

ZSL SCIENCE AND CONSERVATION EVENT

# Habitat loss and human health – understanding the links between ecosystem degradation and infectious disease outbreaks



Tuesday 10 November 2020  
6:00pm – 7:30pm UK Time (BST)

Online event livestreamed to [zsl.org/IOZYouTube](https://zsl.org/IOZYouTube)

[Direct link: <https://youtu.be/RylBrMX7DNQ>]

There is no charge for this event, and no need to register in advance

## AGENDA

Dr David Redding, Zoological Society of London and University College London

*How habitat loss impacts human disease risk*

Dr Rory Gibb, London School of Hygiene and Tropical Medicine

*The effects of land use change on zoonotic host diversity*

Dr Christina Faust, Pennsylvania State University

*Land-use change and disease outbreaks*

Dr Kimberly Fornace, London School of Hygiene and Tropical Medicine

*Zoonotic malaria and deforestation*

# ABSTRACTS

## **How habitat loss impacts human disease risk**

*Dr David Redding, Zoological Society of London and University College London*

The natural world is expected to undergo a significant transformation over the next century, driven by climate change, habitat destruction, human population increases and greater globalisation. Diseases, such as Ebola, Plague and Anthrax, are caught when people encounter specific animal species and these 'zoonotic' diseases are likely to be strongly impacted by global change processes. Perhaps the most immediate global change process is human-led land-use conversion, which is a process by which people are changing the many, varied natural habitats (e.g. forest, desert, savannah) into a discrete set of human dominated land-use types (e.g. farmland, rangeland, plantations, urban environments). How those animals that carry important human diseases respond to such changes will dictate, to a large extent, the burden of disease felt by future human populations. Here, I will break down the current understanding of the links between land-use change and biodiversity and expand on some examples of how changing habitats have impacted specific zoonotic diseases. Finally, I will summarise future avenues for research and provide an overview of possible routes forward to protect both natural habitats and human health.

**David Redding** is an MRC Rutherford Research Fellow at the Zoological Society of London and an Honorary Senior Research Fellow at University College London. He undertook his PhD at Simon Fraser University, Vancouver, Canada, predicting optimal conservation decisions under different scenarios of future biodiversity loss. His research currently focuses on understanding links between major drivers of global environmental change and outbreaks of wildlife-borne diseases in human populations. He has also worked on understanding the processes driving alien bird invasion, and more recently, the evolution of human languages.

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## **The effects of land use change on zoonotic host diversity**

*Dr Rory Gibb, London School of Hygiene and Tropical Medicine*

Land use change – for example, the conversion of natural habitats to agricultural or urban ecosystems – is widely recognised to influence the risk and emergence of zoonotic disease in humans. However, it has been unclear whether such risks are underpinned by generally predictable ecological changes, or are instead idiosyncratic. I will discuss our findings from a recent study in which we answer this question by analysing a large global database (6,801 sites worldwide) of ecological assemblages and their zoonotic hosts. We show that known wildlife hosts of zoonotic pathogens and parasites (bacteria, viruses, helminths, protozoa) overall comprise a significantly greater proportion of ecological community diversity in human-dominated ecosystems, than in nearby undisturbed habitat. This effect varies between important reservoir host groups, and is strongest for rodent, bat and passerine bird zoonotic host species, and weakest for primates, suggesting that the zoonotic risks associated with land use may differ systematically depending on the principal host community. I will discuss the significance of these results for our understanding of the links between environmental change, biodiversity loss, and infectious disease risk and emergence.

**Rory Gibb** is an ecologist whose research focuses on how environmental changes impact ecosystems, human health, and the burden of zoonotic and vector-borne disease. He is currently a Research Fellow at the London School of Hygiene and Tropical Medicine.

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## Land-use change and disease outbreaks

*Dr Christina Faust, Pennsylvania State University*

In many regions across the globe, land is being converted from natural habitats into agricultural fields, pastures, and other human-dominated landscapes. These shifts in land cover impact plant and animal species that are able to survive on the land and usually lead to declines in species diversity compared to natural habitats. This decline in biodiversity is also associated with a change in the abundance and diversity of pathogens that infect remaining animals and plants. Prevalence of a pathogen can decline or increase due to changes in availability of suitable hosts, changes in the environmental conditions, altered movement of hosts, or another condition associated with changing ecosystems. It is important to understand these changes in pathogen burden, as pathogens in these changing landscapes can impact health of domestic animals and humans. The frequency and scale of landscape conversion is increasing in many areas, underscoring the critical value of understanding these pathogen responses. In this talk, I will discuss key characteristics to track in changing landscapes and consequences for pathogen spillover. I will highlight useful examples of how timing and scales of landscape conversion are important to consider. Together, this research will improve our ability to predict the response of a particular pathogen in a landscape undergoing conversion.

**Christina Faust** is a Research Scholar in the Center for Infectious Disease Dynamics at Penn State University in the US. She holds a PhD in Ecology and Evolutionary Biology and a Masters degree in Global Health. Her research focuses on understanding how environmental change affects infectious disease dynamics, with a particular focus in diseases that can impact humans and domestic animals. She has researched the transmission of a diversity of pathogens – including parasitic worms in Uganda and bird flu in the US. She is currently working with the BatOneHealth network to disentangle the impacts of climate change and habitat loss on Hendra virus spillover in Australia.

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## Zoonotic malaria and deforestation

*Dr Kimberly Fornace, London School of Hygiene and Tropical Medicine*

Deforestation and associated land use changes alter human-environment interactions, influencing exposure to infectious disease vectors and wildlife reservoirs. One example of diseases impacted by these changes is the zoonotic malaria *Plasmodium knowlesi*, a type of malaria carried by macaques and transmitted to people through bites of infected mosquitoes. Since the discovery of a large number of human *P. knowlesi* cases in 2004, cases of this zoonotic malaria have increased dramatically and this is now the main cause of human malaria in Malaysia, undermining current malaria elimination agendas. Within Northern Malaysian Borneo, an area undergoing rapid environmental change, the emergence of the zoonotic malaria *Plasmodium knowlesi* is hypothesised to be due to increased spatial overlap between people, mosquito vectors and primate hosts at the forest edges. To identify factors driving this emergence, the MONKEYBAR project utilised a multidisciplinary approach to characterise *P. knowlesi* transmission, collecting data on parasites, people, macaques and mosquitoes. By using remote sensing data collected by satellite and drones, we demonstrate how deforestation, agriculture and habitat changes increase *P. knowlesi* risks. At finer spatial scales, GPS tracking of both people and macaques illustrate the role of local land use and deforestation in driving movement patterns and determining exposure to infected mosquitoes.

**Kimberly Fornace** is an assistant professor of spatial statistics and epidemiology at the Centre for Climate Change and Planetary Health at the London School of Hygiene and Tropical Medicine. Her work focuses on the role of landscape on the transmission of infectious diseases, using drone and satellite technology to monitor changing environments. She has lived in West Africa and Malaysian Borneo and was the scientific coordinator of the MONKEYBAR project, a multidisciplinary research programme on the emergence of zoonotic malaria in Malaysia and the Philippines. She currently leads projects in the Peruvian Amazon, Southeast Asia and Sub-Saharan Africa.

## Format of Live Events

- This interactive online event will be livestreamed to our YouTube channel here: [zsl.org/IOZYouTube](https://zsl.org/IOZYouTube). A direct link to the livestream will also be shared on the event web page before the event.
- Before attending this event, please read our Code of Conduct found [here](#).
- This event will run from 6:00pm – 7:30pm, and will be recorded and available to watch afterwards on our YouTube channel.
- Each event will comprise of 3 – 4 presentations from experts in the topic, similar to our previous events.
- There will be opportunities for the audience to submit questions during the event (this process will be explained on the night), to be answered live after each presentation. If you wish to submit a question to a speaker prior to the event, please send it to [scientific.events@zsl.org](mailto:scientific.events@zsl.org). Please be aware we may not be able to answer all questions.
- There is no charge for this event, and no need to register in advance.

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## Join us at our next online event

### Putting reptiles on the map: ZSL Science for reptilian conservation

8 December 2020, 6:00pm – 7:30pm

Reptiles comprise almost one third of all land vertebrate species on Earth, and also occur in marine and freshwater systems. Despite their amazing diversity, reptiles remain underrepresented in conservation research and action. Join us to hear how ZSL has been engaging with key collaborators to push the global conservation agenda for reptiles, through advances in IUCN Red List assessments, publishing the Living Planet Index for reptiles, and protecting the most evolutionarily distinct and globally endangered (EDGE) reptiles.



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## ZSL Wild Science Podcast

Listen to our award winning **ZSL Wild Science podcast** episodes produced by Dr Monni Bohm and Eleanor Darbey here: [www.zsl.org/zsl-wild-science-podcast](http://www.zsl.org/zsl-wild-science-podcast).

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## Further Information

- Please contact the Scientific Events Coordinator, Eleanor Darbey ([eleanor.darbey@zsl.org](mailto:eleanor.darbey@zsl.org)), if you have any queries about our Science and Conservation events or podcasts.
- For press enquiries, please contact the ZSL Press Office: [press.office@zsl.org](mailto:press.office@zsl.org).
- For more information about the ZSL Fellowship, please visit: [www.zsl.org/membership/zsl-fellowship](http://www.zsl.org/membership/zsl-fellowship).
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