

# Amphibian chytrid fungus reaches Madagascar

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*Boophis quasiboehmei* is from the Ranomafana National Park in Southeast Madagascar. Credit: Miguel Vences / TU Braunschweig

The chytrid fungus, which is fatal to amphibians, has been detected in Madagascar for the first time. This means that the chytridiomycosis pandemic, which has been largely responsible for the decimation of the salamander, frog and toad populations in the USA, Central America and Australia, has now reached a biodiversity hotspot.

The island in the Indian Ocean is home to around 290 species of amphibians that are not found anywhere else in the world. Another 200 frog species that have not yet been classified are also thought to live on the island. Researchers from the Helmholtz Centre for Environmental Research (UFZ) and TU Braunschweig, together with international colleagues, are therefore proposing an emergency plan. This includes monitoring the spread of the pathogenic fungus, building [amphibian](#) breeding stations and developing probiotic treatments, say the scientists, writing in *Scientific Reports*, the acclaimed open-access journal from the publishers of *Nature*.

The entire amphibian class is currently afflicted by a global pandemic that is accelerating extinction at an alarming rate. Although habitat loss caused by human activity still constitutes the main threat to [amphibian populations](#), habitat protection no longer provides any guarantee of amphibian survival. Infectious diseases are now threatening even seemingly secluded habitats. The most devastating of the known amphibian diseases is chytridiomycosis, which is caused by a deadly [chytrid fungus](#) (*Batrachochytrium dendrobatidis*, or Bd). The fungus attacks the skin, which is particularly important in amphibians because they breathe through it. A large number of species have already been lost in this way - particularly in tropical Central America, where two-thirds of the colourful harlequin frog species have already been decimated across their entire area of distribution. Bd has now been identified in over 500 amphibian species, 200 of which have seen a significant decline in numbers. The pathogen is therefore classified worldwide as one of the greatest threats to biodiversity.



Chytrid fungus was proved on *Platypelis pollicaris* from Ranomafana. Credit: Miguel Vences / TU Braunschweig

Until now, however, a few islands like Madagascar were thought not to have been affected. The last series of tests from 2005 to 2010 found no trace of the pathogenic fungus there. However, an analysis of the latest series of tests shows that the chytrid fungus also poses a threat to amphibians in Madagascar. "This is sad news for amphibian-lovers around the world," says Dr Dirk Schmeller of the UFZ, who was involved in analysing the samples. "Firstly, it means that an island that is home to a particularly high number of amphibian species is now at risk. Several hundred species live only on this island. And, secondly, if the pathogen has managed to reach such a secluded island, it can and will occur everywhere."

For the study that has just been published, the research team analysed samples from over 4000 amphibians from 50 locations in Madagascar taken since 2005. Samples from four species of Madagascan frog (*Mantidactylus* sp.) taken in 2010, and from one Mascarene frog (*Ptychadena mascareniensis*) taken in 2011 from the remote Makay massif tested positive for the fungus. In samples from 2013 and 2014 the pathogen was found in five different regions. Prof. Miguel Vences from TU Braunschweig says, "The chytrid fungus was found in all four families of the indigenous Madagascan frogs, which means it has the potential to infect diverse species. This is a shock!" The study also shows that the disease affects amphibians at medium to high altitudes, which ties in with observations from other parts of the world, where the effects of the amphibian epidemic have been felt primarily in the mountains.

The fact that the fungus has been identified in a very remote part of the island has puzzled the researchers. There is some hope that it may prove to be a previously undiscovered, native strain of the pathogen, which may have existed in the region for some time and have gone undetected because of a lack of samples. In this case, Madagascar's amphibians may have developed resistance to it. However, further research is needed to confirm this hypothesis before the all-clear can be given. It is also possible that the fungus was brought to the island in crustaceans or the Asian common toad (*Duttaphrynus melanostictus*), carried in by migratory birds or humans. "Luckily, there have not yet been any dramatic declines in amphibian populations in Madagascar," Dirk Schmeller reports. "However, the pathogen appears to be more widespread in some places than others. Madagascar may have several strains of the pathogen, maybe even the global, hypervirulent strain. This shows how important it is to be able to isolate the pathogen and analyse it genetically, which is something we haven't yet succeeded in doing." At the same time, the researchers recommend continuing with the monitoring programme across the entire country to observe the spread of the disease. The scientists also suggest setting up extra breeding stations

for key species, in addition to the two centres already being built, to act as arks, so that enough amphibians could be bred to recolonise the habitats in a crisis. "We are also hopeful that we may be able to suppress the growth of the Bd pathogen with the help of skin bacteria," says Miguel Vences. "It might then be possible to use these bacteria as a kind of probiotic skin ointment in the future." A high diversity of microbial communities in the water could also reduce the potential for infection, according to earlier investigations conducted by UFZ researchers and published in *Current Biology*.

The outbreak of amphibian chytridiomycosis in Madagascar puts an additional seven per cent of the world's amphibian species at risk, according to figures from the Amphibian Survival Alliance (ASA). "The decline in Madagascan amphibians is not just a concern for herpetologists and frog researchers," says Dr Franco Andreone from the International Union for Conservation of Nature (IUCN), who is one of the study authors. "It would be a great loss for the entire world." In the coming months, the scientists therefore plan to work with the government to draw up an emergency plan to prevent this scenario.

**More information:** *Sci. Rep.* 5, 8633; [DOI: 10.1038/srep08633](https://doi.org/10.1038/srep08633)

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