Emerging infectious diseases and the One Health paradigm

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Collaboration
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HELLENIC REPUBLIC
MINISTRY OF DEVELOPMENT AND INVESTMENTS
GSRI GENERAL SECRETARIAT FOR RESEARCH AND INNOVATION
European Commission

One Health

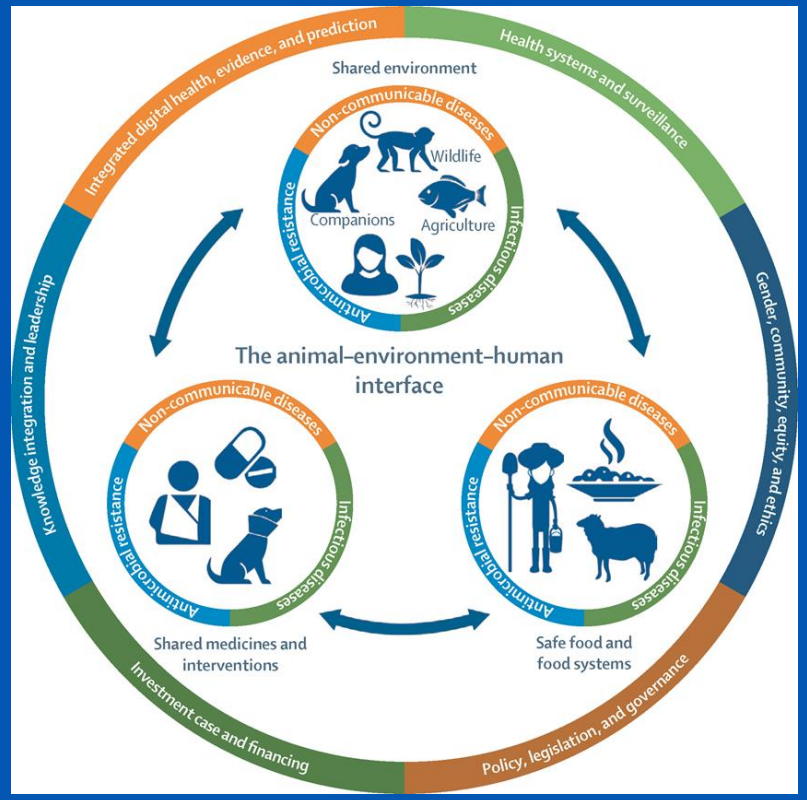
WILDLIFE CONSERVATION SOCIETY

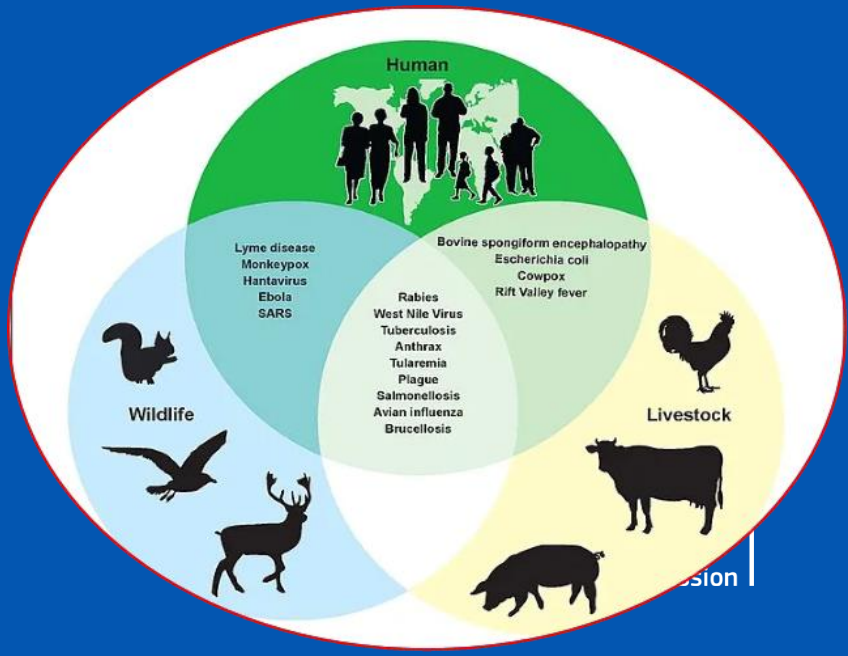
THE ROCKEFELLER UNIVERSITY 1901

29th September 2004,
The Rockefeller University, Caspary Auditorium

Conference Summary
One World, One Health: Building Interdisciplinary Bridges to Health in a Globalized World

The Manhattan Principles on "One World, One Health"





Vector-borne infectious diseases

Western Hemisphere:

Over the past 30 years

Dengue (present over decades and more prevalent in the 1990s)

West Nile Virus (emerged in 1999)
Prevalent from Canada to Argentina

Chikungunya (re-emerged in 2013)

Zika virus (re-emerged 2015)

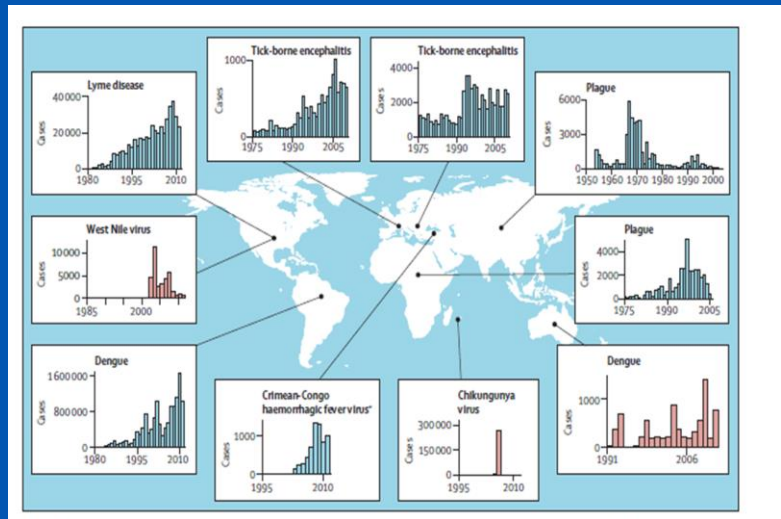
Europe:

Dengue (last outbreak 1927/28 in Greece).
Today:
Endemic in Madeira; major outbreak 2012
Autochthonous cases 2010, 2013-15, in Southern France

Chikungunya 2007, 2017, Italy

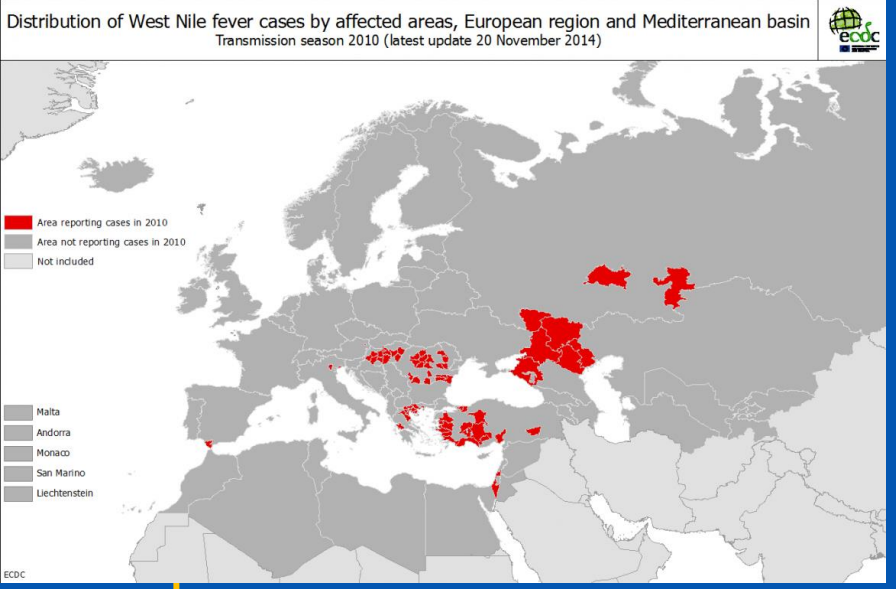
West Nile Virus Southern Europe in 2018 (n=2083) in 2010-2017 (n=1832)

Primary vectors: Aedes mosquitoes (aegypti, albopictus), culex pipiens

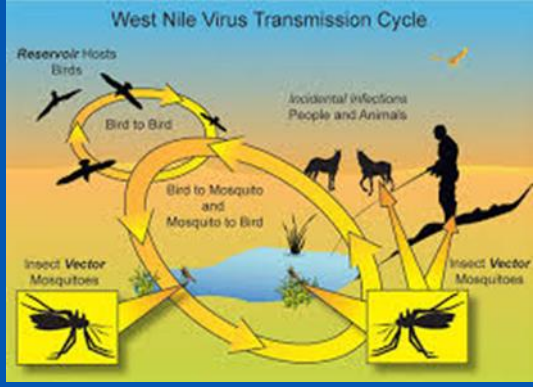


Kilpatrick et al. The Lancet, 2012

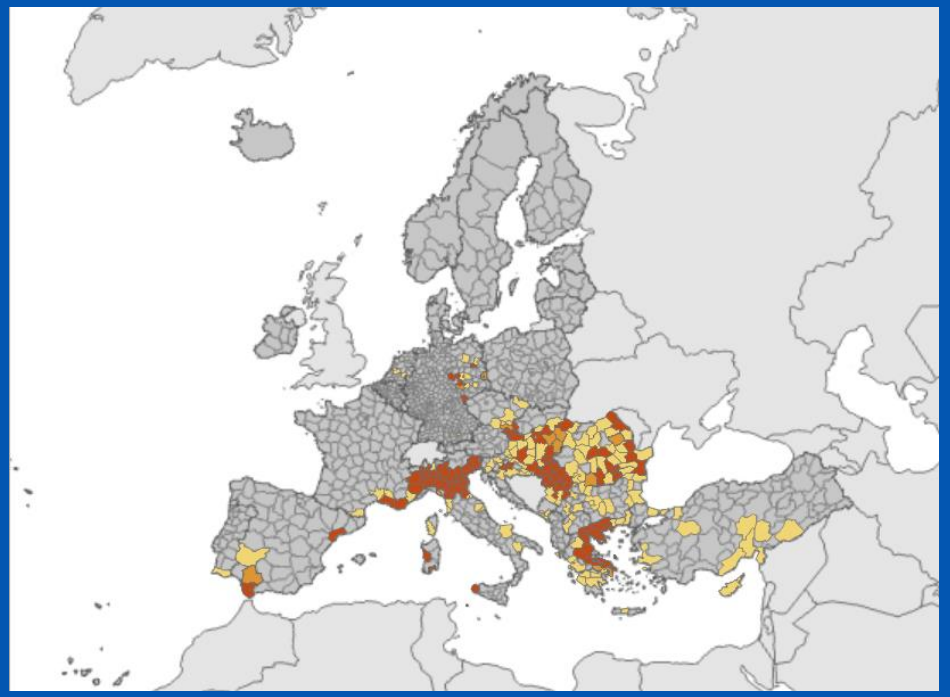
West Nile Virus in Europe

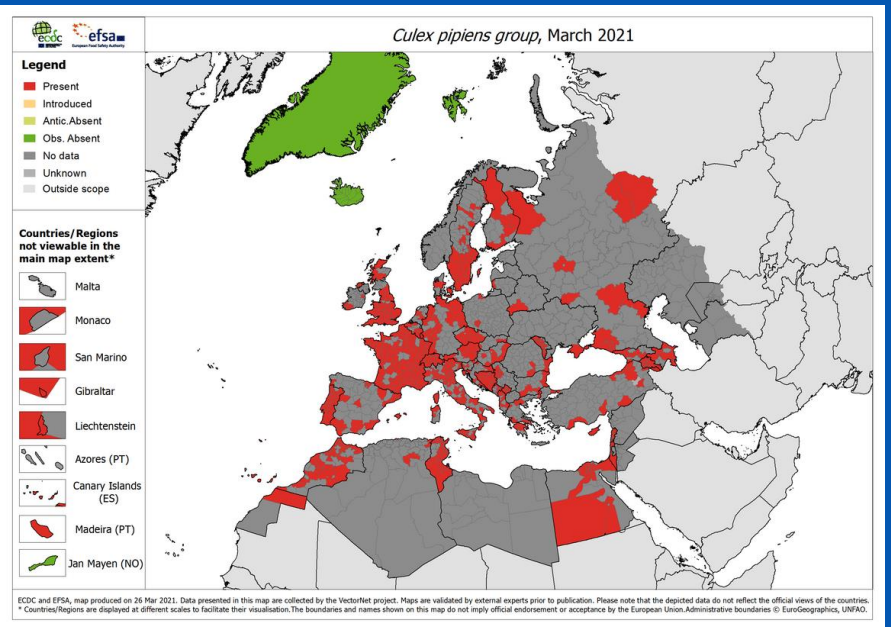


2010



2012-2022





Health risk assessment

Assessment tools for risk mapping and prediction	The case of vector borne diseases
Surveillance systems	Estimation of future distribution of vector species under different scenarios, e.g., environmental change
Satellite remote sensing Geographical information systems Spatial statistical techniques Risk mapping	Identification areas that are at higher risk of being invaded by new vectors
	Identification of vectors that pose the most serious threat in a given area
Mathematical/statistical modelling	To model how vectors, pathogens and humans dynamically interact under conditions of, e.g., extreme climate variability

European Commission

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Acta Tropica

journal homepage: www.elsevier.com/locate/actatropica

Assessment of West nile virus transmission risk from a weather-dependent epidemiological model and a global sensitivity analysis framework

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A climate-dependent spatial epidemiological model for the transmission risk of West Nile virus at local scale

Anastasia Angelou[a], Ioannis Kioutsioukis[a,*], Nikolaos I. Stilianakis[b,c]

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The JRC epidemiological modelling group joint the EYWA network.

Joint work with the Dep. of Physics, Univ. of Patras, Greece

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An epidemiological model for mosquito host selection and temperature-dependent transmission of West Nile virus

Augusto Fasano[1,4], Nicola Riccetti[1,4], Anastasia Angelou[2], Jaime Gomez-Ramirez[1], Federico Ferraccioli[1], Ioannis Kioutsioukis[2]✉ & Nikolaos I. Stilianakis[1,3]

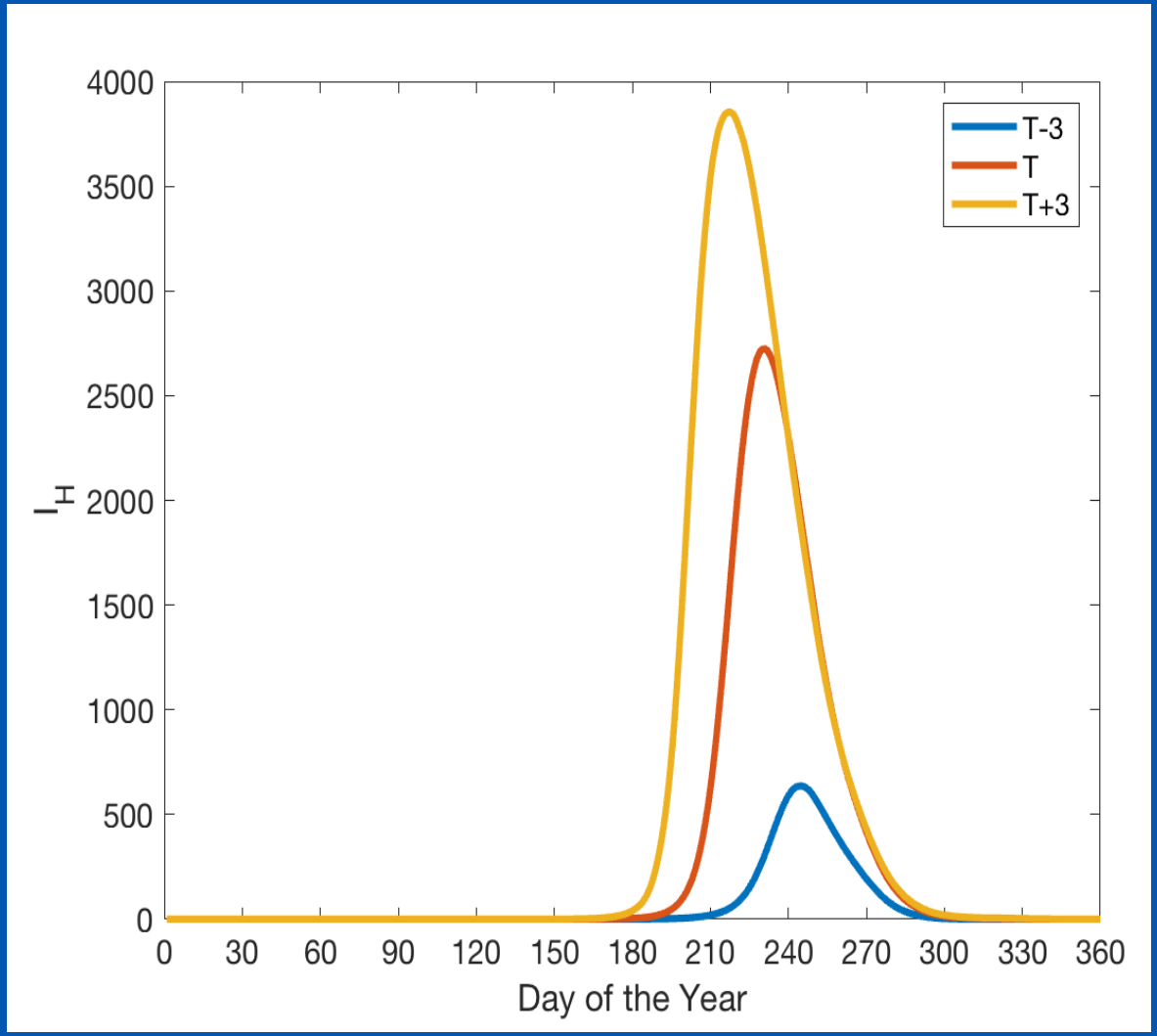
Can we predict WNV outbreak occurrence?
Can we design effective control strategies?

Four parameters affect R_0 and I_{humans} predominantly

Birth and death rate of the mosquitoes

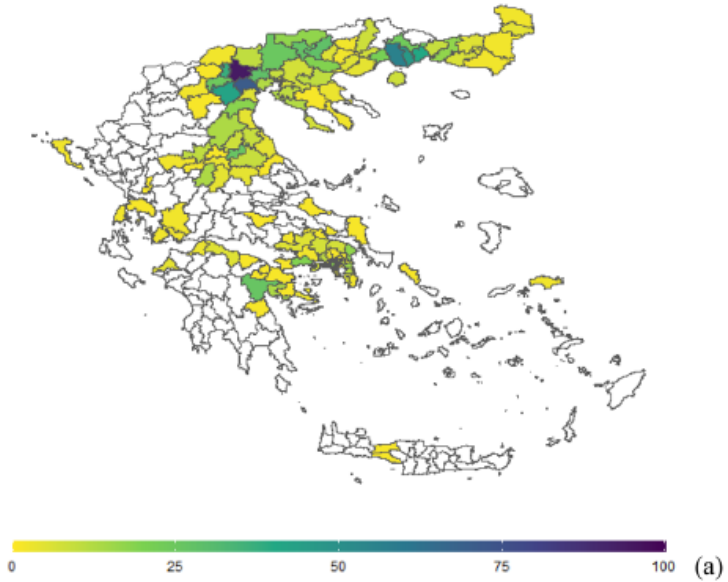
Mosquito biting rate and the transmission probability from birds to mosquitoes

Control strategies may focus on them depending on the time window one looks at.



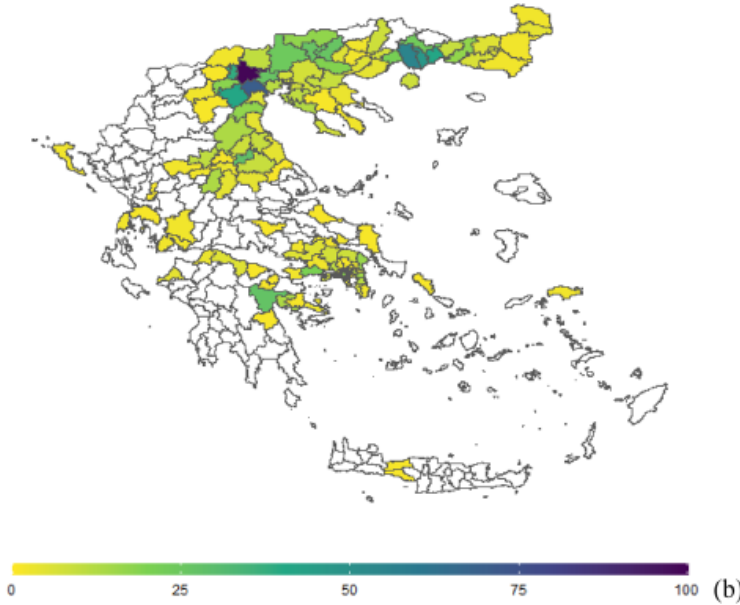
Kioutsioukis & Stilianakis, Acta Tropica, 2019

Total number of laboratory-confirmed human WNV cases (2010-2021)



(a)

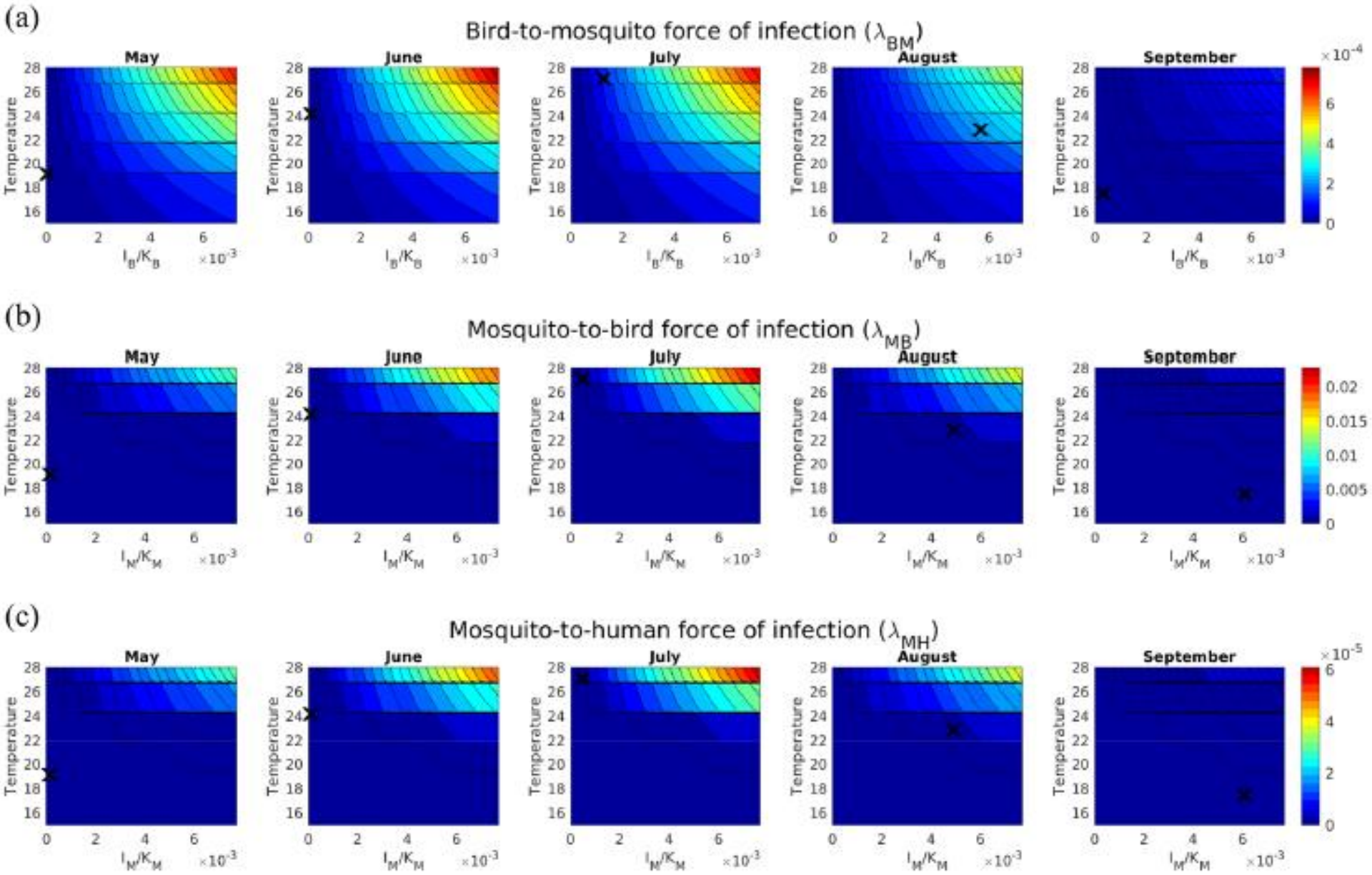
Total number of modelled human WNV cases (2010-2021)



(b)

Fasano et al. Sci. Rep. 2022

European Commission



Fasano et al. Sci. Rep. 2022

Concluding remarks:
Adaptation to global environmental change

Environmental changes, e.g., climate, land use and human activities, e.g., trade and transport affect disease vector habitats and the geographic distribution of vector and pathogens.

Health risk assessments to inform adaptation (modelling, remote sensing, vulnerability mapping)

Forecasting readiness, early detection, rapid response, control operations, early warning systems

Space technological applications enable estimates of environmental parameters, inform on habitats and transmission risks of mosquitoes, tick etc. and in compiling health risk maps

Next steps: Within the EYWA framework the JRC epidemiological modelling group (EPICO) will expand collaboration