





BIOLOGICAL AND CULTURAL DIVERSITY IN THE STATE OF OAXACA, MEXICO:

STRATEGIES FOR CONSERVATION AMONG INDIGENOUS COMMUNITIES



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Palabras claves: biodiversidad, diversidad cultural, Oaxaca, México, comunidades originarias, iniciativas de conservación comunitaria, propiedad social del territorio

DEDICATION

To the late Francisco Toledo “Chico Toledo,” the maximal Zapotecan-Oaxacan artist, who also stood out as a socio-environmental fighter contributing in a forceful way to the defense of the native maize (*Zea mays*) and against genetically modified organisms (GMOs) and glyphosate (Bayer-Monsanto). His efforts, social perspective, and commitment not only consolidated several institutions now referable to the arts, such as painting, engraving, and photography, but he was also a committed defender of the Cerro del Fortín State “Protected” Natural Area against the megadevelopments orchestrated by the state and the private initiative. His role as a socio-environmental fighter was manifested in his direct intervention in the campaign around the liberation of the Lightning Jaguar (“Jaguar de la luz”) in the indigenous community of Cristo Rey la Selva-Asunción Lachixila, Sierra Madre de Oaxaca. In 2019, he convened a forum in Atzompa, Oaxaca, where he made a strong call to civil society to defend their territories and common natural resources against the eco- and ethnocidal megaprojects of the Mexican government (“4T”) known as the Tren “Maya” and the Interoceanic Corridor in the Isthmus of Tehuantepec. In an interview for the newspaper “El Universal” (2019) he said: “*It is very good that holes are made in mother earth to ask for permission, but if this is the case, who should be consulted are the lords of the earth - who are the jaguars - if they want a train or they don’t want a train.*”



“WE ARE VANISHING FROM THE EARTH, YET I CANNOT THINK WE ARE USELESS OR GOD WOULD NOT HAVE CREATED US. HE CREATED ALL TRIBES OF MEN AND CERTAINLY HAD A RIGHTEOUS PURPOSE IN CREATING EACH.”

—GERONIMO

SUMMARY

Oaxaca is the state in Mexico with the greatest level of biological and cultural diversity. The indigenous people of Oaxaca are all descendants, in whole or part, of the ancient Olmec culture also known as “Pueblo del Jaguar.” These indigenous peoples presently are trying to defend their ancestral territories and common natural resources from exploitation by governments and large commercial enterprises. Oaxaca is the fifth largest state in Mexico and encompasses 12 physiographic regions and 16 indigenous-ethnolinguistic groups. The high cultural diversity seen in Oaxaca is interrelated with the considerable biological and environmental diversity and it must be understood that the protection of the one is dependent on the protection of the other. Knowledge of the biodiversity of Oaxaca continues to be augmented, especially among the tetrapod vertebrates. The cultural diversity in Oaxaca, especially with respect to languages, is the most diverse in the entirety of Mexico. In various communities, ejidos, and with small landowners there exists a system of Community Conservation Areas (CCAs), which allows for the protection of various species not included within federal Natural Protected Areas (NPAs), as well as water bodies and forests within the state. These CCAs are part of a resistance movement against involvement in the formal NPA system. The indigenous peoples of Oaxaca are part of a global community of such people who are known to be responsible for protection of some 80% of the world’s remaining biodiversity. The Mexican government’s own efforts at conservation date back to the administration of President Lázaro Cárdenas del Río. Community Forest Management attempts by indigenous peoples around the world have been supported (or not) by federal governments. Low-impact ecotourism is being used by indigenous people in the Sierra Madre de Oaxaca as an additional means of conserving their land and for supporting sustainable lifestyles, while resisting the exploitative efforts by non-indigenous groups in society. The Corredor Interoceánico constitutes the most significant threat to the efforts of such indigenous groups, as well as other large-scale commercial activities undertaken by industrialists underwritten by their political allies in the federal government, calling into question why NPAs really exist and what people they are supposed to benefit. In light of this reality, we have made a number of recommendations for the alleviation of these problems for indigenous peoples to allow for the continuation of their efforts at preserving native biodiversity and their own cultural diversity.

Oaxaca es el estado de México con mayor diversidad biológica y cultural. Los pueblos originarios de Oaxaca son todos descendientes, total o parcialmente, de la antigua cultura madre Olmeca también conocida como “Pueblo del Jaguar”. Estos pueblos originarios actualmente están tratando de defender sus territorios y bienes naturales comunes de la explotación por parte de los gobiernos y las grandes empresas multinacionales. Oaxaca es el quinto estado más grande de México y comprende 12 regiones fisiográficas y 16 grupos etnolingüísticos originarios. La alta diversidad cultural que se observa en Oaxaca está interrelacionada con la considerable diversidad biológica y ambiental y debe entenderse que la protección de una depende de la protección de la otra. El conocimiento de la biodiversidad de Oaxaca continúa aumentando, especialmente entre los vertebrados tetrápodos. La diversidad cultural en Oaxaca, especialmente con respecto a los idiomas, es la más diversa en todo México. En varias comunidades, ejidos y con pequeños propietarios existe un sistema de Áreas Comunitarias de Conservación, que permiten la protección de diversas especies no incluidas dentro de las ANPs federales, así como cuerpos de agua y los bosques dentro del estado. Estas ACC son parte de un movimiento de resistencia contra la participación en el sistema formal de ANP por decreto. Los pueblos indígenas de Oaxaca son parte de una comunidad global de personas que se sabe que son responsables de la protección de alrededor del 80% de la biodiversidad remanente del mundo. Los propios esfuerzos del gobierno mexicano por la conservación se remontan a la administración del presidente Lázaro Cárdenas de Río. Los intentos de manejo forestal comunitario de los pueblos indígenas de todo el mundo han sido apoyados o no por los gobiernos federales. Los pueblos indígenas de la Sierra Madre de Oaxaca están utilizando el ecoturismo de bajo impacto como un medio adicional para conservar sus tierras y para apoyar estilos de vida sostenibles, al tiempo que se resisten a los esfuerzos de explotación de los grupos no indígenas de la sociedad. El Corredor Interoceánico constituye la amenaza más significativa para los esfuerzos de estos grupos indígenas, así como otras actividades comerciales a gran escala realizadas por grandes consorcios industriales suscritos por sus aliados políticos en el gobierno federal, cuestionando por qué las ANPs que existen realmente a qué personas se suponen un beneficio. A la luz de esta realidad, hemos realizado una serie de recomendaciones para el alivio de estos problemas a los pueblos originarios que permitan continuar con sus esfuerzos de preservación de la biodiversidad nativa y su propia diversidad cultural.

RESUMEN

INTRODUCTION

Biodiversity is the variety of living things that inhabit a given place (Wilson, 1988). Mexico is considered one of the top five megadiverse countries worldwide, harboring ca. 12 % of the entire worldwide remnant of biological diversity (Sarukhán *et al.*, 2009). The Mexican state of Oaxaca comprises the most biologically and culturally diverse entity in all Mexico (García-Mendoza *et al.*, 2004); its bio-cultural diversity exceeds even that of entire Central American countries. All the native and mestizo peoples that currently inhabit this territory descend (at least partially, if not completely) from the Olmec culture (the mother culture of Mesoamerica), also known as “El Pueblo del Jaguar” (Piña-Chan and Covarrubias, cited by Nahmad and Sittón, personal communication, 2017). The Olmec founding myth says that the gods would agree to create a primordial couple: a jaguar father and a (human) woman from whose cross the ancestors of all current Mesoamerican indigenous peoples arose (*Ayuujk* [“Mixes”], *Ang pøn* [“Zoques-Chimalapa”], *Tsa ju jmi’* [“Chinantecos”], *Bini Zaa* [“Zapotecos”], *Nuu Savi* [“Mixtecos”], and others).

At present, all these native peoples are in resistance and fighting for the defense of their territories and natural common resources that belong to them legitimately and ancestrally over millennia. The mega-projects, such as open-pit mega-mining, hydroelectric dams, wind farms, extensive livestock farming, large-scale monocultures, especially of genetically modified organisms (transgenic), geoengineering, fracking (hydraulic fracture), Special Economic Zones (“ZEE”), the “Tren Maya”, and the Corredor Interoceánico, are just some of the greatest threats faced in these times, also known as those of “suicide capitalism at the end of the world” (Bartra, 2017). These peoples have historically been seen as “backward” or “reluctant to progress” and “development.” The reality is that they have lived (coexisted) for no less than 3,000

years in these territories that represent the last great bastions of ecosystems in good conservation status in the region and in the world. They have undoubtedly become the last and most effective guardians of life, with ca. 80 % of the worldwide remnant biodiversity, within their ancestral territories that represent currently 25% of the world’s terrestrial surface (United Nations Organization, 2018).

PHYSICAL AND CULTURAL ENVIRONMENT IN OAXACA

The Mexican state of Oaxaca has a territorial extension of 95,364 km²; it is the fifth largest federal entity of the Mexican Republic, occupying 4.8% of the national territory (Figure 1). Socio-politically, it is divided into 30 districts, 570 municipalities, and about 10, 500 localities or towns (INEGI, 2010). The name of the entity comes from the *Náhuatl* language word *huaxyacac*, which means “*en la nariz de los guajes*” (in the nose of the guajes [*Leucaena* sp.], a type of bean-like fruit on a leguminous tree, which is used for food and medicinal purposes). It borders to the north with Veracruz and Puebla, to the east with Chiapas, to the south with the Pacific Ocean, and to the west with Guerrero. Oaxaca has a political-economic regionalization that consists of 8 regions: Cañada, Costa, Istmo, Mixteca, Papaloapan, Sierra Norte, Sierra Sur, and Valles Centrales (Instituto Nacional de Estadística, Geografía e Informática (INEGI), 2022). For its floristic and faunistic study, however, it is divided into 12 physiographic regions: Sierra Madre de Oaxaca, Central Valleys, Western Mountains and Valleys, Central Mountains and Valleys, Isthmic Depression of Tehuantepec, Sierra Madre del Sur, Gulf Coastal Plain, Pacific Coastal Plain, Tehuantepec Coastal Plain, Fosa de Tehuacán, Balsas Depression, and Sierra Madre de Chiapas (their description is in Mata-Silva *et al.*, 2015, 2021). In the entity there are 16 indigenous-ethnolinguistic groups: Amuzgos (Tzjon noan), Chatinos

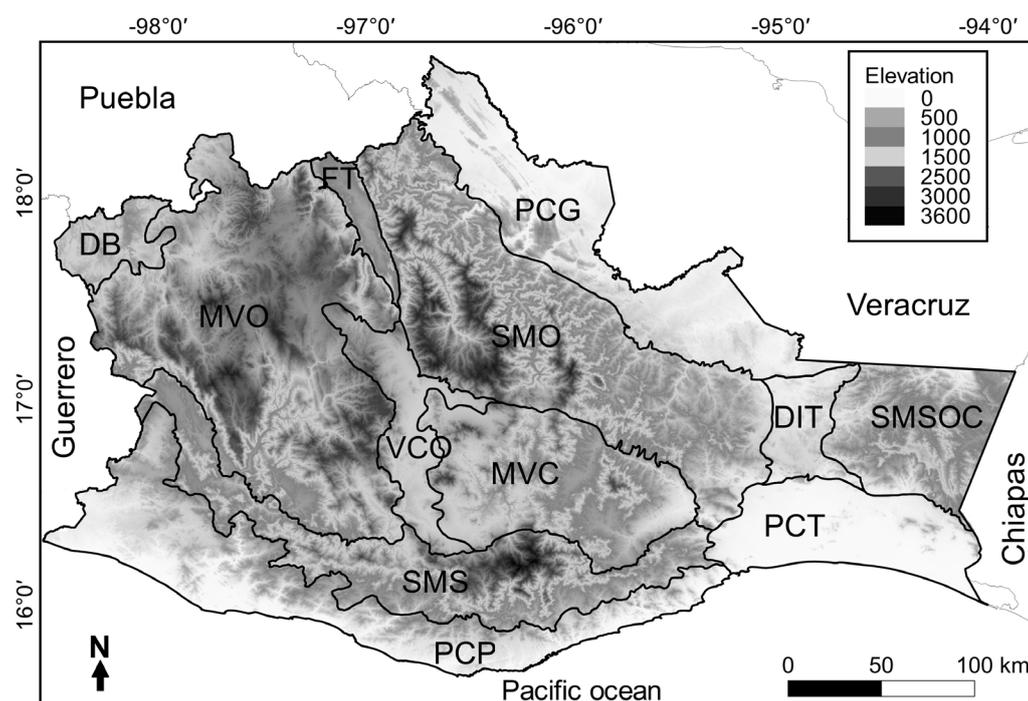


Figure 1. The physiographic regionalization of the Mexican state of Oaxaca.

(*Né cha'tña'*), Chinantecos (*Dza jmiib*), Chochos (*Rru ngigua*), Chontales de Oaxaca (*Lajl pima*), Cuicatecos (*Y'an yivacu*), Huaves (*Ikoots*), Ixcatecos (*Xwja*), Mazatecos (*Ha shuta enima*), Mixes (*Ayuuk ja'ay*), Mixtecos (*Ñuu savi*), Nahuas (Mexicanos), Tacuates (*Tu'un va'a*), Triquis (*Yi ni'nanj ni'in*), Zapotecos (*Binnizá*) and Zoques (*Ang pon*) (Figure 2; De Ávila-Bloomberg, 2004; Barabas *et al.*, 2004).

BIOLOGICAL DIVERSITY IN OAXACA

In 2000 the Interdisciplinary Research Center for Integral Regional Development, of the National Polytechnic Institute (CIIDIR-IPN) convened the "Biodiversity of Oaxaca" Symposium. This important forum confirmed that Oaxaca is the most biodiverse entity in Mexico. Likewise, it revealed the lack of management plans and effective actions for the conservation of said biological and cultural wealth at the institutional level (García-Mendoza *et al.*, 2004). From this effort arose the proposal for the publication of the bibliographic work entitled "Biodiversidad de Oaxaca" (2004), thanks to which the information available at that time was dispersed about the biological and cultural heritage of Oaxaca. As a result of this work, today we know that for the 16 cultural groups registered in Oaxaca, the existence of 157 native languages is documented, a number higher than that of any other entity in the country and even those registered in Central American countries. High cultural diversity is correlated with elevated biological and environmental diversity. In terms of floristics, Oaxaca has a total of 8,431 species of vascular plants, which places the state as one of the richest and most diverse in the country. Likewise, Oaxaca encompasses approximately 40% of the flora of Mexico and 70% of the types of vegetation registered for the country. Regarding the fauna, a total of 1,130 species of Lepidoptera (butterflies), 127 of continental freshwater fishes, 378 of amphibians and reptiles, 736 of birds, and 190 of mammals were registered. In summary, as a result of the contributions of the authors of this work, the presence of 8,431 species of flora and 4,543 species of fauna is documented for Oaxaca, giving a total of 12,974 species (García-Mendoza *et al.*, 2004; Table 1).

Table 1. Faunistic and floristic diversity of Oaxaca (García-Mendoza *et al.*, 2004).

Fauna	Species
Invertebrates	3,112
Vertebrates	1,431
Total	4,543
Flora	
Pteridophytes	627
Gymnosperms	52
Angiosperms	7,752
Total	8,431
Grand total	12,974

It should be noted that these preliminary data are very fluid. More recently, we know, for example, that the diversity of birds in Oaxaca now totals 776 species (Blázquez-Olaciregui, 2016). That of amphibians and reptiles is a total of 480 species (Mata-Silva *et al.*, 2021) and that of mammals is 216 species (Briones-Salas *et al.*, 2015). As exploratory and formal research work continues, new species will be added to the total figures of the entity. If we use as a model the terrestrial vertebrates, we would find that Oaxaca is in fact the entity at the country level with the highest level of biodiversity, with ca. 50 % of the total number for the entire country (Table 2). Oaxaca also harbors the two regions with the highest diversity of terrestrial vertebrates at the country level (Table 3).

CULTURAL DIVERSITY IN OAXACA

According to the Ethnologue database, the number of established languages listed for Mexico is 294. Of these, 289 are living and 5 are extinct. Of the living languages, 282 are indigenous. The Mexican state of Oaxaca is the most diverse entity at the country level in terms of its cultural richness (Figure 2). Therein are found 16 ethnolinguistic families distributed throughout the vast geography of this megadiverse entity. The total number of the linguistic diversity of the state is 157 (languages and dialects). This number exceeds that of any other state in Mexico and those of any of the countries in Central America (De Ávila-Bloomberg, 2004). The total amount of native speakers of the 16 indigenous-ethnolinguistic groups in Oaxaca is as follows: Amuzgos (4,819), Chatinos (40,004), Chinantecos (107,002), Chochos (770), Chontales de Oaxaca (4,617), Cuicatecos (12,128), Huaves (13,678), Ixcatecos (17), Mazatecos (174,352), Mixes (105,443), Mixtecos (245,755), Nahuas (10,979), Tacuates (496,038), Triquis (15,023), Zapotecos (377,936), and Zoques (5,282) (De Ávila-Bloomberg, 2004; Barabas *et al.*, 2004). Additionally, the previous authors also refer to the Pochuteco as an extinct language and the relative recent presence in the state of native speakers of Maya, Tzotzil, and Totonaca languages.

THE ROLE OF INDIGENOUS COMMUNITIES IN THE CONSERVATION OF BIOLOGICAL AND CULTURAL DIVERSITY IN OAXACA

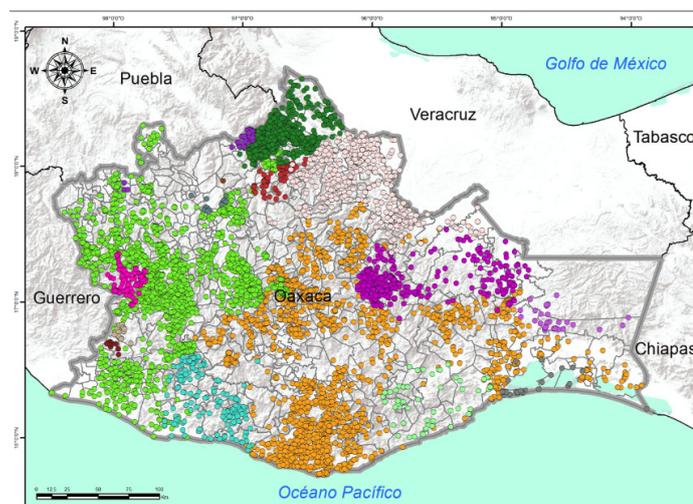
Indigenous people number over 300 million worldwide. They live in about 75 of the world's 184 countries and are inhabitants of practically each major biome of the Earth. Indigenous peoples, also called tribal, aboriginal, autochthonous peoples, national minorities, or first peoples, are best defined by using several criteria. Indigenous peoples can be characterized by all or part of the following criteria: (a) they are the descendants of the original inhabitants of a territory, which has been overcome by conquest; (b) they are "ecosystem peoples," such as shifting or permanent cultivators, herders, hunters and gatherers, fishers, and/or handicraft makers, who adopt a multi-use strategy of appropriation of nature; (c) they practice a small-scale,

Table 2. Terrestrial vertebrate diversity in Mexico as a whole and in the five megadiverse Mexican states (Flores-Villela and García-Vázquez, 2014; Parra-Olea *et al.*, 2014; Mata-Silva *et al.*, 2021; Johnson *et al.*, 2015; Johnson *et al.*, 2017; Navarro-Sigüenza *et al.*, 2014; Blázquez-Olaciregui, 2016; Sánchez-Cordero *et al.*, 2014; Briones-Salas *et al.*, 2015; Woolrich-Piña *et al.*, 2017; Palacios-Aguilar and Flores-Villela, 2018; Torres-Hernández *et al.*, 2021).

Country and States	Amphibians	Reptiles	Birds	Mammals	Totals
Mexico	394	898	1,123	564	2,979
Oaxaca	149	293	776	216	1,434
Veracruz	122	237	719	178	1,256
Chiapas	107	223	659	211	1,200
Puebla	89	178	595	161	1,023
Guerrero	78	181	539	124	922

Table 3. Terrestrial vertebrate diversity among the four Mexican megadiverse regions (Aguilar-López *et al.*, 2016; Navarro-Sigüenza *et al.*, 2008; Lira-Torres *et al.*, 2012; González-García, 1993; Luna-Reyes, 2019; Hernández-Ordoñez *et al.*, 2015; Naranjo and Bolaños-Citalán, 2019; Vázquez-Pérez *et al.*, 2019; Rivero and Medellín, 2015; López-Paniagua *et al.*, 2017).

Regions	Amphibians	Reptiles	Birds	Mammals	Totals
Los Chimalapas (Selva Zoque)	51	105	464	149	769
La Chinantla (Sierra Madre de Oaxaca)	22	75	400	119	616
El Triunfo (Sierra Madre de Chiapas)	32	64	396	120	612
Montes Azules (Selva Lacandona)	35	90	344	134	603



ATLAS DE LOS PUEBLOS INDÍGENAS DE MÉXICO



OAXACA



Figure 2. The cultural and ethnolinguistic diversity in the Mexican state of Oaxaca.

labor-intensive form of rural production, which produce little surplus and has low energy needs; (d) they do not have centralized political institutions, organize their life at the level of community, and make decisions on a consensual basis; (e) they share a common language, religion, moral values, beliefs, clothing, and other identifying characteristics, as well as a relationship to a particular territory; (f) they have a different world-view, consisting of a custodial and non-materialistic attitude to land and natural resources, based on a symbolic interchange with the natural universe; (g) they are subjugated by a dominant culture and society; and (h) they consist of individuals who subjectively consider themselves to be indigenous (Toledo, 1999).

The concept of biodiversity was conceived relatively recently by Walter G. Rosen, from the National Research Council/National Academy of Sciences (NRC/NAS) in 1985, while planning to conduct a forum on biological diversity (Wilson, 1988). As Alcom (1993) stated, however, "...while proof of conservation success is ultimately biological, conservation itself is a social and political process, not a biological process. An assessment of conservation requires therefore an assessment of social and political institutions that contribute to, or threaten, conservation." One of the main social aspects related to biodiversity is, undoubtedly, the case of the world's indigenous peoples. Both cultural diversity and biological diversity are endangered. There exists a bio-cultural axiom: that the world's biodiversity only will be preserved effectively by preserving diversity of cultures and vice versa (Toledo, 1999). Scientific evidence shows

that virtually every part of the planet has been inhabited, modified, and manipulated throughout human history. Although they appear untouched, many of the last tracts of wilderness are inhabited and have been so for millennia. Indigenous peoples live in and have special claims to territories that, in many cases, harbor exceptionally high levels of biodiversity. On a global basis, human cultural diversity is associated with the remaining concentrations of biodiversity (Toledo, 1999).

In the case of Oaxaca, México, there are 16 ethno-linguistic groups that, in some cases, have been occupying this territory for at least ca. 3,000 years. This is the case of the Mixe-Zoque and the Chinantec ethnic groups in the Sierra Madre de Chiapas-Isthmus of Tehuantepec and the Sierra Madre de Oaxaca, respectively. In the case of the first ones known as Zoques or Chimas (*Ang pøñ*), they paid to the Spanish Empire ("Nueva España") the price of 25, 000 gold pesos delivered on "jicaras" (traditional pots from the tree called "morro" [*Crescentia alata*]) to obtain the titles that credit them as the legal owners of this vast territory currently recognized as the one harboring the most megadiverse biological richness at the country level (García-Aguirre, 2013; García-Padilla, 2018). In fact, this ethnic group is considered as the pioneer in the formal efforts of community conservation at the country level with the establishment of the Reserva Ecológica Campesina de los Chimalapas back in 1992 as an alternative method to the imposition of the Natural Protected Areas (NPAs) decrees orchestrated by the Mexican Federal Government and its environmental institutions (García-Aguirre, 2013). The main reason why they neglected to accept a federal decree of NPAs is because they were not disposed to loss of the autonomy and legal right they possess by Federal Constitutional recognition, as the ancestral owners of this vast territory for many centuries before the foundation of Mexico as an independent nation. According to anecdotal data provided by the Comisión Nacional de Areas Naturales Protegidas (CONANP, personal communication), the rhythm of annual deforestation in Los Chimalapas is three times lower than in the Selva Lacandona (Montes Azules) that is the supposed recipient of a Natural Protected Area federal decree since 1978. In addition to this, the population of the Jaguar (*Panthera onca*), the most emblematic, iconic, and important umbrella species, reaches the highest densities at the country level in this region (CONANP personal communication, 2017; Lira-Torres *et al.*, 2012).

In a recent study on the distribution of the Jaguar in Oaxaca (Briones-Salas *et al.*, 2012), it was found that, despite monitoring and field work, there are no formal records in or near NPAs with state or federal decree in the entity, and that of the 31 specific records of veracity of the Jaguar identified in said study, nine were located within Community Conservation Areas (CCAs) without certification owned by indigenous communities and seven more (16 records, 51.6% of the total) less than 15 kilometers away from the same. This highlights the conservation value of these community and social conservation efforts. The regions with the highest number of records of the Jaguar in Oaxaca were the

Sierra Madre de Oaxaca and the Sierra Madre de Chiapas (Chimalapas region). These regions also are not just highly diverse in terms of biodiversity but also in terms of cultural richness.

THE COMMUNITY CONSERVATION SYSTEM VS. THE FORMAL INSTITUTIONAL CONSERVATION SYSTEM

In the case of Oaxaca, the Community Conservation Areas (CCAs) for the conservation of the Jaguar and the associated biodiversity are protected areas at the initiative of communities, ejidos, and small landowners (Figure 3). This is of particular importance for at least two reasons. First, despite the relatively high percentage covered by Natural Protected Areas (NPAs), the great diversity and heterogeneity of species in Mexico means that many of the species are not included within these NPAs (for example, the Jaguar [*Panthera onca*]). An analysis of gaps and omissions in the conservation of terrestrial biodiversity in Mexico (CONABIO-CONANP-TNC-Pronatura-FCF-UANL, 2007, cited in Galindo-Leal, 2010) identified that only 15.9% of the highest priority sites for conservation in the country lie in some NPAs with federal decree. Second, between 70 and 80% of water bodies and forests are socially owned; that is, the owners are the people of ejidos and communities (Galindo-Leal, 2010). For example, Oaxaca, where about 80% of the territory consists of a social order (communal and ejidal), there has been serious resistance to the formal and institutional model of biodiversity conservation by the federal NPAs decrees.

In the case of La Chinantla region, within the Sierra Madre de Oaxaca, there exists scientific research evidence available, based on the community conservation initiatives of the Jaguar (*Panthera onca*) by the Chinantecos indigenous people (Lavariega *et al.*, 2020; Figel *et al.*, 2009). The community conservation efforts they practice are not yet recognized in many cases by the Mexican governmental institutions; however, they have been doing very well in maintaining the best preserved, the most biodiverse (García-Padilla, 2020), and the highest remnants of cloud forest at the Mesoamerican level (see the map provided by Toledo, 2009). Worth mentioning is that some native and mestizo communities have established Community Conservation Areas (CCAs) that lack official recognition (certification) but have functioned since time immemorial, thanks to community organization, the social tenure of the land, and conscious and voluntary community conservation efforts (García-Mendoza *et al.*, 2004; Galindo-Leal, 2010). At present in Oaxaca, where about 80% of the territory is communal, and, therefore, there is no private property, we can find the pioneering initiatives in Mexico and possibly the entire world in terms of the formal Community Conservation Areas.

For its own part, the institutional and federal governmental conservation efforts for Oaxacan biodiversity date back to 1937, when they were created by Federal Decree, when General Lázaro Cárdenas del Río was President of the Republic, including two

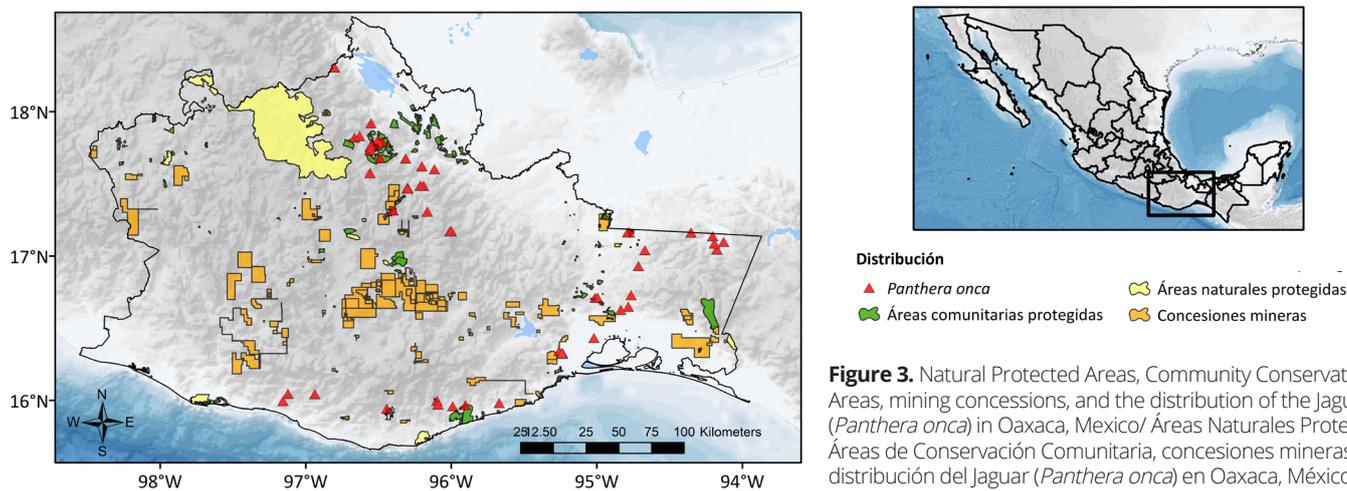


Figure 3. Natural Protected Areas, Community Conservation Areas, mining concessions, and the distribution of the Jaguar (*Panthera onca*) in Oaxaca, Mexico/ Áreas Naturales Protegidas, Áreas de Conservación Comunitaria, concesiones mineras y la distribución del Jaguar (*Panthera onca*) en Oaxaca, México.

national parks: Benito Juárez and Lagunas de Chacahua. Additionally, in 1986 the beaches of La Escobilla and Chacahua were declared reserve zones and refuge sites for the protection, repopulation, development, and control of the various species of sea turtles; and in 2002 both areas were recategorized as “sanctuaries.” In 1998, the Tehuacán-Cuicatlán Biosphere Reserve was established, constituting the largest “protected” area by federal decree in Oaxacan territory. In that same year, the Bays of Huatulco National Park was also created on the Oaxaca coast. Finally, in 1999 the Yagul Natural Monument was established in the Central Valleys, which would achieve the declaration of World Heritage Site by UNESCO (2000) for being considered, among other things, as the place with the oldest archaeological evidence of domestication of the milpa system (*Zea mays*) and other Mesoamerican sacred crops, such as pumpkins, beans, and chilis. As in the vast majority of the country’s parks and nature reserves, however, the administrative neglect and corruption in which they have been maintained has not allowed them to fulfill the purposes for which they were created. Currently, many of these NPAs serve as fertile territory for biopiracy and establishment of concessions and subsequent exploitation of oil and minerals. Additionally, many other environmental crimes have been observed inside them, such as illegal logging, hunting, and traffic of species.

Despite the aforementioned efforts, to date, large gaps in biological and cultural information persist among all levels of social and governmental-institutional actors. For this reason, the purpose of the present document is to compile, discuss, and actualize the inventory figures of the biological richness in the Mexican state (Oaxaca) with the highest level of cultural diversity at the country level and the relevance of the social community initiatives to guarantee the conservation for perpetuity of this rich and invaluable bio-cultural patrimony.

COMMUNITY FOREST MANAGEMENT

Community Forest Management (CFM) is a “rights-based approach.” Securing land and resource rights for indigenous and/or local communities, and for women, within these groups is key to confronting the biodiversity and climate crises, while assuring sustainable livelihoods and food security. The achievements and the magnitude

of the challenges in devolving rights are noted in a new report, which finds that 49.2% of the area of a 42-country sample consists of territories of indigenous, local, and Afro-descendant peoples. Of these lands, 53.5% are recognized by national governments, whereas in 46.5% communities have still unrecognized and frequently threatened customary rights. Evidence is accumulating that community participation is key for the success of forest conservation initiatives. For example, indigenous territories cover 30% of the area in the Amazon Basin. In this fraction, deforestation and fire occurrence are lower and it contains more than half of the region’s carbon stocks, while having only 10% of recent forest loss, despite multiple threats. Another study of social and conservation outcomes in a large sample of protected areas found that those with positive socioeconomic outcomes and cultural and livelihood benefits for communities also had improved conservation (Bray, 2021).

The case of Mexico represents an unusual set of circumstances where agrarian policy beginning in the third decade of the 20th century established communal governance institutions (in some cases blended with traditional forms of governance), and a common property resource on a nation-wide scale. The agrarian governance institutions, with episodic influence from forestry legislation, then served as the organizational and social capital platform for the development of more entrepreneurially-oriented institutions that permitted the vigorous development of a very large sector of community forests managed for the commercial production of timber (Bray *et al.*, 2003 cited in Bray *et al.*, 2006). Reforms to agrarian law, at the constitutional level, in 1992 encouraged a transition from state-led to a community-led community forestry sector (de Janvry *et al.*, 2001 cited in Bray *et al.*, op. cit).

The Sierra Norte de Oaxaca or Sierra Madre de Oaxaca is recognized as an iconic region in the world for the CFM that is practiced there. This makes the conservation of forests and care of biodiversity coincide in the same territory. A recent study of 23 community forestry companies (with a total territory of 201, 994 hectares) showed that they use and conserve their forests according to the criteria of sustainable forest management. Seventy-eight % of said territory (156, 550 hectares) is forested and, according to its uses, is divided

into wood production areas (37%), strict conservation areas (36%), restoration areas (5%), agricultural areas, and other uses (22%). This forest territory is highly productive, since in a period of 20 years, it has produced approximately three million metric tons of wood. In the 1990s, the Community Forest Development Program supported the diversification of forest production into ecotourism and spring water bottling (Bray, 2018).

The success of this productive community initiative depends on what is currently called “comunalidad.” The notion of “comunalidad” was born as a category of anthropological analysis. The late Floriberto Díaz-Gómez (2004) defined it as “the space in which people carry out activities of recreation and transformation of nature, while the first relationship is that of the Earth with the people, through work.” It means that all the efforts and the derived economical resources are produced and distributed among all the community members equally also known as “comuneros.” Currently, the organization known as Unión de Comunidades Forestales Zapotecas y Chinantecas (UZACHI) has set an example now considered as a world leader referent in terms of the CFM, creating the basis for the utopic social progress in harmony with Mother Nature.

SUSTAINABLE OR LOW-IMPACT ECOTOURISM

We consider here a third ally for conservation biodiversity within an indigenous context in Oaxaca, i.e., sustainable or low impact ecotourism. According to the United Nations World Tourism Organization’s (UNWTO, 2022) definition, ecotourism refers to forms of tourism which have the following characteristics:

1. All nature-based forms of tourism in which the main motivation of the tourists is the observation and appreciation of nature as well as the traditional cultures prevailing in natural areas.
2. It contains educational and interpretation features.
3. It is generally, but not exclusively organized by specialized tour operators for small groups. Service provider partners at the destinations tend to be small, locally owned businesses.
4. It minimizes negative impacts upon the natural and socio-cultural environment.
5. It supports the maintenance of natural areas which are used as ecotourism attractions by:
 - Generating economic benefits for host communities, organizations and authorities managing natural areas with conservation purposes;
 - Providing alternative employment and income opportunities for local communities;
 - Increasing awareness towards the conservation of natural and cultural assets, both among locals and tourists.

The sustainable or low-impact ecotourism is currently an economic sustainable activity within the Zapotecan and Chinantecan communities in the Sierra Madre de Oaxaca (Sierra de Juárez). Communities such as Calpulalpan de Méndez and Santa Catarina Lachatao

in the Sierra de Juárez (Sierra Norte; SMO). These two are splendid examples of how human societies have been producing a sustainable lifestyle due to low-impact nature tourism. At the same time, these “comuneros” are struggling against the illegal forest exploitation and against the mining concessions inside their ancestral territories that they legally own. Each year, the people of both communities celebrate the “Festival de Tierra Caliente,” as part of a pacifist resistance movement against the eco- and ethnocidal capitalism represented by mining concessions operating on their lands.

The other referent of sustainable or low-impact ecotourism in the Sierra Madre de Oaxaca are the six Chinantecan communities of CORENCHI (Comité de Recursos Naturales de la Chinantla Alta AC) in the Chinantla region. Specifically, Santa Cruz Tepetotutla and San Antonio del Barrio Chinantecan communities celebrate each year the “Festival de la Biodiversidad de la Chinantla,” an event consistent on multiple activities to promote the low impact ecotourism in the region in benefit of the local owners of the land. Worth mentioning is that these communities do not have Community Forest Management; however, they are doing well in terms of the social conservation initiatives and low impact ecotourism in favor of the conservation of this indigenous territory that is in fact the largest remnant of cloud forest at the country level (Toledo, 2009).

Within the Sierra Madre de Chiapas-Isthmus of Tehuantepec, there is also a community-based, low-impact ecotourism known as “Paraíso Jaguar” in the Ejido La Esmeralda, located in the municipality of Santa María Chimalapa. The comuneros there are facing several challenges to combine the community conservation system and, at the same time, the low-impact ecotourism activities as an alternative economic method to avoid non-sustainable activities long established in the region, such as cattle-raising and illegal logging that are affecting the largest remnant of a mosaic of tropical forests of ca. 400, 000 hectares harboring the highest levels of biodiversity at the country level.

Together, all of these low-impact ecotourism activities, led by the social actors and their strategic level of organization, represent an effective ally for the conservation of some of the most biologically and culturally diverse regions at the country level (e.g., Chinantla and Chimalapas).

THE PRINCIPAL ENVIRONMENTAL PRESSURES ON CONSERVATION EFFORTS

There are several types of environmental issues affecting the biodiversity within the Mexican state of Oaxaca. Examples of them are the megaprojects, such as the mining concessions, hydroelectric dams, wind and solar farms, fracking, and cattle expansion, genetical modified organisms (GMOs), and the use of pesticides and glyphosate. In the region of the Isthmus of Tehuantepec and in general in the whole state of Oaxaca, there are different environmental pressures; however, the most

significant threat is the mega- project known as “Corredor Interoceánico,” orchestrated by the Mexican Government. Additionally, we have been witnessing how the laws at the constitutional level are changing dramatically in the last decades in benefit of the private interests of the big capitalists and to the detriment of the real owners of the land. The Ley Minera and the Ley General de Biodiversidad, which allow the legal establishment of mining concessions inside the natural protected areas by federal decree, are just a couple of examples of how the conditions for the dispossession and extractivism of the territories and the natural resources are created by big capitalists and politicians working for them and their agenda. To date, there are documented ca. 1, 609 mining concessions inside the Natural Protected Areas (Armendariz-Villegas and Ortega-Rubio, 2015). Based on this activity, the questions arise as to what NPAs are for and who they are supposed to benefit.

The Corredor Interoceánico in the Isthmus of Tehuantepec is placing under a lot of social and environmental pressure the most biodiverse and ethnoculturally diverse region of Mexico. This region is also highly valuable in terms of water resources, with ca. 40% of the reservoir of fresh water available at the country level. This same trend is observed in the Yucatan Peninsula with the “Tren Maya” megaproject, which is already suffering from several environmental pressures, such as deforestation, GMOs, soy crops, oils spills, bad drainage management, the plague of sargassum seaweed (*Sargassum* sp.), massive tourism, crime, and land speculation due to the imminent creation of tourist development nuclei of ca. 50, 000 habitants in every train station. In the case of the “Megaproyecto del Istmo,” there are considered the creation of various industrial development nuclei, which will demand the use of land and natural resources at an unprecedented rate in the region. The Isthmus of Tehuantepec is currently suffering in general a lack fresh water even for agricultural purposes and human consumption. Given that we are entering a sixth major extinction crisis; we advocate for alternative sustainable practices to guarantee the continuity of life on planet Earth.

CONCLUSIONS

1. Oaxaca is the most biologically and culturally diverse state in Mexico.
2. The native and mestizo peoples presently inhabiting Oaxaca are all descendants, either partially or completely, from the Olmec culture.
3. The native peoples of Oaxaca currently are attempting to defend their ancestral territories and resources from exploitation by large commercial enterprises, including large-scale open-pit mining, hydroelectric dams, wind farms, livestock farming, large-scale monocultures, geoengineering, and fracking.
4. Oaxaca is the fifth largest federal entity in Mexico and is divided into 30 districts, 570 municipalities, and around 10, 500 towns. The state comprises 12 physiographic regions and supports 16 indigenous-ethnolinguistic groups.
5. High cultural diversity is correlated with equally high biological and environmental diversity.
6. Our understanding of the biodiversity of Oaxaca continues to increase. For example, the diversity of birds now stands at 776 species, that of the herpetofauna at 480 species, and that of mammals at 216 species.
7. The cultural richness of Oaxaca is the most diverse in the country of Mexico, especially in terms of languages.
8. Cultural and biological diversity in Oaxaca are heavily intertwined and it is understood that biological diversity will be preserved only by the protection of cultural diversity and vice versa.
9. The system of Community Conservation Areas in Oaxaca consists of protected areas maintained by various communities, ejidos, and small landowners, and is important for two major reasons. First, because they offer protection to a variety of species that are not included within the natural protected areas system (NPAs) of the federal government, and second, because between 70 and 80% of water bodies and forests are owned by ejidos and communities. Thus, members of these ejidos and communities have resisted being involved with the formal NPA system.
10. The Chinantecan indigenous people of Oaxaca are part of the indigenous peoples in the world in general that are recognized by the United Nations as the guardians of approximately 80% of the remnant global biodiversity.
11. The Mexican government’s efforts to protect Oaxaca’s biodiversity date back to the presidency of General Lázaro Cárdenas del Río, when the national parks Benito Juárez and Lagunas de Chachahua were established. Since that time, a number of subsequent initiatives have been introduced in the federal government’s efforts to add to the system of natural protected areas.
12. Community Forest Management efforts by the world’s indigenous peoples have constituted almost half of a 42-country sample of such efforts, which involve the securing of resource rights for indigenous and/or local communities, as well as for women. While 53.5% of these lands are given recognition and given protection also by federal governments; the remaining 46.5% are still unrecognized and frequently threatened by non-indigenous societal elements. In Oaxaca, such community initiatives have been effective in the social struggle against previous non-indigenous groups.
13. Some indigenous groups living within the Sierra Madre de Oaxaca are utilizing low-impact ecotourism as another means of conserving their lands and allowing for sustainable lifestyles, while at the same time struggling against the exploitative efforts by outside interests.
14. The greatest threat to such indigenous efforts is the large project known at the Corredor Interoceánico, which is a federal government effort to restore some 300 km of railways in the Isthmus of Tehuantepec, ostensibly to move goods rapidly from the Pacific Ocean to the Gulf of Mexico.

15. Several environmental pressures exist that impact the community conservation efforts of indigenous peoples by allowing extractive activities within protected areas by political interests in the federal government, including large-scale mining activities. This deleterious activity is so widespread that it calls into question why natural protected areas really exist and who they are supposed to benefit.

3. We call on the new generations of “comuneros” and community members in general of the Mexican and Oaxaca societies to defend their fundamental human rights for a healthy environment and so a quality of life based on social justice in harmony with Mother Nature, translated into a more sustainable lifestyle that guarantees the viability of the coming generations.
4. To the Mexican Government, we request the abolition of all faces of these ethno- and ecocidal megaprojects that act in favor of capitalists and to the detriment of the civil population. The Ley Minera and Ley General de Biodiversidad ought to be extinguished to guarantee the conservation of the last remnants of biodiversity in possession of the indigenous communities.
5. We strongly call for the civil societies to consider better and more sustainable practices to guarantee the survival of not just the entirety of biodiversity but also of our own species. We are still have time to create collectively the conditions to achieve social and environmental justice. As a predominant mestizo society in Mexico, we still have a lot to learn from indigenous communities and their traditional uses and practices among their ancestral and legally-owned territories and common natural resources. What the environmental elite in Mexico ignore or do not want to recognize is that for the indigenous peoples, their territories and common natural resources possess a value (cultural, ecological, symbolic, magical, and religious), but never a monetary price.

RECOMMENDATIONS

1. We recommend to the Mexican Government and the environmental institutions such as SEMARNAT, CONAFOR, and CONANP, to recognize and declare formally that the native people as not just the real owners of the land but also the real social and environmental heroes. The environmental agenda should include the recognition of the rights among the multiple indigenous groups of Mexico over their ancestral territories, which in many cases were even recognized by the Spanish Empire before the independence of Mexico ca. 200 years ago.
2. We propose also the inclusion and strengthening of Community Conservation Initiatives, Community Forest Management, and Low-Impact Ecotourism as just three of the main alternative productive and sustainable activities in favor of the social and environmental justice. Together with other achievements led by the Oaxacan indigenous people, such as fair coffee trade and agroecology, these will determine the achievement of the still unattained sustainability and preservation for perpetuity of wildlife and human societies.



*I LOVE THE SONG OF THE MOCKINGBIRD,
BIRD OF FOUR HUNDRED VOICES,
I LOVE THE COLOR OF JADE
AND THE INTOXICATING SCENT OF FLOWERS,
BUT MORE THAN ALL I LOVE MY BROTHER, MAN.*

—NEZAHUALCÓYOTL





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Elí García Padilla

1. Francisco Toledo (seated second from the right) during the last forum he organized in defense of the territories and natural common resources in 2019 in the community of Atzompa, Valles Centrales of Oaxaca. Photo by Elí García-Padilla.



2. The landscape in the Valles Centrales of Oaxaca. Photo by Elí García-Padilla.



3. The native maize (*Zea mays*) in the Sierra Madre del Sur, Oaxaca. Photo by Elí García-Padilla.



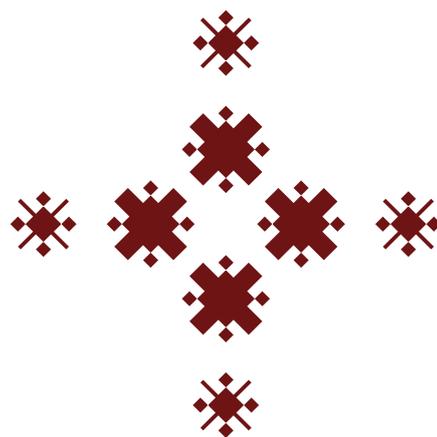
4. The Jaguar represented in the rupestrian art inside the Cave Los Machines in the Ejido Unión Zapata, in the municipality of Mitla (Lyobaa). Photo by Elí García-Padilla.



5. People from the Triqui culture in the community of San Andrés Chicahuaxtla, Sierra Madre del Sur. Photo by Elí García-Padilla.



6. The sale of domestic turkey (*Meleagris gallopavo*) in the market of Tlacolula de Matamoros, Valles Centrales. Photo by Elí García-Padilla.





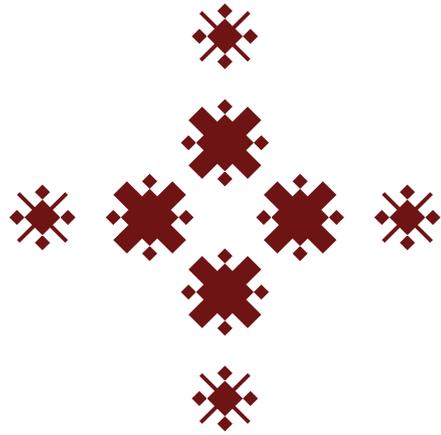
7. Cacao (*Theobroma cacao*) in the region of the Los Chimalapas, Isthmus of Tehuantepec. Photo by Elí García-Padilla.



8. The mescal and diversity of agaves (*Agave* sp.) in the region of Sola de Vega, Sierra Madre del Sur. Photo by Elí García-Padilla.



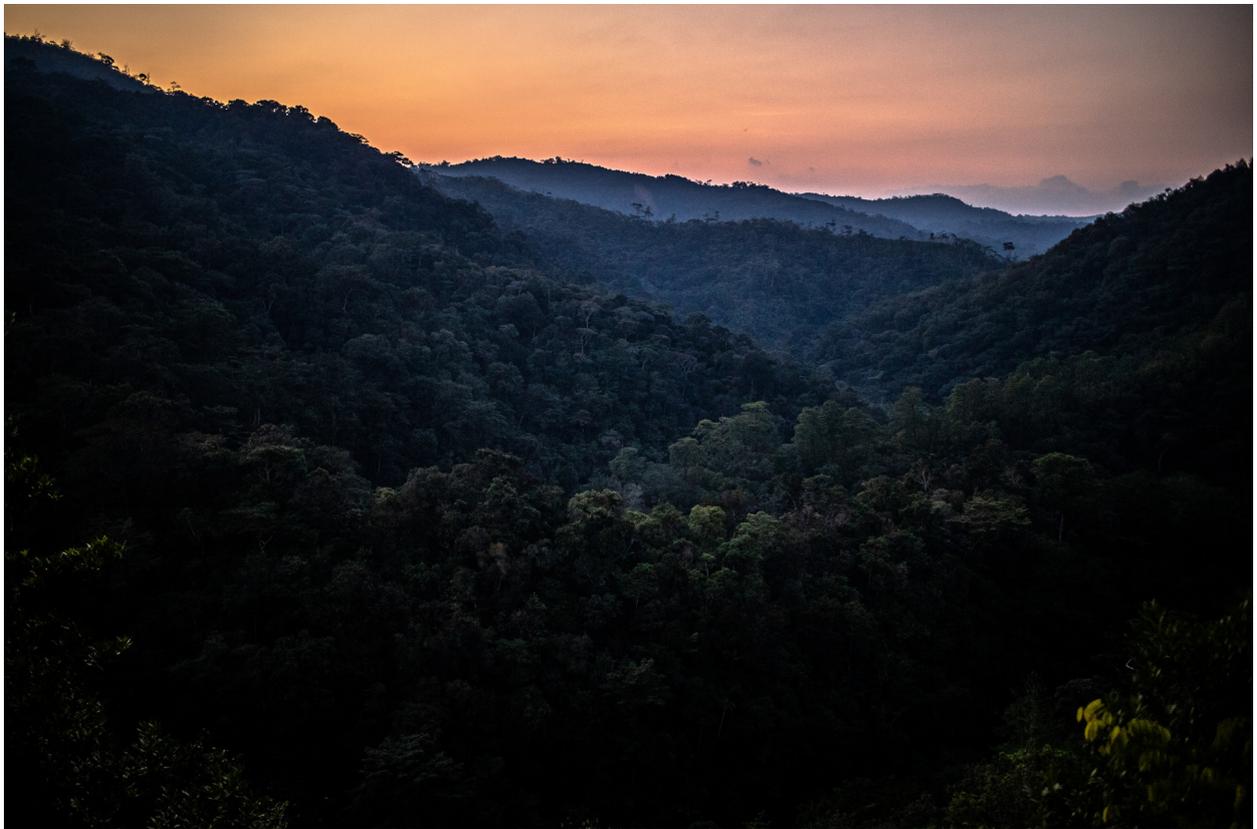
9. The pulque (octli) obtained from the pulquero agaves (*Agave americana*) in the vicinity of El Almacén, Santa María Apasco, Mixteca region. Photo by Elí García-Padilla.



10. The Mexican horned pit viper (*Ophryacus undulatus*) found in the community of Santa Catarina Lachatao, Sierra Madre de Oaxaca. Photo by Elí García-Padilla.



11. A pair of military macaws (*Ara militaris*) in the vicinity of San Pedro Jocotipac, Cañón del Sabino, Cañada region. Photo by Elí García-Padilla.



12. The vegetation composed of tropical evergreen forest in the vicinity of La Gloria in Los Chimalapas region, Isthmus of Tehuantepec. Photo by Elí García-Padilla.



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13. The individual of Baird's Tapir (*Tapirella bairdii*) in the photo was photographed in captivity in the Zoológico Regional Miguel Álvarez del Toro in Tuxtla Gutiérrez, Chiapas. Photo by Elí García Padilla.



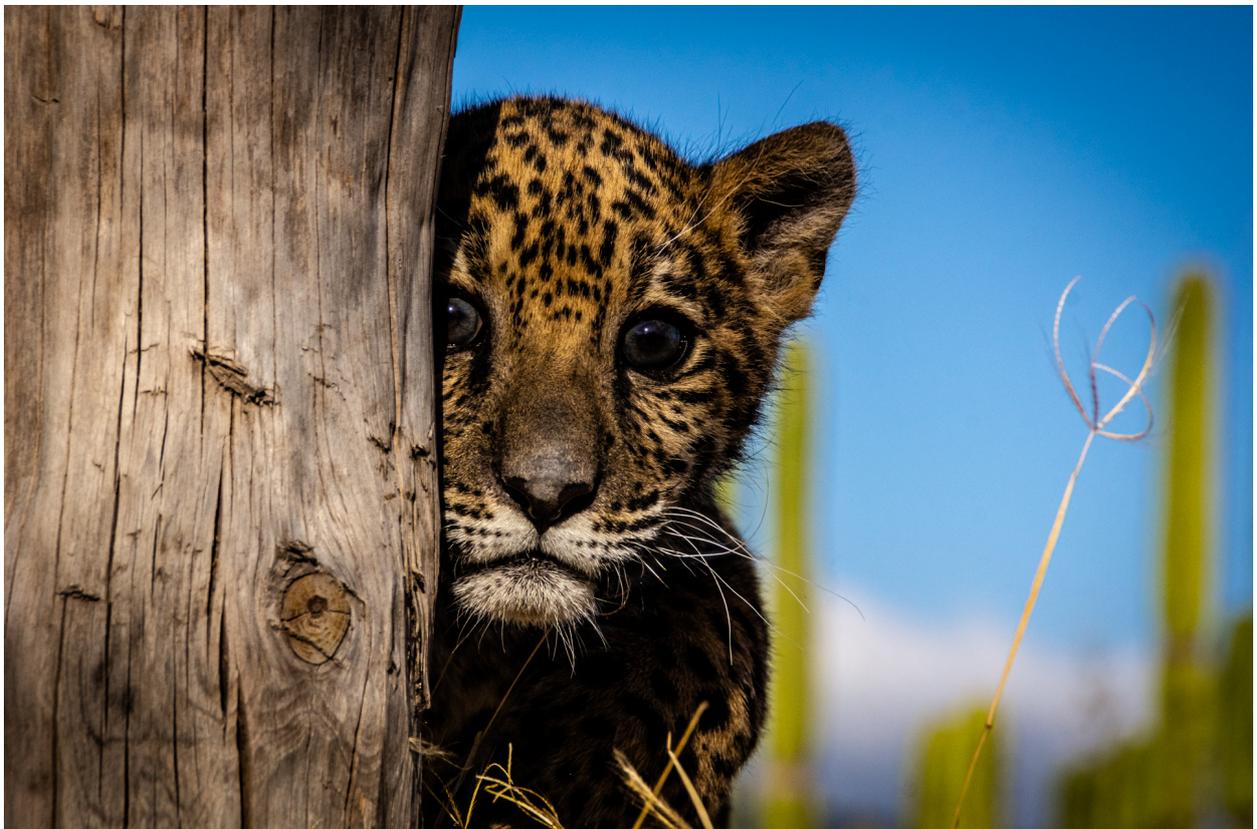
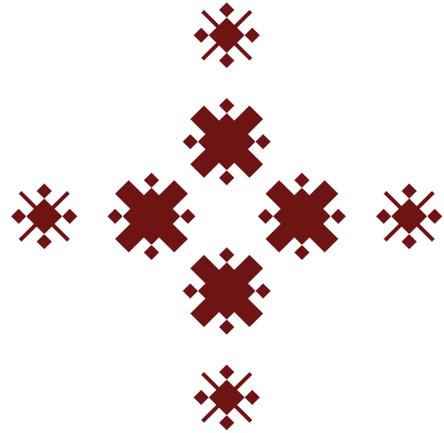
14. A Zapotecan woman from the Central Valley of Oaxaca. San Miguel del Valle, Oaxaca. Photo by Elí García-Padilla.



15. A Zapotecan woman from the Sierra Madre del Sur, Santa Lucía Miahuatlán, Oaxaca. Photo by Elí García-Padilla.



16. A group of Zapotecan women from Sierra Norte (SMO), San Melchor Betaza, Oaxaca. Photo by Elí García-Padilla.



17. A baby Jaguar called "Pitao Bedxé" (God Jaguar) photographed in captivity at the local zoo "Yaguar Xoo," Tanivet, Oaxaca. Photo by Elí García-Padilla.



18. The olive ridley sea turtle (*Lepidochelys olivacea*) on the shore of the community of La Ventanilla, Santa María Tonameca, Oaxaca. Photo by Elí García-Padilla.



19. The Oaxaca spiny-tailed iguana (*Ctenosaura oaxacana*) and habitat in the vicinity of Morro Ayuta in the Isthmus-Coast of Oaxaca. Photo by Elí García-Padilla.



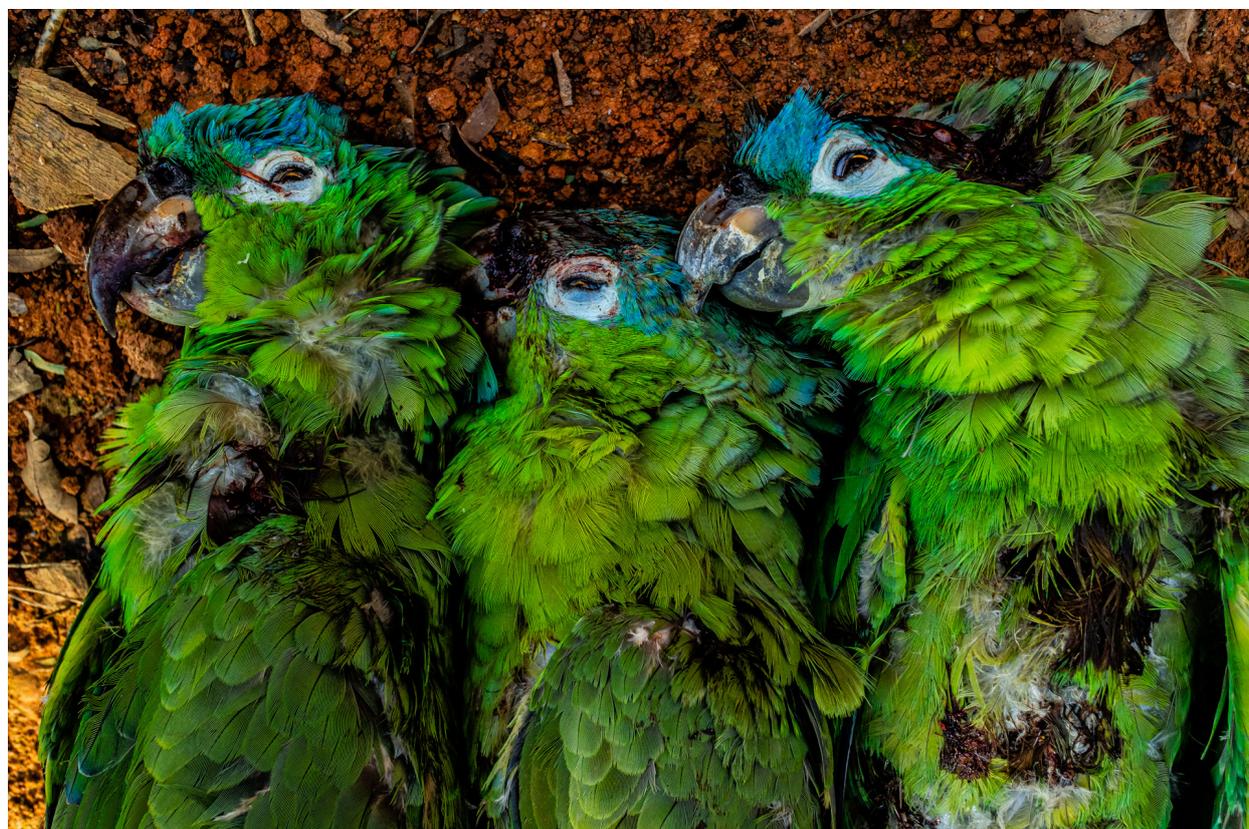
20. The Chamula mountain brook frog (*Duellmanohyla chamulae*) in the vicinity of Santa María Chimalapa in the Isthmus of Tehuantepec. Photo by Elí García-Padilla.



21. The Conant's false brook salamander (*Pseudoeurycea conanti*) in the vicinity of Vega del Sol, in the municipality of Sola de Vega. Photo by Elí García-Padilla.



22. The community forests of the Sierra de Juárez, worldwide pioneer of the Community Forest Management. Santiago Comaltepec, Oaxaca. Photo by Elí García-Padilla.



23. A group of *Amazona guatemalensis* hunted by local people to be consumed as forest meat. This species supposedly is protected and under a high category of vulnerability according to the Mexican and international legal instruments. However, we personally observed that in the region of the Los Chimalapas, a bastion of ca 400, 000 hectares of well- preserved forests, it is a very common species. Photo by Elí García-Padilla.



24. The tropical deciduous low forest and xeric vegetation typical of the Reserva de la Biósfera Tehuacan-Cuicatlán and the communal lands of San Pedro Jocotipac in the “Cañada” region, sanctuary of the last populations of Military macaw (*Ara militaris*). Photo by Elí García-Padilla.



25. The tree ferns typical of the mountain cloud forest in the humid zone of the Sierra Norte or Sierra Madre de Oaxaca, Sendero Relámpago, La Esperanza, Santiago Comaltepec. Photo by Elí García-Padilla.

