Dispatches

Salamanders' wield microbial shield

Virginia Gewin

Some salamander populations may have an invisible microbial shield protecting them from the deadly chytridiomycosis disease which is currently devastating amphibian populations worldwide, according to new research presented at the 2013 Ecological Society of America conference in Minneapolis, MN, in August.

Researchers at the University of Maryland hypothesized that salamander declines along the US east coast may be due to *Batrachochytrium dendrobatidis*, the fungus that causes chytridiomycosis. However, field surveys revealed that only 1% of the salamanders tested harbored *B dendrobatidis*, even though they are susceptible to the fungal infection in lab experiments. The researchers therefore shifted their focus to determining whether something in nature was protecting the salamanders from infection.

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Skin swabs of salamanders reveal disease-fighting bacteria.

Carly Muletz, a PhD student at the University of Maryland, presented initial results comparing the skin microbiome composition – the cutaneous bacterial communities – of two species of terrestrial salamanders (*Plethodon cinereus* and *Plethodon cylindraceus*) in the Shenandoah, Catoctin, and Mt Rogers National Parks in the Appalachian Mountains of the eastern US.

To identify antifungal bacteria, Muletz pursued two approaches. First, she swabbed the salamanders' skin and cultured bacteria to determine which individuals could inhibit *B dendrobatidis*. Then she amplified the 16S rDNA sequences – the conserved genetic region of prokaryotic ribosomes – from the skin swabs to identify and characterize the entire skin bacterial community, a technique referred to as metagenomics.

In total, Muletz identified 131 strains of bacteria capable of inhibiting *B dendrobatidis*. Interestingly, she found salamanders in Shenandoah National Park contained the most antifungal bacteria (on average, four strains each). Furthermore, 96% of Shenandoah salamanders had at least one *B dendrobatidis*-inhibiting bacteria, whereas less than 50% of salamanders at Catoctin and Mt Rogers harbored any. "Something is happening at Shenandoah National Park, but I'm not yet sure what", admits Muletz.

It's not clear how the diversity of microbial communities relates to disease – does disease lower microbial diversity? Or does having lower diversity predispose a salamander to disease? These are questions increasingly being asked by wildlife biologists.

"Pairing culturing work with metagenomics is a spectacular way to get at how microbes are involved in disease resistance", says Valerie McKenzie, an amphibian ecologist at the University of Colorado at Boulder, who is also exploring the importance of amphibian skin microbes in fending off disease. "It could be that the environment is shaping the microbiome, which shapes the organisms' response to disease", she suggests. ■

India's wind power worries ecologists

Dinesh C Sharma

Wind power is often seen as an environmentally friendly energy source as it does not involve the burning of fossil fuels; however, construction of large-scale wind farms in ecologically sensitive areas may be ecologically harmful. India, the fifth largest wind power producer in the world, has seen a growing demand that wind power projects be subject to the same regulatory rigor as thermal and hydropower stations.

At present, it is not mandatory to conduct an environment impact assessment (EIA) for wind power projects under India's Environment Protection Act; approval from the Ministry of Environment and Forests is required only if the location of a wind power project is within a forested area or wildlife sanctuary. Now, an assessment conducted by the New Delhi-based advocacy group Centre for Science and Environment (CSE) has found that even these basic restrictions are routinely violated; about 45% of the total wind power generated in India derives from turbines located in forested areas.

"Erection of turbines on hilltops and in forests means building access roads, which causes linear fragmentation of habitat and scares away animals, and the [subsequent] soil erosion results in silting of streams and water bodies", explains Chandra Bhushan of CSE. Wind farms pose a threat to migratory birds if they are located in flight corridors and may also have human health impacts due to noise pollution and shadow flicker.

Calls for more stringent regulation of wind power generation have intensified in light of these findings. "The environmental footprint of wind farms can be minimized by developing and implementing strict criteria for site selection and ensuring that ecologically sensitive lands are not used for wind farms", says Ritwick Dutta (EIA Resource Centre, New Delhi, India).

Some believe that subjecting wind energy to the same level of environmental regulation as other power sources could hamper the development of green energy. Alok Jindal of The Energy and Resources Institute (New Delhi, India) warns that regulation "may lead to delays in approval and implementation of wind power projects and limit the growth of wind power, as in some states most potential wind farm sites are in forested areas". ■

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