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Spreading of fungus dangerous for bats in the Czech Republic and Slovakia

A team from the Czech and Slovak republics, lead by Doctor Natália Martínková from the Institute of Vertebrate Biology of the Academy of Science of the Czech Republic and Professor Horáček from Charles University, Prague, Czech Republic, found that over a tenth of bats hibernating in caves and mines may be infected with fungus *Geomyces destructans* in the region. Recording increase in incidence of *Geomyces destructans* infection on that scale is unique in Europe and has never been seen before. In North America, *Geomyces destructans* has been associated with white-nose syndrome that has already caused drastic mortality in hibernating bats. The scientists published their results on Friday in a peer-reviewed scientific journal, PLoS ONE.

Bats hibernating in North America have died in massive numbers in recent years. The extent of mass mortality is so severe that the scientists predict that once common bat species may disappear from large areas in the northeastern United States in less than two decades. This catastrophe is associated with the white-nose syndrome. Affected bats show white growth of microscopic fungus, with the Latin name *Geomyces destructans,* on muzzle and wings.

Number of infected bats increased in 2010

In 2009, the fungus was first found in Europe. In total, four bat species were infected. All bats were alive, and presumably, the disease white-nose syndrome was not present in Europe, and infected bats represented incidental cases. „We expected the same, when we started a regular survey of hibernating bats this year in February and March. However, we found many more sites with infected bats than the year before," says Professor Ivan Horáček. „Only in the Moravian Karst area we found *Geomyces destructans* in six caves," clarifies Professor Jan Zima from the Institute of Vertebrate Biology in Brno. „In Slovakia, mines in Dubník were most affected, whereas the region is important for hibernating bats on a European scale," says Doctor Marcel Uhrin from the P. J. Šafárik Univerzity in Košice, Slovakia.

Old photographs occasionally depicted bats with white patches on their wings or white, puffy growth on their muzzles since 1995. „In total, we assessed over six thousand hibernating animals on old photographs. Bats with fungal growth on their bodies were present in the past, but our group of photographers documented up to fourteen percent of affected bats this year," says Assistant Professor Jaroslav Červený from the Czech University of Life Sciences in Prague.

Mass mortality was not observed in Europe to date

White fungal growth is easily discernible on animals, but it might not always represent the pathogenic *Geomyces destructans*, the fungus associated with the white-nose syndrome. „A dead animal starts to decompose in the environment. Some of the first organisms that colonize carcasses in caves are fungi. Many of them are white," says Professor Zdeněk Hubálek from the Institute of Vertebrate Biology. Increase of incidence of bats with white fungal growth in the last year is critical thanks to additional evidence. The bat biologists collected the fungus from life animals, and microbiologists, mycologists and molecular geneticists unambiguously confirmed that we are dealing with *Geomyces destructans* on a large scale in Europe.

Geomycosis, infection by the fungus *Geomyces destructans*, is one of the clinical signs of the white-nose syndrome in North America. However, diagnosis of the white-nose syndrome is based on pathologic examination of skin of the affected individual. In Europe, this has not been done yet. „All bat species in the Czech Republic are protected both by national laws and legislation of the European Union. Bats may not be

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killed without appropriate permits for any reason, including scientific investigation. And to obtain a permit, the scientist must provide a rigorous reason for killing bats," says Helena Jahelková, who represents the Czech Republic in the international organization for bat conservation, Eurobats. Massive die-off that has coincided with white-nose syndrome in the USA could be considered a valid reason for a limited number of culled bats. However, bats in Europe hibernate dramatically differently to those in North America. In Europe, hibernacula house small populations, the bats stay in small clusters or they hide alone in crevices in cave walls. Die-offs would be harder to spot in Europe.

„To reveal if bats die unobserved, we investigated long-term data of bat population surveys," says Doctor Tomáš Bartonička from the Masaryk University in Brno. „Statistical models for the greater mouse-eared myotis showed population increase since 1995. Data for the last two years are consistent with the prediction. Therefore, even if bats could die of geomycosis, population decline is not significant yet," say Professor Emil Tkadlec from Palacký University in Olomouc and Doctor Ondřej Májek from Masaryk University.

We know very little about the disease at the moment, but already, based on the knowledge we have, we should start implementing measures for bat conservation. The Czech and Slovak scientists suggest that cavers should use new clothing and equipment for expeditions to different continents. They should then dispose of all gear they used to enter the underground on the visited continent and never bring it home with the spores. In September, Eurobats issued a resolution that warns against the lethal fungal infection in bats and urges for increased awareness of the problem and its monitoring. The Czech Republic signed the resolution. „We cooperate with management of caves and protected areas where we found *Geomyces destructans* as the problem affects also show caves. Bats play an important role in the ecosystem, and they also have an economic value because they feed on insects. Preventing the spread of the dangerous pathogens is important for mankind," says Natália Martínková.

Bat species with confirmed *Geomyces destructans* infection in the Czech Republic and Slovakia:
Greater mouse-eared bat (*Myotis myotis*)
Bechstein's myotis (*Myotis bechsteinii*)
Natterer's bat (*Myotis nattereri*)
Whiskered myotis (*Myotis mystacinus*)

Bat species with confirmed *Geomyces destructans* infection elsewhere in Europe:
Greater mouse-eared bat (*Myotis myotis*)
Pond myotis (Myotis dasycneme)
Daubenton's myotis (*Myotis daubentonii*)
Brandt's myotis (*Myotis brandtii*)
Lesser mouse-eared myotis (*Myotis oxygnathus*)

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