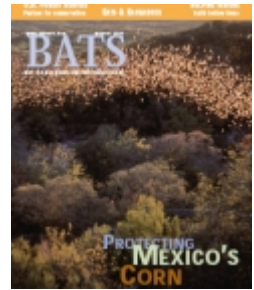



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Protecting Mexico's Corn
Bats help keep the pests at bay
Leonardo J. López-Damián



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Corn is the heart and soul of Mexico's agriculture. It accounts for more than 60 percent of the nation's total agricultural output and 62 percent of its cultivated land. Up to 18 million people – some 17 percent of Mexico's population – depend on corn production for their livelihood. And bats help them do it.

Mexican free-tailed bats (*Tadarida brasiliensis*) make a major contribution to protecting these all-important corn crops from insect damage. That fact, however, is almost completely unknown to most farmers in Mexico, where bats face a wide array of perils. Although bats are invaluable to ecosystems and human economies, they are often persecuted because of needless fears born of myths and misinformation. Accurate information confirmed by scientific investigation can be a powerful tool in promoting bat conservation.

Under the direction of National Autonomous University of Mexico Professor Rodrigo Medellín, who heads the Program for Conservation of Mexican Bats (PCMM), I am conducting the first systematic study of the diet of Mexican free-tailed bats in Mexico. PCMM and its parent, BIOCONCIENCIA, which promotes conservation throughout Mexico, are sponsoring the study, which is designed to document the freetails' role in reducing corn pests. This project is supported in part by a BCI Student Research Scholarship funded by the U.S. Forest Service International Programs.

Among the most damaging pests of Mexico's corn crops are two insects: corn earworm (also known as cotton bollworm) moths (*Helicoverpa zea*) during summertime in northern Mexico, and fall armyworm moths (*Spodoptera frugiperda*) during winter months in the south. The larvae of these moths cause enormous destruction to corn plants and ears. Both moths are active primarily at night, and bats are primary predators of night-flying insects.

Both moths are also major crop pests in the south-central United States, where bats' economic values are well documented and many farmers, especially Texas cotton growers, have learned the lesson. Close to 100 million Mexican free-tailed bats spend their summers in caves, bridges and tunnels of Central Texas. Each bat can eat roughly two-thirds of its body weight in insects every night for a remarkable total of roughly 1,000 tons of insects nightly.

In 2006, an interdisciplinary research project concluded that the pest-reduction services of Mexican free-tailed bats in south-central Texas are worth an average of about \$740,000 a year to cotton farmers whose annual harvest is valued at about \$6 million.

But what is the bats' impact in Mexico? To find out, we decided to document the freetails' diet and how it changes across the nation. Millions of these bats spend winters in central and southern Mexico, then migrate to northern Mexico and the southwestern United States each spring. The bats' geographical and seasonal distribution coincides with the activity of the two major insect pests over cornfields, so bats obviously prey

heavily on the moths. Our task was to document that and convince people of the direct economic value of protecting these bats.

We worked in three caves, each home to about 1 million Mexican free-tailed bats: La Boca Cave in northern Mexico; El Salitre Cave in central Mexico; and in the south, San Francisco Cave in the state of Chiapas.

We visited each cave once a month for more than a year, capturing bats as they returned from their nightly foraging. Even now, whenever we approach one of the sites, we are awestruck by the thick stream of bats emerging from the depths, their darting bodies and flapping wings silhouetted against the twilight sky. It takes up to an hour for these thousands upon thousands of bats – each one a voracious hunter of insects – to fly out of their roost.

We captured more than 1,500 Mexican free-tailed bats returning from their foraging bouts, and obtained nearly 900 samples for dietary analysis. Insect identification requires careful comparison of various pieces with pictures and descriptions of insects in the scientific literature, as in a complex jigsaw puzzle.

Our results showed a very diverse diet. Among bats from all three caves, we identified insect parts from 40 insect families that represented 15 orders. Major food items were moths, small beetles and true bugs, such as stinkbugs and seed bugs.

At La Boca and El Salitre, where Mexican freetails are largely absent during winter months, the diet is dominated by moths from July to September. This is right after adult flying moths begin to emerge from cornfields in June. In San Francisco Cave in the south, where freetails are found year-round, moth consumption peaks from January to March and again from August to December. This coincides with moth emergences from cornfields in the region.

Bats are clearly taking advantage of this abundant food supply and feeding heavily on moths that wreak so much destruction on Mexico's most important crop. The order Lepidoptera (moths and butterflies) accounted for approximately 63 percent of total volume of the Mexican free-tailed bat diet in our samples from all three caves. Our next step is DNA analysis of a subset of fecal samples to document the bats' consumption of specific crop pests.

BCI and PCMM have worked to protect these and other bat caves in Mexico for more than 12 years. The bat colonies in this study present complex challenges that require long-term commitment. For example, San Francisco Cave is being used as a drainage for local wastewater. We have been working for three years to convince the local government of the health risk, and La Trinitaria Municipality has begun work on a recovery plan that is to include a water-treatment plant.

We hope research such as ours may stimulate these and other conservation projects in Mexico. Efforts to protect bats must be solidly based on strong science, knowledge of local conditions and cooperation with the local people. Our goal is to provide clear and convincing evidence of bats' exceptional values and help people appreciate the economic payoff of protecting these bats and their habitats. Such knowledge can go a very long way toward building a consensus on bat conservation in Mexico and around the world.

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