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Pesticides endanger bats

Date: August 27, 2012

Source: Universität Koblenz-Landau

Summary: Bats are a highly threatened group of animals and many people are concerned with their conservation. The entire group of animals is protected in Europe. Therefore it is worrying that bats are not included in the EU-wide authorization procedures for plant protection products. A new study has revealed that pesticide contamination of their diet can lead to long-term effects in bats.

FULL STORY

Bats are a highly threatened group of animals and many people are concerned with their conservation. The entire group of animals is protected in Europe. 10 of the 19 bat species native to Germany are already found on the red list of threatened species. Therefore it is worrying that bats are not included in the EU-wide authorization procedures for plant protection products. A study by the University of Koblenz-Landau revealed that pesticide contamination of their diet can lead to long-term effects in bats.

Before the EU issues a pesticide approval, it will undergo a regulatory risk assessment required by law. Using various scenarios, the risks for different organisms from acute to long-term effects such as impatcs on reproduction are estimated. To date it is assessed whether new pesticides harm birds and mammals, but so far bats are not mentioned in the current relevant guideline for risk assessment in the EU.

Studies have already indicated that bats are particularly sensitive to pesticides. The threatened animals are still ignored in the risk assessment procedure, even after the amendment of the applicable regulations in 2009, since there is a lack of data according to Dr. Carsten Brühl and Peter Stahlschmidt from the Institute for Environmental Sciences at Landau. "Most studies on bats were carried out in protected areas or in forests" explains Stahlschmidt. So far it was not investigated whether bats forage for food in the agricultural landscape at all although more than half the area of Germany is used for agriculture. In a previous study, the researchers were able to detect 14 bat species on intensively managed agricultural land.

In their current study, the Landauer ecotoxicologists took a closer look on the diet of bats in a fruit-tree planta-

tion. After spraying the commercial pesticide active ingredient fenoxycarb, which inhibits the growth of insects, the scientists measured the remaining chemical residues on flies, moths and spiders for two weeks. The highest residues were recorded on leaf dwelling insects and spiders, lower contamination was found for flying insects. Based on this data, they calculated different scenarios of the current risk assessment procedure. In the calculated best-case scenario, where the animals find their food also in unpolluted areas, long-term effects of one of the six used bat species in the calculation could not be ruled out, in the worst case scenario 3 bat species were affected. Hardest hit were so called gleaners, bats that collect insects and spiders from the leaves of the fruit trees.

The actual risk could be even higher than calculated, suspects Stahlschmidt. Because there are no sensitivity data for bats, the formulas in the risk assessment process use the toxicity data of the house mouse and add a safety factor of 5. "The bat, however, because of ecological characteristics such as a long lifetime and only one offspring is a very sensitive organism," says Stahlschmidt. Therefore, it is even likely that a difference in sensitivity between the house mouse and the bat could exceed 5. This could mean that even those species that prefer the less contaminated flying insects are at an unacceptable risk.

Something needs to change urgently if the endangered flying mammals should be effectively protected. "The responsible authorities must take action," says Stahlschmidt. "The current approval process for pesticides should be extended to bats and further research on the sensitivity of this mammalian group to pesticides is immediately needed" the researcher closes.

Story Source:

Materials provided by **Universität Koblenz-Landau**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Peter Stahlschmidt, Carsten A. Brühl. **Bats at risk? Bat activity and insecticide residue analysis of food items in an apple orchard**. *Environmental Toxicology and Chemistry*, 2012; 31 (7): 1556 DOI: 10.1002/etc.1834

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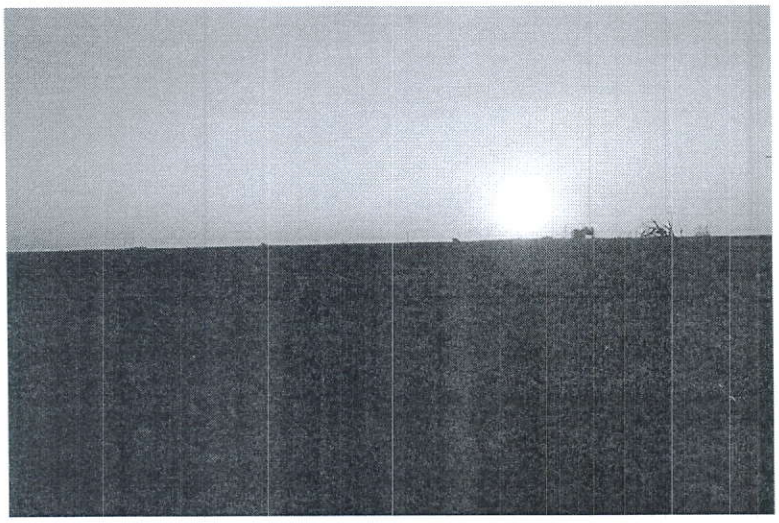

Bats are a valuable resource for agriculture

Bats are nocturnal creatures that move with stealth and speed. They patrol farmland using echo location to capture their insect prey and help save farmers billions in pest control, according to *Farm Journal*.

They provide consistent crop protection and save agriculture up to $53 billion per year, according to estimates from the University of Pretoria, U.S. Geological Survey (USGS), University of Tennessee and Boston University.

Research has proven the value bats have to agriculture. Cotton growers saved $74 per acre in pesticide treatments across eight Texas counties in a 2006 study.

Josiah Maines, a graduate student at Southern Illinois University Carbondale and his advisor, Justin Boyles, ran a concrete field trial in 2013-2014 to show the relation between bats and corn protection. The team built a canopy system to prevent bats from accessing particular sections of corn at night.

For two years, from May to late September, Boyles would open the enclosure during the day and close it at night to cut off bat access to earworm moths.

A 50 percent drop in earworm presence in control areas and a similar reduction in corn ear damage was the result. The bats also reduced the presence of fungal species and toxic compounds, the trial showed.

"Globally, we estimate bats save corn farmers over $1 billion annually in earworm control," Maines told *Farm Journal.* "It's an incredible amount when we're only considering one pest and one crop. Bats are truly a vital economic species."

Paul Cryan, a USGS research biologist at the Fort Collins Science Center, says there are several issues that could impact the future of U.S. bat populations. White Noise Syndrome

(WNS), which first appeared in 2006, has killed about 6 million bats, Cryan said.

"I believe farmers would see an immediate impact in insect suppression if overall bat populations were seriously reduced," Cryan said.

August 5th, 2016 | 1 Comment

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One Comment

Judy Sheridan August 6, 2016 at 8:04 am

Interesting! I had never connected bats with crop protection.

Comments are closed.

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lews Release
Media Contact: Tom Harvey, 512-389-4453, tom.harvey@tpwd.state.tx.us
lune 25, 2007

Research Proves Bats Help Control Insect Pests

AUSTIN, Texas — New research shows bats suppress agricultural insect pests, saving armers millions of dollars in avoided pesticide costs and better crop yields. Although ne study area focuses on eight counties in Texas, scientists say insect suppression y bats benefits farmers up into the Midwest and Canada, and that this underscores ne need to protect large bat colonies and promote public education and bat cotourism.

team of researchers from Boston University, University of Tennessee, U.S. Department of Agriculture and Texas Parks and Wildlife Department is this summer ntering the fourth year of a five-year research project funded by a $2.4 million lational Science Foundation grant. Researchers are focusing on an eight-county egion in South Texas near Uvalde, studying how free-tailed bats (*Tadarida rasiliensis*) protect corn, cotton and other crops against insect infestation.

n a 2006 article in the scientific journal Frontiers in Ecology and the Environment, the esearch team reported that the annual value of insect pest suppression provided by ats approaches $1.7 million dollars. This figure reflects the cumulative value of voided yield loss and avoided pesticide costs for cotton grown in the eight-county tudy region.

he study area includes Uvalde, Medina, Zavala, Frio, Dimmitt, LaSalle, McMullen and tascosa counties, known as the Winter Garden agricultural area. But researchers say ne benefits of insect suppression by bats extend far beyond the Texas study region.

Large bat colonies in Texas provide value nationwide, because they intercept moths nat would otherwise migrate out of the area to infest fields elsewhere in Texas or in ther states, especially in the Corn Belt of the upper Midwest," said John Westbrook, h.D., USDA meteorologist, and a co-principal investigator on the research team. "I'm eeing new interest in this research among scientists in states as far away as Iowa nd Minnesota. Nationally, producers are planting more corn because of the higher ommodity price for corn, which is one of the most suitable hosts for the corn arworm. This comes at a time when there is increased national interest in biofuels om crops like corn."

Vestbrook says the corn earworm, also known as the cotton bollworm, and another est, the tobacco budworm, cost farmers about $1 billion per year nationwide, epresenting the cost of pesticide use and yield losses due to crop damage. These ests start as caterpillar larvae and turn into moths.

Researchers have been tracking the way insect pests progress among plant species, evealing a surprising link with the Texas state flower, the bluebonnet.

Corn earworms start with bluebonnets in early stages, then move to corn in the econd and third generations, and cotton in the fifth and sixth generations," said homas Kunz, Ph.D., of Boston University, the NSF research project principal nvestigator. "They could almost be called bluebonnet worm. Prior to corn and cotton, elds that now support crops most certainly had more abundant wildflowers that rovided food for these moth larvae."

Jsing thermal imaging cameras, researchers from Boston University have for the first me been able to accurately count the numbers of bats that emerge nightly from their lay-time roosts. Kunz explained that "our research has revealed that current bat opulation estimates are an order of magnitude less than what scientists reported 50 ears ago. These lower estimates may in part reflect actual population decreases due o previous use of pesticides, but they also may reflect the fact that Texas free-tailed ats now have more places to roost—especially beneath highway bridges. Scores of ridges in Texas are now occupied by bats, where before bat friendly bridges did not xist."

he NSF research project originally focused on natural bat caves, which remain the rimary roosting resource for most bats; however, large bat colonies now commonly oost under highway bridges. This behavior has fostered a growing partnership etween bat scientists and highway engineers, who have actually begun designing ridges to accommodate bats. Today, sites such as Congress Avenue Bridge in Austin nd Waugh Drive Bridge in Houston are becoming important tourism attraction and ublic education venues.

Auch of the current research developed after the National Weather Service installed JEXRAD Doppler radar in the early 1990s. These weather surveillance radars letected large, mysterious "clouds" in areas where no storm activity was expected. he clouds turned out to be hundreds of thousands of bats emerging from cave roosts.

Soon after, another radar system operated by the U.S. Department of Agriculture, nder the guidance of John Westbrook, detected additional radar images that were ntersected by the bats at altitudes of thousands of feet. These images were found to e millions of migrating moths—a favorite food of free-tailed bats.

t took a decade for researchers to learn how to precisely measure and demonstrate he presence of insect pests in the diet of bats. It turned out that specific insects could e detected from DNA gene fragments in bat feces. Today researchers can not only letermine which bats eat moths, but can specify which insect species the bats eat and ven estimate the quantity of moths consumed.

What's really impressed me is that the bats are tracking the availability of these major rop pests," said Gary McCracken, PhD, an evolutionary biologist with the University of ennessee and a research co-principal investigator. "The pests are very episodic," he xplained, "characterized by dramatic increases in numbers, followed by down times. hey flush and then disappear, and the bats are somehow able to track these things. his speaks strongly for the bats as effective control agents, because when the insect opulations erupt, the bats are demonstrating their ability to cue in and take them out."

longside the agricultural pest research, the NSF grant is also funding public ducation. Texas Parks and Wildlife Department is producing a bilingual book and VD for schools connected with the bat research. The department and partners such s Bat Conservation International, the Texas Department of Transportation and cities nd counties who host bat sites are also promoting public bat viewing sites and bat-