

Bats, agaves, and people: Collaborative conservation to protect endangered pollinating bats

By Kristen Lear

Mexican long-nosed bats (Leptonycteris nivalis) are listed as endangered in the United States and by the International Union for the Conservation of Nature. Populations have declined by approximately 50% in 15 years, a decline expected to continue without immediate conservation action. Each spring, pregnant females migrate from central Mexico to give birth to and raise their pups in northeast Mexico and the U.S. Southwest. During this journey, they rely on the nectar of agave plants for food, and in turn provide critical pollination services for agaves. However, these foraging resources are under threat from destruction of natural habitat, climate change, and the harvest of agaves by people for numerous economic and cultural uses. Current conservation efforts include agave restoration initiatives to increase foraging habitat for the bats during their migration. My research aims to fill critical knowledge gaps and to directly inform the implementation of these restoration efforts, particularly around two important roosting caves in Nuevo León and Coahuila in northeast Mexico.

RESEARCH APPROACH

The goal of my work is to provide a better understanding of how to design restoration and conservation efforts that are both ecologically and socially feasible and effective. I adopt an interdisciplinary research approach that integrates methods and analyses from the natural and social sciences.

In order to design appropriate habitat restoration programs, it is imperative first to understand the animal's foraging requirements. This entails a deeper analysis of what constitutes a high quality foraging area - the characteristics of the agaves and the surrounding landscape that attract foraging bats. To help answer these questions, I used infrared cameras to monitor and record the bats' nightly feeding visits to flowering agaves. Additionally, I conducted agave surveys to measure key characteristics of the landscape and the flowering agaves in the monitoring sites. I will subsequently employ statistical modeling tools that will shed light on resource and landscape preferences of pollinating bats.

Appreciating that the issue of bat conservation is a subset of a larger socio-ecological system, I have also focused on

Significance

Contribution to conservation practice: This research will contribute to on-the-ground conservation efforts for an endangered pollinating bat, including ongoing agave restoration initiatives in the U.S. and Mexico.

Strategic communication: Collaborative work with local conservation partners in Mexico has focused on increasing awareness of bats and their ecological and economic importance and encouraging participation in bat conservation efforts.

Strengthening international

collaborations: I have sought to strengthen U.S.-Mexico relations through my contribution to a bi-national bat conservation network and partnerships with Mexican organizations.

understanding the social contexts of the rural communities that harvest and use agaves in the region. Through semi-structured interviews with community leaders and ethno-ecological interviews with agave harvesters in 14 communities near known bat roosting sites, I hope to provide a better understanding of how people in the region harvest and use agaves, the effects of harvest practices on agave growth, reproduction, and overall populations, and what institutional, economic, and environmental drivers guide management decisions.

RESULTS

Preliminary results from the foraging study indicate that the bats prefer agaves that are clustered together rather than spread out across the landscape. This information can guide conservation organizations as they implement agave restoration programs. In addition, the videos recorded during nightly monitoring can be valuable educational tools for communities and researchers interested in participating in and designing restoration efforts.

Interviews with community members have revealed numerous uses of agaves in northeast Mexico, including the use of the sap for traditional beverages like agua miel and pulque, the use of the leaves and flowering stalks for livestock fodder and fences, and planting of live agaves to serve as "living fences." Importantly, the level of agave harvest differed across communities, with some communities relying heavily on harvest for their livelihoods, and others using agaves mainly as a supplementary resource (for example during times of drought).

Understanding these differences is key to developing agave restoration programs that fit within the livelihoods and social contexts of local communities. In addition, results from the ethno-ecological interviews indicate that the effects of harvest on agave growth and reproduction vary by agave species and the specific harvest practices used. This cautions us against making unidirectional assumptions about the effects of agave harvest - harvest may not necessarily be detrimental to agave populations (and therefore bats) and instead encourages us to incorporate local ecological knowledge and context when planning restoration initiatives.



When feeding on agave nectar, Mexican longnosed bats pollinate the plants, which helps maintain healthy agave populations.



Interviewing a community leader about local agave harvest and management practices.

CONCLUSIONS

In 2016 my colleagues and I established the Nivalis Conservation Network, a bi-national group of researchers, NGOs, and government agencies from the U.S. and Mexico working for the conservation of the species. Our efforts so far have resulted in revision of the bat's Species Status Assessment for the U.S. Fish and Wildlife Service and hosting a colloquium on pollinating bats for local stakeholders. With Bat Conservation International, we are now initiating community agave restoration programs in the region. I am hopeful that these kinds of collaborative, transnational efforts will ensure effective and long-lasting conservation outcomes.

Kristen Lear is a PhD Candidate in the Warnell School of Forestry & Natural Resources and Integrative Conservation program. In her work as a bat conservationist, she seeks to develop effective and equitable solutions to bat



conservation challenges through collaborative research, partnership with local communities, and public engagement and outreach. For more information, visit https://kristenlear.wixsite.com/ batconservation.



The Integrative Conservation PhD Program (ICON) trains agile scientists to address 21st century socio-ecological challenges. ICON is currently a degree option in the Department of Anthropology, Department of Geography, Odum School of Ecology, and Warnell School of Forestry & Natural Resources.