Final Evaluation Report

Your Details	
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Project Title	Hummingbirds and their nectar resources in Tabasco (Mexico): Identifying priorities and strategies for their conservation
Application ID	39330-1
Date of this Report	14h February 2025

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Establishing monitoring sites across three areas: Tapijulapa, Tenosique de Pino Suárez, and Comalcalco.		X		1. Particular interests of producers regarding insect monitoring in their crops. 2. High levels of insecurity throughout the state related to drug and human trafficking.
Identify the diversity of hummingbirds and their nectar resources.			X	1. Conduct long-term monitoring. 2. Include sites with different ecosystems and varying degrees of conservation.
Seeds and cuttings collection.		X		1. Enrich the availability of native plant species as resources for pollinators in pollination gardens. 2. Have enough plants and seeds available for outreach activities. 3. Identify the permanent sites to establish and monitoring floral strips.

2. Describe the three most important outcomes of your project.

a). Succeed in establishing hummingbird monitoring sites in three areas of Tabasco involving rural communities, citizens, students and government entities. During the first phase of this project, and for the first time in the state of Tabasco, we established three permanent sites to study hummingbird ecology. These sites involve a broad range of stakeholders, meaning that the activities and outcomes of this project will have an impact at various scales. For example, monitoring at the La Florida Biological Station (Tapijulapa) has allowed us to engage with both government and ejidal sectors. The Dirección de Bienestar, the authority responsible for the station, has requested biological data on hummingbirds and plants, which can be used to support conservation initiatives in the area. In the case of Villa Guadalupe, ecotourism is an important economic resource for the local community. As such, our visits are having a positive impact on the local economy by covering the costs of accommodations

during fieldwork. More importantly, our activities in the field are helping those involved in ecotourism explore the potential for incorporating birdwatching into the tourism offerings of the community (Figure 1). Finally, at ECOSUR, we are having a positive impact on the entire community, from administrative staff to academics, as well as students and children who visit our campus. Since the establishment of the plants and the beginning of hummingbird monitoring activities, we have been sharing our results with the community and offering plants and seeds to those who wish to create their own gardens. This project is linked to two others also carried out on ECOSUR campus (both directed by me): one monitoring bird biodiversity and the other monitoring mammal diversity using camera traps and recorders. Together, these three initiatives are producing impressive results regarding the importance of vegetation and the conservation of green spaces in suburban areas.

b). To have a preliminary lists of hummingbird species and plant species used by them as nectar resources. To date, we have identified eleven hummingbird species in the four sites visited, with the Florida Biological Station being the place with the highest diversity (ten species) (Table 1). We recorded four species that are rarely reported in the state of Tabasco, but given their frequency in the area, I believe the lack of records is due to a lack of research on this group in the state of Tabasco. In the case of *Campylopterus hemileucurus* (Figure 2), this species can be considered resident and is present almost year-round in Tapijulapa and Villa Guadalupe. In the case of species such as *Pampa curvipennis* (Figure 3), *Heliomaster longirostris* (Figure 4), and *Florisuga mellivora* (Figure 5), these species are local migrants and are occasionally present. Regarding plants, 31 species with an ornithophilous syndrome have been identified in the four sampled sites (Table 2). For these areas, families such as Rubiaceae, Heliconiacea, Acanthaceae and Bromeliaceae have the highest flower biodiversity with morphologies specialized for hummingbird visitation. Gesneriaceae is a plant family with flowers adapted for animal pollination. Specifically for this family, we identified three species with ornithophilous flowers that are very common in the area but have no records in scientific databases (Table 2, Figure 6). Also, we identified four endemic and four exotic plant species. This information allows us to detect plant species ideal for pollination gardens, such as *Hamelia patens*, *Malvaviscus arboreus*, *Ipomoea hederifolia*, and *Russelia sarmentosa*, which have already been planted in two pollination gardens. Other species, such as *Malvaviscus achanioides* (Figure 7) and *Helicteres guazumifolia*, show great potential and will be planted there very soon. Our monitoring activities at ECOSUR have detected the nectar preferences of hummingbirds, including native plants planted in the pollination garden and others present in the area before our project (Table 3). Finally, our results in La Florida are relevant for hummingbird conservation because we recorded nine hummingbird species visiting flowers of 16 plant species (Table 4). Compared to the records in iNaturalist, we have observations of three additional species: *Phaethornis striigularis*, *Amazilia yucatanensis*, and *Heliomaster longirostris.*

c). Seeds and cuttings collection. We established and enriched the seed and cutting collections using many of the plants detected during field monitoring. We applied different germination treatments to the seeds collected, using space available in the soil laboratory at ECOSUR (Figure 8). Nearly 90% of the seeds and plants that survived were planted and distributed in pollination gardens and outreach activities (Figures 9-11). The remaining 10% is kept at ECOSUR as a reserve to replace plants that may

be lost in the gardens due to herbivory, as well as genetic material for future cross-breeding experiments and seed production for germination and distribution at outreach events. What is relevant to start in the next phase of the project is identifying the permanent sites to establish and monitor floral strips. This will be crucial to begin the process of planting these nectar resources and monitoring hummingbird responses to nectar availability

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

During this first year, some difficulties arose, and I had to modify and implement some strategies to solve these problems. The main consequence of these difficulties was the need to search for different places to carry out the monitoring. Specifically, we fully completed the monitoring at La Florida Biological Station (Tapijulapa). Regarding Comalcalco, we were able to conduct monitoring for three months (from February to May 2024). Unfortunately, we were unable to visit Tenosique (I will explain the reasons later). Instead, we established a monitoring site at ECOSUR's campus (Centro) and another at Villa Guadalupe (Huimanguillo), both of which were fully and partially sampled, respectively.

Specifically regarding ECOSUR, due to the facilities available for sampling and monitoring on the campus where I worked, the activities planned for hummingbirds such as point counts, and monitoring the effect of planting native species on hummingbird biodiversity, were fully completed. It is important to note that we are obtaining interesting results regarding the use of native tree species by hummingbirds as nectar resources (Table 2). Also, as of December last year, we have detected five species of hummingbirds, one of which is a long-distance migratory specie (Table 1). Additionally, we are measuring how the presence of native plants collected and planted at ECOSUR is increasing not only hummingbird biodiversity but also the presence of other pollinating animals in the area. It is important to mention that ECOSUR is located in a suburban area, and compared to our monitoring sites in downtown Villahermosa, the biodiversity of pollinators is notably higher at ECOSUR, even despite the presence of many ranches and agricultural areas.

Regarding Villa Guadalupe, I am very happy to have managed to arrange the facilities to reach the community and establish a monitoring site there. As I will explain later, the people of this community have huge potential to benefit from hummingbirds and their nectar resources through ecotourism and plant sales activities.

At this point I can expose the first difficulty: **The lack of personal or institutional transportation that would allow me to reach the sampling sites**. ECOSUR does not have a sufficient vehicle fleet to meet the needs of the researchers, and because I do not have a personal vehicle, at the beginning it was difficult to figure out how to get to locations like Villa Guadalupe, where there are no commercial transport routes. By July 2025, I was able to get authorization at ECOSUR to pay for fuel using vouchers and also pay for driving services with daily wages. With these two approvals, I was able to hire someone to act as an 'Uber' to take us to and from the communities, including all the equipment and materials we needed. Fortunately, and given the characteristics of my project, it is now certain that I will be able to continue using this strategy to get to the different monitoring sites.

The second major difficulty I had to face, and the main reason I was unable to conduct monitoring in Tenosique and Comalcalco, was **the insecurity in the state, which is directly linked to drug and human trafficking**. Unfortunately, Mexico is currently facing complex security issues, and certain characteristics of the state of Tabasco (mainly its proximity to the state of Chiapas and the border with Guatemala) have contributed to this phenomenon exacerbating in an unexpected way. Many of my academic colleagues advised me not to take unnecessary risks on the roads. Instead, they recommended to look for study sites where, in addition to not needing to pass through areas with security challenges, there would be a strong and stable community organization and all the necessary amenities for food and lodging within the community.

During this first phase, the process of establishing relationships with the producers was slower than I expected, because **being woman and not being Mexican were obstacles to being considered an equal by some men**, especially older men who were used to hearing collaboration proposals from male engineers. Fortunately, I found a way to initiate interactions and be heard by some men in the community: during my first visit (or visits), I had a male colleague accompanying me. This allowed me to participate in discussions and learn about the community's difficulties and needs. From this initial indirect contact, I earned the opportunity to be recognized and demonstrated that I have knowledge and experience in certain areas. But most importantly, I was able to express my interest in learning from them and working together to build options for individual and collective well-being.

In the case of the Comalcalco site, the owner of the cocoa field expressed his interest in identifying the types of pollinators present in his field and which plants they are using as nectar and polliniferous resources. However, one month after starting the sampling, he expressed that he was particularly interested in non-stinging bees, as he plans to set up beehives on his land to produce honey, which has a high market value. In other words, **the landowner showed more interest in studying bees rather than hummingbirds.** As part of a different project, we included the collection of pollen loads from bees in the protocol (only at this site) and used palynology for pollen identification. Unfortunately, by May 2024, we had to stop monitoring due to the presence of forest fires and an increase in insecurity in the area.

The last difficulty was **learning how to obtain the scientific collection permit from the Mexican government in the fastest and most efficient way possible**. Since the headquarters of SEMARNAT (the Mexican government agency responsible for issuing permits) are in Mexico City, processing the permit from regional offices takes four times longer than usual. I was unaware of this difference, as all my previous processes with SEMARNAT were done in Mexico City, since I lived there. Now that I understand the process in detail, from the application to the submission of the final report, I have been able to request other collection permits quickly (within 30 days). So, for the following phases of this project, getting the permits will go smoothly.

4. Describe the involvement of local communities and how they have benefitted from the project.

At this point, the involvement of local communities is at an early stage. However, we have already taken significant steps forward.

During the monitoring in La Florida, as per the regulations at the station, we worked together with park rangers. In particular, one of them, named Miguel, is very enthusiastic about plants. During our talks and walks in the forest, my students and I taught him how to use tools for bird and plant identification, such as Merlin (Cornell Lab of Ornithology) and Naturalista (iNaturalist). He showed genuine interest in this, and during subsequent visits, Miguel improved his ability to identify birds, and his help was crucial for our activities. Miguel was the one who informed the local authorities around the station about the importance of birds and their potential for tourism. For sure, acquiring these skills will allow Miguel to identify plant and animal species in the area, and this will positively impact his activities as a guide and while conducting the monitoring station trails.

In the case of Villa Guadalupe, we carried out our activities with the guidance of Rómulo Olvera Sánchez. He lives in the community and is a farmer with crops and livestock in the area (Figure 1). He has an agroecological approach to land management, a perspective he developed empirically in his effort to increase production sustainably while respecting nature. Additionally, he also led tours to Cerro El Jaguar, accompanying various types of tourists. Since our first visits, he showed great interest in birdwatching and in how specific tours could be designed in the area for this purpose. I told him about the possibility of creating a community monitoring group, and he was very interested. He is a key figure in the socialization of the project and in advancing the proposed objectives.

In this community, Rómulo's wife, Magda, and Alicia (another woman from the community) have a great love for plants. We told them about our pollinator gardens at Centro and our challenges in obtaining native plants for them. Magda is currently reproducing some plants that will be planted in our pollinator garden at ECOSUR very soon (Figure 6). As I will explain later, this is an area with tremendous potential.

Finally, in May 2023, my students and I planted a pollinator garden at ECOSUR. Since then, we have been adding plants to the surrounding areas and other parts of the campus. It has been a beautiful experience with the ECOSUR community, which has expressed its joy in seeing many butterflies, bees, and hummingbirds flying around the area, as well as enjoying the amazing view of multiple colors throughout the year as they walk across the campus on a regular workday. Many students and community members are collecting seeds and seedlings to grow their own plants at home.

Related to this, the receptivity of the pollinator gardens among the citizens has been an amazing experience. Many people received the plants and seeds with great joy, and several of them sent me photos or emails sharing their experiences of growing and taking care of the plants.

5. Are there any plans to continue this work?

Yes, there are. As I mentioned earlier, some initiatives have arisen over the past months because of our interaction with communities and local authorities. Specifically for La Florida Biological Station (Tapijulapa), local communities around the station were informed about our bird research through one of the park rangers who works at the station and is also an ejido owner in the area. As a result of this interaction, local

authorities are now interested in initiating projects aimed at learning about bird diversity in their territories. A similar situation is occurring in Villa Guadalupe (Huimanguillo), where, years ago, a group of men and women organized around ecotourism, taking advantage of the community's proximity to a wonderful and unique mountainous area within the geography of the state of Tabasco: Cerro el Jaguar (Figure 1).

For both areas, I would like to explore the possibility of training local people in bird monitoring using the expertise of M.Sc. Carlos Soberanes, who is coordinating the Community-based Bird Monitoring Network in Mexico. This network falls under the responsibility of the National Coordination of the North American Bird Conservation Initiative (NABCI). Participants in this network are people from rural communities who learn how to perform standardized monitoring protocols. The implementation of these initiatives in the communities will generate useful information not only for their specific projects but also for species as well. Establishing relationships with the ejidatarios (through the monitoring of hummingbirds and birds) will allow me to directly connect with local producers. These producers are precisely the best candidates to establish floral strips in their territories. As I mentioned earlier, machismo (or gender bias) was an aspect that complicated my process of contacting farmers without difficulty during this first year, but by using the strategy of having a male colleague accompany me in the process, I have no doubt that I will be able to move forward with my initial proposal.

I also want to take advantage of the interest of the two women in Villa Guadalupe regarding the reproduction of native plants for pollinators, and with their support, grow the network of women actively participating. Given the economic challenges of this community, selling plants could be a very interesting income opportunity for the families. The key is to provide close support to them, prioritizing nursery germination and teaching them the importance of maintaining the genetic diversity of the plants that will be sold.

Of course, in the next phase, I plan to continue with the establishment and monitoring of pollinator gardens. This activity goes hand in hand with the ongoing monitoring of hummingbirds and plants, and it will be strengthened by the acquisition of native plants that can be grown by the communities themselves. It is important to note that my team will continue collecting and reproducing plants at ECOSUR. Academically, our gardens are essential for obtaining quality data that will help establish the role of gardens in the conservation of hummingbirds and other pollinators in urban areas of tropical regions in Mexico that have not yet been intensively studied.

I am so eager to continue with this project that, even though I haven't received the renewal yet, I've already started the process to obtain the collection license again with Mexico's environmental authorities (SEMARNAT). This will allow me to resume sampling as soon as possible.

6. How do you plan to share the results of your work with others?

My plan is to implement or continue with the following strategies:

a. Continue carrying out and participating in scientific outreach events in different urban areas. In June of this year, the third event 'Celebrating

Biodiversity' will take place. In this event, in addition to talks about local biodiversity, we will have activities for people of all ages. In my case, we will participate with a photographic exhibition on hummingbirds and native plants of Tabasco for pollinators. We will also have board games on the same theme, and we will continue giving away plants and seeds.

b. Continue creating audiovisual material about hummingbirds, plants, and pollination, which will be published on social media and targeted to different audiences. Social media is a tool that allows us to reach a diverse audience quickly, and it provides an opportunity to raise awareness about the biodiversity of a little-known state in Mexico. For sure, the Foundation will receive publicity in all these audiovisual materials.
c. An excellent way to share the results we are collecting is by inviting people from the community to participate in our field work activities. This strategy has helped me open new channels of communication, on a small scale but very efficiently, with people from the local communities. Some of the results and perspectives presented here are the outcome of this activity.
d. Continue giving national and international talks on hummingbirds, plants, and pollination. Talks that will not only be given by me, but also by my students, which will help them strengthen their skills in scientific outreach.
e. Publish the research results in peer-reviewed academic journals and outreach magazines. Specifically, by September 2025, the results of Melissa's Master's thesis, which include observational data on floral visitors to native plants planted in pollinator gardens, will have been submitted for publication. Part of these results are the product of the monitoring work of this project, and the Foundation will receive the corresponding credit.

7. Looking ahead, what do you feel are the important next steps?

For me, the crucial steps to move forward in seeking hummingbird conservation in Tabasco are:

a. **Continue with the monitoring of hummingbirds and plants at the established sites.** The method used so far has proven effective in detecting the diversity of hummingbirds and their nectar resources in the different monitored areas. However, it is a method that requires long-term monitoring, which, given the rapid destruction of ecosystems in the region and the recent climate changes, is an excellent tool for diagnosing the effects of the mentioned changes.
b. **Continue propagating native plants to enrich the pollinator gardens and to be distributed to both local and urban communities**. It is essential to always consider genetic diversity and avoid promoting the reproduction of clones without restriction.
c. **Use the charisma of hummingbirds for the conservation and recovery of native plants and other pollinator animals.** With the data collected so far in the pollinator gardens, we have confirmed the importance of these spaces in terms of biodiversity and the recovery of ecological interactions. Although this project focuses on hummingbirds, the work carried out has also supported the increase in biodiversity of other floral visitors and other ecological interactions around the gardens, such as herbivory, predation, and seed dispersal.
d. **It is vital to establish and strengthen relationships with the producers in the communities**. The objective is to take advantage of the relationships we are

building with community members through our visits and fieldwork, and connect with people who are interested in making changes in the way they manage their land in aspects related to pollinator conservation. And, very importantly, these people will allow us to monitor these changes and their results.

e. **Explore the possibility of organizing and involving residents interested in initiatives related to Community-based Bird Monitoring**. This type of training will be relevant for the improvement and diversification of the ecotourism activities that some communities are currently developing. It will also offer new alternatives to communities that want to learn about and record bird biodiversity in their territories.
f. **Establish and strengthen plant propagation as an economic alternative for the women in the community**. Teach and organize all the women interested in participating, focusing on how to grow and propagate plants. It would be great to invite some specialists who can offer workshops on techniques and strategies for plant propagation and establishment.
g. **Continue visiting other areas in Tabasco**. Currently, the areas my team is monitoring correspond to forests (with varying degrees of conservation). However, Tabasco has a large portion of its territory covered by aquatic ecosystems such as lakes, lagoons, and wetlands. I will visit areas with these characteristics to explore future research possibilities, as hummingbird ecology in these areas of Tabasco is almost unknown.

8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?
Yes, I did use The Rufford Foundation logo, and the Foundation received publicity. I will list these activities:

1. I created two videos I created two videos (available on Facebook) talking about hummingbird ecology, and proposing strategies to conserve this birds in our cities. Together, these two videos have accumulated over 5,500 views. These are the links:
   https://fb.watch/uSMDbi1xo4/
   https://fb.watch/uSMEafzPFq/
2. We are collaborating with the Jean Piaget School in Villahermosa, where we planted a pollinator garden. Our activities have also included workshops with parents and other students on pollination, plants, and the importance of this interaction in our lives (Figure 9).
3. We have participated in outreach activities in public places such as parks and Villahermosa's planetarium, including games, drawing activities, and photographic exhibitions about pollinators, flower colors, and pollination gardens (Figure 10-13). We are using these activities to give people seeds and native plants to help them start their own pollination garden.

9. Provide a full list of all the members of your team and their role in the project.

a. Name: Melissa Alejandra Ruíz Calao.
   Grade: She is pursuing a Master of Science in Natural Resources and Rural Development at ECOSUR under my supervision. For her thesis, she is monitoring two pollination gardens in the Municipality of Centro.

Role in the project: Melissa is working on plant reproduction at ECOSUR (seed germination and cutting establishment). Also she is doing the monitoring and maintenance of three pollination gardens in the Municipality of Centro. Melissa enjoys working with people and has been my right hand during workshops for citizens and the general public (Figure 8, 12, 13).

b. Name: Eduardo Emilio Bejarano.
   Grade: He is studying Biology at Universidad Juárez Autónoma de Tabasco and will receive his degree next September.
   Role: Emilio is participating in all the monitoring sessions conducted during the first phase of the project in Tapijulapa, Huimanguillo, and Centro. He has learned to implement the point count methodology and is amazing at watching and identifying not just hummingbirds, but birds in general. He is also a great photographer and collaborates in outreach activities (Figure 1, 14, 15).
c. Name: Fanny Karina May Frías
   Grade: She has been working with me for the last 6 months as a research fellow. In September, she will start the Master of Science in Natural Resources and Rural Development Program at ECOSUR.
   Role: Fanny is working on plant reproduction at ECOSUR (seed germination and cutting establishment). Also, together with Melissa and Emilio, she is monitoring and maintaining three pollination gardens in the Municipality of Centro and conducting hummingbird censuses in Municipality of Centro (Figure 12).
d. Name: Leticia Yatzil León Echavarría
   Grade: She has a degree in Economics with a Master's in Financial Management, and she is a dedicated birdwatcher for several years.
   Role: Lety joined the project in September of last year. She is participating in all the monitoring sessions conducted in Tapijulapa and Huimanguillo. She has learned to implement the point count methodology and is amazing at watching and identifying not just hummingbirds, but birds in general (Figure 1).
e. Name: Elsa Michel.
   Grade: She is studying Biology at Université de Sherbrooke (Quebec, Canada). She completed a six-month internship with me in Mexico from September to December 2024.
   Role: During her visit, she participated in all the monitoring sessions conducted in Tapijulapa and Huimanguillo. Additionally, she collaborated in the monitoring and maintenance of three pollination gardens in the Municipality of Centro (Figure 1,15).
f. Name: Félix Laberge.
   Grade: He is studying Biology at Université de Sherbrooke (Quebec, Canada). He completed a six-month internship with me in Mexico from September to December 2024.
   Role: During his visit, he participated in all the monitoring sessions conducted in Tapijulapa and Huimanguillo. Additionally, he collaborated in the monitoring and maintenance of three pollination gardens in the Municipality of Centro (Figure 1, 15).

10. Any other comments?

The possibility of receiving this grant has made a significant difference in my research capabilities, which in turn has had a positive impact on the development and

opportunities for my students. Currently, the support and internal funding situation for Mexican public research centers is very limited, as we directly depend on the government, and our budgets are guided by the priorities and needs of the entire governmental entity. Mexico is currently facing a very complex situation in terms of security and economic stability. For this reason, the budget for ECOSUR was reduced by 11% this year, which will directly affect my annual research budget.

I would like to request the renewal of the grant for a second period and be allowed to continue researching and learning about hummingbirds and plants in this complex part of the world. This year has been an amazing learning experience, where I faced some difficulties, but with the support and guidance of my friends and students, I was able to move forward and continue pursuing this dream.

TABLES

Table 1. List of hummingbird species recorded at study sites in Tabasco (Mexico) from July 2023 to December 2024. FL: La Florida Biological Station (Tacotalpa), VG: Villa Guadalupe (Huimanguillo), ECO: ECOSUR Campus (Centro), CUN: Cocoa field (Comalcalco/Cunduacán).

Species	Sites			
	FL	VG	ECO	CUN
Amazilia tzacatl	*		*	*
Amazilia yucatanensis	*		*	*
Anthracothorax prevostii	*		*	
Archilochus colubris			*	
Campylopterus hemileucurus	*	*		
Chlorestes candida	*		*	
Florisuga mellivora	*			
Heliomaster longirostris	*			
Pampa curvipennis	*			
Phaethornis longirostris	*	*		
Phaethornis striigularis	*	*		

Table 2. List of plant species with ornithophilous flowers recorded in Tabasco study sites (Mexico). FL: La Florida Biological Station (Tacotalpa), VG: Villa Guadalupe (Huimanguillo), ECO: ECOSUR Campus (Centro), CUN: Cocoa field (Cunduacán).

Family	Species	Site				Origin
		FL	VG	ECO	CUN	
Acanthaceae	*Justicia aurea*	*	*			Native
Acanthaceae	*Justicia mirandae*		*			Endemic
Acanthaceae	*Megaskepasma erythrochlamys*		*			Exotic
Acanthaceae	*Odontonema tubaeforme*		*	*		Native
Asteraceae	*Hidalgoa ternata*	*				Native
Bignoniaceae	*Jacaranda sp.*		*			
Bignoniaceae	*Tabebuia rosea*			*		Native
Bromeliaceae	*Pitcairnia punicea*	*				Native
Bromeliaceae	*Tillandsia sp.*	*				
Convolvulaceae	*Ipomoea hederifolia*			*		Native
Convolvulaceae	*Ipomoea quamoclit*			*		Native
Costaceae	*Costus scaber*	*	*	*		Native
Fabaceae	*Calliandra houstoniana*			*	*	Native
Fabaceae	*Delonix regia*			*		Exotic
Fabaceae	*Erythrina americana*	*	*	*	*	Endemic
Gesneriaceae	*Chrysothemis pulchella*	*				Native
Gesneriaceae	*Kohleria spicata*		*			Native
Gesneriaceae	*Moussonia deppeana*		*			Native
Heliconiaceae	*Heliconia latispatha*	*		*		Native
Heliconiaceae	*Heliconia rostrata*	*				Exotic

Table 2. Cont.

Family	Species	Site				Origin
		FL	VG	ECO	CUN	
Heliconiaceae	*Heliconia stricta*	*				Exotic
Heliconiaceae	*Heliconia uxpanapensis*	*	*			Endemic
Heliconiaceae	*Heliconia wagneriana*	*				Native
Lythraceae	*Cuphea cf. nitidula*		*			Endemic
Malvaceae	*Helicteres guazumifolia*	*	*	*		Native
Malvaceae	*Malvaviscus achanioides*		*			Native
Malvaceae	*Malvaviscus arboreus*		*	*		Native
Plantaginaceae	*Russelia sarmentosa*	*	*			Native
Rubiaceae	*Hamelia patens*	*		*	*	Native
Rubiaceae	*Manettia reclinata*		*			Native
Rubiaceae	*Palicourea tomentosa*		*			Native

Table 3. List of plant species visited by hummingbirds in ECOSUR Campus (Centro, Mexico). AMYU: *Amazilia yucatanensis*, AMTZ: *Amazilia tzacatl*, ANPR: *Anthracothorax prevostii*.

Family	Species	Hummingbird Species			Origin	Plant habit
		AMTZ	AMYU	ANPR		
Acanthaceae	*Odontonema tubaeforme*		*		Native	Herb
Asteraceae	*Zinnia elegans*	*	*		Native	Herb
Bignoniaceae	*Tabebuia rosea*			*	Native	Tree
Convolvulaceae	*Ipomoea quamoclit*		*		Native	Vine
Convolvulaceae	*Ipomoea hederifolia*		*		Native	Vine
Costaceae	*Costus scaber*			*	Native	Herb
Fabaceae	*Calliandra houstoniana*		*		Native	Shrub
Fabaceae	*Delonix regia*	*		*	Exotic	Tree
Fabaceae	*Inga vera*	*	*	*	Native	Tree
Heliconiaceae	*Heliconia latispatha*		*	*	Native	Herb
Malvaceae	*Malvaviscus arboreus*		*		Native	Shrub
Musaceae	*Musa × paradisiaca*	*			Exotic	Herb
Rubiaceae	*Hamelia patens*	*	*		Native	Shrub

Table 4. List of plant species visited by hummingbirds in La Florida (Tapijulapa, Mexico). AMYU: *Amazlilia yucatanensis*, AMTZ: *Amazilia tzacatl*, ANPR: *Anthracothorax prevostii*, CAHE: *Campylopterus hemileucurus*, CLCA: *Chlorestes candida*, FLME: *Florisuga mellivora*, PACU: *Pampa curvipennis*, PHLO: *Phaethornis longirostris*, PHST: *Phaethornis striigularis.*

Family	Species	Hummingbird Species									Origin	Plant habit
		AMTZ	AMYU	ANPR	CAHE	CLCA	FLME	PACU	PHLO	PHST		
Acanthaceae	*Justicia aurea*										Native	Herb
Asteraceae	*Hidalgoa ternata*					*					Native	Vine
Bromeliaceae	*Pitcairnia punicea*										Native	Epiphyte
Bromeliaceae	*Tillandsia sp.*	*										Epiphyte
Costaceae	*Costus scaber*										Native	Herb
Fabaceae	*Erythrina americana*		*						*		Endemic	Tree
Fabaceae	*Inga vera*	*		*						*	Native	Tree
Gesneriaceae	*Chrysothemis pulchella*					*					Native	Herb
Heliconiaceae	*Heliconia latispatha*	*			*	*	*	*		*	Native	Herb
Heliconiaceae	*Heliconia rostrata*	*				*			*		Exotic	Herb
Heliconiaceae	*Heliconia stricta*	*			*				*		Exotic	Herb
Heliconiaceae	*Heliconia uxpanapensis*									*	Endemic	Herb
Heliconiaceae	*Heliconia wagneriana*	*			*				*		Native	Herb
Malvaceae	*Helicteres guazumifolia*	*									Native	Herb
Plantaginaceae	*Russelia sarmentosa*		*								Native	Herb
Rubiaceae	*Hamelia patens*					*				*	Native	Shrub

FIGURES

Figure 1. Photograph of the work team conducting hummingbird and plant monitoring at Cerro El Jaguar (Villa Guadalupe, Huimanguillo). Rómulo Olvera Sánchez (in the right corner) is our guide and local expert. Photographer: Leticia León Echavarría. Place: Villa Guadalupe (Huimanguillo. Date: 2024/11/30

Figure 2. *Campylopterus hemileucurus* resting in a perch close to a patch of heliconias. Photographer: Emilio Bejarano. Place: La Florida Biological Station (Tapijulapa). Date: 2024/09/09.

Figure 3. *Pampa curvipennis* visiting *Heliconia latispatha*'s inflorescence. Photographer: Emilio Bejarano. Place: La Florida Biological Station (Tapijulapa). Date: 2024/09/09.

Figure 4. *Heliomaster longirostris* resting in a perch close to a patch of heliconias. Photographer: Ramsés León. Place: La Florida Biological Station (Tapijulapa). Date: 2024/09/07.

Figure 5. *Florisuga mellivora* resting in a perch close to a patch of heliconias. Photographer: Emilio Bejarano. Place: La Florida Biological Station (Tapijulapa). Date: 2024/09/09.

Figure 6. *Kohleria spicata* (Gesneriaceae). Photographer: Emilio Bejarano. Place: Villa Guadalupe (Huimanguillo). Date: 2024/11/29.

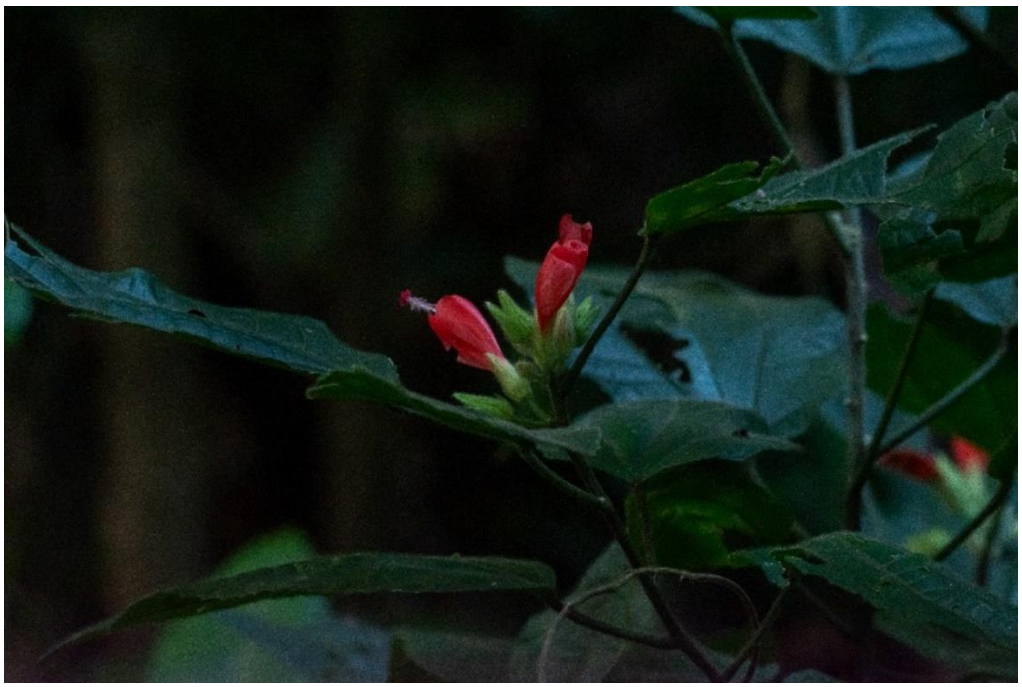

Figure 7. *Malvaviscus achanioides* (Malvaceae). Photographer: Emilio Bejarano. Place: Villa Guadalupe (Huimanguillo). Date: 2024/11/29.

Figure 8. Seed treatments applied to seeds collected at La Florida Biological Station and the Municipality of Centro. Photographer: Claudia Rodríguez. Place: ECOSUR (Villahermosa). Date: 2024/07/17.

Figure 9. Workshop for parents and students to learn about pollination, flowers, pollinators, and urban gardens. Here there are the plants and seeds given to the participants. Photographer: María Concepción Frias. Place: Jean Piaget School, Villahermosa. Date: 2024/02/2.1

Figure 10. We were invited to the 2nd Biodiversity Festival in Villahermosa. There, we participated with games, drawing activities, and photographic expositions about pollinators, flower colours, and pollination gardens. Photographer: Emilio Bejarano Place: Parque Museo La Venta, Villahermosa. Date: 2024/05/26.

Figure 11. Pollination garden in ECOSUR (Municipality of Centro). Photographer: Claudia Rodríguez. Place: ECOSUR Unidad Villahermosa. Date: 2024/08/16.

Figure 12. Photograph of the work team conducting the monitoring at Yumká Park (Centro), where a pollinator garden was planted. Photographer: Melissa Alejandra Ruíz. Place: Yumká Park, Centro. Date: 2024/09/27.

Figure 13. We were invited to the 3rd National Knowledge and Innovation Week 2023. There, we participated with games, drawing activities, and photographic expositions about pollinators, flower colours, and pollination gardens.
Photographer: Emilio Bejarano
Place: Villahermosa's Planetarium.
Date: 2023/11/16

Figure 14. Photograph of Emilio Bejarano during the monitoring of hummingbirds and plants at Villa Guadalupe (Huimanguillo).
Photographer: Claudia Rodríguez
Place: Villa Guadalupe (Huimanguillo).
Date: 2024/11/30

Figure 15. Photograph of the work team conducting hummingbird and plant monitoring at Cerro El Jaguar (Villa Guadalupe, Huimanguillo).
Photographer: Claudia Rodríguez
Place: Villa Guadalupe (Huimanguillo)
Date: 2024/11/30