TECHNICAL REPORT WITH RESULTS DECEMBER 2019- DEC 2021

CONSERVATION PROJECT OF MAMMALS AND BATS INCLUDED IN THE NOM

By: Xiomara Gálvez

Direction of the Komchén de Los Pájaros Protected Area.

The expansion and generation of new urban areas have modified and fragmented the natural landscapes (Noss 1994; Aguilar et al. 2000) and caused local or regional extinction of species (Kirkpatrick and Jarne 2000) and, in some cases, has forced animal populations to move and concentrate in the relicts of vegetation that still remain intact (Tilman et al. 1994). in (Edwin Hernández-Pérez et., al 2015). In the case of Komchén de Los Pájaros, the protected area was affected by the henequen and cattle industry, although it is currently showing visible signs of recovery after more than 30 years of forest protection and a ban on hunting.

In the state of Yucatan, there are 51 species cataloged as at risk by Mexican regulations, 38 included in the Convention on International Trade in Endangered Species, and 15 globally threatened.

Komchén de Los Pájaros is a newly created Natural Protected Area (NPA) (2019). Regarding mammals, we only had references obtained through surveys of a group of local residents; there were no records of species or studies to confirm the presence of the mastofauna that inhabited the area.

Since 2019, the Civil Association (CCC) to which the Protected Area belongs, has signed collaboration agreements with several research institutions and local and foreign universities, so that researchers from different zoological groups could support us to obtain an inventory of flora, birds, terrestrial mammals, chiropters, reptiles, amphibians, and insects.

1- Study of the diversity of terrestrial mammals.

In 2019 The Autonomous University of Yucatan, under the coordination of Dr. Silvia Hernandez Betancourt. Research Professor of the UADY and Dr. Jorge A. Vargas Contreras Professor of the Autonomous University of Campeche and Professor Sol de Mayo Mejenes, of the Technological Institute of Chiná, conducted, as part of the exercise called “Bioblitz” the identification of rodents

and bats respectively, in the Private Natural Protected Area, Komchén de Los Pájaros achieving a preliminary inventory.

In order to quickly obtain a list of the species present in the different orders of flora and fauna in the protected area, two citizen science exercises called "Bioblitz" were organized with the participation of students, volunteers from the community, high schools and students from COBAY of Dzemul, who joined researchers from different centers and universities such as UADY, ECOSUR, CICY, UAC, El Parque Científico de Yucatán, Western Colorado University, and a group from the Instituto Tecnológico Chiná, in order to document with their cellular equipment, the photographic records of all the species of any genus of the animal kingdom that each person saw, during the 24 hours of monitoring, that comprised the exercise. The photographs were immediately uploaded to the INaturalist application within the project created for this purpose, called "Biodiversity in Komchén de Los Pájaros and its surroundings" and you can see them at the following link:

https://www.inaturalist.org/projects/biodiversidad-en-komchen-de-los-pajaros-y-sus-alrededores

However, it should be noted that the Tecnológico Nacional de México campus Chiná, Campeche (ITChiná) under the leadership of Sol de Mayo A. Mejenes-López, Professor B, has been the one who, since its participation in the Bioblitz, has followed up the inventory and continuity of several mastozoological investigations, grouped in the fundamental subprojects called:

2- 1- Study of the diversity of terrestrial mammals.

3- 2- Study of the diversity of bats.

4- 3- Monitoring of wildlife collisions on the Xtampu-Dzemul highway.

5- 4- Identification of plastic contaminants in the protected area "Komchén de Los Pájaros".

Since December 2019, the year of its establishment, the monitoring of mammals in Komchén de Los Pájaros began using the photo-trapping technique. Eight cameras provided on loan from the Instituto Tecnológico de Chiná, (ITChiná), were randomly placed on different trails in the forest. Small troughs of one meter in diameter were made by the ANP in the spaces determined as stations by the cameras, with the objective of expanding the network of water bodies that exist in the same and contributing to a greater probability of sightings in less time. Each camera was assigned a station (E), established by the history of animal sightings, by the presence of water troughs, and accessibility for its revision, which with an effort of Professor Sol Mejenes and 14 students of (ITchiná) on average were programmed, placed and revised every fifteen days.

Although photo-trapping is ideal for the study of species that are difficult to observe, due to their elusive behavior and low abundance (Chávez et al. 2013), camera monitoring was complemented with hikes along the main roads and transects within the PA to locate evidence such as feces, tracks on the ground, hairs, and laying sites. There have been four rounds in search of indirect records with the participation of four specialized people, in addition to the previous fourteen, as a collective effort.

During the days between June 1 and 12, 2020, tropical storms "Manuela" and "Cristobal" hit the Yucatan Peninsula hard, causing severe flooding; the camera traps were swept away by the water current and only two were not damaged. The damaged ones were quickly replaced by the ITChiná group to continue the work.

The diversity and species richness of terrestrial mammals in the state of Yucatan is 100 species (Sosa-Escalante et al. 2013), of which only 39 are medium and large mammals (orders Chiropter and Rodentia are discarded). The accelerated transformation of natural habitats that are replaced by various agricultural and livestock production systems has put the fauna at risk, especially the medium-sized mammals, given their ecological requirements; they are in themselves a group sensitive to anthropogenic disturbances that respond to environmental variations (Silvia Hernández Betancourt et al 2010).

The combination of photo-trapping and systematic transect monitoring allowed us to considerably expand the lists of terrestrial mammal species that had been reported in March and December 2019 by the Bioblitz. The current confirmed inventory is a total of 23 terrestrial mammals and 4 chiropterans. Its conservation status indicates that, of these 27 species, 10 are considered in the Mexican Standard with some degree of risk.

Of the terrestrial mammals, (four are endangered and five are threatened) and one chiropter (Mimon cozumelae) is considered threatened. Among the terrestrial species that are in some category of risk under NOM059-SEMARNAT-2010, are the Ocelot (Leopardus pardalis), Margay (Leopardus weidiiy), Tayra (Eira bárbara) and Anteater (Tamandua mexicana) are Endangered, and the Yaguarundi (Herpailurus yagouaroundi), Porcupine (Higgurus mexicanus), Greater Grison (Galictis vittata) and Badger (Nasua narica) are Threatened. (Fig.1 to 8). A table with each of the species can be found at the end of the document in (ANNEX I).

Because many of the species are considered endemic to Mesoamerica and their distribution is wide, 22 of the species recorded in the ANP are considered by the IUCN as of least concern (LC), and one species (Leopardus wiedii) in the Near Threatened (NT) category.)

Photo-trapping in 2019, also allowed us to detect the sporadic presence of dogs and cats belonging to neighboring common land shareholders. Recently, in mid-2021, we detected the presence of the coyote (Canis latrans), which had not been

seen or heard of in the area, nor reported by those surveyed in the local communities and shareholders' lands surrounding us, which is possible because this carnivore has expanded its natural distribution towards the peninsula as a result of deforestation caused by anthropogenic activities (Sosa-Escalante et al. 2013). The possible impact of this last species, which is a recent addition to the PA, will be evaluated in the near future (Fig. 9).

Fig. (1- 9) Photographic records of the photo-trapping process in Komchén de Los Pájaros.

Fig.1 Margay
(Leopardus weidiiy)

Fig.2 Ocelote
(Leopardus pardalis)

Fig.3 Jaguarundi
(Herpailurus yagouaroundi)

Fig.4 Great Grison
(Galictis vittata)

Fig.5 Aarvark
(Tamandua mexicana)

Fig.6 Porcupine
(Higgurus mexicanus)

Fig.7 White nosed Coati *(Nasua narica)*

Fig.8 GRAY FOX *(Urocyon cinereoargentus)*

Fig,9 Coyote *(Canis latrans)*

Fundamentally to the excellent and constant field work developed by the group of the Tecnológico de Chiná, important advances have been achieved in these two years:

As part of the results of the monitoring by photo trapping, a scientific report was published on the coexistence of two meso-carnivores (Urocyon cinereoargenteus and Spilogale angustifrons) in Komchén de Los Pájaros. (Copy of the Article in the block).

The paper "Preliminary identification of plastic contaminants in the area voluntarily destined for conservation "Komchén de Los Pájaros", Dzemul, Yucatan, Mexico, was presented at the "3rd Congress and 5th National Meeting of the Network of SOMUCAAB A.C." (Mejenes-López et al., 2021).

As a Requirement to Accredit the IX Semester of the bachelor's degree in Biology with a major in Biodiversity and Sustainable Development Presented by: Guadalupe de Los Ángeles Cab Paat Internal Advisor: Sol de Mayo A. Mejenes-López External Advisor: Gustavo E. Mendoza-Arroyo

The student of Professional Residency by Competence, Jonathan Pedro Morales Can accredit the XI semester of Forestry Engineering with a specialty in Tropical Forest Management and Climate Change, presented under the title: "Photo-trapping of terrestrial mammals and phenology of predominant trees in a low deciduous forest, Dzemul, Yucatan" with M. in C. Manuel Marin Quintero as an internal advisor and biologist Sol De Mayo A. as Mejenes Lopez as an external advisor.

All these results provide relevant information for the management plan of Komchén de Los Pájaros.

The current objective, to continue working under the hypothesis that "the diversity and conservation status of the native mammal fauna can be indicators of the conservation status of a forest", is to acquire stop camera traps and now that we

already know the diversity of species in the area, widen the study in other important aspects such as: knowing the seasonal abundance of at least for those species considered in the Mexican Standard, something extremely important because this could be related to water scarcity vs. abundance within the area or abundance or scarcity of certain foods. Many species tend to increase their activity areas, in search of food during the dry season (Reyna-Hurtado et al. 2009). Activity Patterns (Diurnal/Nighttime/Crepuscular; Crepuscular/Diurnal or Crepuscular/Nighttime) also allow actions to be taken at specific times. With information on their abundance and activity patterns, more precise strategies can be outlined for the conservation of those that are threatened, as well as for the maintenance of these little-studied low deciduous forest habitats.

6- Diversity of Bats in Komchén de Los Pájaros according to the studies carried out December 2019 - Dec 2021

Professor Sol Mejenes of (ITChiná) placed cameras and training students in the collection of footprints and other indirect traces in transects.

©Photo: SBrito, enero2020, Komchén de los Pájaros

Spear nosed *(Mimon cozumelae)*

In the face of serious and imminent global threats of climate change and environmental degradation, it is increasingly important to document the state of ecosystems and understand how human activities impact them. The order of Chiropters represents one of the most diverse groups of mammals, with more than 1200 species recognized worldwide that inhabit all terrestrial ecosystems except the polar circles (Wilson 2009). They are an ecologically important group due to the diversity of processes in which they are involved, such as plant pollination, seed dispersal and control of insect populations (Jones et al. 2009); and because they can respond to human-induced changes in ecosystems (Medellín et al. 2008). The bats of Latin America and the Caribbean form a particularly diverse group with more than 300 species and at least 58 of these are in danger of extinction

according to the IUCN (Hutson et al., 2001). There are 37 species reported for Yucatan (MacSwiney 2010).

The most important threats to bats in the region are considered to be the loss of habitat, the destruction of daytime roosts by humans due to the multiple myths that exist about bats (Navarro-López and Arroyo-Cabrales, 2011);

During the two Citizen Science exercises to take a snapshot of the biodiversity of the protected area, in order to involve the local surrounding communities of influence in the environmental education process, students from the Ricardo López Méndez high school and Colegio de Bacheller's de Dzemul were invited along with other young Scouts from Mérida who helped the scientists to place nylon nets to capture the bats, monitor them every hour, so that after their identification and registration by the experts (Dr. Jorge A. Vargas Contreras and Dr. Silvia Hernández Betancourt) they could be released. During the Bioblitz exercise, three species of bats were confirmed: Artibeus jamaicensis, Glossophaga soricina and Mimon cozumelae, which are listed in the NOM-059-SEMARNAT-2010 in the Threatened category.

During the 2020 and 2021 period, systematic studies have been carried out to widen the inventory of chiropteran species by the Tecnológico de Chiná ITchiná group. Currently we do not have the information because it is in the publication phase by their specialists.

The spear-nosed bat, also known as the bat of the Mayan cenotes (M. cozumelae), has a distribution from the south of the state of Veracruz, through Tabasco, the north of Chiapas and the entire Yucatan peninsula in Mexico, to the north of Colombia. In Yucatan it has been recorded because of its peculiar habitat, as it prefers to be inside cenotes. However, its prefered environmental characteristics, are not fully known (one of the points of interest). The importance of conserving them is related to their feeding habits for it is a bat that eats small insects that are dangerous to public health; it captures them during flight.

This bat is on conservation status by NOM-059-SEMARNAT-2010 as threatened, understanding that their populations are decreasing. The Tecnológico de ITChiná has continued sampling in one of the two cenotes of the PA, where in situ populations of the Mimon cozumelae bat have been recorded along with another species, the hematophagous bat (Desmodus rotundus), which has been found by placing nets nearby.

Since 2021, IT Chiná and ECOSUR specialists have conducted acoustic recordings of bats two nights per month with the Blogger equipment. The purpose of this is to expand and complement the records in the ANP. The scans have been downloaded to the computers and the records are currently being analyzed to determine the species. The ultrasonic bat detectors are considered an adequate methodological tool to improve the inventories of Neotropical bats. They increase by 40% the bat inventory recorded with traditional capture methods in a site with low deciduous forest in the Yucatan Peninsula. (Pech-Canche, 2010) Both studies are in the process of analysis and upon completion, the results will be published by the authors.

Because of their important and indispensable ecological role, the conservation of bats, in addition to studies of species diversity and ecology, requires the implementation of a specific and well-structured program to raise awareness among the local population; many species could ensure their survival in a favorable anthropogenic scenario. Bat conservation may not be a popular topic among the general public, but their ecological interactions represent many benefits for human activities (Kunz et al., 2011).

The general objective of this sub-project: To learn about, recover, and conserve the habitat and populations of bats that inhabit the NPA and its area of influence and to influence the inhabitants of neighboring human communities on the need to conserve them for their own benefit.

Main lines of action, Research: Continue with the studies mentioned above is our main tool to determine the diversity that exists, and identify priority species, areas, and sites of importance for the conservation of bats to focus our efforts. In the medium term, apply a Risk Assessment Method to determine and prioritize, under established criteria, those species at greatest risk in the ANP and its zone of influence.

Education: The goal is to increase people's knowledge on bats by raising awareness about their importance in the communities surrounding the ANP. Carrying out a pilot environmental education plan with children from one or two nearby communities, providing dynamic workshops to learn about these "demonized" mammals using participatory and dynamic, playful, and reflective techniques. The activities carried out in the pilot plan must have a perceptible and measurable impact on the target population; Train ANP workers and key people within the related communities in the knowledge of the bat species found within these areas and the environmental services they provide - At least 70% of the key people attending the training sessions recognize the feeding habits of bats-; To make the importance of bats known to people living in urban areas, creating synergies and alliances with key institutions (Botanical Garden, Zoological Park,

primary schools in Merida, among others) to carry out environmental education actions.

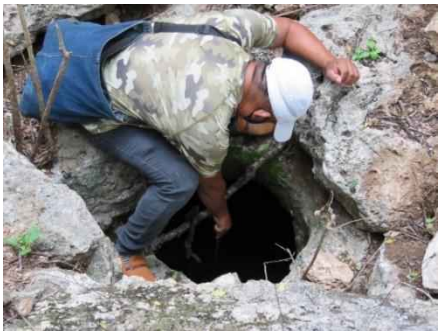
A weekend camp will be launched for elementary school children, which will allow them to learn about these species while enjoying participatory games with their parents. Please pay attention to this site, where we will soon give the specifications and you will be able to register

Chiropter Diversity in Komchén de los Pájaros 2020-2021

ESPECIES/SPECIES	TIPO DE REGISTRO/ TYPE OF RECORD	NOM-059-SEMARNAT- 2010	UICN
Fruit bat *(Artibeus jamaicensis)*	Bioblitz caught-released		
Sole bat (*Glossophaga soricina)*	Bioblitz caught-released		LC
Cozumel spear (*Mimon cozumelae*)	Bioblitz caught-released	**A**	**LC**
Hematophagous bat (*Desmodus rotundus)*	caught-released		**LC**

The bat studies were extended to 2022, but their results are being processed for scientific publication by the authors.

Professor Sol de Mayo (ITChiná) and her students setting up the nets to determine the diversity of bats in the protected area each month.



With the use of a GoPro camera attached to a cell phone, the colony of Cozumel Lance Bat (Mimon cozumelae) was corroborated in one of the two cenotes of the protected area.

Using a GoPro camera attached to a cell phone to corroborate the presence of a colony of bats (Mimon cozumelae) in one of the cenotes of the protected area.

3-Monitoring of wildlife collisions on a section of the Xtampu-Dzemul highway.

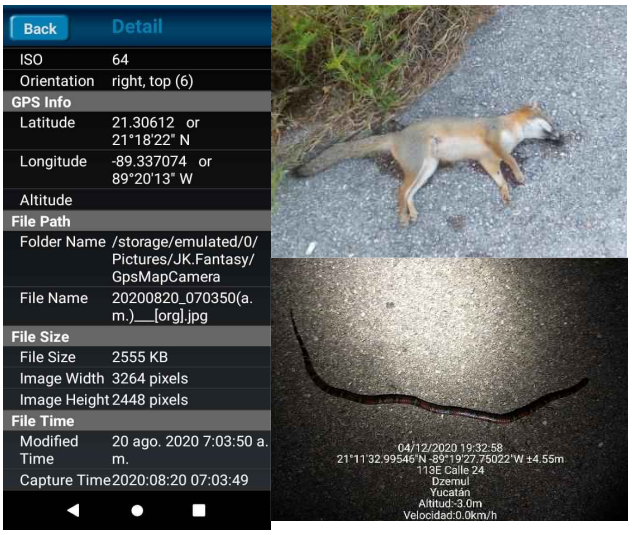
In general, road projects represent a social and economic benefit for development, but cause significant ecological effects such as fragmentation of ecosystems, reduction of native flora and fauna species populations, alteration of the hydrological cycle, production of particulate matter and noise, and water and soil contamination, ultimately affecting natural habitats and reducing biodiversity.

The barrier effect they produce tends to create groups of populations resulting from the division of a large population into small and partially isolated subpopulations, which over time have a greater probability of extinction than large populations (Primack, 1998); several studies indeed prove that the population densities of 60% of the forest and grassland species that live near roadsides are lower than the densities located far from them (Reijnen et al., 1996); that the noise generated by the Vehicular traffic is one of the factors that causes the greatest ecological impacts on fauna since it produces effects such as displacement, reduction of activity areas and low reproductive success, which is associated with hearing loss, increased stress hormones, altered behaviors and interferences in communication during the reproductive season, among others (Forman and Alexander, 1998). (María del Pilar Arroyave et al (2006). This author analyzes the run over rate of and its frequency and considers it related to various factors, such as traffic flow, speed, road width, species behavior, and vegetation cover. In Florida (USA), the

black bear, which is on the list of endangered species, had a mortality rate of 2-3 individuals per year in 1972, and increased rapidly to 44 individuals per year in 1989, due to the increase in vehicles in the area. Certain seasonal patterns of behavior, such as courtship, migrations, reproduction, mating, abundance of species and search for food, among others, make it possible for there to be a greater number of dead animals on the road at certain times of the year, According to a study carried out in the Yellowstone National Park in the United States by (Gunther et al., 2001). The implementation of signage to restrict speed decreases the number of cases of dead animals. Dome (2002)

The general objective was to evaluate the impact of the 16 km Dzemul-Xtampú road section on wildlife roadkill by determining the annual rate of species run over on the road section; identify the months with the highest number of deaths; identify the species most susceptible to being run over; and analyze mitigation measures to reduce the rate of wildlife lost to present to local and peninsular government bodies.

Methods and preliminary results



A community volunteer travels this road to work on the coast every other day.

The application was put on his cell phone and monthly payment was made to guarantee the data.

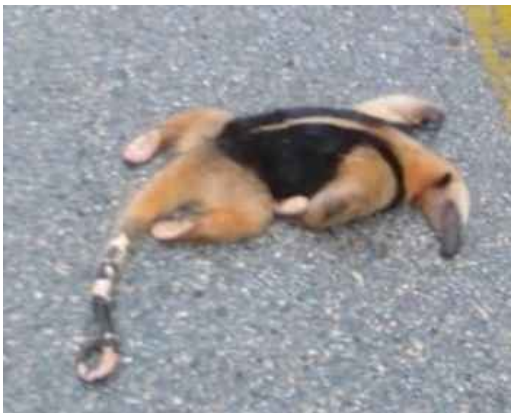
If the animal was in a condition to be taxidermized, the ANP is called, and the animal is kept cold until it is taxidermied and serves as a museum for environmental education

Preliminary results

In six months of sampling, from February to September 2021, 21 records of roadkill were documented. August is the month with the highest number of roadkill (11 species). The most affected species were the gray fox (Urocyon cinereoargentus) and the Tayra (Eira barbara).
Of the 21 deaths recorded, 4 representatives are among those considered to be in risk categories in the Mexican Official Standard (19.04%). In the case of the Tayra and the aardvark, two specimens of each were killed in six months. The results and

proposed measures to the government and authorities such as SEMARNAT will be made public soon.

ENDANGERED SPECIES (P) and THREATENED THREATS (A)



Aardvark (*tamadua mexicana)*

Oselote (*Leopardus pardalis) (P)*

Tayra(*Eira barbara)* (P)

Badger (*Nasua narica) (A)*

The specimens that can be taxidermized are recovered and used to train students by Professor Sol Mejenes of the Chiná Technological Center and as material for the protected area's environmental education project

If you wish to support this project or specifically each of the investigations mentioned above with your valuable time, activities such as clearing water bodies, collecting solid waste in old garbage exposition, doing work to remove small obstacles on the trails already open to receive visits from people with special abilities or you can easily help with funds to acquire resources such as cameras, cards, batteries or other supplies you can do it:

BBVA PayPal

Owner: Caribbean Conservation of Coastal Ecosystem A.C.

Account No.: 0113990583

CLABE: O12910001139905836

Please send us your proof of donation

Email: donativos@caribbeancoastconservancy.org

Or via **at: (52) 99 91 52 59 17**

Annex I

Diversity of terrestrial mammals confirmed in the studies performed December 2019 - Dec 2021

	SPECIES	TYPE OF RECORD	NOM-059-SEMARNAT-2010	UICN
1	Skunk (*Spilogale angustifrons*)	**FT, D**		**LC**
2	Gray fox *(Urocyon cinereoargentus)*	**B, FT, D, EX, AT**		**LC**
3	White tailed deer *(Odocoileus virginianus)*	**FT, EX, D, B**		**LC**
4	Aarvark (*Tamadua mexicana)*	**FT, EX, D, AT**	**P**	**LC**
5	Ocelote/Ocelot *(Leopardus pardalis)*	**E, FT**	**P**	**LC**
6	Jaguarundi *(Herpailurus jagouaroundi)*	**EX, FT, E, D**	**A**	**LC**
7	Margay *(Leopardus wiedii)*	**FT, AT, EX**	**P**	**NT**
8	Tayra (*Eira barbara)*	**D, AT,**	**P**	**LC**
9	Deer mouse(*Peromyscus yucatanicus)*	**B**		**LC**
10	Big-eared Climbing Rat (*Ototylomys phyllotis*)	**B**		**LC**

11	American opossum (*Didelphis virginianus)*	**FT, EX, D, AT**		**LC**
12	Grayish mouse opossum (*Tlacuatzin canescens*)	**D to be confirmed**		**LC**
13	Gray four-eyed opossum (*Philander opossum*)	**AT**		LC
14	Hispid Pocket Gopher (*Orthogeomys hispidus)*	**D**		**LC**
15	Armadillo (*Dasypus novencintus)*	**FT, D, AT**		**LC**
16	Badger (*Nasua narica)*	**B, FT, EX, D, AT**	**A**	**LC**
17	Racoon (*Procyon lotor*)	**FT, AT**		**LC**
18	Yucatan squirl *(Sciurus yucatanensis)*	**B, D, AT**		LC
19	Deppe's Squirrel (*Sciurus deppei)*	**B, D**		**LC**
20	Eastern cottontail rabbit (*Sylvilagus floridanus)*	**FT, EX, D**		**LC**
21	Porcupine *(Higgurus mexicanus)*	**B Foto**	**A**	**LC**
22	Greater grison *(Galictis vittata)*	**FT**	**A**	**LC**
23	Coyote *(Canis latrans)*	**FT, EX, D**		**LC**

FT: Photo trapping
EX: Excretive
D: Direct
AT: was run over /Run over (Roadkill)
B: Bioblitz
E: Heard

NOM CATEGOTIES	**UICN CATEGORIES**
Endangered (P).	**Near threatened (NT)**
Threatened (A).	**Least concern (LC)**