-made "cocoons" are remarkably similar. This raises questions about the centrality of auditory qualities over visual ones.

In his examination of sound-making instruments in the Bolivian Andes, Henry Stobart explores Indigenous views of "sound as energy, or as the animating quality of living things and of the cosmos";[17] this "energy" or "animation" is referred to in Quechua language as "animu".[18] According to this position, sound holds the same significance as life itself, and the process of shaping music can be interpreted as the shaping of life.[19] Thus, panpipes and other Andean sound-making instruments such as rattles and bells act as vessels of animu" that can be released in performances. As Stobart explains, the sounds generated by these instruments, often overlooked by musicologists, have the power to induce transformations.[20] Similarly, *Navajo* ritual songs recorded by George Herzog on wax cylinders in the early 1930s, preserved as copper negatives in the Berlin Phonogramm-Archiv, are considered historic treasures by museum curators. However, for the *Navajo* of Arizona and New Mexico, the songs are immaterial, possess agency, and therefore should not be stored on physical media at all.[21] According to *Yoreme* specialist Bernardo Esquer, the utilization of recorded deer songs for educational purposes is futile. According to *Yoreme* epistemology, ritual specialists must connect with the "enchanted world of the deer" (*juyia annia*).[22] The sounds produced by the various rattles, the rasping sticks, and the pulsating beat of the water drum are the transformative force that unlocks the realm of *juyia annia*.

Eliot Bates, author of "The Social Life of Musical Instruments", urges us to take musical instruments seriously – not just as objects or tools that humans use, make, or exchange, or as passive sound sources. He argues that their power and allure stem from their entanglement in complex relationships: between humans and objects, between humans themselves, and between objects. The same instrument can participate in fundamentally different relationships depending on its sociohistorical context.[23] Musical instruments not only possess a degree of agency but can also be the protagonists in narratives, functioning as "actors who facilitate, prevent, or mediate social interaction among other characters", as Bates demonstrates in various literary examples from the Western world.[24]

Applying Alfred Gell's arguments on art and agency[25] to sound-producing objects, one might ask: If sound is not a crucial aspect of an object's identity and social role, why does the object have the ability to produce sound at all? One might also question whether the cocoons (*ténabarim*) produce the sound, whether the dancer produces the sound shaking the leg rattles, or whether it is their interplay and their mutual enabling, the dancer-leg-rattle-network as a hybrid entity with its own agency. The *Yoreme* word "ténabarim" refers to both "cocoons" made by the silk moths and "leg rattles" crafted by human "artists". Thus, the sound created during the ritual performance originates from both non-human and human agents. This idea stands in contrast to the (Western) view that musical action and appreciation are primarily centered on humans.[26] As Bernd Brabec de Mori argues, drawing on Descola's analytical framework, Western or "naturalistic ontology" tends to separate

the external, unintentional nature from the internal, intentional human culture – a sharp differentiation that is not drawn in many Indigenous and traditional communities around the world.[27]

The *Yoreme*, similar to other Mexican Indigenous groups, do not adhere to a naturalistic worldview but rather an analogical one. Following Descola's ontological typology,

> "[a]nalogy is a flexible and polyvalent means of producing resemblances [between things] that is likely to make use not only of symmetry but of various forms of inversion, encompassment, and division. To this may be added links of attraction or sympathy, that is, action at a distance, which is also metonymic at least in the sense that it brings together in a sui generis relationship the previous separate relations that each thing had with its neighboring things".[28]

According to musicologist Gary Tomlinson, metonymy in Indigenous Mexican cultures "is not a connection of part to whole but rather the contact of proximate aspects of the world, in contrast to the relations across distance struck up in metaphor".[29] In the context of ritual performance, this is a metonymy that – in the moment of ritual transformation – collapses into sameness or "ontological units" (Figure 2).[30]

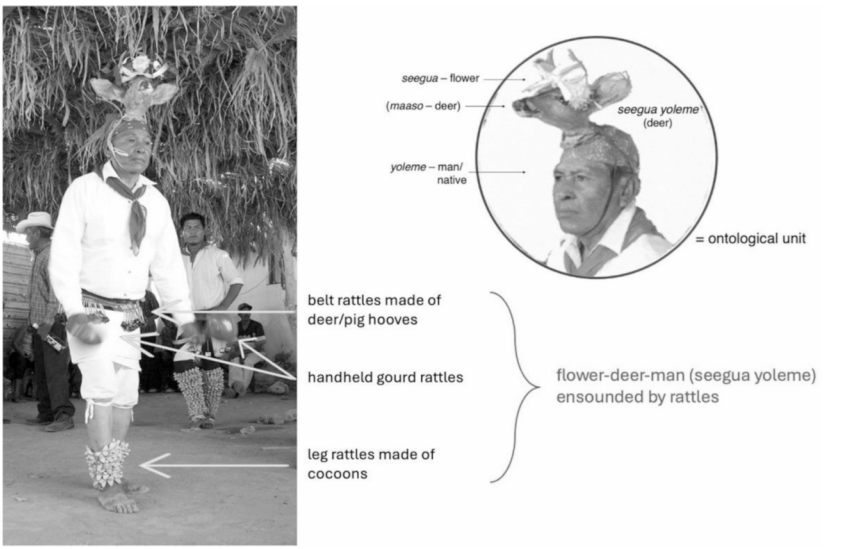

Figure 2: Proximate aspects of the world collapsing into sameness: seegua yoleme, the "ontological unit" of the flower-deer-man. Photo and illustration by Helena Simonett.

To conclude, the cocoons used to make leg rattles highlight the importance of studying the materiality and sonority of musical instruments from an ecological perspective. This approach shifts our focus from viewing materials as inert objects to understanding the intricate relationships between materials, living beings, and the environment. The cocoons, in alignment with the editors' assertion in the volume *Current Directions in Ecomusicology*, serve as a reminder of our interconnectedness with and dependence on the earth and our environments for survival.[31]

Moths that silently struggle to survive and reproduce in a hostile environment are an indicator of environmental degradation. Although Sinaloa's butterfly nurseries and the urgent call to add the *mariposa cuatro espejos* to the endangered species list may raise public awareness, they do not address the underlying issues causing the moths' decline.

In a sense, the Indigenous people of Northwest Mexico, to quote Eduardo Viveiros de Castro, "have managed to abide, and learned to live in a world [that] is no longer their world 'as they knew it'".[32] In Indigenous sound ontology, rattles crafted from man-made materials, such as plastic or tin, can substitute for the *ténabarim* because the importance lies not in the material of the vessel, but in the quality and context of the sound produced.[33] Thus, even if the *mariposas cuatro espejos* have ceased to exist, the *Yoreme* will be able to continue their performances. And these will, sadly, continue to include *responsos* for those that have died from the consequences of man-made environmental disasters until action is taken on pesticide regulation.

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Figure 1: Pascola dancers with leg rattles of insect- and man-made materials, 2010. Photo by Helena Simonett.

Figure 2: Proximate aspects of the world collapsing into sameness: seegua yoleme, the "ontological unit" of the flower-deer-man. Photo and illustration by Helena Simonett.

Notes

1 This is an excerpt from the author's unpublished fieldnotes, dating from May 1st, 2013.

2 The *Yoreme* are one of the 68 Indigenous groups officially recognized in Mexico, characterized by their distinct language and customs. This paper adopts the self-designation *Yoreme* rather than the official label "Mayo" or the combined term "Mayo-Yoreme". The *Yoreme* share close cultural ties with the *Yaqui*

and *Tarahumara* peoples, who refer to themselves as *Yoeme* and *Rarámuri*, respectively. The latter communities are primarily located in the northwestern Mexican states of Sonora, Durango, and Chihuahua, with additional *Yaqui* settlements across the U.S.-border in Arizona.

3 Rituals for the deceased are called "responsos". The first *responso* is performed a week after death occurred (finishing on the eighth day); the second *responso* is held at the first anniversary of the dead to release the family from their year-long mourning and the spirit of the deceased from its final year of bondage in this world: see Simonett, Helena: "Narrativity and selfhood in Mayo-Yoreme mortuary rituals", *The World of Music* 51, no. 2 (2009): pp. 45–64. These ceremonies include deer and *pascola* dances: see Simonett, Helena: "*Cantos de venado*: New insights into Mexican Indigenous performance and composition practices", *Flower World: Music Archaeology of the Americas/Mundo Florido: Arqueomusicología de las Américas*. Edited by Matthias Stöckli and Arnd Adje Booth. Vol. 1. Berlin: Ekho, 2012, pp. 137–154; Simonett, Helena: "Of human and non-human birds: Indigenous music making and sentient ecology in Northwestern Mexico", *Current Directions in Ecomusicology: Music, Nature, Environment*. Edited by Aaron S. Allen and Kevin Dawe. New York: Routledge, 2012, pp. 99–108.

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human health in Mexico: A review", *Reviews on Environmental Health* 15, no. 4 (2000): pp. 399–412, https://doi.org/10.1515/REVEH.2000.15.4.399; Kirkhorn, Steven R. and Schenker, Mark B.: "Current health effects of agricultural work: Respiratory disease, cancer, reproductive effects, musculosketeltal injuries, and pesticide-related illnesses", *Journal of Agricultural Safety and Health* 8, no. 2 (2002): pp. 199–214; Alvarez Arredondo, Anthon and Campaña-Salcido, Alba Delia Aby: "Migrant farm workers exposed to pesticides in Sinaloa, Mexico", *Pesticides in the Modern World – Effects of Pesticides Exposure*. Edited by Margarita Stoytcheva. Rijeka: IntechOpen, 2011, pp. 101–114; Lara-Valencia, Francisco et al.: "Neighborhood socio-environmental vulnerability and infant mortality in Hermosillo, Sonora", *Instituto Nacional de Salud Pública* 54, no. 4 (2012): pp. 367–374; Schwartz, Norah Anita et al.: "'Where they (live, work and) spray': Pesticide exposure, childhood asthma and environmental justice among Mexican-American farmworkers", *Health & Place* 32 (2015): pp. 83–92, https://doi.org/10.1016/j.healthplace.2014.12.016; Martínez-Valenzuela et al.: "Plaguicidas en el norte de Sinaloa"; Ruiz-Arias, Miguel Alfonso et al.: "Social vulnerability to pesticide exposure in children from an agricultural community in Mexico", *Child Indicators Research* 16, no. 6 (2023): pp. 2489–2510, https://doi.org/10.1007/s12187-023-10061-x; Dowler, Crispin: "Europe shipping banned pesticide linked to child brain damage to Global South", *Unearthed*, 2023, March 28, accessed 2025, February 2, https://unearthed.greenpeace.org/2023/03/28/eu-banned-pesticide-global-south/.

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10 Lopez-Carmen, Victor A. et al.: "United States and United Nations pesticide policies: Environmental violence against the Yaqui indigenous nation", *The Lancet Regional Health – Americas* 10 (2022),100255, p. 2, https://doi.org/10.1016/j.lana.2022.100255.

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14 Simonett, "Yoreme cocoon leg rattles", p. 24.

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