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How might climate change affect *Ixodes ricinus* populations in France?

Phrutsamon WONGNAK, Séverine BORD, Frederic BEUGNET, Karine CHALVET-MONFRAY

Context:

- Ixodes ricinus* ticks (Acari: Ixodidae) are the most important arthropod vector species in France.
- They are sensitive to abiotic factors such as temperature and relative humidity.
- Climate change could affect their distributions (seasonal and spatial), resulting in changes in the epidemiology of tick-borne diseases in France.

Objective:

To understand direct impacts of climate change (abiotic factors) on:

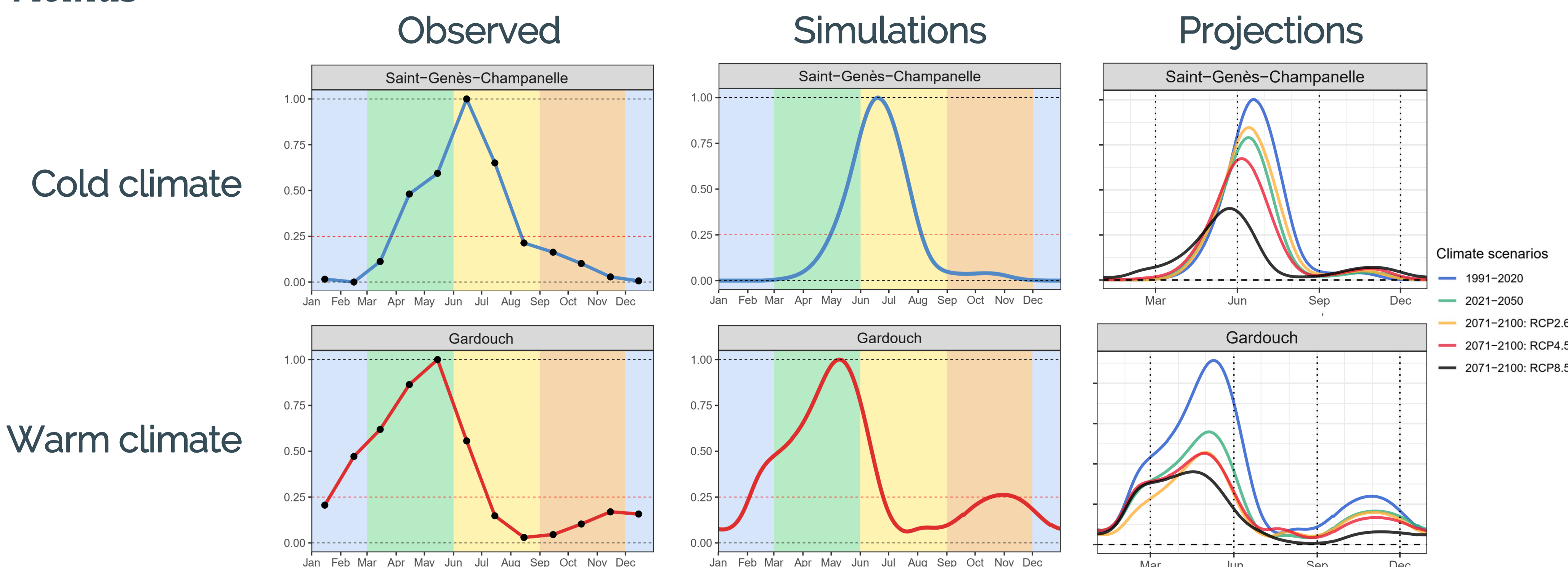
- 1) **Population dynamics** of *I. ricinus* ticks
- 2) **Spatial distributions** of *I. ricinus* populations in France

Methods:

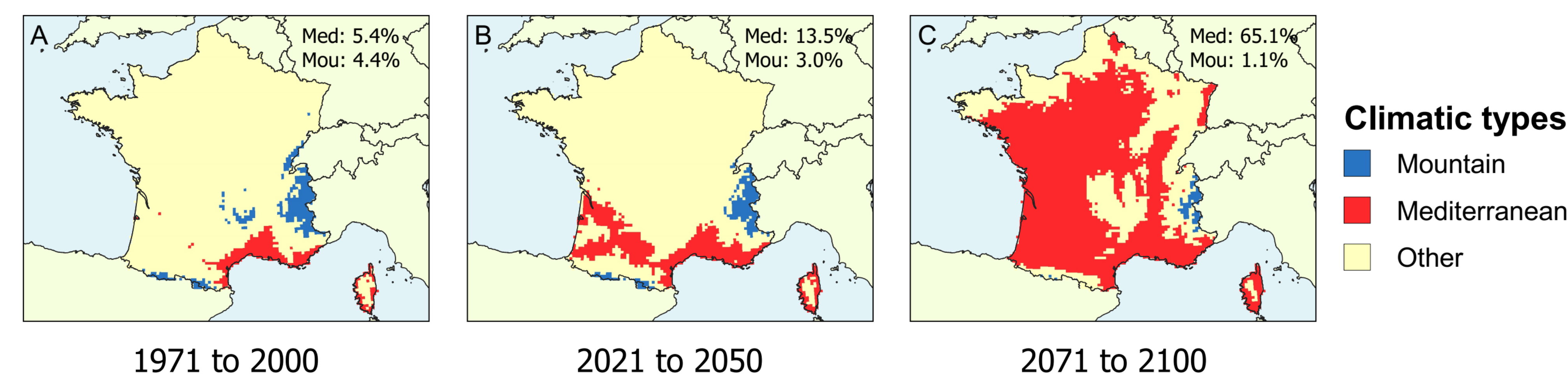
- 1) Population dynamics model
 - A stage-structured, delayed differential equation (DDE) model.
 - Calibrated against observed phenological patterns of questing nymphs in France (The CLIMATICK project).
 - Projected future scenarios using the DRIAS database (Three climatic pathways: RCP 2.6, RCP 4.5, and RCP 8.6)
- 2) Expansion of the Mediterranean climate (unfavourable for *I. ricinus*)
 - Projecting the future expansion of the Mediterranean climate using the DRIAS database

Results:

1) Population dynamics model (Delayed Differential Equations; DDE) of *Ixodes ricinus*



2) Expansion of the Mediterranean climate (unfavourable for *I. ricinus*) – RCP8.5



Perspectives and conclusion:

Our models suggested direct impacts of climate change on:

- Seasonal change of questing activity, shifting to early period.
- Expansion of unfavourable climatic conditions for *I. ricinus* around France.
- Possible emergence or expansion of new vectors and/or pathogens in France due to climate change

Further studies about the climate change impacts on the host-vector-pathogen ecosystem are still needed.

