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Mammal's diversity of Tequila municipality, Veracruz, Mexico

Diversidad de mamíferos del municipio de Tequila, Veracruz, México

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Abstract

The study of the mammalian community structure is basic knowledge for the conservation of the group. The objective of the study was to describe the diversity of mammals in Tequila municipality, Veracruz, Mexico, using the phototramp technique. From September 2014 to April 2015, 11 phototramps were installed at 500 m from each other, to cover most of the geographic surface of the municipality. Each photocaptured mammal was identified with specialized guides and its risk category was verified in Mexican legislation and the structure of the mammalian community was described by the effective number of species. A richness of 16 species of mammals was recorded, of which eight species were rare and eight were abundant, indicating a balanced community due to the balanced proportion between carnivores, omnivores and herbivores. The study recorded three species of mammals at risk of extinction and, in addition, an endemic species from Mexico. To conserve the wealth of mammals it is necessary to implement actions to improve and enrich the habitat and a program of sustainable management of biodiversity by the indigenous society of Tequila, Veracruz.

Keywords: coniferous forest, mountain mesophilic forest, conservation, phototramp, mastozoology.

Resumen

El estudio de la estructura de la comunidad de mamíferos es conocimiento básico para la conservación de este grupo. El objetivo del estudio fue describir la diversidad de mamíferos en el municipio de Tequila, Veracruz, México, mediante la técnica del fototrampeo. De septiembre del 2014 a abril del 2015, se instalaron 11 fototrampas dispuestas a una distancia de 500 m entre sí, para abarcar la mayor parte de la superficie geográfica del municipio. Cada mamífero fotocapturado se identificó con guías especializadas y su categoría de riesgo se constató en la legislación mexicana y la estructura de la comunidad de mamíferos se describió mediante el número efectivo de especies. Se registró una riqueza de 16 especies de mamíferos, de las cuales ocho especies fueron raras y ocho fueron abundantes, lo que indica una comunidad en equilibrio debido a la proporción balanceada entre carnívoros, omnívoros y herbívoros. En el estudio se registraron tres especies de mamíferos en riesgo de extinción y, además, una especie endémica de México. Para conservar la riqueza de mamíferos se requiere implementar acciones de mejoramiento y enriquecimiento del hábitat y un programa de manejo sustentable de la biodiversidad por la sociedad indígena de Tequila, Veracruz.

Palabras clave: bosque de coníferas, bosque mesófilo de montaña, conservación, fototrampeo, mastozoología.

INTRODUCTION

Mammals are considered a key group in the structure and function of the ecosystem, but in Veracruz, these vertebrates are the least studied and with the greatest threat of extinction (Peterson *et al*., 2000). The community of mammals has a biological structure that is very sensitive to anthropogenic disturbances (Vázquez and Gastón, 2005) and to changes in the heterogeneity of its habitat (García-Burgos *et al.,* 2014), thus generating knowledge about the richness and abundance of this group in little-known or explored geographic regions, it is essential to implement conservation strategies (Ceballos, 2007).

In the territory of Veracruz state, Mexico, the presence of 195 species of mammals is reported, of which 30% (60 species) are monotypic, 18.5% (36 species) are endemic to Mexico and approximately 0.5% represent an endemic species (*Habromys simulatus*) (González-Christen and Delfín-Alfonso 2016). The Veracruz state is politically divided into several eco-geographical and socioeconomic regions, being Las Montañas region, located in the center of the state (Secretaria de Planeación and INEGI, 2010), an area little explored and with little knowledge about the community of mammals (González-Christen *et al.,* 2003). Las Montañas region, located within the physiographic region of the Sierra Madre Oriental, is considered the most important of the Transverse Neovolcanic Axis of Mexico, because the transition zone of mammalian species of nearctic and neotropical affinity converges (Fa and Morales, 1999) . Therefore, studying the diversity of mammals in this region represents a contribution to knowledge about the richness and abundance of mammals and it is the basis for decision-making on management and conservation (González-Christen *et al.,* 2006).

In Las Montañas region, studies on mammalian diversity (Serna-Lagunes *et al.,* 2019 a), predator-prey interactions (Serna-Lagunes *et al.,* 2019 b) and the effects of anthropogenic disturbance on the mammalian community (Macario-Cueyactle *et al.* 2019), point out that the socioeconomic conditions that prevail in the region may be affecting the mammalian community. For example, in municipalities of Veracruz with higher rates of poverty, illegal exploitation and indiscriminate and unplanned use of biodiversity are increasing (Cruz-Angón, 2011). Studying the community of mammals in socioeconomically vulnerable zones and with human-mammalian conflicts (Valdez *et al.,* 2006; Vázquez y Gastón, 2005), can provide basic/essential information to plan actions where society is incorporated in the sustainable management of wildlife and their habitat (Rodríguez-Macedo *et al.,* 2014), in order to minimize the overexploitation of their populations and the pressure on their habitat (González-Christen, 2011).

In the southeastern part of Las Montañas region, Veracruz, Tequila municipality is home to an indigenous population with a very high degree of marginalization (Apodaca-González *et al.,* 2014). In this sense, the municipality represents a scenario to study a)

threats, habitat loss and socioeconomic factors that impact the mammalian community (Tlapaya and Gallina, 2010; Macario-Cueyactle *et al*., 2019), b) have a clear diagnosis of the species or group of mammalian species that are being overexploited due to the uses that indigenous peoples place on wild fauna (Ojasti and Dallmeier, 2000) and c) to identify mammalian species whose minimum population size viable may be compromised (Mavíl and Cañedo, 1998). If this biological information is available, precautionary recommendations can be developed that reduce the risk of local extinction of mammalian species (González-Christen *et al.,* 2006).

Based on the above, the objective of the study was to describe the diversity of mammals in the municipality of Tequila, Veracruz, using the photo trapping technique, in order to generate knowledge for their conservation.

MATERIAL AND METHODS

Study area. This study was carried out in the municipality of Tequila, Veracruz, Mexico, located at coordinates 18° 42', 18° 48' of North Latitude and 96° 57', 97° 08' of West Longitude (figure 1). It has an area of 99.7 km^2 and an altitude that varies between 600 and 2,700 meters above sea level. It presents two types of climate: the first is determined by a temperate-humid-extreme climate (56% of the territory) with abundant rains in summer [(C (m) (w)], and a second climatic group that brings together a semi-warm climate -humid (32% of the territory), with abundant rains in summer [(A) C (m)] and semi-warm-humid (12% of the territory), with abundant rains throughout the year [(A) C (fm)]. The average annual temperature and precipitation is 18 °C and 1,496 mm, respectively (INAFED, 2019).

Three types of vegetation converge in the municipality: pine forest, mountain mesophilic forest and high evergreen forest (INAFED, 2019). These types of vegetation interact forming a gradient of environmental heterogeneity, due to the altitudinal proximity between these types of vegetation (Cházaro-Basáñez, 1992). In biogeographic terms, the municipality is immersed in one of the priority regions for the conservation of mammals in Mexico (Espinosa, 2003; García-Marmolejo *et al.,* 2008).

Tequila municipality is in the number three position, in terms of coffee production (8.7% of the regional production registered in the Fortín Irrigation District), obtained from indigenous municipalities of Veracruz state (Apodaca-González *et al.,* 2014). Tequila society is considered to be in a situation of greater vulnerability and with a very high degree of marginalization. In other words, they lack education (in Tequila there is a population of 30.2% illiterate and 54.7% of the population has not finished the basic education level), lack of access to food (88.8% of the population is in a degree of moderate to extreme poverty, 10.6% have social deprivation; while 0.1% is the vulnerable population due to lack of economic income and 0.5% is the population that is not in poverty or in conditions of vulnerability), with a high social lag rate; placing the municipality of Tequila

in the 11th position of the municipalities with the greatest social backwardness in Veracruz (INEGI, 2010).

In Tequila municipality, the land allocation for the establishment of coffee plantations has been extended to areas of natural occurrence of mammals, this may increase the probability of hunting on local wildlife; but we have scarce data on the hunting of vertebrates in Tequila municipality, both as hunted species and for catch volumes. According to studies carried out on cultural aspects of the Tequila society, it indicates the hunt of the "tiger", a ritual practiced by indigenous groups for the reaffirmation and preservation of the traditions that are part of their culture (Cuicahua and Xotlanihua, 2008). Another problem that occurs in this municipality is the disturbance of the mammalian habitat, due to the change in land use of the native vegetation that is replaced by another type of anthropic coverage, which represents an environmental mosaic with wide heterogeneity that they form agroecosystems, since there is 21.9 km^2 of surface area of the municipality destined to agriculture (coffee, cherry, grain corn and beans); 13.3% is constituted by a cover of mountain mesophilic forest, 64.1% corresponds to secondary vegetation and 0.5% is the surface corresponding to urban areas (INEGI, 2010).

Monitoring and taxonomic identification of mammals. The monitoring of mammals was carried out during the period from September 2014 to April 2015. During this period, 11 camera traps (Cuddeback® and Bushnell®) remained active to take photographs for 24 h, every 30 s when motion was detected. The cameras were held on the stem of a tree at an average height of 50 cm from the ground, they were installed at an average distance of 500 m between cameras and a strategic place was located at each site (permanent water sources, wildlife trails, fruit trees, cliffs, etc.), to increase the probability of capture (Chávez *et al.,* 2013). The photocaptured mammals were taxonomically identified by comparing the descriptive phenotypic characters of each species (Ramírez-Pulido *et al*. 2014).

Analysis of data. In order to evaluate the effectiveness of mammalian monitoring, the sampling effort indicator was used (represented in trap days). It was calculated using the number of days in the sampling period multiplied by the number of camera traps used in monitoring (Monroy-Vilchis *et al.,* 2011). To estimate the coverage of the sampled surface, the buffer zone covering the sampling surface range was obtained (Chávez *et al*. 2013). A mean range of 250 m in diameter was established from the center of each phototrapping (figure 1).

From the taxonomically identified mammals, a taxonomic list was prepared, which was ordered based on the nomenclature proposed by Ramírez-Pulido *et al.* (2014) and for each species, its risk category was found in Official Mexican Standard 059-SEMARNAT-2010 (DOF 2010).

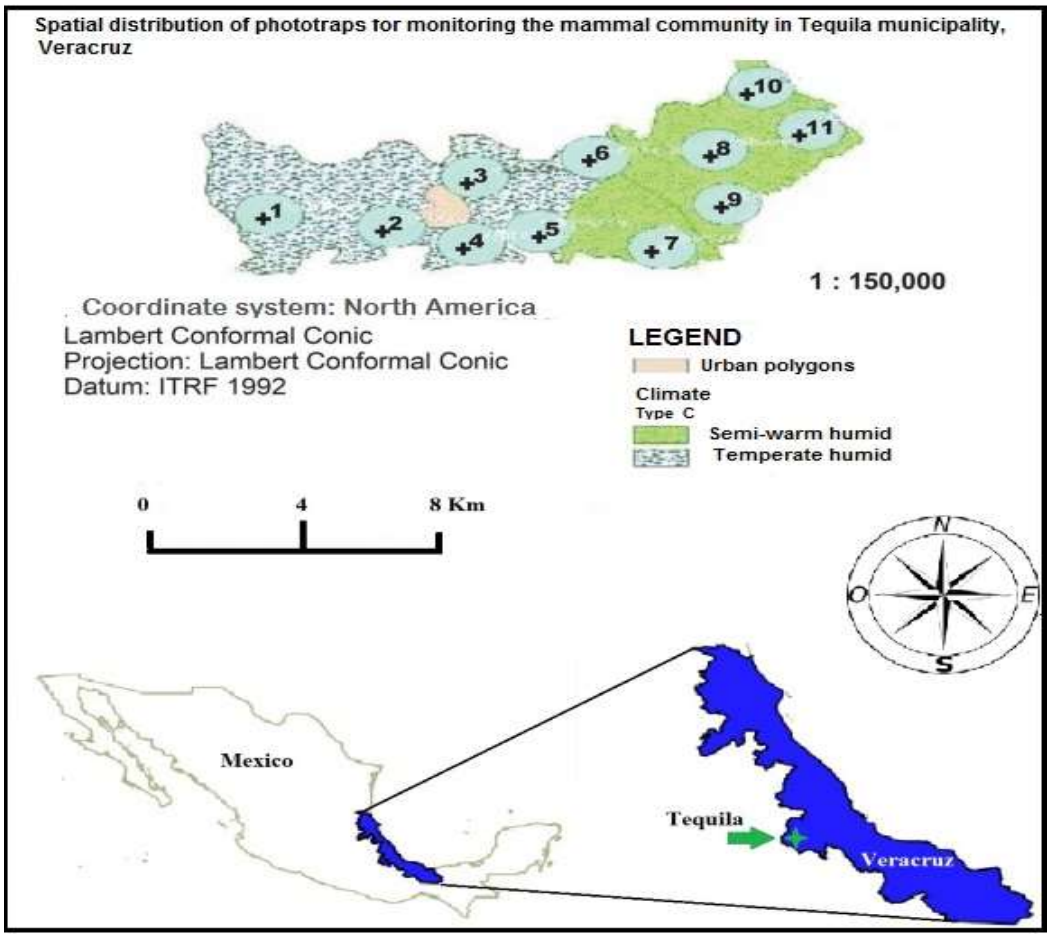

Figure 1. Location of the study area and monitoring characteristics of the mammal community of Tequila municipality, Veracruz

Before performing the diversity analysis, the mammalian photocaptures were classified as independent records by species (or number of different individuals), when they met the following criteria: 1) in consecutive photographs where animals of the same species were photocaptured, but that are fully distinguishable, 2) photographs in which it was not possible to identify different individuals, but whose photocaptures were taken 3 h apart, and 3) distinction of each individual in photographs of several individuals (Chávez *et al.,* 2013; Serna-Lagunes *et al.,* 2019 b).

In the Excel® program, a data matrix of records by species was constructed, ordered from highest to lowest. This file was configured to perform the analysis of a biological community, through the observed frequency of mammals in the monitoring; therefore, the structure of the mammal community of the municipality of Tequila was described by the prediction and species diversity estimators proposed by Chao and Jost (2015), as n: sample size; that is, the number of individuals of all registered mammalian species; number of species observed (*D*, equivalent to species richness), the proportion of coverage of the sample (*C*) and its coefficient of variation (*CV*).

The descriptive analysis also included the number of individuals observed for a rare group (n_rare), number of species observed in a rare group (D_rare), estimator of coverage of the sample of the rare group (C_rare) and its coefficient of variation of the rare group. (CV1_rare), number of individuals observed in an abundant group (n_abun) and number of species observed for the abundant group (D_abun). The description of these mathematical models used to estimate the diversity indicators can be consulted in Chao *et al*. (2015). The expected number of species with the Chao1 model or the richness of order 0 was calculate; because it uses the number of single and double counts to estimate the number of undetected species, since the information on undetected species is mainly concentrated in counts of species with low frequencies (Chao and Jost, 2015).

The exponential value of the Shannon entropy index was also calculated, using the estimator of Chao and Shen (2013), which determines the number of common species in the community (richness of order 1). Finally, the impartial estimator of the minimum variance of the inverse value of the Simpson concentration index was calculated, which is considered as the number of rare species in the sample (richness of order 2; Chao and Jost, 2012). These analyzes were carried out with the Species Prediction and Diversity Estimation software (Spade_R Online; Chao *et al*. 2015), following the user guide for calculating these indicators of the effective number of species (Chao *et al.,* 2015).

RESULTS AND DISCUSSION

This study represented an effort of 330 days of sampling and an effectiveness of 3630 days-trap. The effective sampling area covered by the camera traps is equivalent to 11% of the area of Tequila municipality, where 16 species of mammals were taxonomically identified using the photo-trapping technique. These species corresponded to 11 families and six taxonomic orders of the Mammalia class. The Carnivorous Order was the best represented group, because the presence of seven species was recorded, followed by the Order Didelphimorphia and Rodentia with three species each; the orders Artiodactyla, Lagomorpha and Cingulata were each represented with one species (Table 1). Of the 16 species of mammals registered in the study, three of them (18.7%) are in some category of extinction risk according to NOM-059-SEMARNAT-2010 (DOF, 2010). Only one species, *Dasyprocta mexicana*, is considered endemic to Mexico. 81% of mammalian species were recorded in both forests (coniferous and mesophilic) and 82% were recorded in the Jungle and Coffee plantation (Table 1).

Table 1. Mammals of the municipality of Tequila, Veracruz, Mexico. Its risk category is presented

Order	Family	Species	Common name	NOM 059	Coverage	Abundance
DIDELPHIMORPHIA	Didelphidae	*Didelphis virginiana*	Northern tlacuache		B, SC	20
		Didelphis marsupialis	Southern tlacuache		B, SC	9
		Philander opossum	Four-eyed tlacuache		SC	4
SYNGULATA	Dasypodidae	*Dasypus novemcinctus*	Armadillo		B, SC	26
LAGOMORPHA	Leporidae	*Sylvilagus floridanus*	Mountain rabbit		B, SC	20
RODENTIA	Sciuridae	*Sciurus aureogaster*	Red bellied squirrel		B, SC	30
	Cuniculidae	*Cuniculus paca*	Tepezcuintle		B, SC	20
	Dasiproctidae	*Dasyprocta mexicana*	Serete		SC	3
CARNIVORA	Procyonidae	*Bassariscus astutus*	Northern Cacomixtle	A	B, SC	28
		Nasua narica	Coatl		B, SC	13
		Procyon lotor	Raccoon		B, SC	9
	Mephitidae	*Conepatus leuconotus*	Skunk		B, SC	8
	Canidae	*Urocyon cinereoargenteus*	Grey vixen		SC	2
	Felidae	*Leopardus pardalis*	Ocelot	P	B	1
		Herpailurus yagouaroundi	Yaguarundi	A	B	1
ARTIODACTYLA	Cervidae	*Mazama temama*	Red brocket deer (Temazate)		B, SC	22

(A = threatened, P = danger of extinction), type of cover where it was photocaptured (B = coniferous forest and / or mountain mesophilic forest, SC = jungle and coffee plantation), and the number of records independent (abundance).

The sampling carried out in this study had a representativeness of 216 individuals of 16 species, this is equivalent to 99% coverage of the sample (CV=0.692); that is, 99% of the expected species were registered in the mammalian community. From the sample of mammals, 37 individuals were counted in a rare group composed of eight species; mentioning that these eight species had less than 10 individuals (table 1). The coverage of the rare group sample was equal to 0.946 (CV=0.63). The number of individuals observed in the abundant group was 179 individuals, belonging to eight abundant species; that is, those species that had abundances greater than 10 individuals (table 1). The number of species expected according to the Chao1 model was equal to 17.9 ± 3.72 (lower and upper confidence interval = 16.18 and 38.03 species); approximately equal to 18 expected species.

It was obtained that the richness of order 1 or the number of common species in the sample was 12,324±0.511 species (lower and upper confidence interval=11,323 and 13,326 species) and 10.91±0.57 rare species in the sample lower confidence interval and superior=9,786 and 12,046 species).

In this study, a richness of 16 mammals was recorded for Tequila municipality, Veracruz; these represent 8.2% of the 195 species of mammals with distribution in Veracruz state (González-Christen and Delfín-Alfonso, 2016). When comparing the richness of mammals observed with that reported in other studies, It was found that the community of mammals studied is more diverse than the richness of mammals that is distributed in the Pico de Orizaba National Park (10 species of mammals; Serna-Lagunes *et al.,* 2019 a) and exceeds the mammalian richness reported at approximately 50 km of linear distance from the area where this study was conducted (11 species of mammals; Macario-Cueyactle *et al*., 2019). When comparing the richness obtained in this study with that registered in Misantla municipality, north of Veracruz, it was only surpassed with one species (17 species); but the diversity of medium and large mammals was different, which is due to the distribution patterns of the species (Rodríguez-Macedo *et al.,* 2014).

From the 16 species of mammals, 50% of them were common or very abundant species, and the other 50% corresponded to rare or low abundance species in the community. This structure of the community of mammals represents a balance between the number of common and rare species, if analyzed from a trophic guilds perspective (Pérez-Irineo and Santos-Moreno, 2012); that is to say, the structure of the mammalian community is represented by 43.7% of mammals from the carnivorous guild, 37.5% by species from the herbivorous guild and 18.8% from the omnivorous guild; In this sense, the carnivores were the rare species or with low abundances, the herbivores behaved as common or very abundant species and the species of the omnivorous guild presented both species and common.

The temazate, *M. temama* was a common or very abundant species in the mammal community of Tequila municipality, this possibly as a result of the absence of natural predators of this species, such as the jaguar (*Panthera onca*) and cougar (*Puma concolor*) (Hernández-SaintMartín *et al.,* 2013; Ávila-Nájera *et al.,* 2016). On the other hand, the hunting pressure towards this species may have decreased in recent years due to factors such as the difficulty of hunting them, the arrival of the armed forces to the area, or the employment of people who were dedicated to hunting. They are now engaged in activities such as coffee cultivation; which limits their time to practice hunting this species. An interesting aspect of the analysis of this community of mammals is that the prediction of the Chao1 index determined that the community of mammals studied should contain two more species; that is, from the detected species it was predicted that two species should potentially be represented in the community. This coincides with the absence of records

of the two species of natural predators (jaguar and cougar), rare or not very abundant in nature. Therefore, it is difficult to detect them in a short period of monitoring (Ávila-Nájera *et al.,* 2015), or ultimately they are no longer present in the study area. However, the main threat of *M. temama* lies in the fragmentation of its habitat, due to the isolation of its populations to remnants of vegetation, which limits the ecological environmental niche for this species in Las Montañas region, Veracruz (Serna-Lagunes *et al.,* 2014).

It should be noted that *Odocoileus virginianus* and *P*. *tajacu*, two species with the highest hunting intensity in Mexico, do not have an ideal habitat in Tequila municipality, Veracruz, which would be limiting the geographical distribution of these species in the area; Another reason for the absence of these species is because historically they were hunted for hunting; they were potentially locally extinct or were displaced to other nearby habitats. It is a priority to carry out more studies to support the inclusion of *M. temama* in the list of Mexican species at risk of extinction, as in NOM-059-SEMARNAT-2010 (Diario Oficial de la Federación, 2010), to seek its protection from a legal perspective.

It is important to mention the relevance of the records of presence of *Dasyprocta mexicana* in Tequila municipality, Veracruz. This is an endemic species of Mexico, and that for the geographical region studied there was no previous information on its abundance. Therefore, these records represent new known localities for this species and confirm its presence within the range of its potential geographic distribution (Ceballos *et al.,* 2006). This species presented a low abundance in the community of mammals of Tequila municipality of, due to the fact that only three individuals were registered. The low abundance of this species in the study area may be due to the fact that habitat conditions are not favorable to maintain an abundant population; its low abundance may also be due to the fact that, as occurs in other localities in the central region of Veracruz, this species is the most hunted in the municipality (Tlapaya and Gallina, 2010); although it may also indicate that the species is in a recent process of colonization towards the ecosystems of the municipality. To carry out a sustainable management of this species, property owners and those interested in establishing a production system can develop and register a management plan in the System of Management Units for the Conservation of Wildlife, through habitat improvement practices. Its population size can be increased and it can be used for hunting, after estimating the density, authorizing the harvest rate and obtaining hunting bands; or it can also be raised intensively for local consumption or legalized commercialization of products (meat, skin and skull), as a successful production model; The example of the production system of *Cuniculus paca* to south of Veracruz can be considered (Pérez *et al*., 2010). This species*, C. paca*, presented a high abundance, compared to that reported in other mammalian diversity studies from different locations in Veracruz, Mexico (Gallina and González-Romero, 2018). This high abundance may mean that the ecosystem provides the necessary resources for the population of this rodent and that it is growing; because there are few natural competitors and predators in their habitat,

this would favor an increase in their local abundance (Santos-Moreno and Pérez-Irineo, 2013).
Despite the fact that the territory of Tequila municipality is home to a wealth of mammals, important in terms of the effective number of species, the presence of threatened and endangered species stands out. For example, *Herpailurus yagouaroundi* is at risk of extinction threat; while *Leopardus pardalis* is in danger of extinction (DOF, 2010). The two species of felines were rare species in the studied mammal community, as they had only one individual. Therefore, the low abundance of *L*. *pardalis* may be the result of its hunting for its use in rituals of the indigenous community of Tequila, since due to the characteristics that describe a "tiger" in the ritual (Cuicahua and Xotlanihua, 2008), coincides with the morphological characteristics of the species.

On the other hand, these feline species require habitat surfaces with dense forest masses, with basic conditions such as shelter and diversity of food resources (Bianchi *et al*., 2011), water sources and reproduction areas (Ruiz-Soberanes and Gómez-Álvarez, 2010; Rumiz, 2010), essential factors to maintain an abundant population (Sánchez-Lalinde and Pérez-Torres, 2008). It is necessary to carry out studies on the spatial and temporal overlap between the species that make up the mammalian community (Serna-Lagunes *et al.,* 2019 b), to have a clear diagnosis of the biotic interactions that occur in this ecosystem.

The cacomixtle, *B. astutus* is another species in danger of extinction (DOF, 2010) with a presence in Tequila municipality, but fortunately it was the second most abundant species in the community of mammals under study. It is possible that the anthropic environment experienced by *B. astutus* in Tequila municipality, Veracruz, favors this species in maintaining an abundant population (Sansores-Sánchez, 2016). In protected natural areas, a low abundance of *B. astutus* is reported, due to the low availability of resources (Cruz-Jácome *et al.,* 2015), but their populations are abundant in anthropogenic environments (Cisneros-Moreno and Martínez-Coronel, 2019), mainly because it has the ability to broaden the spectrum of its diet (Sansores-Sánchez, 2016); the latter could be occurring with the population of this species in Tequila, Veracruz.

On the other hand, only individuals of four species of mammals were recorded: *C*. *leuconotus*, *D*. *mexicana*, *P*. *opossum* and *U*. *cinereoargenteus*, in the type of vegetation of the jungle and coffee plantations. It is possible that due to the tolerance of these species to human presence during the coffee harvest, cultivation areas such as coffee plantations can provide food resources easily used by these mammals, despite the human presence (Pérez-Irineo and Santos-Moreno, 2010). The presence of these species, considered to have generalist habits and tolerance to disturbance, is the result of the resilience capacity of the mammal community to disturbed environments (Rosenblatt *et al*. 1999).

In Tequila municipality, there are anthropic threats that can alter the structure of the mammal community, such as habitat disturbance due to the change in land use for the establishment of coffee cultivation (Apodaca-González *et al.,* 2014), but through an agroecological management of the crop, the conservation of fragments of original vegetation and connected to each other, can contribute to the conservation of the habitat and reduce the risks that impact the structure of the mammalian community (García-Burgos *et al.,* 2014). It will be a priority to focus actions that help reduce deforestation and clandestine hunting directed at these species, to minimize the population impact on this group of mammals (Tlapaya and Gallina, 2010; Macario-Cueyactle *et al*. 2019). Another option to conserve the mammal species registered in the municipality of Tequila is to implement an environmental education program where key residents of the communities are integrated to make them aware of the hunting pressure that is exerted on the species and their habitat; as well as a biodiversity management program for the municipality of Tequila, which includes actions for the legalized use of wild fauna, such as hunting UMAs or ecotourism. For example, the temazate, *M*. *temama*, and the mountain rabbit, *Sylvilagus floridanus*, can be used through a hunting UMA, with extractive use and managed by the indigenous communities of Tequila municipality. For this, the Tequila city council administration can hire a specialist in the management of game fauna for the registration, operation and start-up of UMAs, whether communal or group, which under a long-term training program can potentiate the economy of the locals through the planned, ordered and legalized use of the total use or parts, or derivatives of the flora and fauna of the municipality, this would contribute to reduce poverty in this area.

CONCLUSIONS

A richness of 16 species of mammals was recorded, eight were rare species and eight were common. This balanced ratio reflects a balance in the community. The number of species in each trophic guild (carnivores, herbivores and omnivores) was proportional to that expected in a trophic pyramid. In the community of mammals, three species at risk of extinction were registered (*H. yagouaroundi*, *B. astutus* and *L. pardalis*). Eleven species were recorded in the jungle and forest, four species were considered habitat generalists and one species was present in a type of habitat. The community of wild mammals in the municipality of Tequila, Veracruz, has potential for its use and conservation through the UMAs system, although technical support is required that is based on the concept: “conserve by producing and producing to conserve”.

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