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## The Tucson Bee Collaborative

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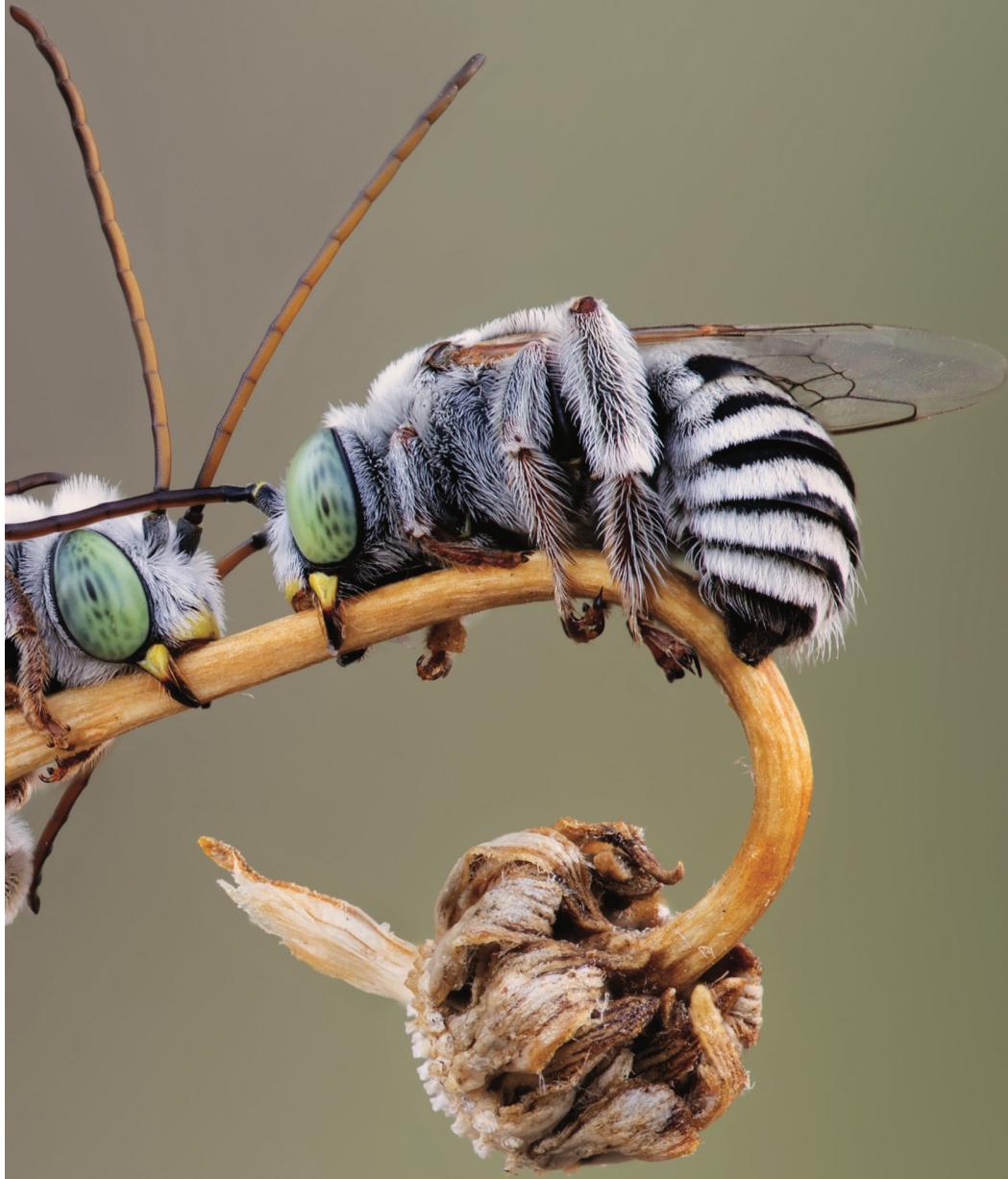
Women Take to  
the Skies

# The Tucson Bee Collaborative: Helping Save Arizona's Native Bees

Story by Wendy Moore, Kimberly Franklin, Jennifer Katcher  
Photography by Bruce D. Taubert



Native Arizona bees in the genus *Idiomelissodes*. Males sleep (in aggregate) by grabbing plants with their mandibles to keep them from falling off the stalks while sleeping.



People—researchers, educators, students, artists, citizen scientists—in Southern Arizona concerned about the environment are coming together in the Tucson Bee Collaborative. Aimed at increasing knowledge about native bees and the importance of pollination writ large, the Tucson Bee Collaborative celebrates biodiversity and empowers community members to be part of regional conservation efforts.

Even awareness of native bees eludes many. Species of native bees vary in size, from the big black carpenter bees (reaching an inch in length) to minuscule bees no bigger than a carpenter bee's foot. Bees are also remarkably varied in color and behavior. Unlike honey bees, which live in hives, most native bees are solitary, meaning that individual females work alone to excavate their nest, construct brood chambers, and provision them with a mixture of pollen and nectar. Once a single egg is laid within a provisioned brood chamber and sealed off, the bee larva develops into an adult bee in the protective solitary confinement of its private chamber.

Given that native bees do not make honey, nor do they make large nests with hundreds of offspring, they are much less conspicuous than their famous honey bee relatives, which originated in Europe. But native bees are no less important to life in the Sonoran Desert; they are the primary pollinators of native plants. Unlike honey bees, which were brought to North America by humans 400 years ago, native bees (and their ancestors) have lived here for millions of years and are specifically adapted to pollinating flowers in the Sonoran Desert Region.

As important as these species are ecologically, we know very little about them. Many species are very difficult to identify visually, even by the few bee specialists in the world. It is for this reason that we don't even know how many species actually live here, but estimates vary between a staggering 700 to 800 species. In fact, southeastern Arizona is one of the hottest biodiversity hotspots in the world for native bees. More species live here than in any other place in the world, with the possible exception of the desert areas in and around Israel.

Females in the genus *Centris* collect oils and pollen from native flowers to feed to their offspring.



*Centris pallida* mating on mesquite. This species pollinates palo verde trees and has evolved to survive the extreme heat of the Sonoran Desert's midday summer temperatures.

To track the health of native bees we need to be able to recognize and identify the many species. To help surmount this challenge, the Tucson Bee Collaborative is creating tools that allow researchers and conservationists to identify all the bee species in the Sonoran Desert Region, using their DNA sequence data.

Founded on the principle that well-curated natural history collections have always been, and will always be, the foundation of modern biology, the University of Arizona's Insect Collection (UAIC) plays a central role in the collaborative. The collection houses

more than 2 million specimens, including 16,000 native bee specimens acquired during the Arizona-Sonora Desert Museum's (ASDM's) long-term native bee survey and monitoring project, as well as 100,000 additional specimens of native bees from collections accumulated throughout the Sonoran Desert Region over the past 60 years.

The collaborative aims to reveal the DNA sequence of a portion of the cytochrome c oxidase subunit I (COI) gene region (the animal "DNA barcode") of every bee species in southeastern Arizona and then to make those sequences publicly and freely

available. Much like the barcodes on items in grocery stores, the pattern of the nucleotides in each bee species' "DNA barcode" gene is unique. Once revealed, that species-specific pattern of nucleotides can aid researchers, students, and conservationists in the challenging task of species identification, which is crucial for survey and monitoring projects such as those being conducted at ASDM, the US Geological Survey's Southwest Biological Science Center, and others. Vouchered, barcoded specimens will be curated in the UAIC, providing a touchstone for researchers to determine the accurate scientific names of other unknown specimens in the future.

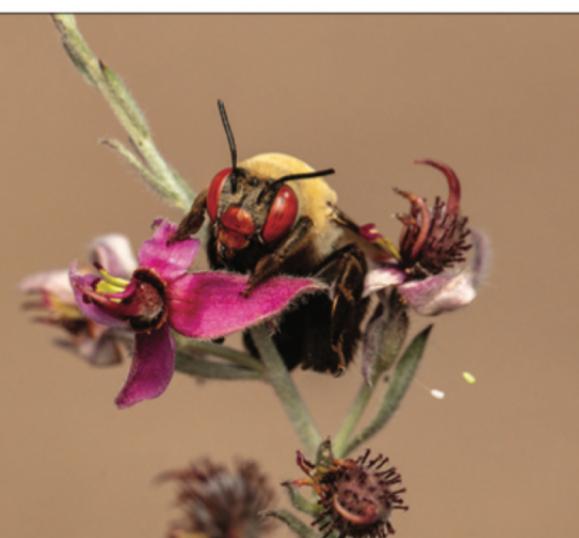
With seed funding from the Agnes Nelms Haury Program in Environmental and Social Justice, students at Sunnyside and Flowing Wells high schools are joining those at Pima Community College and the University of Arizona to generate those DNA sequences while learning advanced biotechnology skills that will be useful in the workplace. Information flows between campuses like the water in the network of tributaries of a meandering river, building energy and strength as the

*Top right:* This *Diadasia rinconis* bee is perched on its favorite flower, the prickly pear cactus. These "cactus bees" harvest cactus pollen to feed their young; in the process they pollinate the cacti.





*Centris cockerelli* is one of many Arizona native bees that collect oil and pollen from only a small group of plants in the family Krameriaeae.



This male *Centris caesalpiniae* is waiting on an oil-bearing flower (genus *Krameria*) in the hope of mating with a female bee while she visits the plant to collect the flowers' oils and pollen to feed her offspring.

collaborative grows. The collaborative has already published 107 bee bar-codes with the help of more than 107 local students.

Volunteers and docents are the foundation of the collaborative, participating at every step of the way—from collecting the bees, to creating a synoptic bee collection from survey and monitoring projects, to recording accurate data about where and when the bees were collected. Artists are capturing the beauty of these important pollinators through macrophotography, scratchboard paintings, and watercolors. Together, all are making a difference to our understanding of native bees, the state of our environment, and the health of the bees that call Tucson home.

To learn more about the collaborative and how to become involved, visit [tucsonbeecollaborative.com](http://tucsonbeecollaborative.com).

**DL**

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