



TRANS 20 (2016)

DOSSIER: INDIGENOUS MUSICAL PRACTICES AND POLITICS IN LATIN AMERICA

## Yoreme cocoon leg rattles: An eco-organological perspective

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### Resumen

Al igual que en otros países desarrollados, la tecnología de la revolución verde en México está basada en gran medida en el uso de fertilizantes, herbicidas y pesticidas para aumentar el rendimiento de los cultivos. Sin embargo, los contaminantes agrícolas afectan negativamente al ecosistema, un sistema que ha sido la base de la vida cotidiana y de la cosmología indígena durante milenios. La vida cultural de los Yoreme, un grupo de indígenas del noroeste de México, está integrada en una cosmovisión ecológica que choca con la realidad económica de una industria agrícola orientada a la exportación, la cual, al mismo tiempo, es la base de su propia subsistencia. El foco de este artículo es la mariposa cuatro espejos, una mariposa nocturna gigante, que ha evolucionado para sobrevivir en la vegetación costera sinaloense. Sus capullos, rellenos con piedrecitas y ensartados, han sido utilizados en ceremonias, muy probablemente desde la antigüedad, como instrumentos que se usaban en ritos de fertilidad agrícola. Los Yoreme de hoy se ven confrontados con cuestiones de cómo negociar su identidad cultural frente a una invasión y expansión agrícola que no solo pone en peligro la mariposa cuatro espejos, sino también la vida de sus hijos.

### Palabras clave

Ecomusicología, Ecosistema, Organología, Instrumento Musical, Ténabari (capullo de mariposa), Rothschildia cincta (mariposa cuatro espejos), Derrota ambiental, Yoreme, Noroeste de México.

Fecha de recepción: octubre 2015

Fecha de aceptación: mayo 2016

Fecha de publicación: diciembre 2016

### Abstract

Like elsewhere in the developing world, Mexico's Green Revolution technology has relied heavily on the use of fertilizers, herbicides, and pesticides for increasing crop yields. Yet, agricultural pollutants negatively affect the functioning of the ecosystem — a system that has been the basis of indigenous lifeways and cosmology for millennia. Yoreme cultural life is embedded in an ecological worldview that clashes with the economic reality of an export-oriented agricultural industry that sustains their livelihood. This paper focuses on the cocoons (*ténabarim*) of the *mariposa cuatro espejos*, a giant silk moth, that has evolved to survive in the thorn scrub covered foothills of Sinaloa's northern coastal plain. Filled with pebbles and stringed together, *ténabarim* have served as leg rattles in ceremonies — most likely since ancient times as rattling instruments were used throughout Mesoamerica in agricultural fertility rites. Yoreme today are faced with the question of how to negotiate their cultural identity in the face of an ever-accelerating agricultural encroachment and expansion that not only endangers the *mariposa cuatro espejos* but also the lives of their children.

### Keywords

Ecomusicology, Ecosystem, Organology, Musical Instrument, Leg Rattles, *Ténabari* (Cocoon), Silk Moths (*Rothschildia cincta*; *mariposa cuatro espejos*), Environmental Degradation, Yoreme People, Northwest Mexico.

Received: October 2015

Acceptance Date: May 2016

Release Date: December 2016

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## Yoreme cocoon leg rattles: An eco-organological perspective

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*Seegua yoleme, juiya ania'apo  
emjua tósimlátaca  
sali liti jéca emjo'ohua.*

*Canto de venado* (Saturnino Valenzuela)<sup>1</sup>

Swaying in the light sea breeze, attached to the dry twig of the *sangrengado* tree by silken strands hangs the fragile white cocoon (*ténabari*) of the *mariposa cuatro espejos*, a giant silk moth, that has evolved to survive in the thorn scrub covered foothills of Sinaloa's northern coastal plain. The cocoon, a meshwork of silken threads, has been spun by the larva after feeding on the foliage until getting plump and ready for the final stage in its cycle of life. Protected in its silken chamber, over the course of half a year, the larval body has been rebuilt into that of the adult insect. Its metamorphosis completed, the mariposa emerged on a late afternoon toward the end of the dry season and took to the wing. Having served its purpose for the insect, the deserted cocoon will now fulfill its obligation in the Yoreme ceremony.

The Yoreme are one of Mexico's many ethnic groups.<sup>2</sup> Jesuit missionaries, who first interacted with the native peoples in this remote frontier region of the Spanish Empire, had grouped them together with the Cáhita-speaking people.<sup>3</sup> Erroneously called "Cáhita" — literally meaning "nothing" in Yoreme as well as in Yaqui language — and then "Mayo," according to their location on the riverbanks (*mayóa*), they prefer calling themselves Yoreme, derived from the verb *yore*, which means "the one to be born."<sup>4</sup>

The vast territory of what is today northwest Mexico was populated by hunter-gatherers an estimated 30,000 to 15,000 years before the present. The fertile soil of the alluvial plains, formed by the deposition of sediment from the periodic flooding of the rivers running down from the Sierra Madre Occidental toward the Gulf of California, attracted early human settlement dedicated to horticulture. Contacts with Mesoamerican civilizations and migratory movements brought about an "agricultural revolution" that changed peoples' way of life as "village cultivators acquired the accouterments of sedentary life" (Radding 1997: 26). Riverine peoples relied on raising maize, beans, and squash in the floodplains, but traditional patterns of seasonal movement related to hunting and gathering practices remained.<sup>5</sup> A millennium later, these same routes

<sup>1</sup> Deer song by Saturnino Valenzuela (in Spanish and English translation): *Flor nativa, dejaste tu casita/ la dejaste colgando en un arbolito / y el viento la está sonando*. Native flower, you left your little house / you left it dangling from the little tree / and the wind made it sound.

<sup>2</sup> According to the 2010 census of the National Institute for Statistics and Geography, in the states of Sinaloa and Sonora, 39,051 people older than five speak Mayo (Yoreme) as their primary language; that constitutes 0.6% of the 6.7 million Native-language speakers nationally. In comparison, Náhuatl is spoken by 1.5 million people or 23% (INEGI 2011a: 20; 2011b: 23).

<sup>3</sup> Speaking eighteen closely related dialects that belong to the Uto-Aztecan language family, the so-called Cáhita peoples of Sinaloa and Sonora numbered about 115,000 at the time of the encounter (1533). They inhabited the coastal area of northwestern Mexico along the Sinaloa, Fuerte, Mayo, and Yaqui rivers.

<sup>4</sup> Bernardo Esquer López, pers. com. 2009. Moctezuma Zamarrón (2001: 41) translates the term *yoreme* as "la gente" ("the people"). A discussion of Yaqui self-designation as "Yoeme" can be found in Shorter (2009: 5-6).

<sup>5</sup> Archaeological evidence for the transition from hunting and gathering to agricultural food production in West Mexico has been published in Benz (2002).

linking Mesoamerica and the Great Basin of western North America, encompassing numerous Uto-Aztecan speech communities in the region, brought Spanish explorers and missionaries into the land and life of the Yoreme's ancestors. Early Sinaloa's lingua franca was violence (Folsom 2014). Ensuing cultural, social, political, and economic clashes loomed throughout the colonial period (Radding 1997), post-independence (Voss 1982), and the twentieth century. One of the most contentious issues was the economic development of the fertile Yaqui-Mayo valleys that lie between the mountain-skirts of the sierra and the shores of the gulf. Occasional Indian uprisings and attacks on the encroaching settlers in the Sonora and Sinaloa provinces and the final defeat of the Yaqui in 1929 by the Mexican army bespeak the highly asymmetrical relations of power. Many of the characteristics of this "contact zone" (Pratt 1992) perpetuate today.

In this century, the Yoreme will be additionally challenged by the question of how to negotiate their cultural identity in the face of an ever-accelerating agricultural encroachment and expansion, unsustainable agribusiness practices and environmental policies that further impoverish their communities, and an environmental degradation that endangers their very lives as well as the lives of other beings that inhabit the region. Indeed, the North American Free Trade Agreement (NAFTA), signed by neoliberal politicians in the belief to stimulate Mexico's economy, has high costs in unintended consequences for the environment, people's way of life, and local sovereignty. A report released on the twentieth anniversary of NAFTA (2014) draws a damning picture.<sup>6</sup> The increase in Sinaloa's export-oriented agriculture, relying heavily on fertilizers, herbicides, pesticides, high-yield crops, irrigation water, and cheap labor, has enriched multinational corporations at the expense of small subsistence farmers. The intensified agricultural production attracts thousands of seasonal laborers from other parts of Mexico who join the local work force, many of whom are drafted from indigenous communities.<sup>7</sup> Environmental degradation affects the social, economic, and cultural life of local communities, eventually resulting in greater violence, criminality, and a lack of opportunities (Alfie Cohen 2011: 95-96).

"Deforestation, land degradation, water shortage and contamination, air pollution and the loss of biodiversity are some of the many environmental problems we face today in both developed and developing countries" (Duraiappah 1996: 3). One of these losses in Sinaloa's biodiversity might very likely be the *Rothschildia cincta* silk moth, once endemic in the region. Yoreme blame the waning numbers of this giant insect on the agricultural pollutants and on the overharvesting by (mainly mestizo) artisans who have created a lucrative market niche for traditional leg rattles made of cocoons. The increased scarcity of this precious silk case will have a devastating effect on Yoreme ceremonies for which the sound of the ténabarim, both acoustically and symbolically, is vital.

Materials are a fundamental primary resource necessary for cultural production. Organology (as an academic discipline) has long recognized the prime importance of the material of which musical instruments are made and tended to view them as artifacts. Devised by Erich Moritz von Hornbostel and Curt Sachs at the turn of the twentieth century, the Hornbostel-Sachs

<sup>6</sup> NAFTA: 20 Years of Costs to Communities and the Environment,

<https://content.sierraclub.org/creative-archive/report/2014/03/nafta-20-years-costs-communities> (accessed May 1, 2015). The report was released in March 2014 by the Sierra Club, the largest and most influential grassroots environmental organization in the United States with more than 2.4 million members and supporters nationwide, summarizes more than 100 nonprofit, government and scholarly studies of NAFTA. The evidence documented in this report demonstrates that NAFTA has reduced the ability of governments to respond to environmental issues while empowering multinational corporations to challenge environmental policies.

<sup>7</sup> A large share of the products harvested by the highly technified, Mexican and foreign-owned, agribusinesses that thrive on Sinaloa's irrigated land are exported to the United States: see Los Angeles Times reporter Richard Marosi's four-part story on "Product of Mexico," <http://graphics.latimes.com/product-of-mexico-camps> (accessed June 15, 2015).

system is still widely accepted as the only cross-cultural system for the classification of musical instruments. Based on the sounding material and the method with which instruments are being played, this numeric system is supposedly free of cultural or linguistic bias. Accordingly, Yoreme leg rattles belong to the family of percussion instruments (idiophones), more precisely, struck idiophones: “A formal sub-classification of idiophones that are comprised of an object that produces sound by shaking or rattling small particles contained within the instrument or objects that jingle. Primarily rattles, these instruments have no discernible pitch and are typically used for rhythmic interest.”<sup>8</sup> To be even more precise, leg rattles are “indirectly struck idiophones”; that is, idiophones set in vibration not through the movement of striking, but indirectly through some other movement of the player. Within this subgroup, they are further specified as “strung rattles – rattling objects strung in rows on a cord.” Yoreme would care very little to know that their leg rattles are organologically very precisely defined by the number 112.111, for none considers them to be “musical instruments” in the first place. Rather than artifacts that humans use to make rhythmic sound, the *ténabarim* are “entangled in webs of complex relationships” (Bates 2012: 364) — relationships that involve all constituents of the environment: human and other-than-human (animals, spirits, deities), animate and inanimate.<sup>9</sup>

Because the *ténabarim* are used in ceremonial context, we must expand the kind of ecological approach to the study of materials suggested by Ingold — “the ways in which human lives are bound up in processes of production with the lives of animals and plants, weather, and the land” (2012: 431) — to include the instrument’s cosmological and ontological significance as well. A number of groundbreaking ecomusicological studies of musical instruments that stress the importance of materials while including analyses of the social, ritual, historical, economic, and ecological complex surrounding their performance have served as inspiration for this present case study (foremost Allen 2012, Dawe 2015, Ryan 2015, Solis 2012). I believe that only by telling the histories of the materials of which sound-producing instruments are made will we be able to unravel these webs of relationships. Drawing from archaeological and scientific sources, combined with ethnographic evidence acquired over the course of a decade in northern Sinaloa, I will attempt to untangle the meshwork of the silk cocoon by following multiple strands, from material culture and indigenous cosmology to sustainability and biodiversity, from agro-pollution and insect mortality to political ecology and cultural production.

### Archaeological and ethnohistorical records of idiophones

During the Late Postclassic period (AD 900-1521) the semi-sedentary groups in Mexico’s northern periphery shared some customs and core beliefs with the then-dominant Aztecs who occupied the valley of Mexico and controlled large parts of Mesoamerica.<sup>10</sup> Several of the Yoreme ceremonial musical instruments resemble Aztec instruments in use before and at the time of the Encounter, such as the *omichicahuaztli* bone rasp and the *ayacachtli* handheld gourd rattle (Both 2007). According to Robert Stevenson, the ubiquitous leg rattles had various names, their jingles (*coyolli*)

<sup>8</sup> [http://dictionary.onmusic.org/terms/3118-shaken\\_idiophone](http://dictionary.onmusic.org/terms/3118-shaken_idiophone) (accessed June 15, 2015).

<sup>9</sup> The Yoreme call themselves *yoreme* or *yoleme*, derived from the verb *yore* (“the one to be born”), but an animal or a flower may also have the attribute of *yoleme* because they are sentient beings as well. During the extraordinary time of ritual, there is no distinction between human and non-human beings, and dancers may transform into the animal they represent. For more details, see Simonett (2014 and 2015).

<sup>10</sup> In the past decade there has been an increased interest by archaeologists in documenting Mesoamerican practices in western Mexico; for a detailed overview see Beekman (2010). Established agriculturalists along the coast are best studied to date, while archaeological traces of nomadic populations are too tenuous for any conclusive statements. “Much research in western Mexico remains cultural-historical, with ceramic typologies and dating occupying much effort. But the growing list of theoretical topics includes interregional interaction, production and exchange, social inequality, mortuary practices, the symbolism of rock art, human adaptation, subsistence intensification, diet, political organization, and diverse studies of symbolism, particularly of objects and their cultural meanings” (Beekman 2010: 45).

were made of clay, nutshells, dried fruits, as well as gold and copper: “Slit below and with a hard pellet inside, they were often strung together and worn as dancers’ necklaces, bracelets, and anklets” (Stevenson 1968: 40). Stevenson does not mention jingles made of cocoons. In fact, no archaeological findings of leg or ankle rattles made with moth cases or pictorial evidence of this delicate idiophone are known.

While it is also unknown since when indigenous dancers in northwestern Mexico have used *ténabarim* as leg rattles, there is ample archeological and pictorial evidence for the usage of ankle bells and rattling idiophones throughout ancient Mesoamerica and adjacent regions (Fig. 1). Widely utilized in agricultural rites, the sounds of rattles and bells in rituals were intended to promote human and agricultural fertility and regeneration (Seler 1903). Bells and bell sounds were associated with one of the major Mesoamerican deities, the feathered serpent Quetzalcóatl, whose earliest-known representation as vegetation god stems from the Teotihuacán civilization (pyramid at Teotihuacán, central Mexico, AD 150 to 200). Since then, the deity had often been depicted with prominent rattles, sometimes shown as bells. Quetzalcóatl in human form wears ankle bells, as portrayed in the sixteenth-century *Florentine Codex* (Sahagún 1951). Occasionally Quetzalcóatl is shown holding the *chicahuaztli* rattle-stick or *ayacachicahuaztli* mist rattle-board, believed to bring about rain when shaken (Stevenson 1968: 38; Hosler 1994: 236). Various earth, vegetation, water, and rain deities, such as the *pulque* god Tezcatzóncatl (*Codex Magliabechiano*, folio 54; *Florentine Codex*, Book 1) and Xipe Tótec (*Codex Borgia*, folio 49), god of agriculture and patron of the metal smiths, are invariably represented with rattling instruments (Hosler 1995: 109). As a life-death-rebirth deity, Xipe Tótec connected agricultural renewal with warfare. In western Mexico (present-day Michoacán), seat of the Purépecha (Tarascan) Empire, depictions of chief warriors wearing ankle bells indicate that bell and rattle sounds were associated with warfare (Hosler 1995: 111).

The Tarascans, who had imported the knowledge of metallurgy from Central and South America (Ecuador and Peru) via maritime routes, developed techniques of bell manufacturing emphasizing specific sound and color properties that expressed fundamental religious beliefs (Hosler 1995: 113). Bells and other metallic objects were worn by elites and nobles and used in rituals. One of those sounds pertaining to the sacred paradise in Aztec cosmivision were the sounds of bells, “associated with the shimmering, colorful, singing birds and with human voices that represent deities and their human transformations” (Hosler 1995: 107). Diffusion by trade or migration brought metal bells, maybe including the concepts associated with their sound, to the less stratified societies in the Mesoamerican



Figure 1: Female figurine with headdress and leg rattles made of clay. Provenance unknown; Middle Preclassic period (950–400 BC).

peripheries. Indeed, long-distance trading routes along the Pacific coast had existed since the Classic period (Kelley 2000). Copper bells were unearthed from mounds in northern Sinaloa. Gordon Ekholm, who led the archaeological excavations at Guasave in 1941, suggested that the person buried with 87 bells tied in a row and wound around his right ankle (on his left ankle were shell beads) belonged to the local elite (further evidenced by two trophy heads buried with him). Other bells found at the site had been used as part of a necklace; another handful was attached to the arm bones of various skeletons (Ekholm 1942: 97). Carpenter and Sánchez (2008) suggest that items, such as Mesoamerican-style pottery, copper bells and other copper artifacts, turquoise, obsidian blades, and trophy heads, were part of an emerging local prestige economy.

Local prehistory is (still) poorly documented. A crucial reason for the paucity of data, Daniel Reff holds, is the academy's disproportionate interest in Mexico's high cultures that overshadowed everything else, particularly frontier regions, and a tenacious belief in the civilization-savagery myth that propagates northwestern Mexico as barbarian wilderness (Reff 1991: 11).

Due to the scarcity of ethnohistorical records from northwestern Mexico and haphazard archaeological findings, such as the copper bells in funerary assemblages during the Guasave period (AD 1100-1400), nothing specifically is known about the usage of these bells in prehispanic times other than for adornment. Early Spanish explorers reported sizable villages and towns and occasional large urban centers in the Culiacán valley, with markets where cotton, fruit, fish, and other commodities were traded and purchased (Reff 1991).<sup>11</sup> Although accounts lack ethnographic details, they concur with extant archaeological records that confirm artisanal production of elaborate polychrome pottery, ornate objects of gold, silver, copper, shell, alabaster, turquoise, and obsidian. Local elites wore ear pendants and arm and leg bracelets of silver and turquoise (Reff 1991: 26). The most extensive eyewitness report from the early colonial period (1604–1619), written by the Jesuit missionary Andrés Pérez de Ribas (1645), was unfortunately more of a textbook on missionary work than an ethnographic account. Pérez de Ribas's "attention to ethnographic details reflected his belief that one had to understand native idolatry and superstition in order to combat and replace them with Christian spirituality" (Reff 1999: 4). Unlike Sahagún's in-depth *General History* about the "civilized" and "noble" Aztecs, Pérez de Ribas very broadly described natives' "barbarous" behaviors such as dancing, without specifying any aspects of them. What musical instruments besides the mentioned drums did the indigenous people in the frontier region use for their dances? Were any of them idiophones attached to the body? What was their meaning beyond sound production?

However, just because there are no extant artifacts today or customs and practices are "unmentioned," we shouldn't assume that they did not exist (Griffen 2000: 264). In the regions of Mexico with a substantial ethnohistorical record, the roots of precolumbian music cultures can be easily followed through colonial times to the twentieth century. For regions with little or no archaeological or ethnohistorical record, Adje Both holds, "living music cultures [may] preserve certain aspects, which enable us to look and listen back on the musical past" (2012: 11). Similarly, Alfredo López Austin (1997) stresses that ethnographic knowledge may illuminate ancient practices and worldviews not fully understandable from archaeological and colonial-period sources alone. While it is not my intention to establish the existence of uninterrupted indigenous traditions or demonstrate their antiquity, it is nonetheless a fruitful approach as numerous studies

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<sup>11</sup> The first account on the Cáhita was written by Diego de Guzmán on his 1533 expedition into northern Sinaloa and Sonora. An estimated 100,000 people were living in permanent villages along the three major rivers.



that bridge material and living cultures have shown.<sup>12</sup> The convergence of ethnomusicology and music archaeology, Grazia Tuzi concludes in her study of the Nahua *voladores* dance, “opens up a way not only for the interpretation of the archaeological past by means of contemporary music and dance practices, but certainly also for the interpretation of the way contemporary music and dance practitioners adapt ‘their’ past in order to shape their present” (2013: 173).

Due to dynamic trading networks along the Pacific coast, particularly after the collapse of the interior, copper bells cast in the West Mexico metalworking zone, which according to Hosler (1995: 101) stretched into central Sinaloa, could easily have ended up in the hands of semi-sedentary people further north. The earliest known photographic evidence of their use is captured in a studio photograph (a commercial *carte-de-visite*) of a deer dancer taken around 1870. His attire consists of a white long-sleeved cotton shirt and pants, a colored short skirt and a waist sash; on top of his head, which is covered by a white scarf, is a stuffed deer head adorned with a white flower; a belt with brass bells is wrapped around his waist and strings of cocoons around his ankles; he holds a pair of gourd hand rattles. Curiously, the outfit of this deer dancer resembles a contemporary Yoreme *pascola* dancer wearing a deer head and a pair of handheld gourd rattles — a strange mixture of ceremonial paraphernalia (Fig. 2).<sup>13</sup>

Several more photographs were taken by foreign scientists and travelers in the late nineteenth and early twentieth centuries that show *pascola* dancers with belts of *coyoolim* (brass bells) and both *pascola* and deer dancers wearing leg or ankle rattles made of cocoons.<sup>14</sup> Staged photographs from then on consistently show attires corresponding with contemporary usage by both Yoreme and Yaqui communities in Sinaloa and Sonora.<sup>15</sup>

We know of deer and *pascola* dances from nineteenth- and turn-of-the-century sources (Hardy 1829, Zúñiga 1835, Escudero 1849, Velasco 1850, Hernández 1902, Hrdlička 1904),<sup>16</sup> but



Figure 2: 1870 *carte-de-visite*. Provenance unknown.

<sup>12</sup> I allude here to the XII Congress of the ICTM Study Group for Music Archaeology in Valladolid, Spain (2011), titled “Sound and Ritual: Bridging Material and Living Cultures.” Some notable publications that attempt to bridge these cultures are Howell (2007), Simonett (2012), and Tuzi (2013).

<sup>13</sup> The *carte-de-visite* photograph’s title refers to a Yaqui deer dancer; however, the attire resembles contemporary Yoreme custom to dress fully (whereas Yaqui deer dancers’ upper bodies are naked) (Collection, Musée de l’Homme, Paris). Equally equivocal is the title of a photograph taken by Léon Diguët ca. 1896, reprinted in Debroise (2002: 126): a portrait of a Yaqui group, consisting of a deer dancer, a masked *pascola* dancer and musicians (harp, violin, flute-drum player, and the three deer singers), is mislabeled as “Huichol Indians,” although elsewhere in the text there is mention of an image of “musicians of the deer dance of the Cahita Yaquis of Baja California.”

<sup>14</sup> Because of the similarity of ceremonial dances throughout the Cahita region, I include ethnohistorical data from other indigenous communities to construe Yoreme cultural practices, following Reff’s remark that “the paucity of data for some groups is offset by the fact that native peoples throughout [the region] shared many behaviors and beliefs arising from a common adaptation to an arid environment” (1991: 19).

<sup>15</sup> See Dorotinsky Alperstein (2009) on the construction of the concept of indigenismo via photography in the early decades of the twentieth century.

<sup>16</sup> Except for Hrdlička, an anthropologist employed by the Smithsonian Institute (but whose account on the Yaqui is largely based on hearsay), these early authors were interested in the indigenous populations for rather mundane reasons: How pacific and laborious were they? How safe was the region for entrepreneurial investments? See Corral (1884 [1959]), a Sonoran politician, later governor of Sonora and vice-president of Mexico, who described the Yaqui and Mayo in 1884; or Hernández (1902), who was commissioned by the state to report on the Yaqui and Mayos. Hernández apparently observed the *pascola* dance (“baile del Pascol”), but quoted Zúñiga (1835) for a more detailed description (1902: 93-94).

unfortunately, they lack ethnographic detail. For instance, Lieutenant Hardy, commissioned by the General Pearl and Coral Fishery Association of England to explore the Gulf of California, reported that “in their festivities the [Seri] Indians wear the head (with their horns on) of this animal [the deer], for ornamenting their own!” (1829: 298). Zúñiga observed a Yaqui *pascol*, [un bufo] “con una máscara muy deforme en su cara, sonajas en pies, manos y cintura y una suelta entre las manos con que se acompaña á llevar el compaz [*sic*]” (a pascola [jester] with a very disfigured mask over the face, rattles on the feet, hands and waist, and one between the hands accompanying himself to keep time) (1835: 8). Appointed by the Mexican government to assemble military statistics, Escudero (allegedly) observed a masked jester doing a “fantastic dance” called *pascol*, wearing “sonajas en los pies, brazos y cintura, y una sola en la mano con que acompaña a la música [pito y tamboril] llevando el compas” (rattles on legs, arms and waist, and one in the hand with which he accompanies the music [whistle and tambourine] keeping time) (1849: 135).<sup>17</sup> In the mid-century, an officer of the Commandancy General noted the Yaqui’s festive nature: “de noche se ocupan [...] en sus bailes llamados el Tesguin, el Pascola, el Venado y el Coyote, en los cuales amanecen” (throughout the night, and until dawn, they engage in dances called the Tesguin,<sup>18</sup> the Pascola, the Deer, and the Coyote) (Velasco 1850: 74). Half a century later, Hernández, a medical doctor and ethnographer commissioned by the government to report on Sonora’s tribes and their uprisings, noted that the deer mask of the Seri signifies strength and courage, the rattles of the rattlesnake mean nobility and extra-human power, and antelope hooves indicate agility and lightness (“la mascara de venado es emblema de fuerza y valentía, las sonajas de cascabel de serpiente significan nobleza y extra-humano poder, y las pezuñas de antílope indican agilidad y ligereza”) (1902: 55). It is doubtful whether the Seri ever had idiophones made of rattlesnake tails. They for sure shared the custom with other tribes in northwestern Mexico to fabricate ankle rattles of moth cocoons.

It is not until the twentieth century that regional accounts yield more detailed information. Anthropologist Ralph L. Beals, a pioneer of modern Mexican ethnography, described the “ceremonial regalia” of the pascola dancers as follow: “About each leg is wound a long double string which has been sewn through a series of cocoons (tenóvares), the ends of which have been clipped off and the hollow filled with small pebbles or gravel [...] Coyóles are fastened about the waist, a leather belt with a dozen or so copper bells or spirals of metal dangling from leather strips” (1945: 119). This is one of the few detailed ethnographic descriptions from that time. In an earlier publication, Beals referred to “strings of cocoon rattles” wrapped around ankles and lower legs as part of the costume of Yaqui-Mayo pascola and deer dancers, and leather belts “with pendant bits of metal on strips of rawhide” for the former and “belts of plaited leather with pendant deer hooves” for the latter (1934: 502). Beals did not explain the nature of the cocoons used for the leg rattles, but at least he recognized them as such unlike Mexican ethnographers who speculated about the material: Basauri presumed that the rattles were made of “dried fruits of a plant in the region” (1940: 274); González Bonilla thought that the dancers used snake rattles (1940: 69). Though both dried fruits and snake rattles could be used to manufacture leg rattles, Basauri identified them as “ténabaris” (“un largo rosario de cascabeles” — a long rosary of rattles) and González Bonilla as “animal [que] se llama ‘tenábari’” (an animal called “tenábari” [*sic*]). In contemporary Yoreme language, a *ténabari* is a silk moth cocoon; the plural form (*ténabarim*) refers to a string of cocoons. The close-up photograph of the leg rattles of a pascola dancer,

<sup>17</sup> The words used in this source are almost identical to Zúñiga’s, letting me conclude that Escudero may not have observed the pascola dances himself. Hernández (1902: 93) credited Zúñiga for the description of the pascola dance.

<sup>18</sup> No such dance is known. The author may have misunderstood: *tesgüino* is a corn beer made of sprouted maize customarily served during ceremonies. The other three dances are still performed today.



reproduced in Basauri's book (1940: 253), are called "ténabarim" and are unmistakably made of cocoons and not, as he assumed, of dried fruits.

Texan historian and archaeologist William C. Holden (1936) superficially described deer and pascola dances he observed at a Sonoran Yaqui fiesta, referencing Frances Densmore's (1932) more detailed description of cocoon anklets. In 1922 the American anthropologist had witnessed the Holy Week celebrations in a Yaqui village near Phoenix, Arizona, and published the first in-depth study of Yaqui music on the United States side of the border. According to Densmore, only the "leading dancer" (the deer dancer) wore a "special rattle [which] consisted of cocoons sewn together side by side, forming a strip 6 to 8 feet long which was wound around the dancer's leg below the knee. Each cocoon contained a few small pebbles which gave forth a soft, jingling sound with his motion. The rattle worn on this occasion was said to be very old and above any valuation in money. A similar ornament collected in 1870 by Dr. Edward L. Palmer, is shown in Plate 29, *b*, and is recorded at the United States National Museum as 'used in the Poscola [*sic*] dance.' The cocoons were identified as *Rothschildia jorulla*" (1932: 155–156), a saturniid native to Arizona.<sup>19</sup>

British-born naturalist Edward Palmer traveled throughout the Americas to collect botanical specimens. Between 1869 and 1910, he collected extensively for the United States Department of Agriculture and the Smithsonian Institution contributing significantly to early American archaeology and ethnology.<sup>20</sup> It was almost certainly he who identified the cocoons of the Yaqui deer dance rattle he had collected as *Rothschildia jorulla*. This designation was repeated in subsequent ethnographic publications (Kurath 1966: 32, Varela 1986: 94, Griffith 1998: 589). Others, unaware of Densmore's study or less interested in instruments or in the performance aspect of the deer and pascola dancers, turned to the basic description of "cocoons with gravels inside" (Spicer 1980: 102), "capullos de mariposa con pequeñas piedrecillas por dentro" (butterfly cocoons with little gravels inside, Olmos Aguilera 1998: 113), or "capullos de crisálida" (cocoons of the chrysalis, Ochoa Zazueta 1998: 195). Even more recent descriptions of indigenous dance in northwestern Mexico avoid referring to the specifics of materiality: Shorter (2009), whose monograph centers on the Yaqui deer dance, mentions "leg rattles" once (not even rendering their Yaqui name); the over 400 page heavy *Atlas etnográfico* of Mexico's northwestern indigenous peoples (2013) includes striking color photographs featuring dancers with ténabarim — including the newer versions of man-made materials — and an overexposed close-up of a mariposa cuatro espejos; although the *Atlas* greatly emphasizes material culture and leg rattles are used by several of the indigenous groups discussed, they are merely described as "una sarta de capullos de mariposa con unas piedritas adentro, que produce un sonido muy peculiar" (a string of butterfly cocoons filled with pebbles that produce a very peculiar

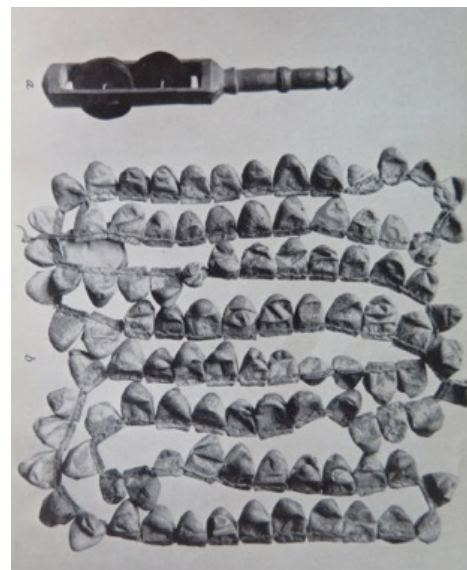


Figure 3: "Yaqui Rattles. a) Used in Deer [*sic*, pascola] dance; b) worn in Deer dance." Collected by Edward Palmer in 1870 for the Smithsonian Institute (Densmore 1932, Plate 29).

<sup>19</sup> Mexico has about 195 Saturniidae species; 40 species residing in northern Mexico alone. At first a subspecies of the *Rothschildia jorulla*, entomologists elevated the *cincta* to full species status in 1976 (Tuskes, Tuttle, and Collins 1996: 189).

<sup>20</sup> Palmer collected over 100,000 specimens and discovered approximately 1,000 new species. He studied the cultural uses of plants by visiting local markets to procure them. His documentation of plant uses helped found modern ethnobotany. See: <http://ocp.hul.harvard.edu/expeditions/palmer.html> (accessed June 27, 2015).

sound, Moctezuma Zamarrón and Aguilar Zeleny 2013: 188).

Lepidopteran insects occupy a special place in many indigenous cultures of the New World. Their “exquisite wing designs, thirst for the finest flowers, allure, sense-perceptions that far exceed the ken of vertebrate humans, improbable stamina in flight, capacity for mimesis and, above all, spectacular metamorphosis” have garnered them deity status (Brotherston 2011: 234). Embodiments of Lepitoptera are known in various ancient Mexican cultures and are evidence of longstanding reciprocities between Mesoamerica and its northern regions. The Chichimeca, who abandoned the increasingly more arid north-central plains during the Postclassic for the fertile valley of Mexico, were allegedly guided by Itzpapalotl, the “obsidian butterfly.” The Chichimec heroine led the migration, pressing forward through arrows shot from all cardinal directions, four of them penetrating her body despite protection by an obsidian rimmed white moon shield (Brotherston 2011: 251). The representations of Itzpapalotl in ancient codices resemble a mariposa cuatro espejos, its four large irregular triangular semitransparent spots on the wings indicating the arrows. When the Aztecs conquered the Chichimec, they absorbed many earlier deities into their religion, including Itzpapalotl. Butterflies were often depicted on Aztec warriors’ shields, some referring to the “obsidian or clawed butterfly” Itzpapalotl and others to the “precious feather flower” Xochiquetzal, which resembles a Two-tailed Swallowtail (*Papilio multicaudata*), a very common butterfly in central Mexico. Lepidopteran motifs also figure prominently on pottery, stone carvings, mural paintings, codices, feather work, breastplates, sculptures, and metal ornaments. Often they appear in such highly stylized forms that pioneer archaeologists misinterpreted them (Ross 1998).

Mexican Lepidoptera biodiversity is astounding. Of the estimated 22,000 species some 14,000 are known (Heppner 2002). Being exceedingly diverse in habitats, a quarter of the species is endemic to Mexico, among them the Rothschildia cincta. At the time of the Encounter, wild silk moths were widespread, some spinning individual cocoons and others large nests with as many as a hundred larvae, but apparently indigenous people did not use the fibers to make yarn (Borah 1943). In 1541, the Franciscan missionary Toribio de Benavente Motolinía commented that the Nahuas did not know the value of the wild silkworm cocoons common in the Valley of Mexico (Borah 1943: 110). Maybe there was no necessity to exploit the cocoons because cotton, from which fine garments were woven, was available in abundance. In any case, Spanish explorers found Mexico’s climate suited for silk production and ordered shipping of mulberry seedlings and silkworm eggs as early as 1523. Based on abundant archival sources including tithe records, Borah traced the emerging silk raising industry for which skilled cultivators from southern Spain had to be enlisted to teach the indigenous workers the techniques of successful sericulture. By 1540 these efforts began to yield success: Silk raising became one of the most lucrative economic enterprises in colonial Mexico until its decline in the late sixteenth century. As colonial mulberry-silk culture lost all commercial importance, natives would make use of wild silk, employing the techniques they had learned from sericulture.

It may not surprise that people in different parts of the world discovered that whole silk moth cocoons might be used in the construction of a variety of artifacts. Filled with gravel, these natural containers historically served various Californian Indians as handheld stick rattles for ceremonial purposes, although very few of these idiophones seem to have been collected and deposited in museums (Kroeber 1925: 419-20). Entomologist Richard Peigler noticed a remarkable similarity in moth cocoon anklets in southern Africa and northwestern Mexico, suggesting ancient origin (1994: 2). In both places, strings of cocoons are worn as ankle rattles, but the making of them is quite different. Even among the ethnic groups of northwestern Mexico and the

southwestern United States there are noticeable differences in the assembling of the cocoons.<sup>21</sup>

### Entomology and ecology of the mariposa cuatro espejos

In Yoreme territory, the most prevalent silk moth is the mariposa cuatro espejos, named after the triangular-oval “mirror” on each of its four wings. This giant moth (saturniid), with a wingspan of 4–6 inches (10–15 cm) was scientifically discovered in 1882 and introduced as a new moth species in the *Bulletin of the Brooklyn Entomological Society* (Tepper 1883) by the name of *Rothschildia cincta*, a nod to the British banker and zoologist Lionel Walter Rothschild (1868–1937) whose collection of butterflies included 2.25 million specimens. The majority of saturniids live in wooded tropical and subtropical regions, with over 40 species residing in northern Mexico alone (Tuskes et al. 1996). Moths are nocturnal insects and thus less spectacular in color than butterflies.<sup>22</sup> Silkworms in particular have kindled scientific curiosity for centuries. The earliest scientific publication about lepidopteran insects, *Insectorum Theatrum (Theater of Insects)*, appeared in London in 1634 (Majerus 2002: 28).

The life cycle of a moth has four major stages: egg, larva (caterpillar), pupa (chrysalis), and adult insect. Eggs take about two weeks to hatch into larvae. The larvae feed on the foliage of the sangregado (*Jatropha cinerea*, Ashy Limberbush), a large, succulent shrub with silvery-leathery leaves typical of the coastal environments and scattered throughout the thorn scrub in the foothills (Yetman and Van Devender 2002). A reddish sap drips from the cut branches, hence its Spanish name (derived from *sangre*, blood). Because livestock will not touch it, the scrub has proliferated on the coastal plain, providing plenty of nourishment for the ravenous caterpillars.<sup>23</sup> After the tiny silkworms with disproportionately large heads and jaws have left their eggshells, they start to munch on the sangregado leaves. Over the next month, they molt five times to grow into plump caterpillars of 2–3 inches (5–8 cm). The larvae feed voraciously to complete growth before the hot summer temperature dries out the leaves and to minimize exposing their vulnerable bodies to parasitoids and other predators. *Rothschildia* caterpillars have adapted well to their environment: Of bright green color, with yellowish lines that divide the segments of their bodies and rows of tiny orange spots from which short hairs sprout, they are difficult to spot in the foliage of the sangregado.<sup>24</sup>

When ready for pupating, the larvae search a protected location and begin to mesh themselves into silk strands produced by their salivary glands, a feature unique to moths.<sup>25</sup> The larvae devote a considerable proportion of their biomass to the production of silk and many hours for spinning the cocoons (Tuskes, Tuttle, and Collins 1996). Silkworms are master craftsmen. Firmly attached to a twig, a meshwork of silken strands forms a chamber where the pupae will remain motionless for the next 8 to 9 months, protected from weather, parasitoids and other enemies. The *Rothschildia* caterpillars spin thick silken cocoons; the ones made in the *monte* (mountainous wilderness) a bit off the seashore the Yoreme consider of perfect thickness for creating the ideal sound of the ténabarim — “un sonido delgado” (a slender or thin sound). In the

<sup>21</sup> Leg rattles from other parts of northwest Mexico that Peigler (2011) had inspected occasionally also contained cocoons of the *Eupackaria calleta*, *Hyalophora columbia gloveri*, or *Antheraea montezuma*. *Rothschildia cincta* cocoons are used by Yoreme as well as Yaqui, Seri, Pima, Tarahumara, and Tohono O’odham. The making of the Yoreme ténabarim will be explained below.

<sup>22</sup> Belonging to the Lepidoptera family, moths may be called “butterflies of the night.” In Spanish language no distinction is made between butterfly and moth: they are both called *mariposa*.

<sup>23</sup> Unlike livestock that simply avoid toxic plants, insect species have evolved adaptations to specific host plants, such as developing enzymes that detoxify the plant compounds (Tuskes, Tuttle, and Collins 1996).

<sup>24</sup> Photographs of full-grown caterpillar and cocoon:

<http://www.silkmoths.bizland.com/RothschildiacinctaNovember2007ls.htm> (accessed June 2, 2015)

<sup>25</sup> To watch a pupating *Rothschildia cincta*: [https://www.youtube.com/watch?v=NWOi1d\\_Ad\\_U](https://www.youtube.com/watch?v=NWOi1d_Ad_U) (accessed June 2, 2015).

foothills away from the coastline, the cocoon walls are too leathery to make a pleasing sound, but they last longer. The pupae remain dormant throughout the dry season, their ash-colored cocoons hardly distinguishable from their surroundings. Prolonged droughts may make them stay inside their chambers for several years. Due to human greediness, this stage in the cycle of a moth's life, as will be shown later, has become most vulnerable.



Figure 4: Caterpillar, ténabari, and mariposa cuatro espejos (male). (Photographs by Helena Simonett)

Entomologists admit that “with the exception of the distantly related commercial silkworm, little is known of spinning behavior or the physiology and ecology of cocoons” (Tuskes, Tuttle, and Collins 1996: 21) — even less so about the metamorphosis of the pupa into the adult insect, which is still considered a mystery. For what we know, after the metamorphosis is completed, the *Rothschildia* moths hatch from their pupae in a late afternoon at the beginning of the rain season (July to October). With a life span of 7 to 10 days only, they immediately take to the wing in order to accomplish their most important task: seeking a mate to reproduce.

In recent years, public awareness of the impending disappearance of the emblematic mariposa cuatro espejos has grown due to local environmental activism and newspaper reports, calling for legislation to protect the insect. A butterfly house (*mariposario*), dedicated to preserving the insect and educating the public, was inaugurated on August 9, 2014 in Los Mochis's botanical garden.<sup>26</sup> Moth population size fluctuates naturally over time due to factors such as changing birth and death rates and migration into or out of the population's territory. Bacterial, fungal, and viral infections may cause a decrease of moth populations. Diseases are usually cyclic because they depend on seasonal environmental conditions. In addition to seasonal changes in temperature and humidity, climate change is playing a major role in the spread of diseases. The region's climate variability caused by the El Niño phenomenon will further aggravate living conditions as a robust tendency to more extreme warm phases is predicted for the future.<sup>27</sup> Synergistic effects of both climate change and land use are expected to cause a replacement of semiarid by arid vegetation and a risk of significant species extinctions: up to 11% of Mexico's butterflies may be committed to extinction with a temperature increase of 1.3–3°C above pre-

<sup>26</sup> Los Mochis is situated in northern Sinaloa. “Protección de la majestuosa mariposa cuatro espejos y planta de sangregado en Parque Sinaloa,” <https://www.youtube.com/watch?v=sVCIZ-1EHao>, posted April 22, 2015 (accessed June 21, 2015).

<sup>27</sup> Paleoenvironmental studies show that Mexico's macroclimate has been rather stable since the arid period that extended into the first millennium — an extreme aridity that had contributed to the abandonment of the north-central part of Mesoamerica (Beekman 2010: 73).



industrial levels.<sup>28</sup>

Arid regions are most vulnerable to climate variability that affects water resources. The upper Fuerte River was sealed off by the El Mahone Dam (Presa Miguel Hidalgo y Costilla) in 1956; a second water reservoir was built in 1996 (Presa Huites) in order to increase northern Sinaloa's power production, flood control, and to appease the demand for irrigation water by the ever-growing agricultural industry. The long-term consequences of these drastic changes in the ecosystem are not (yet) fully assessable. Human activities have certainly accelerated processes already underway.

Moths encounter a multitude of adversities, but humans are their greatest enemy. Majerus's list of direct human actions that harm insect populations include chemical insecticide sprays, biological control using bacterial and viral diseases, genetically modified crops containing insecticide (anti-insect) genes, and pheromone traps to catch males (2002: 261). Chemical insecticides are widely used on Sinaloa's agricultural fields to suppress lepidopteran insect pests; such toxins cause high mortality in non-target species, including saturniids. Additionally, the population of the mariposa cuatro espejos is put in danger by the overharvesting of cocoons that have not yet been abandoned by the animals. An increased competition of who-gets-to-harvest-the-most makes people rush into the wilderness to cut the precious cocoons off the twigs with the pupae still inside. The price of a single ténabari in the region is half a peso. At the Festival Yoreme 2014 in the capital of Sinaloa, it would have cost me two pesos. A pair of leg rattles (each strand 3–4 m long) consists of up to 1,000 pieces; at a cost of 300 pesos per meter (in comparison: an agricultural laborer earns 100 to 150 pesos per day). Peigler was told in the 1980s already that the population level of the silk moth along the Yaqui River (Sonora) had dropped due to massive sprayings of illegal fields of opium poppies and marijuana with herbicides by the Mexican government (Peigler 1994: 6). The disappearance of the saturniids from their land forced the Yaqui to buy ceremonial regalia from their southern neighbors. Yoreme dancers sometimes sell their leg rattles after performing in fiestas in Sonora to generate some extra income. Ténabarim are much sought-after, given the increasing scarcity of wild silkworm cocoons.



Figure 5: Wandering in the nearly impenetrable thorny foothills near Lázaro Cárdenas, Sinaloa, with Don Saturnino Valenzuela searching for ténabarim. (Photograph by Helena Simonett, 2014)

<sup>28</sup> "Climate Changes Impact in Mexico," IPCC 4th Assessment Report, 2007, [http://www.panda.org/about\\_our\\_earth/aboutcc/problems/rising\\_temperatures/hotspot\\_map/mexico.cfm#sthash.DCMvB6LS.dpuf](http://www.panda.org/about_our_earth/aboutcc/problems/rising_temperatures/hotspot_map/mexico.cfm#sthash.DCMvB6LS.dpuf) (accessed July 31, 2015). According to the IPCC (Intergovernmental Panel on Climate Change), 2–18% of Mexico's mammals, 2–8% of the birds, and 1–11% of the butterflies are committed to extinction with temperature increase of 1.3–3°C above pre-industrial levels (IPCC 2007: 583). Using modeling projections of species distributions for future climate scenarios, Mexico is expected to lose 7–19% of its butterfly species by 2050.



In November 2014, biologists at the university in Culiacán alerted the public about the impending disappearance of the mariposa cuatro espejos and urged Mexico's environmental ministry to declare the insect an endangered species.<sup>29</sup> Several newspaper reports picked up the story blaming the Yoreme (or collectors that commercialize the cocoons) as culprits, for they use the cocoons in their costumes for the pascola and deer dances.<sup>30</sup> Yoreme feel unjustly accused for the vanishing of the mariposa cuatro espejos, holding that their ancient customs have evolved from a close relationship with, not against, the environment (Simonett 2015). Their cultural practices stem from a deep ecological knowledge that has evolved over centuries of living in, engaging with, and depending on this particular environment. Human greed and selfishness destroy the ecological balance between humans (Yoreme), non-human beings, and their physical environment. Harsh is thus their criticism of individuals who comb the monte to amass cocoons, particularly the ones that hire indigenous people as *jornaleros* (a reference made to the usual occupation of Yoreme as agricultural day workers paid by the bucket for harvested produce). Gone are the mariposas from their immediate environment; maybe due to the droughts or the heavy use of pesticides on the circumjacent agricultural fields, my Yoreme acquaintances ponder. It has been said that the rising number of new cases of leukemia in northern Sinaloa, particularly among children, may be caused by agrochemicals.<sup>31</sup> Jornaleros and their children in particular are subjected to the deadly substances on a daily basis; sprayed overhead on the fields and absorbed by the soil with which the children play and the water in which they bathe and which they sometimes drink. A number of families I've known for a decade have lost an infant or a child, and in recent years I have attended more *resposos* (rituals of honoring the dead) for children than any other celebration involving deer and pascola dances.<sup>32</sup>



Figure 6 Ceremonial paraphernalia in a Yoreme house. (Photograph by Helena Simonett, 2008)

<sup>29</sup> "Pedirá Sinaloa declarar a la mariposa 'Cuatro espejos' en peligro de extinción,"

<http://www.noticiasmvs.com/#!/noticias/pedira-sinaloa-declarar-a-la-mariposa-cuatro-espejos-en-peligro-de-extincion-695.html> (accessed June 21, 2015).

<sup>30</sup> <http://www.informador.com.mx/tecnologia/2014/557650/6/piden-declarar-en-peligro-de-extincion-a-mariposa-cuatro-espejos.htm>

(accessed July 10, 2015): "El considerado insecto culturalmente más importante en México ha disminuido en las últimas décadas por la colecta de los capullos por parte de indígenas o personas que los comercializan para realizar los llamados ténabaris. Los ténabaris, dijo [el biólogo] son los capullos relleno de pequeñas piedras, que son utilizados en los atuendos para las danzas de La Pascola y El Venado, de las tribus mayos y yaquis."

<sup>31</sup> Carlos Orduño, "Leucemia, principal cáncer en Sinaloa," posted Feb. 14, 2012,

<http://www.noroeste.com.mx/publicaciones.php?id=756239>; "La Leucemia, ocupa el primer lugar en cáncer en niños sinaloenses," posted Feb. 12, 2015, <http://www.rutasinaloa.mx/?p=3111> (accessed June 22, 2015).

<sup>32</sup> 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 (Simonett 2009).

### The making of the ténabarim

The artificial desiccation of the alluvial plains for the extraction of irrigation water increased depressions that are at risk of temporary flooding during the rain season. Over the decades, the government relocated many indigenous people from these zones into newly created settlements on higher grounds. Despite the hydroelectric dams up in the Sierra to regulate the rivers' water flow, the floodplains are still prone to occasional inundation. Yoreme keep their ténabarim stored away in a plastic or cotton bag when not in use: like for other things in their humble dwellings, a nail will do to keep them off the ground and dry (Fig. 6). Apart from possible damage by water, the use of the leg rattles during the rituals also wears them off. For instance, one of the movements pascola dancers may do to create a harsh rattling sound is to hit their lower legs together, squashing the tender cocoons; or dancers may accidentally step on the ténabarim and crush them if the string comes loose during the dance. If taken good care of, however, ténabarim can last a lifetime despite the delicate material. The need to manufacture a new pair of leg rattles for one's own use is usually of economic nature. As already mentioned, when performing at a fiesta (ceremony) outside their community, dancers may be enticed to sell their ténabarim for dearly needed cash. However, few Yoreme make leg rattles with a commercial intention.



Figure 7: Advertising a mestizo-owned artisan workshop in San Miguel Zapotitlán, Sinaloa. (Photograph by Helena Simonett, 2014)

There are multiple reasons for or against engagement in the commercialization of ceremonial paraphernalia — opinions are not shaped along ethnic lines, however, although there is a tendency among Yoreme to discredit mestizo involvement in indigenous matters. The information in this section is largely based on recent ethnographic research among my Yoreme acquaintances, skilled craftsmen but not artisans by trade. Artisan Francisco Javier Melendrez (a.k.a. “Chester”), from whom I learned “the mestizo way” of making leg rattles, generously shared his art as well as his opinion on the state of the mariposa cuatro espejos. I’m grateful to him for allowing me to share the documentary video clips I took in his workshop in San Miguel Zapotitlán in December 2014.<sup>33</sup>



Figure 8: “Artesanías El Chester” in San Miguel Zapotitlán, Sinaloa. The mural was painted by Chester’s father. (Photograph by Helena Simonett, 2014)

Local artisans are well aware of the accusations to be responsible for the near extinction of the mariposa. Thus, when asked about the provenance of his cocoons, Chester immediately replied that he does not collect the cocoons himself, rather he buys them bagful from collectors and state-run nurseries for 80 cents to a peso per cocoon. Before crafting the cases into leg rattles, he leaves them lying around in the sun to make sure that all moths have hatched. He stocks up as many as 50,000. This is an impressive number of cocoons — sufficient for 50 pairs of the kind of *ténabarim* Chester manufactures. Leg rattles sell well in Sonora where, as he says, the mariposas are gone and the idiophones are high in demand. Since he makes a living as an artisan in a village that is center stage for one of the most elaborate celebrations of Holy Week (*semana santa*) in the region, leg rattles are just one of several Yoreme paraphernalia he crafts. His workshop is filled with other natural materials: dried deer heads, gourds of all sizes, wild boar and goat fur, horsetail hair, woods, sisal fibers, among many others.

<sup>33</sup> Chester shows how to stitch together the cocoons. Artesanías El Chester, Dec. 1, 2014, [https://youtu.be/\\_M8XCA2DL74](https://youtu.be/_M8XCA2DL74) (posted Dec. 10, 2015). For a comparison with the making of leg rattles by a Mayo artisan, see Yocupicio (2013), <https://www.youtube.com/watch?v=ChBQAHePvSM&feature=share> (accessed June 21, 2015).





Figure 9: Judíos during Semana Santa in San Miguel Zapotitlán, Sinaloa. (Photographs by Helena Simonett, 2004 and 2007)

Chester has acquired his expertise over the years, largely self-taught. He has picked up some basic ideas about sound aesthetics (discussed in detail below), but as any other Yori — as non-indigenous people are called by the Yoreme — he lacks a more profound understanding of the indigenous sound world. Experienced indigenous dancers would never buy sounding instruments or masks made by a Yori artisan. In fact, the design of Chester's leg rattles is geared towards the *judíos*, the enactors of the Jews in the Passion story who wear similar leg rattles as the *pascola* dancers (Fig. 9). Participation of Yoris in the *kontis* (Sacred Way processions) on the six Fridays of Lent and culminating in the Holy Week celebrations is strong.<sup>34</sup> Pilate's many soldiers want their leg rattles to have a forceful sound, which requires a large number of cocoons filled with a larger than usual number of gravel inside each of the cocoons. So, if the demand for leg rattles is ever-increasing, it is not for the numbered Yoreme deer and *pascola* dancers who care well for their treasured sacred paraphernalia, but for the (mostly Yori) *judíos* who have the monetary resources to buy the appropriate outfit in order to participate in the revelries of *semana santa*, even if just for one season.

Due to the increased noise level at local ceremonies, *pascola* dancers also feel compelled to wear long leg rattles of about 500 cocoons per string. Half a century ago, Gertrude Kurath (1966: 32) counted only 120 on each string; Leticia Varela (1986: 95) 150 to 200. The manufacturing of the leg rattles for *judíos* and *pascolas* only differs in the way a pair of cocoons is placed together: for the *pascola* rattles, the sides of the two teardrop-shaped cocoons, where the larva constructed an emergence valve from where to exit after completing metamorphosis, are faced and squeezed together. In the case of the *judío* rattle, the opposite, harder, sides are pressed together which causes them to stand apart; wrapped around the lower leg they will appear bulkier. Kurath reported that “four pebbles from the top of an ant hill” were placed in each cocoon; Varela talked of three to six gravels of different size that were put into each of the cases. After having cut off the upper end of the cocoons and cleaned the hollow space, Chester fills them with pebbles of different size to create contrasting pitches for the right and left leg rattles: between 7 to 10 of the bigger gravels for the right leg and between 4 to 6 of the smaller ones for the left leg — because of its feebler sound, this latter rattle is also suitable for the deer dancer.<sup>35</sup>

<sup>34</sup> Lenten observances among the Mayo of southern Sonora have been described in detail by anthropologist N. Ross Crumrine (1997), based on fieldwork he did in the 1960s.

<sup>35</sup> Chester demonstrates the sound of a pair of *ténabarim* in his workshop, Dec. 1, 2014, <https://youtu.be/Erpsz9hn5tc> (posted Dec. 10, 2015).

The pairs are then sewed together using two cotton strings to interlink the stitches. The beginning loop in the string will be fastened to the dancer's big toe, from which it is wrapped around the lower leg, starting above the anklebone and working upward. Secured with the rest of the cotton strings, the *ténabarim* will stay put even during vigorous dancing.



Figure 10: Preparation of the cocoons, "Artesanías El Chester." (Photograph by Helena Simonett, 2014)

The younger *pascolas* are indeed vigorous dancers who like to produce strident rhythmic rattling sounds. The agile deer dancer, on the other hand, leaps and bounds unconcerned with rhythm: his gestures are those of a deer, not of a "human dancer," and it is not his intention to be noisy. His rattles are shorter, only covering the lower part of his leg above the ankle. While Varela did not notice a difference in the making of the leg rattles for either deer or *pascola* dancers or Pilate's soldiers (called *Chapayecas* by the Yaqui), she correctly observed that the two cocoons forming a pair have a different pitch ("De cada par de capullos, uno debe sonar más agudo que el otro"). For that effect, one is filled with five small pebbles and the other with three bigger ones (Varela 1986: 95). Kurath's (more detailed but less accurate) description of Yaqui's "passive idiophones" refers to the leg rattles of the deer dancer she observed: "As the [dancer] bounds, the 960 pebbles within the 240 leather-like cocoons rustle with each motion, twice as fast as the hoofs [of the deer dancer's belt], within the 1-inch confines of each cocoon. All together their quality is still *pianissimo*, perhaps *piano* during especially vigorous leaps" (Kurath 1966: 32). Yoreme still use only a few pebbles for deer dancers' rattles, with each cocoon of the pair containing 3 to 4 pebbles of distinct size to make them sound differently — taking the small gravels from the nest mounds of the harvester ant (*Pogonomyrmex*), a stinging ant species abundant throughout the desert regions. Although the overall rattling of the *ténabarim* may appear the same, for Yoreme sound aesthetics it is vital that each cocoon of the pair emits a different, complementary, pitch. Yoreme sound worlds are profoundly dualistic, as will be explained below.

Although much time has passed and much has changed in the lives of indigenous people since these earlier scholars made their observations in the field, musical concepts that are based



on cosmological beliefs remain relatively stable. I doubt that these earlier scholars observed the actual making of the instruments they described. Kurath (1966) acknowledged Beals (1945) and Densmore (1932) as sources of information and Varela (1986) cited Kurath, whose account of the way cocoons were collected she trusted more than the one her Yaqui informant provided.<sup>36</sup> Early scholars' preoccupation with material culture resulted in a reductionistic functionalism, although they must be credited for having tried to present a full picture of what they considered an important element of music cultures. Their writings, for what they are, serve as historical documents that allow us to construe a better understanding of the changes in indigenous material culture.

### Spiritual world, symbolism, and sound aesthetics

Yoreme material and spiritual worlds are inextricably interwoven. Yoreme thus do not consider *ténabarim* as artifacts that humans utilize to make sound. Rather, as pointed out in the introduction of this paper, *ténabarim* are entangled in webs of complex relationships that involve human, other-than-human, animate, and inanimate constituents of the environment. During the ceremonial fiesta, skilled performers immerse themselves mentally and sensorially in the landscapes of the monte. This natural landscape constitutes what Yoreme call *juiya annia*, the enchanted world or world of sensation. *Juiya annia* is both a real and a sacred world in which the deer is the perfect creature, an ancestral figure that dwells in mythological time — poetically expressed in numerous *cantos de venado* (deer songs) in the word combination “seegua yoleme” (lit. “native flower” or “man-flower,” used interchangeably with “deer”).<sup>37</sup> Thus, when singing of the *ténabari*, it is from the perspective of the wandering deer that sees it hanging from a twig, the breeze making it sway and sound (free translation of the epigraph). In collective ceremonies, Yoreme performatively remember a primordial world when communication between humans and other-than-humans (animals, spirits, deities) were normal (Simonett 2009). The *ténabari* already had a voice in the primordial past of humanity, but to make it audible to humans, it has to be given sound (“darle sonido”) by putting gravel inside the cocoon.

Indigenous spiritual traditions, Robin Wright explains, “characteristically embed their metaphysical questions in a language and art of the sacred that is embedded in the natural, material world in which they live” (Wright 2013: 57). Rustling noises belong to the sunburned landscape of northwestern Mexico. Anthropologist Ochoa Zazueta (1998) assumed that the rustling of the *ténabarim* symbolized the noise of the rattlesnake; Varela (1986) was told by her Yaqui informants that it was the crunching of the dry leaves on which the deer steps while walking through the monte — I was told something similar. With each of the deer dancer's moves the dozens of deer hooves dangling from his belt make a crackling sound like that of deer antlers rubbing against a tree; the coyoolim (brass bells) that jangle at the pascola's waist symbolize the birds' perpetual trilling and warbling.

Except for the water drum, the deer's pulsating heartbeat, the sounding of all other idiophones used in the fiesta is based on an all-encompassing ontological dualistic belief system. The premise of such an indigenous philosophical and religious system is that everything has a counterpart without which it cannot exist. Polarities are not antithetical but interdependent, mutually supportive, and complementary. In indigenous cosmogony, “the divine beings [...] hold

<sup>36</sup> Kurath “afirma que los capullos son recolectados en primavera, cuando las mariposas ya han culminado su metamorfosis y abandonado el capullo seco. Esto parece más natural y lógico que la elaboración artificial del capullo colectivo que menciona el informante yaqui” (Varela 1986: 95, fn. 16).

<sup>37</sup> For an explanation of the metonymic relationship between flower, man, and deer, see Simonett (2012: 147).

within themselves the duality of being and becoming, manifesting themselves as specific phenomenal beings (the sun, moon, animals, etc.), although, in so doing, they do not lose their original nature of constant becoming or intentionality” (Wright 2013: 45). Complementarity becomes the major organizing principle within all aspects of community life, from social to spiritual. Yoreme value qualities of sound without having developed a grand philosophical theory about the nature of music and beauty; thus, indigenous sound aesthetics is not readily available to the outside observer. As mentioned above, Yoreme fill each cocoon forming a pair such that they emit a different, but complementary pitch. Left and right cocoon leg rattles produce different pitches; the two notched rasps, the pairs of metal discs of the wooden hand rattle, the pair of the handheld gourd rattles, and the two membranes of the handheld frame drum all succumb to the principle of this complementary dualism (Fig. 11).



Figure 11: Sound-making instruments based on complementary dualism used in Yoreme ceremonies: gourd rattles, ténabarim, rasp (the second rasp has wider cut notches), a sistrum-like hand rattle, and a frame drum.

Symbols represent ideographic codes transmitting cultural messages that refer to basic values. Bonfiglioli (2006), in his splendid analysis of notched rasping sticks used in Tarahumaran healing rituals, argues that the rasp has to be understood as “camino cósmico” or stairway connecting cosmos and humans and on which the deer descended in primordial time. Shamans are rasping throughout curing ceremonies to vitalize the flow of cosmic energy. The rasp thus functions as *axis mundi* through which mental strength is transmitted. The spatial representation of the axis is motivated by the sun’s east-to-west journey, itself associated with the cycle of life. The symbol of the spiral carries the same idea as the straight stairway. The so-called “peyote motif,” a spiked counter-clockwise spiral, has been identified on archaeological pottery and is used today as a peyote symbol among the Huichol (Bonfiglioli 2006: 95). This particular spiral also appears among the roughly 640 petroglyphs at Las Labradas on Sinaloa’s shoreline (Fig. 12). Rock carvings at this site were made between 2,500 B.C. and 1,200 A.D., possibly by shamans to represent visions seen during their trances.<sup>38</sup>

<sup>38</sup> According to Marriner, trances induced by hallucinogenic plants have a transitional stage where shamans pass through a similar spiral or vortex tunnel. “Interpretation of these design motifs is believed to be culture-bound but, on the other hand, what is actually seen and recorded is controlled by specific biochemical effects of the active principles in the plant” (2008).



Figure 12: Peyote motif at Las Labradas.  
(Photograph by Helena Simonett, 2014)

Spiral motifs are found in a wide variety of representations throughout native cultures. Perceived as an entrance to the spirit world, the counter-clockwise spiral is one of the most common figures reportedly seen during shamanic trancing.<sup>39</sup> Upward–downward and spiral motions are essential in Yoreme performativity. The strings of *ténabarim* are wrapped around the leg spirally (working clockwise upward, but symbolically suggesting a motion toward the earth); the *pascola* dancers move counter-clockwise when dancing to the harp–violin music, imprinting a volute of footprints in the dirt (Fig. 13).<sup>40</sup>



Figure 13: Footprints of dancing *pascola*. (Photograph by Helena Simonett, 2013)

<sup>39</sup> Marriner holds that “more than 90% of hunter-gatherer tribes incorporate the shamanic trance as an important part of their culture” (2008). It is no coincidence that the spiral motif is so widespread in such societies.

<sup>40</sup> *Pascola* dancing, <https://youtu.be/-cty4Hjtjr0> (posted Dec. 11, 2015).

Deer and pascola dancers, musicians, and singers are, by tradition, bestowed with the responsibility to transmit their deep knowledge by way of sound and movement and so to convey the meaning of Yoreme humanity. Unlike in Yoreme culture, among the Tarahumara the deer has lost its symbolic significance: Deer hooves on the belts have been replaced with shell casings or tubes of tin foil, yet, according to Bonfiglioli (2006: 89), they retain their original connection to the hunt. For lack of deer hooves, some Yoreme deer dancers have substituted them with pig hooves, which are practically indistinguishable in shape as well as in sound — both aspects important to Yoreme deer dancers. The shortage of cocoons has forced dancers to be inventive: some use plastic water hoses or aluminum cans to fabricate their *ténabarim* (Fig. 14).



Figure 14: Leg rattles of insect- and man-made materials: plastic water hose and aluminum can. The boy deer wears a belt with squeezed beer bottle caps instead of hooves to practice the dance. (Photographs by Helena Simonett, 2007 and 2010)

Visually, these leg rattles are quite distinctive; soundwise, they are surprisingly similar. Chester abhors these “new kinds” of leg rattles: From a mestizo artisan’s point of view, they are unsellable, hence worthless. Opinions among my Yoreme acquaintances were split: “they don’t look good”; “they sound alike, so it’s fine to use them”; “better than nothing”; “hoses and cans are not from *juiya annia*, they don’t belong to the world of the deer”; “they are fine for the *judíos* but not for the *venado* and *pascolas*”; “they don’t sound right.” Because of the deep mythological nature and narrative significance of deer and pascola dances, the materiality of ceremonial sound-making instruments still matters. Even sound qualities are described in material terms: *grueso* (thick) and *delgado* (thin) refer to pitch (in Spanish usually *grave* and *agudo*, low and high). Symbolically, the sound of the nature-made rattles is a vital spiritual energy that nurtures all living beings. Although indigenous peoples’ capacity to re-elaborate and reformulate their own cultural practices has proven to be a compelling strategy for ethno-cultural survival, some Yoreme doubt that the deer dance can go on without the insect-made *ténabarim*.

## Concluding remarks

Yoreme cocoon leg rattles are very unique “sound makers.” Their materiality is of prime importance to the culture bearers because it is entangled epistemologically, ontologically, and cosmologically with the animate and inanimate environment of their living space. Starting with the story of the *ténabari* — the center of the spiral to be unraveled, so to speak — I have drawn from archeological and colonial-period records to document the presence of idiophones, such as bells and rattles, in ancient cultural practices and from ethnohistorical and ethnographic accounts to illustrate the usage of leg rattles among indigenous peoples in post-Independence northwestern Mexico. Entomological research on Lepidoptera has helped me to understand the nature of these extraordinary insects, as well as their struggle to survive in increasingly more hostile environments.

Toxins are widely used in Sinaloa’s agribusinesses to suppress insect pests in order to improve crop yields, but they cause high mortality in non-target species, saturniids and human beings alike. There is no question that Sinaloa’s ecosystem is severely out of balance. But while moths develop circumventory strategies such as migrating to avoid detrimental living conditions, human beings seem less adaptive. Substandard living conditions and poverty persist in indigenous communities and contribute to higher mortality rates. Drug-trafficking related violence in the region further aggravates the already precarious living conditions of the indigenous and other marginalized peoples. In 2008, the Mexican government completely opened up trade relations with the United States and Canada, dropping remaining tariffs on basic foodstuffs such as corn, beans, milk, and sugar, forcing domestic small-scale farmers out of business. After a severe frost in 2011 and a series of very cold winters, Sinaloa’s large farmers and multinational corporations changed their planting strategies: frost-sensitive but labor-intensive produce like tomatoes were replaced by crops such as rice and white corn.<sup>41</sup> Since these crops require little human labor, agricultural day laborers, almost all of whom are indigenous people, suffer from unemployment. In 2012, a severe drought, compounded by freezing temperatures, pushed up the cost of staple foods, including corn and beans.<sup>42</sup> Considered to be Mexico’s worst drought in 70 years — and one that was predicted would last for several more years — the dry spell caused grave problems in the agricultural economy and threatened the viability of rural communities, particularly in the northern parts of the country.<sup>43</sup>

The newspaper articles that appeared on the occasion of the opening of Los Mochis’s butterfly house blamed the near extinction of the mariposa on the overharvesting of its cocoons by indigenous and other people to make *ténabarim* for deer and *pascola* dancers. They not only failed to mention that large numbers of cocoons are actually used for the popular *judío* costumes, unrelated to Yoreme deer and *pascola* dances, but also avoided to relate the problem of elevated insect mortality to the aerial spraying of the fields in this intensive farming region, or to the specie’s sensitivity to variations of climate. So why blame the indigenous people for a phenomenon that is more likely caused by environmental degradation due to unsustainable human activities and by climate change?

The *ténabari* teaches us the importance of the study of the materiality and sonority of musical instruments from an ecological perspective: one that shifts our attention from the inert

<sup>41</sup> Sinaloa is the leader in rice and vegetable production and second in wheat and bean production in the country. Crops are mainly under irrigation.

<sup>42</sup> Karla Zabłudovsky, “Food Crisis as Drought and Cold Hit Mexico,” *The New York Times*, Jan. 30, 2012, [http://www.nytimes.com/2012/01/31/world/americas/drought-and-cold-snap-cause-food-crisis-in-northern-mexico.html?\\_r=0](http://www.nytimes.com/2012/01/31/world/americas/drought-and-cold-snap-cause-food-crisis-in-northern-mexico.html?_r=0) (accessed July 10, 2015).

<sup>43</sup> “Long, Hard Drought Predicted,” *New Mexico State University, Frontera NorteSur*, Nov. 23, 2011, <http://fnsnews.nmsu.edu/long-hard-drought-predicted> (accessed July 10, 2015).



material to new insights into the complex relationships of materials with their environment. Ultimately, it also teaches us “how we are part of and depend upon the earth and our environments for our survival” (Allen and Dawe 2015: 8). Moths that struggle to survive and reproduce in a hostile environment are indicators of environmental degradation. But while Sinaloa’s butterfly nurseries and the dramatic call to add the mariposa cuatro espejos to the list of endangered species may raise public awareness, they will not solve the problem at the heart of the moths’ disappearance.

Dawe argues that “the sources or provenance of materials used in musical instrument construction are important indicators of value [...], connected to landscape and integral to placemaking” (2015: 112). For Yoreme, *juiya annia* is the place where all life forms began, including human life. The *ténabari* holds within itself the duality of being and becoming: the possibility for new life, both in the form of a mariposa cuatro espejos and as a sound-making instrument — transitory and ephemeral, thereby challenging our assumptions about the durability of things and life itself. Rather than encoding their spiritual beliefs in imperishable media, the indigenous people of northwestern Mexico carry them out in their ceremonies — rituals that renew the links of humanity with primordial powers each time they are being performed. In so doing, they keep alive the knowledge of their ancestors.

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#### Cita recomendada

Simonett, Helena. 2016. "Yoreme cocoon leg rattles: An eco-organological perspective". *TRANS-Revista Transcultural de Música/Transcultural Music Review* 20 [Fecha de consulta: dd/mm/aa]



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