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Robosquirrel fools rattlesnake

By Beth Marie Mole bethmole@mercurynews.com Posted: 04/10/2012 05:53:16 PM PDT Updated: 04/11/2012 11:28:19 AM PDT

In a flash of fangs, the rattlesnake lunged, striking in less than a second. Its prey: a mechanical, remote-controlled squirrel, now with a pool venom in its head.

"That was really exciting," said ecology doctoral student Bree Putman. "The snake saw it as real prey."

On a high-tech reserve in the rolling, pastoral hills east of San Jose, Putman and her adviser, San Diego State ecologist Rulon Clark, are using robosquirrel to understand the relationship between the predator and prey, which it turns out is "complicated." That's where robosquirrel comes in. Clark and Putman said that decoding their conversations, one robotic move at a time, could help explain how populations of the pesky critters naturally balance out.

A tense conversation: Unlike robosquirrel's debut last year, real squirrels don't normally get bitten; they just make a fuss. When Californian ground squirrels notice a snake, they usually pop their tails straight up and wave them like flags, staying nose-to-nose with the reptile.

"Why don't they just stay away from it?" Putman asked.

Clark and Putman, a joint graduate student at San Diego State and UC Davis, are starting the second round of research next month in San Jose to find out why squirrels interact that way with snakes.

Rattlesnakes, a type of pit viper, can "see" in infrared -- including heat -- and squirrels heat up their tails while flagging.

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houses a computer chip and controllers.

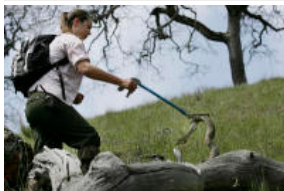
"The first version was big and bulky," Joshi said.

Since robosquirrel doesn't walk, they designed a track that it can be pushed down toward a waiting snake. In the field, Putman crouches behind a hunting blind to present the robot to a hidden snake.

Last, they had to make it smell like a real ground squirrel. The team stored the furry robot in the old cage bedding of ground squirrels to make it smell as lifelike as possible.

When a snake took a taste of version 2.0 last year, which caused only minimal robotic damage, they knew they were on

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Bree Putman uses a tong to capture a rattlesnake hiding under a log in a remote... (Gary Reyes)

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"Maybe it's a way to confuse or misdirect the snake," Clark said. "If it tries to target the squirrel for a strike, it doesn't know what to aim for."

But it also could just be blowing the snake's cover.

Because snakes rely on surprise, Putman explained, flagging could just be telling the snake, "I know where you are, and you're not going to be successful."

Mechanical meet-and-greet: The team set out to untangle the mystery by using a robotic squirrel and joining forces with UC Davis mechanical engineer, Sanjay Joshi.

"It's hard to tell a squirrel, 'Next time, do this,'" Joshi said. He and student Randy Johnson have been developing robosquirrel since 2005 and are now on version 3.0.

If you cracked open robosquirrel, Joshi explained, you'd find the shell of a taxidermist's squirrel stuffed with a motor that wags the tail, a heating coil in the body that simulates body temperature and a heating rod in the tail for thermal flagging. The disguised robot sits on a box -- about the size of a small, rectangular tissue box -- that



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the right track. "It made it quite well, and (the snake) injected quite a bit of venom," Joshi said. "It's a serious deal."

Don't tread on these: The Northern Pacific rattlesnake is the most common snake in the Bay Area and can get 3 to 4 feet in length, explained Michael Hamilton, director of the Blue Oak Ranch Reserve, where the team of researchers is unleashing robosquirrel.

The 3,000-acre UC reserve is one of the few places where researchers can find natural populations of both snakes and ground squirrels. Though it's closed to the public, the reserve sits alongside the Joseph D. Grant Santa Clara County Park, just east of San Jose.

"Most people try to kill (snakes), so they're scarce in areas that are populated," Hamilton said.

If anything, Hamilton explained, people have it backward -- rattlesnakes aren't the aggressive ones. The secretive animals, he said, rely on surprise rather than hunting to snag a snack. They'll try to escape instead of fight.

"Stepping on them is pretty much the riskiest thing you can do," Hamilton said.

Squirrels, on the other hand, aren't so nice.

Adult ground squirrels are immune to the snake venom and have quick enough reflexes to dodge even unexpected snake strikes. "We call it 'ground squirrel kung fu,'" Hamilton said, laughing. "They can literally jump through the air, kick the snake and get away without being bitten."

Large populations of ground squirrels and other rodents can pose additional threats by carrying flea-borne diseases, such as bubonic plague.

Though plague is endemic to Santa Clara County and in much of the state, there have been no incidences of plague in people here, according to an email from the California Department of Public Health.

The natural snake populations can keep the rodents in check, Hamilton explained. "There's a war going on between these two animals," Hamilton said. "The bigger message here is that the more we know about nature and how complex it is, the better we can be stewards of our planet."

Snake whispering: In May, Clark, Putman and a handful of undergraduate research students will head to San Jose with robosquirrel 3.0. They'll try to nail down what each squirrel behavior means to the snake and how the snakes respond.

Putman stopped by the reserve Monday to tag snakes with radio transmitters for tracking. Putman wants to see if the snakes relocate after interacting with robosquirrel.

She handled the snakes with tongs and collected them in bags. Their tails rattled constantly, but there wasn't a strike or even a hiss from them.

"They're not as scary as people think they are," she said.

"We should be fearing cars, guns and cupcakes," Clark added. "Those are the things that are killing us -- not snakes, sharks and bears."

Contact Beth Marie Mole at 408-920-5064.

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Nancy Chace
 Dear Ms. Putnam, with all due respect for your research, which is interesting, being a native of the area where you are working I would encourage you not to take any rattlesnake for granted and to exercise extreme caution in your handling of them. Rodent populations notwithstanding, it is unwise to underestimate the wisdom of the old-time ranchers in that area. Rattlesnakes are killed for a reason up there. Because they are dangerous. God forbid, but if you ever get bitten by one, you will learn this first hand.
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Andy Whitfield · Top Commenter · San Jose State University
 Don't forget, if you hear a rattle, that means the snake is happy and wants attention.
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Peter Wiles · Top Commenter · Milpitas, California
 "Adult ground squirrels are immune to the snake venom"
 "The natural snake populations can keep the rodents in check"
 Erm, seems to not make a huge amount of sense!!!
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