

Pennsylvania bear mange epidemic focus of Penn State and Game Commission project

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This bear had a severe case of mange. Normally, most bears that are exposed to mites may have a dermal response, but after the initial reaction their immune system can fight the parasites off. But that doesn't seem to be happening with sarcoptic mange in some bears in Pennsylvania. Credit: Pennsylvania Game Commission

Pennsylvania's black bear population is experiencing a mange epidemic, and a Penn State research team will work with the state Game Commission to gain a better understanding of the disease and develop strategies to manage it.

Mange is a highly contagious skin disease carried by parasitic mites that results in hair loss and sometimes emaciation and death. It has afflicted mammals around the world for centuries and likely much longer. To learn why the disease has grown so common and severe in Pennsylvania bears in recent years, a small group of biologists, immunologists and entomologists in Penn State's College of Agricultural

Sciences will study bear ecology, movement and immune response.

Researchers also will focus on the genetics of the sarcoptes mites and ticks the bears are carrying.

"Mange is a recurring problem in Pennsylvania but it is occurring at an accelerating and seemingly unprecedented pace in bears," said lead researcher Erika Machtinger, assistant professor of entomology and a certified wildlife biologist. "We want to work with the Game Commission to try to figure out what's going on. Different species of skin mites can be found in bears in other states but this severe outbreak of sarcoptic mange is a unique Pennsylvania situation."

Researchers will help a Game Commission crew trap, radio collar and then track 36 bears for two years, analyzing tissue and blood samples taken from the animals. Bear trapping for the study began this month and will continue through the summer. People who see bears with mange in Pennsylvania are urged to contact the appropriate Game Commission region office: Northwest, 814-432-3187; Southwest, 724-238-9523; Southcentral, 814-643-1831; Northcentral, 570-398-4744; Northeast, 570-675-1143; and Southeast, 610-926-3136.



Lead researcher Erika Machtinger, assistant professor of entomology and a certified wildlife biologist, holds a pair of cubs while their tranquilized mother was being processed during a Pennsylvania Game Commission operation in March. Credit: Penn State

The first group of 12 radio-collared bears will be normal, healthy bears, Machtinger noted. The second group of 12 will be comprised of bears that have moderate cases of mange, and the third group will be bears that have moderate cases of mange, but they will be dosed with Ivermectin, a medication widely used to treat animals with parasites. Jennifer Murrow, applied spatial wildlife biologist with the University of Maryland, will be collaborating on addressing movement of these different bear groups on a landscape level.

"Over a two-year period we'll see how many of those bears' mange cases resolve on their own, how many resolve with treatment, and how many bears come down with mange," Machtinger said. "That should give us an idea of how mange affects denning and potential reproduction, and that ultimately should show how mange actually is affecting the bear population. We'll also see how mange may affect bear movement, home range size, and use of human habitats."

The Game Commission has estimated in recent years that there are about 20,000 black bears in Pennsylvania. Upwards of 3,000 are killed in hunting seasons annually.

Blood and tissue samples from bears will be analyzed by Suresh Kuchipudi, clinical associate professor of veterinary and biomedical science, who is going to be looking at the immune functions of black

bears to learn whether there is a difference between bears with mange and healthy bears. With that knowledge, researchers may be able to identify genes that are "either up- or down-regulated" because of mange infection.

There is little known about black bear immune system functioning, Machtinger pointed out. She said that quite a bit of work has been done with [polar bears](#) and immune function related to mange, but not with black bears. "We are kind of in the dark," she said. "We want to establish baseline levels for immune parameters in [black bears](#). So, we need to know what is normal and identify the immune genes that are associated with warding off mange. And then we need to look at how those may change associated with mange status."

Hannah Greenberg, incoming graduate student in entomology, who will help trap and collect bear samples, will try to determine if the sarcoptes mites responsible for the outbreak have somehow become adapted to bears. She will be assisted in that investigation by Joyce Sakamoto, a research associate in entomology at Penn State, who studies arthropod-associated microbial ecology. Sakamoto will use genetic methods to determine whether the mites may have jumped hosts to bears.



A highly contagious skin disease resulting in hair loss and sometimes emaciation and death -- caused by parasitic mites -- mange has grown common and severe in Pennsylvania black bears in recent years. To find out why, a small group of biologists, immunologists and entomologists in the College of Agricultural Sciences will study bear ecology, movement and immune response Credit: Pennsylvania Game Commission

There are several varieties of sarcoptes mites, including sarcoptes scabiei, the hominis variety that attacks humans, resulting in scabies, and the canis variety that commonly infests coyotes and foxes.

"We are curious if this variety has been circulating in bears for decades and if we are now seeing a new variety that could potentially be an 'ursus'—or bear adapted—variety," said Machtinger. "We will have to dig deep into the mite's genetics to see."

The research project also will focus on ticks and lice the bears carry because there is some evidence that immune-suppressed animals have a greater ectoparasite burden, Machtinger explained. Researchers want to know if bears with mange are beset by more ticks and/or lice than healthy bears. Ticks and mange may be somewhat connected, she said, potentially because ticks have a better capability to parasitize an animal unable to resist them.

Normally, most bears that are exposed to mites may have a dermal response, but after the initial reaction their immune system can fight the parasites off.

"But that doesn't seem to be happening with sarcoptic mange in some [bears](#) in Pennsylvania," Machtinger said. "And we need to find out why."

Provided by Pennsylvania State University

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