New Pollinators

Buzzing With Potential

An ice-cold glass of cranberry juice makes a tasty, refreshing, and healthful drink on a warm spring day. To produce this zesty fruit, cranberry plants rely on busy insect pollinators to move grains of cream-colored pollen throughout the berry bog. The domesticated honey bee, *Apis mellifera*, has always played a key role in handling that task at America's commercial cranberry farms.

Today, however, thousands of this country's honey bee hives are besieged by mites or beetles or by microbes that cause devastating diseases. That means the hardworking honey bee—along with commercial beekeepers and growers of the crops that rely on this useful insect—might benefit from some help from other, lesser known pollinators.

Pollinating cranberries is a particularly daunting task. That's because an average acre of cranberry plants produces about 20 million blooms. Each flower needs to be visited at least once by an efficient pollinator in order to turn the white blooms into ripe crimson berries.

Cranberry growers are seeking the expertise of entomologists at the Agricultural Research Service's Bee Biology and Systematics Laboratory in Logan, Utah, to discover new pollinators that might be adept at working in cranberry bogs.

With funding from a cooperative research and development agreement between ARS and the country's largest cranberry-grower cooperative—Ocean Spray Cranberries, Inc., of Lakeville, Massachusetts—entomologist James H. Cane of the Logan lab is investigating bees that pollinate cranberries. Working in a New Jersey cranberry bog, Cane has found two species of native bees that might have the requisite pollination prowess.

One, known as *Osmia atriventris*, belongs to a family of native bees that nest in holes in stems, branches, fence posts, tree trunks, or other aboveground cavities.

"We are encouraging this small, steely blue bee to work in cranberry bogs," says Cane, "by furnishing plenty of nesting materials, such as wood blocks with holes drilled in them."

Another bee that looked promising in Cane's preliminary tests: a honey bee-sized leaf cutter called *Megachile addenda*. "This bee," says Cane, "makes its shallow home in the sandy bottom of the cranberry bog, remaining there even when the bog is flooded for half the year." Cane hopes to acquire a large enough supply of both bees this year to further test their pollinating know-how.

Help Wanted: Tireless Workers To Boost Crop Yields

Besides cranberry farmers, growers of other crops have also sought out the Logan bee researchers for help in finding other insects well-suited for pollinating their fields or orchards—and for ensuring high yields. For instance, California avocado producers, are looking to the Logan team for help in overcoming pollination-related problems that are being blamed for disappointing yields.

Their request led Logan entomologists Jordi Bosch and William P. Kemp to launch a new study using two commercial

JACK DYKINGA (K8872-6)

The hills are alive with the sounds of pollinating insects, and that's exactly what technicians Rebekah Andrus (left) and Olivia Messinger are netting in a field near the Wellsville Mountains (Utah).

SCOTT BAUER (K7791-11)

Blue orchard bee, *Osmia lignaria.*

avocado groves in southern California as their primary test site.

Bosch and Kemp are comparing the pollen booty collected by several different bee species—including the domesticated *Apis mellifera* honey bee and the big and furry Western bumblebee, *Bombus occidentalis*. They are also

checking the blue orchard bee, *Osmia lignaria,* which gets its common name from its metallic blue-black color, and the perky, white-banded *Megachile rotundata,* or alfalfa leafcutting bee, best known as a superb pollinator of this field crop.

In addition, Kemp and Bosch are working with colleague Carlos H. Vergara of the Universidad de las Americas in Puebla, Mexico, to conduct insect surveys in avocado groves there. They are identifying native avocado-pollinating insects that have co-evolved with this exotic crop in its homeland. That might lead them to species useful in California groves.

Bee Haven

Though the primary focus of the research at Logan is on finding superior pollinators for commercial crops, the scientists have also built an international reputation for excellence in research on bee biodiversity and conservation.

That's why the U.S. Golf Association and The Xerces Society, an international, nonprofit conservation group based in Portland, Oregon, turned to the lab for help with Wildlife Links, the U.S. Golf Association's innovative effort to increase the diversity of plants and animals at roughs and out-of-play sites on golf courses.

Logan entomologist Vincent J. Tepedino is determining the best native plant species and nest-making supplies to use to motivate bees to nest and forage in specially replanted sections of golf courses. He is doing the work at three Wildlife Links golf courses in Oregon and Washington.

"Golf courses," says Tepedino, "have a reputation of being biological deserts. But strategically locating oases of native vegetation on Wildlife Links courses should boost biodiversity. We expect these plantings to become havens for native bee species."

Inventory of Pollinators

Other biodiversity and conservation research under way at Logan includes a multiyear survey of pollinating insects that the National Park Service asked the Logan scientists to conduct at Pinnacles National Monument in California. ARS entomologist Terry L. Griswold, who is also curator of the laboratory's U.S. National Pollinating Insects Collection (see story, page 6), leads this insect census—the first of its kind for the site. The intent: to help the National Park Service identify and protect the monument's native pollinators.

What's more, Griswold is investigating native bees of the rugged canyonlands of southern Utah, including the newly established Grand Staircase-Escalante National Monument.

And the Logan scientists were responsible for conducting the most detailed survey ever completed of the pollinating insects of southern Nevada's Clark County, where urbanization is speeding ahead at a breakneck pace. Entomologist Tepedino's scrutiny of pollinators that visit a rare native poppy known as Las Vegas bear claw, or

JACK DYKINGA (K8874-18)

Entomologist Vincent Tepedino examines a *Megandrena enceliae* bee specimen.

Arctomecon californica, for example, has shown that nearly two dozen different pollinators—bees, beetles, and wasps—frequent the poppy's bright yellow flowers.

Among the most important of these is *Megandrena enceliae.* With white stripes on its dark body, *M. enceliae* is an unusually handsome bee. Male bees "might spend their nights sleeping in poppy flowers," says Tepedino, "and their days seeking females to mate with,

JACK DYKINGA (K8872-17)

Technician Olivia Messinger and collection curator Terry Griswold observe newly captured insects.

all the while spreading significant amounts of pollen among poppies."

The comprehensive inventory of Clark County's wild pollinators can be used by planners and land managers to increase the odds that *M. enceliae* bees and other important pollinators will continue to flourish in this unique desert ecosystem.—By **Marcia Wood,** ARS.

This research is part of Crop Production, an ARS National Program (#305) described on the World Wide Web at http://www.nps.ars.usda.gov/programs/cppvs.htm.

James H. Cane, William P. Kemp, Jordi Bosch, Terry L. Griswold, and Vincent J. Tepedino are with the USDA-ARS Bee Biology and Systematics Laboratory, 5310 Old Main Hill, Logan, UT 84322-5310; phone (435) 797-2524, fax (435) 797-0461, e-mail beeweb@cc.usu.edu.

Visit the Logan bee laboratory on the World Wide Web at http://www.LoganBeeLab.usu.edu. ◆

World Class Museum
Bee Detectives Identify Puzzling Pollinators

With nearly 1 million bees, wasps, and other insects neatly arrayed in boxes and trays, the U.S. National Pollinating Insects Collection in Logan, Utah, ranks as one of the world's top 10 bee museums.

"We have one of the best collections of native American bees, as well as significant holdings from Mexico, Costa Rica, Spain, and several other countries," says curator Terry L. Griswold. He oversees the collection as part of his job as entomologist with the ARS Bee Biology and Systematics Laboratory at Logan.

Though much of the museum's work takes place indoors, Griswold and his museum associates regularly make collecting forays of their own.

Bees in the collection range in size from the petite *Perdita minima,* a light tan, 1/8-inch-long bee that lives in the Sonoran and Mojave Deserts, to the imposing 1.5-inch-long *Xylocopa frontalis,* or carpenter bee, a brown or blackish-brown insect from Central and South America. These and other specimens are safeguarded in some 1,600 drawers at the bee laboratory, located at Utah State University.

A steady stream of requests to help identify specimens pours into the laboratory all year. Last year, in fact, the museum identified a record-breaking 15,100 specimens sent in from all over the world plus an additional 75,000 specimens collected by Griswold and colleagues.

Some requests come from beekeepers who need help identifying strange bees that have wandered into wooden blocks meant to house other species. Agricultural officials who inspect cargo—looking for insects that could threaten America's fields and orchards—rely on the Logan curatorial crew for help in determining who's who among their insect captures. Griswold and colleagues, for example, have helped identify insect hitchhikers discovered in shipping containers or, in one instance, in the cockpit of a jetliner.

JACK DYKINGA (K8874-1)

One of the top bee museums in the world, the U.S. National Pollinating Insects Collection requires careful maintenance. Here, technician Susana Messinger places labels on samples.

Homeowners beleaguered by bees that have taken up residence in the walls of a bedroom or garage similarly want to know the identity of the unwanted houseguests.

Researchers eager to learn about bees they've recently collected from places near and far will often find out from Griswold that they've discovered a new species.

"We know we have a new species," Griswold says, "when we can't find an exact match to our museum specimens or to specimens borrowed from other insect collections around the world.

"When we identify a species as new, we can often help with the classification, or systematics. Systematics is about the relatedness of one species to another. It's sort of like figuring out where a relative belongs on your family tree.

"Sometimes these new discoveries," says Griswold, "can help us catch—and correct—old errors in classification made decades ago, when scientists had to base their classification decisions on much less information than we have today."

From time to time, Griswold's indoor work includes supervising scientific illustrators who create elegant, highly detailed, pen-and-ink sketches of portions of bee anatomy that are critical to distinguishing one species from another.

"No matter how many times one of those insects turns out to be a new species," Griswold says, "it's still a real high. You know that you are holding in your hand a bee that, until now, no one even knew existed."—By **Marcia Wood,** ARS.