Infrared imaging leaves invasive pythons nowhere to hide

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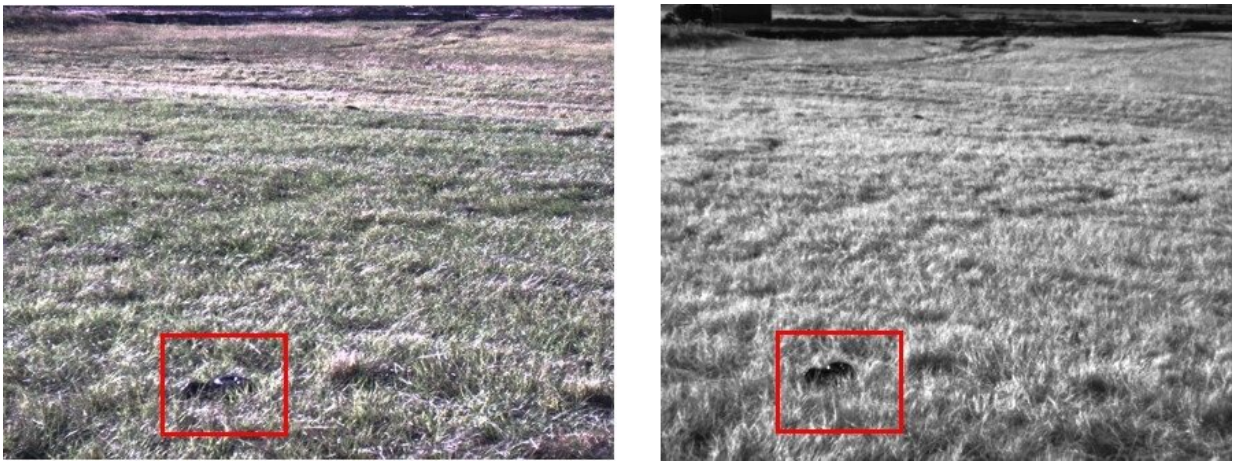

A new study shows that infrared cameras could make it easier to spot invasive Burmese pythons in Florida. Compared to an RGB visible image (left), the near-infrared image (right) helps the snakes stand out in the grass. Credit: Jennifer Hewitt, University of Central Florida College of Optics and Photonics

For more than 25 years, Burmese pythons have been living and breeding in the Florida Everglades, where they prey on native wildlife and disrupt the region's delicate ecosystems. A new study shows that infrared cameras could make it easier to spot these invasive snakes in the Florida foliage, providing a new tool in the effort to remove them.

In the Optical Society (OSA) journal *Applied Optics*, researchers led by

Dr. Kyle Renshaw from the University of Central Florida College of Optics and Photonics report that a near infrared camera helped people detect Burmese pythons at distances up to 1.3 times farther away than was possible using a traditional visible-wavelength camera. Because infrared sensors are small and low cost, they could easily be incorporated into handheld or vehicle-mounted systems designed for seeking out pythons.

"The removal of Burmese pythons is vital to preventing further damage to the Floridian ecosystem and preventing their spread to other regions," said Hewitt, a Ph.D. student and lead author on the study. "Our study—one of the first to examine the efficacy of near infrared sensing in locating these pythons—can help inform methods used to remove them from the environment."

Making snakes stand out

Burmese pythons can be up to 20 feet long and weigh as much as 200 pounds. They arrived in the U.S. as exotic pets in the 1980s and the snakes proliferated in the Everglades after a breeding facility was destroyed during Hurricane Andrew in 1992. Their natural camouflage makes them blend in with grass and foliage, making them hard to see with the human eye or a traditional visible-light camera. In a previous study, the authors measured the reflectivity spectra of Burmese pythons in the visible and infrared wavelengths, finding that pythons are more visible against the background at infrared wavelengths longer than 750 nm.

"Based on these earlier findings, we hypothesized that using near infrared wavelengths for imaging could make the pythons easier to see because they would appear dark against bright foliage," said Hewitt. "Although we haven't acquired reflectivity measurements from other species of snakes, the pythons should be easy to distinguish since they

are larger than any other native species of snake."

To test their hypothesis, the researchers took images of Burmese pythons in grass using visible and infrared cameras with similar fields of view and resolution. They then asked volunteers to examine these images and indicate whether they saw a python. Based on the responses of the volunteers, the researchers calculated the advantage of using near infrared images compared to visible.

"The method we used to evaluate each of the sensors was originally established for military sensing applications," Hewitt explained. "It accounts for the attributes of human vision and perception in addition to the characteristics of the system components to determine how effective a system is at allowing the observer to accomplish a task."

Spotting pythons day or night

Although other studies have explored using thermal infrared sensors to find Burmese pythons, the snakes had to have been basking in the sun during the day for them to be detected at night. The thermal contrast against their environment also diminished over time.

"In this work, we don't rely on thermal contrast," said Hewitt. "We found that near infrared imaging can be used both during the day as well as at night with illumination to improve detection, even if the pythons have not been basking."

The researchers have contracted with the Florida Fish and Wildlife Conservation Commission (FWC) to work on a project that expands on these results. "We are evaluating whether or not this technology will be effective in the field, and if so, how to make it field-ready in the challenging Florida everglades ecosystem," said McKayla Spencer, the FWC interagency python management coordinator. "We are just in the

beginning stages of our project with the researchers."

More information: Jennifer Hewitt et al, Detection of Burmese pythons in the near-infrared versus visible band, *Applied Optics* (2021). DOI: 10.1364/AO.419320

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