



# Island of The Snakes

The invasive brown tree snake has devastated Guam's ecosystems. Can it be eradicated?

As the leader of a specialized team of snake hunters based on Guam, biologist James Stanford was used to getting calls at odd hours. Early in the morning on 20 March 2005, his cellphone rang. On the line was a worried official with the Division of Fish & Wildlife on Saipan, one of the Northern Mariana Islands, some 200 kilometers away. He urgently needed Stanford's help.

The previous night, just after 1 a.m., a flight attendant had glimpsed a meter-long snake slithering off the runway at Saipan International Airport. The plane had come from Guam. Alarmed, her supervisor immediately called a government hotline set up to protect Saipan's native wildlife from invasive predators. Guam is a stronghold of the invader that its island neighbors fear most: the brown tree snake.

Since arriving on Guam, a U.S. territory in the western Pacific, in the 1940s, brown tree snakes (*Boiga irregularis*) have extirpated native birds, bats, and lizards and disrupted entire ecosystems. Although harmless to adult humans, they have slipped into houses and tried to swallow infants' arms, sickening them with mild venom. By crawling onto power lines, the snakes have caused up to 200 blackouts a year, electrocuting themselves in the process.

To prevent the spread of brown tree snakes, the U.S. Department of Agriculture (USDA) inspects all cargo leaving Guam and kills snakes in the forests surrounding ports and runways. The U.S. Geological Survey (USGS) runs a rapid response team, headed by Stanford until earlier this year, to help investigate sightings on other islands.

The report from Saipan sounded credible, so Stanford didn't hesitate. He grabbed the packed suitcase he always kept at home, and after picking up some search equipment and a trained Labrador retriever, he and three other biologists with USGS caught the next flight to Saipan. Their mission: Find any snakes and kill them.

That's not easy. Even when brown tree snakes are abundant, as on Guam, it is hard to know how many there are. But years of research on Guam have provided unique and valuable insights into tracking snake populations, says J. D. Willson, an ecologist at the University of Arkansas, Fayetteville.

Monitoring the snakes will be crucial to the next challenge: beating them back. Researchers are now testing new tools. In September, USDA started dropping poisoned bait from helicopters into fenced-off forests. This approach, some say, finally raises the possibility of eradicating the brown tree snake from Guam.

## Invade and conquer

In the summer of 1944, the U.S. military was amassing forces in the Pacific to advance the battle against Japanese troops. Materiel from the Admiralty Islands of Papua New Guinea was transported to large Navy and Air Force bases on Guam. The brown tree snake, native to Papua New Guinea, came along for the ride.

Away from its usual predators—thought to include large monitor

**Looking up.** Research has improved the ability to find tree snakes.

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Authorities on other Pacific islands began to fear what could happen if the snakes spread. USDA's Animal and Plant Health Inspection Service started an interdiction program on Guam in 1993 and fenced off loading areas at ports and airports. Ever since, inspectors have patrolled nightly with spotlights. Every piece of cargo leaving the island is searched by teams of Jack Russell terriers, agile and energetic snake hunters. And each week, traps baited with caged, live mice are placed on the fences and in nearby forests. Some of the traps have poisoned bait: dead mice stuffed with 80 milligrams of acetaminophen, a widely used pain reliever that kills a snake in about 24 hours. Since 1993, the combined efforts have caught more than 150,000 brown tree snakes. Those that are trapped, rather than poisoned, are euthanized.

The government and university researchers who have developed these control measures have also investigated the snake's biology and improved their survey methods. A unique experimental facility has helped tremendously. In 2004, USGS enclosed a 5-hectare site with a snake-proof fence. Rodda and his colleagues then captured all 122 snakes inside and implanted each one with a transponder tag. As a backup, they also marked each animal by clipping a unique pattern of scales, a classic method in herpetology.



**Defense line.** Fences, traps, and constant vigilance are needed to prevent tree snakes from sneaking off the island of Guam.

The setup has allowed the team to test traps and other control tools on a real-world population. One important conclusion is that the traps rarely collect small snakes. As it turns out, young snakes don't like the mice used as bait; they prefer geckos. Unfortunately, baiting traps with geckos would be too expensive, so catching young snakes by hand is the only way to get them.

Thanks to the testing ground, scientists have honed their ability to catch snakes. During searches, teams of experts and volunteers fan out, armed with hooked staffs to pull snakes from branches. They spend hours aiming their headlights into the trees, looking for the sheen of snakeskin.

Over the years, the team has identified some two dozen factors that can help or hinder the search. For example, a moonless night increases the odds of success by 20%, as does a calm night without fluttering leaves. Even the type of headlamp makes a difference. Snake hunting still takes twice as much time per snake caught as using traps, but it has become more effective. As a result, even though Stanford's team didn't find the reported snake on Saipan after 2 weeks of nightly searching, they could be confident that the island didn't harbor a population.

### Attack from above

Now, a new phase in the battle has begun. USDA wants to scale up the use of poison bait, so its officers are strapping dead rodents to pieces of cardboard attached to biodegradable streamers. When tossed from a helicopter, the mice get snagged in the tree canopy, available to tree snakes but not to animals on the ground. This could be an easier way to kill snakes in remote or rugged terrain.

Initial tests were promising. Dozens of mice were dropped on a 6-hectare site last year, some of them with tiny radio transmitters implanted. All 30 snakes that ate bait with transmitters died, the researchers reported last fall. (A toad and monitor lizard had also eaten one toxic mouse each, but did not appear to be the worse for it.) In September, USDA expanded the tests to two 55-hectare fenced sites on Andersen Air Force Base. Helicopters will drop bait there every few weeks for 16 months. Researchers will compare the snake populations to those at a nearby reference site.

The ultimate aim is to eradicate the brown tree snake from the island. “We are nowhere near that goal,” says Daniel Vice, USDA’s supervisory wildlife biologist in Barrigada, Guam. Among the hurdles are the island’s considerable size—it’s two-thirds the size of New York City—and the biology of the snake. Females often hide out for months after mating and can store sperm for years, producing new offspring even if the males have been extirpated. Visual searches alone can’t confirm success; for the 5-hectare USGS plot, for example, it would take 42 searches, each requiring 36 person-hours, to be 95% certain that the last snake had been found.

But Robert Reed of USGS in Fort Collins isn't discouraged. He expects that aerial poisoning will sharply reduce the snake population across the landscape. Even without full eradication, that might allow restoration of native birds, some of which persist in zoos. "I think it will become possible at some point," says Daniel Simberloff, an invasive species biologist at the University of Tennessee, Knoxville. And as snakes' numbers dwindle, other islands need to worry a little less about suffering Guam's misfortune.

**—ERIK STOKSTAD**