

Centre of Expertise on Animal Disease Outbreaks

Projecting the effect of climate change on the risk of incursion of exotic animal diseases into Scotland

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BACKGROUND

A list of potential disease threats has been drawn up for Scotland by combining the global distribution of each disease with data on the likelihood of introduction into Scotland for trends in 2012-2019. However, we are now entering a new era of infectious disease threats aided by global connectivity and climate change. AIMS: to assess the disease threats in the context of historic and projected climates in Scotland that influence vector distribution, activity, and pathogen replication.

DISEASE THREATS

TABLE 1. Vector-borne livestock diseases that may be of increasing threat to Scotland due to climate change

We explored whether climate change is likely to affect the likelihood of incursion into Scotland of key vector-borne diseases (Table 1, 1st slide). We chose these because they are climate-sensitive due to pathogen transmission being dependent on temperature and a vector



FIGURE 1. Number of reports of key vector-borne diseases (ASF, BTV, LSD) compared to Avian Influenza in Europe 2019 – 2024; source: empres-i.apps.fao.org

UK SUMMER CLIMATE CHANGE

Climate change projections are for temperatures to sometimes exceed 25°C in Scotland and reach 40°C in the South of England, whereas precipitation will increase most in the west. This implies that conditions may eventually become suitable for mosquito-borne pathogen transmission in Scotland. However, the threat to Scotland is

DISEASE		MODE OF TRANSMISSION
Lumpy skin disease	LSD	Biting flies, mosquitoes
Bluetongue Virus	BTV	Culicoides
African Swine Fever	ASF	exotic soft ticks
African Horse Sickness	AHS	Culicoides
Equine Infectious Anemia	EIA	Tabanids
West Nile Virus	WNV	Mosquitoes
Epizootic haemorrhagic disease	EHD	Culicoides

CONCLUSIONS

The risk of new disease incursion from imported livestock has been already assessed, but the roles of wildlife and climate change are still to be explored. The projected changes in temperature and precipitation due to climate change is likely to affect the chance of disease incursion into Scotland. Emergence of bluetongue virus in eastern England poses a significant risk to Scottish livestock sectors.

FiGURE 2. Weather projections in the UK in summer for years: 2000, 2024, 2040; (Left) Maximum temperature; (Right) Precipitation; [source: Met Office]



not so severe or as imminent as it is to England.

MIDGES AS VECTORS

- > Midges thrive in the warm and wet conditions of a **Scottish summer**.
- > Their response to temperature likely varies among different species, sub-species, localities.
- they are likely vectored by similar midge species.
- >As temperatures increase, virus replication increases but midge longevity decreases [2].



FIGURE 3. Observed temperature (top) and precipitation (bottom) in the UK 1900 – 2024; **Source: Met Office database.**

MOSQUITOS AS VECTORS

- **Knowledge** about the prevalence of mosquitoes in Scotland is limited. A new Scottish mosquito surveillance project started in 2024 (www.mosquito-scotland.com).
- >As EHDV (Epizootic Haemorrhagic Disease Virus) is closely related to BTV (Bluetongue Virus), > With rising temperatures, we are likely to see an increase in mosquito populations, potentially including different species **migrating from other regions** that can transmit pathogens.

> These mosquitoes may remain active for longer periods, thereby posing increasing potential risk.



BLUETONGUE VIRUS

Bluetongue virus (BTV-3) outbreaks have occurred in Eastern England in 2023 and 2024, and the restricted zone is currently less than 300 km from the Scottish border. Southern Scotland experiences mean minimum temperatures of > 9.2°C (the threshold of BTV replication in *C. sonorensis*) from May-August.

C. obsoletus/Scoticus complex occurs in Scotland and can transmit some BTV strains, such as BTV-8 that is circulating in northern France. Investigations are ongoing to detect which BTV strains can be transmitted by which Scottish midges under Scottish climatic conditions. This will change the official status of the disease in Scotland.









FIGURE 4. Bluetongue cases in Europe 27th April – 14th October 2024 (source: wahis.woah.org) with marked livestock movement restricted zone and infected area in Eastern England as of 10th **October 2024 (source: APHA Interactive Bluetongue Virus Map [3])**

[1] Bessell, P. et al "A Tool for Prioritizing Livestock Disease Threats to Scotland", Frontiers in Veterinary Science, 2020, v. 7 (DOI=10.3389/fvets.2020.00223)

[2] Wittmann EJ, Mellor PS, Baylis M (2002) "Effect of temperature on the transmission of orbiviruses by the biting midge, Culicoides sonorensis", Medical and Veterinary Entomology 16, 147-156. [3] https://www.arcgis.com/apps/webappviewer/index.html?id=514ec88edec74575958d860f0196d2ea







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