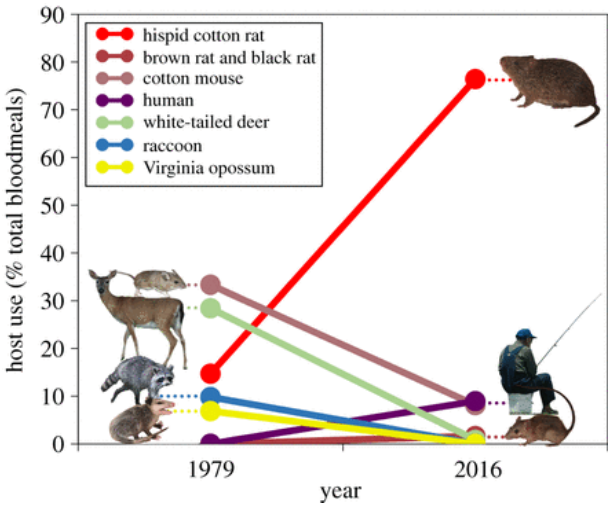
ScienceWatch – Upsetting Mother Nature (And Paying For It)

"We Have Met The Enemy And He Is Us." - Pogo

People love to keep exotic pets that often get out of hand. My favorite example occurred in 2003 when a full-grown Bengal tiger was discovered prowling around in a Harlem apartment. The owner had reported that he was bitten by a dog, but the next day an anonymous caller told police it was really a wild animal, and a neighbor complained of urine seeping through her ceiling. When police arrived they also found a five-foot caiman!

Snakes have long been a preferred exotic pet choice—snakes like the Burmese python (*Python bivittatus*), a top predator that is now wreaking havoc in the Florida Everglades (the U.S. banned their importation in 2012). Starting at 10 inches they can grow to nearly 20 feet and are likely released into the wild by hapless owners, which may have happened in the Everglades. Or pythons may have escaped when in 1992 Hurricane Andrew destroyed a reptile breeding facility there.

In any case, by 2003 Everglades National Park was teeming with giant, nonnative pythons that targeted the native mammals. Populations of rabbits, foxes, deer, raccoons, bobcats and opossum all crashed, some to extinction. One study in 2015 by Bob McCleery, University of Florida, Gainesville, FL, showed that 77% of rabbits with tracking devices were consumed by pythons within 11 months of being released. The snakes even went after large alligators. But one native mammal, the hispid cotton rat (*Sigmodon hispidus*) persisted, either because it's a prolific breeder or its predators were decimated.



Unfortunately, the hispid rat is a reservoir host for an encephalitis-causing virus, Everglades virus, that can infect humans and is spread by a mosquito (*Culex cedecei*) that feeds on mammals. The illness is non-fatal, but can cause fever, headache and brain swelling.

Knowing that many of the *C. cedecei* hosts had vanished from python predation, Nathan Burkett-Cadena, an entomologist at the University of Florida, Vero Beach, FL, and his students collected blood meals in 2016 from mosquitoes to see if their feeding habits had changed at snake-infested sites. Their study, published in the October 5, 2017 issue of *Biology Letters*, shows that change for the worse did indeed occur.

Using DNA sequencing the researchers determined the sources of blood meals from *C. cedecei* mosquitoes in the Everglades and compared them with those collected from *C. cedecei* feeding at Vero Beach, located 150 miles north and lacking pythons. They found that mosquitoes in Vero Beach were feeding on a variety of mammalian hosts, with the hispid rat comprising 18%. In contrast, 75% of blood meals collected in the Everglades came from hispid rats, and this represented a four-fold increase when compared with an Everglades study done in 1979 before the python had established itself. They also found that the fraction of blood meals from humans went from negligible in 1979 to 10% in 2016 (see chart).

The logical conclusion is that *C. cedecei* is feeding more often on the hispid rat because it can't readily find any other mammalian hosts, which may lead to more human cases of encephalitis. "I don't think that anyone could have predicted that this large snake, decimating some native mammals in a relatively wild area, could have some kind of cascading impact for human health. As far as I'm aware this is the first time that researchers have found that an invasive predator has caused an increase in contact between mosquitoes and a host of a human pathogen," said Dr. Burkett-Cadena.

"As ecologists, we've known that this is really bad for some time. You can't completely alter an ecosystem and not expect that there won't be other implications that will impact humans," said Dr. McCleery.

In other words, don't mess with Mother Nature.