

Buzzing Across the Border

Scientists and beekeepers search for ways to lessen the impact of Africanized honey bees on U.S. agriculture and society.

“They can be almost impossible to work...”

“They killed my donkey...”

“They aren’t very scary...”

“They wouldn’t let me out of my car...”

“They are a gift from God...”

Who they are, are the Africanized honey bees—a.k.a. the “killer bees”—and these are reactions from Mexican beekeepers who have to live with them.

ARS scientists are monitoring the impact of Africanized honey bees in Mexico, both in the wild and in apiaries, or bee yards; it’s the best way to forecast what U.S. beekeepers will be up against in coming years.

Although entomologists have always been sure that Africanized honey bees would nowhere near live up to their Hollywood reputation as evil villains preying on the public, there has been a major concern about what Africanized honey bees will do to beekeeping in the United States.

Originally, the ARS honey bee monitoring program in Mexico was designed to document the effect of Africanized honey bees on the

resident population of honey bees. It also provided an early warning to the United States about when to expect the Africanized bees’ arrival.

But the problems that beekeepers face are common on both sides of the border, explains William T. Wilson, an entomologist who heads the ARS Honey Bee Research Unit in Weslaco, Texas.

“Finding ways to manage honey bees when the feral bees surrounding the area are Africanized is just as important to Mexican beekeepers as it is to U.S. beekeepers. Mexico simply had the Africanized bees before we did,” says Wilson.

So a cooperative program was created through a memorandum of understanding between the two countries’ agriculture departments.

Wilson not only surveys apiaries in Mexico, he exchanges research information with his Mexican counterparts on a regular basis. More informally, he provides advice and management information to beekeepers.

On a recent surveying trip across the border, Wilson was asked by a Mexican agricultural official if he had time to discuss treatments for parasite problems with local beekeepers. When Wilson agreed, more than 15 beekeepers from the Montemorelos area showed up for the impromptu session, with just 24 hours’ notice.



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Migration of Africanized Honey Bees

These bees have spread northward and southward since their accidental release in Brazil in 1957. The rate at which they migrate is influenced by many factors including weather. Approximate migration lines on the map show that the bees’ advance has slowed significantly since 1992. The area Africanized in 1995 was almost the same as 1994 except in Southern California.

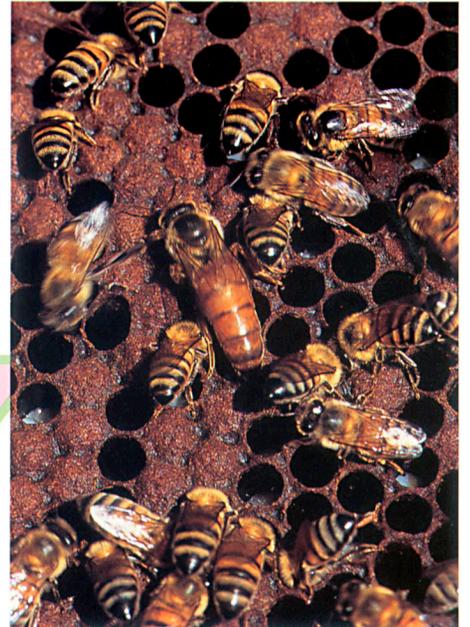


◀ ARS chemist Raul Rivera (left), technician Jesus Maldonado (center), and entomologist William Wilson use smoke and a specially modified handheld vacuum to collect Africanized honey bees to study the impact of parasitic mites on them. (K7102-12)



▼ Africanized honey bee queens such as the one at the center of the photo appear nearly identical to queens of European ancestry. Most queen bees in northeastern Mexico are now Africanized. (K7102-1)

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Beekeeping differs across the border in that it is primarily for honey production in Mexico, while paid pollination of crops is nearly as important a source of income for commercial U.S. beekeepers. "Otherwise, beekeeping is beekeeping," Wilson says.

Pollination, and therefore beekeeping, is essential for U.S. agriculture—about one mouthful of food in three is directly or indirectly pollinated by honey bees managed by beekeepers. That adds up to as much as \$20 billion worth of fruits, vegetables, seeds, nuts, and forage to feed livestock every year. In addition, bees produce about \$150 million worth of honey annually.

But, while Africanized honey bees are spreading very slowly through the southwestern United States since their arrival in Texas in 1990, Mexico has had to deal with them face-to-face for almost a decade.

In 1988, ARS entomologists William L. Rubink and Wilson, along with Mexican collaborators, set up a trapline to monitor changes in the feral honey bee population as Africanized bees moved northward. That trapline was installed across northeastern Mexico about 150 miles south of the U.S. border.

Since then, several times a year, Rubink and bee lab technicians collect samples from feral swarms that have taken up residence in special bee "traps" made of pulp nursery pots, baited with attractant, and placed in trees about every 2 miles. Big enough to hold a basketball, the pots are used in pairs joined at the top, with an opening at each end for the bees to enter and exit.

The feral population in Mexico became Africanized very quickly. In 1988, none of the swarms sampled were Africanized; the first find in the

trapline came in 1989. Less than 2 years later, almost 100 percent of the bees were Africanized.

Completely unmanaged honey bees are considered feral, rather than wild, because honey bees are not native to the New World. The feral honey bees now found throughout the Americas are descendants from escaped bees brought here by European colonists in the 1600's.

How the Legend Started

These European-descended honey bees evolved in a temperate climate and did not perform well in the tropical climates of South America. So in 1956, a Brazilian geneticist imported African honey bees to Brazil in an effort designed to improve beekeeping in tropical regions. Some of those African honey bees escaped and interbred with

existing feral bees, and the hybrid of fear, myth, and legend was created.

In 1992, Wilson and entomologist James Baxter started monitoring apiaries in northeastern Mexico, taking samples to determine the effect of interbreeding between the feral Africanized honey bees and managed bee colonies, as well as checking for the spread of honey bee parasites. Queens from managed colonies are inseminated by as many as 17 drones on their mating flights.

Many of these drones can be from feral swarms. So when a surrounding area is "Africanized," these matings could introduce Africanized bee genes into managed hives.

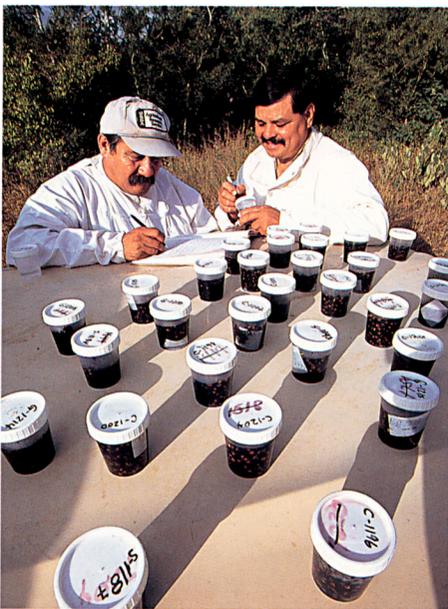
Because beekeepers occasionally introduce new queens and can destroy overly aggressive hives, it was hoped that the process of Africanization would take longer in managed hives.

"By learning what is happening in Mexico, we get an idea of what to advise U.S. beekeepers about and what their best management options will be, once Africanized honey bees arrive in their vicinity," says Wilson.

To monitor the managed honey bee population, ARS personnel visit 12 to 18 apiaries scattered across the Mexican states of Tamaulipas and Nuevo Leon twice a year. They gather 10 samples of a few hundred bees each from the apiaries using a handheld vacuum that has been altered to suck up bees instead of dirt.

Because the vibration of the vacuum motor can set off the Africanized honey bees' well-known temper, the ARS researchers gird themselves like knights dressing for battle in full protective gear—bee veil, sting-proof coveralls, and thick gloves. Although the Mexican beekeepers escorting the researchers to their yards are offered similar protection, most of them pre-

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Technician Jesus Maldonado (left) and chemist Raul Rivera record ID's on bee samples collected from colonies in a Mexican commercial apiary. The samples will be analyzed later at ARS' Honey Bee Research Unit in Weslaco. (K7109-19)



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Near Ciudad Victoria in the Mexican state of Tamaulipas, ARS researchers William Wilson and Jesus Maldonado, assisted by cooperating beekeeper Jose Santos Rodriguez, examine bee colonies for parasitic mites. (K7101-19)

fer to simply wear the amount of protection in which they usually work their bees.

“These [Africanized] bees do sting me more. And now I wear a veil, sometimes even gloves, which I didn’t do before. But they aren’t very scary, and I don’t need more protection,” explained Jose Santos Rodriguez, who manages 100 of his own bee colonies, plus about 1,500 colonies for Apicultura Cardoso, a commercial bee operation owned by the Cardoso family in Allende, Nuevo Leon.

When Wilson and his crew started their monitoring in the spring of 1992, they found that less than 20 percent of managed bee colonies in Mexico were Africanized—even in areas where nearly all the feral bee population had been.

Their most current data indicates that today almost all of the managed hives are Africanized to some extent.

“The process of Africanization of managed yards has gone much slower than we ever expected without heroic measures being taken to prevent it,” Wilson says. “That’s good news for beekeepers in the United States.”

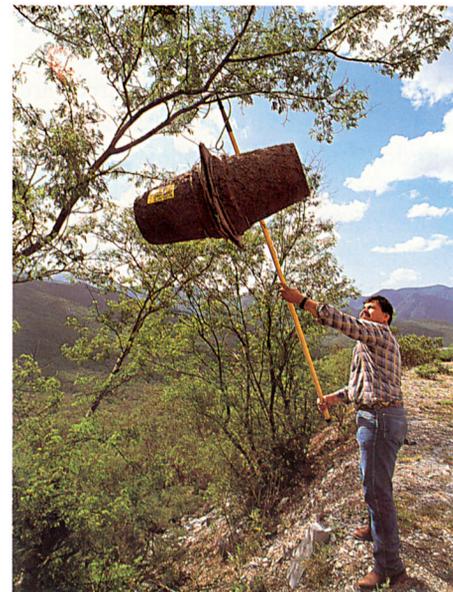
Africanization Does Bring Change

Africanization is creating complications, according to some Mexican beekeepers.

Santos says the single largest change has been the problems of transporting his hives.

“When the bees first started getting meaner, I was moving them from the citrus orchards to the brush with my truck. I got stuck on a one-lane bridge waiting to cross, and people along the side of the road

JACK DYKINGA



To learn about Africanized honey bee swarming and population changes, chemist Raul Rivera attaches a pheromone-baited trap made of nursery pots to a tree in Mexico’s Sierra Madre mountains. (K3753-9)



Chemist Raul Rivera (left) and entomologist William Wilson discuss research on control of parasitic bee mites during an informal meeting with a group of beekeepers in Montemorelos, Tamaulipas, Mexico. (K7111-3)

started getting stung. Since then, they have widened the bridge, and I started using a net over the boxes to protect people,” Santos says.

Moving bee hives between sites reveals another problem of Africanized honey bees: They are more likely to be honey robbers and absconders. If they are disturbed too much—as can happen when hives are being transported—the bees can withdraw all of their honey from the comb and take off, looking for another home, Wilson explains. “European bees don’t leave with their honey like that.”

In fact, the only really good thing that Santos can come up with about Africanized honey bees is that “people who used to steal some of my honey, don’t anymore,” he says.

Guillermo Aquiles Cardoso Rodriguez, who heads Apicultura Cardoso, seconds Santos’ dislike for the Africanized honey bees. “It has been much harder to find workers who will work around these bees, because some days the bees can be almost impossible to work with, and some days they are easy.”

Cardoso’s hives are usually placed in orange orchards so bees can gather pollen and nectar. “When the bees are there, I find that no one is working in that part of the orchard,” he says. “We used to be able to leave the colonies in place for a long time; now we just put the colonies out when trees are blooming.”

This type of attitude explains another major problem that Mexican beekeepers are facing: They are losing sites at which to keep hives. Beekeepers in both Mexico and the United States commonly seek the permission of landowners to place groups of bee boxes near concentrations of flowering plants or crops to gather nectar and pollen.

Noe Jaramillo Navarro, who is a veterinarian and a beekeeper, as well as the Coordinator of the Mexican National African Honey Bee Control Program for the state of Tamaulipas, has had to buy land on which to keep his hives in some cases.

“They [other land owners] are worried now about people getting stung. They don’t want the bees back,” Jaramillo says.

Many jurisdictions in Mexico have nearly doubled the required distance between apiaries and houses and roads. Beehives must now be 500 feet from neighbors’ houses and 200 or more feet from roads. This has driven several backyard beekeepers out of business in Ciudad Victoria, where Jaramillo is based.

Jaramillo points out one benefit of Africanized honey bees. “When the bees came, it forced beekeepers to organize. That’s when the government took the lead in helping to create training to improve the honey industry.” As program coordinator, Jaramillo holds courses for beekeepers on how to manage honey bees. Topics include Africanization, diseases, and parasites.

“Unfortunately, some beekeepers cannot afford the safety equipment and treatments for disease. They go out of business,” Jaramillo says. “But more new beekeepers come into the business, and we teach them how to do it well.”

Hardest hit have been those who are referred to as rustic beekeepers. These are rural Mexicans who make bee boxes out of hollow logs and capture feral swarms from the wild to produce a small but important income by selling honey. Many are very poor and among those who find equipment too expensive.

“Also, for a long time after the Africanized bees came, the government discouraged people from capturing swarms and keeping them in their backyards, because the feral swarms are the most Africanized and get riled up and sting people,” says Jaramillo. “That drove a lot of the rustics out of business.”

Rustic beekeeper Tomas Arriaga still keeps his bees within a few feet of the stick, thatch, and tarpaper hut in which he and his wife live near Hidalgo, Tamaulipas. The increased

number of stings on his hands that he began to get, once his bees were Africanized, does not bother him.

“But the bees keep absconding,” he says. “Then one swarm killed 10 little chicks plus the hen, and they killed my donkey. That swarm absconded, but I never messed with it. I was glad to see it go.”

Livestock being killed by bees is one of the biggest problems for the public and for beekeepers. Many animals are closely confined, either enclosed by fences or staked out on ropes to graze. Confined animals cannot outrun attacking bees, and horses, cows, pigs, and donkeys have all been stung to death. The beekeeper is held responsible for the cost of any damage or loss.

Beekeepers say they even occasionally end up paying for an old horse or cow that someone purposely put too close to a bee yard.

For the most part, though, the Mexican public has become used to living with Africanized honey bees.

“There was a lot of panic and many phone calls in the beginning,” recounts Juan Francisco Rios Aguilar, who is Coordinator of the Mexican National African Honey Bee Control Program for the state of Nuevo Leon. “When people would see any swarm, they would immediately call for help, especially in the big cities like Monterrey.”

Though he originally set up a program to train and equip volunteers in each town to deal with swarms, that program has ended.

“Many of the volunteers we trained started out willing to capture swarms, but after they dealt with a few, they got into trouble and were stung,” Rios says. “The police chief in one town told me he could send two men to get the worst criminal in town, but he couldn’t get eight people to go after a swarm.”



Although not wearing a protective veil, retired beekeeper Tomas Arriaga has learned to respect the unpredictable behavior of Africanized honey bees. Here he cautiously opens a hive located a few yards behind his home. (K7105-20)

Today, most calls for removing a swarm are referred to local brigades of beekeepers, agriculture department personnel, or fire fighters. In Mexico City and Guadalajara, an average of 10,000 feral swarms are eliminated each year—most of them Africanized.

More Than Just Temper Problems

Africanization is not the only problem that Mexican beekeepers have been facing. Two years of drought have severely limited honey production. Tracheal mites have spread to honey bees in northeastern Mexico from the south, and varroa mites have spread from the north.

Wilson was the first to find tracheal mites in Mexico during a sampling trip in 1980. These mites cause millions of dollars in losses annually in both the United States and Mexico. Wilson and other ARS scientists developed a menthol treatment to kill tracheal mites that is being used in both countries today.

The participation of Mexican department of agriculture officials and beekeepers in field trials of the men-

thol treatment allowed that treatment to be developed more quickly.

Some Mexican beekeepers see the presence of the Africanized honey bee as a great benefit, a “gift from God,” because they believe the hybrids are more resistant to tracheal and varroa mites.

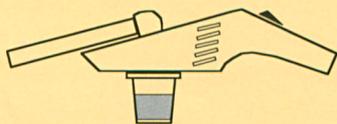
Wilson and other researchers have been testing this hypothesis. “We haven’t seen any evidence that Africanized bees are more resistant, but the jury is still out,” Wilson said.

It is possible that there is more resistance to tracheal mites simply because of survival of the fittest. “Mexican beekeepers often cannot afford expensive chemical treatments,” Wilson explains. “The bees that survive naturally will have more resistance.”

Wilson and visiting ARS scientist Frank Eischen are also investigating natural products that are readily available in the wild that could be used to treat varroa mites.

“We need something less expensive than the chemical treatments on the market now for both U.S. and Mexican beekeepers,” says Wilson.

SAMPLING WITH A BEE-VAC



When ARS scientists began their monitoring of apiaries, beekeepers in Mexico were leery about letting them gather samples.

“We take 10 vials of bees from each yard that we visit, with about 200 bees in each container,” says Wilson. “To some of the beekeepers, that looked like we were taking too many bees from their hives. After all, when honey production is the main goal, every bee means a little more honey and, therefore, money.”

But Wilson persuaded many beekeepers that it was important to participate in the monitoring of hives for Africanization and the presence of diseases and parasites.

Taking samples involves using a souped-up handheld vacuum to suck bees directly off a frame from the hive box. A plastic tube replaces the vacuum’s conventional snout, and a plastic cup filled with alcohol replaces the dustbag.

“We modified this contraption ourselves, and we carry about 10 of these bee-vacs on each trip,” says Wilson. “I wonder what the maids in the hotel think when they see all of them lined up, recharging, in our room?” —By **J. Kim Kaplan**, ARS.

The cooperation of Mexican officials and beekeepers also allowed entomologist Anita Collins, then in charge of the Honey Bee Research Unit at Weslaco and now with the ARS Bee Research Unit at Beltsville, Maryland, to test chemicals that might repel Africanized honey bees from humans.

“We were looking for something that beekeepers and people who might have to deal with Africanized swarms could carry with them,” explains Collins. In infested areas, meter readers, outdoor machinery operators, and even hikers could find a repellent a useful item to carry.

The most effective chemicals from Collins’ tests were all common mosquito repellents: DEET, dimethyl phthalate, and 2-ethyl-1,3,-hexandiol. But they all had to be sprayed in a fine mist directly on the bees to deter them. “Just spraying your clothes didn’t do any good,” Collins says.

The Texas Situation

The first Africanized honey bees were found in Texas in 1990. Now, almost 6 years later, the feral bee population there is highly Africanized, though still less than 100 percent.

But Texas beekeepers are now having to deal with the intrusion of Africanized bees in their apiaries.

“I’m wearing gloves now all the time, when I used to handle bees with bare hands,” says William Vanderput, who owns Magic Valley Honey and Pollination in Pharr, Texas. “The Africanized bee is unpredictable; you don’t know when or what provokes it. These bees are moody.”

And Africanized honey bees have increased his costs about 20 to 25 percent. “We are requeening more often with virgin queens to keep

Africanization to a minimum. The first generation isn’t that much different from the Europeans; but after that, if you haven’t requeened, they get really mean,” he explains.

Requeening is still the best way to maintain European honey bees in managed colonies in Africanized areas, according to Wilson.

“To survive in beekeeping today, with all of the troubles like Africanized honey bees and mites,” says Vanderput, “you really have to love it. It can’t just be a business.”—By **J. Kim Kaplan**, ARS, with special thanks to Weslaco laboratory technicians Raul Rivera and Jesus Maldonado for translation services.

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Entomologist William Wilson (left) and beekeeper William Vanderput examine a colony of European honey bees used for crop pollination in the lower Rio Grande Valley of south Texas. Feral colonies in south Texas are now mainly Africanized. (K7110-1)