

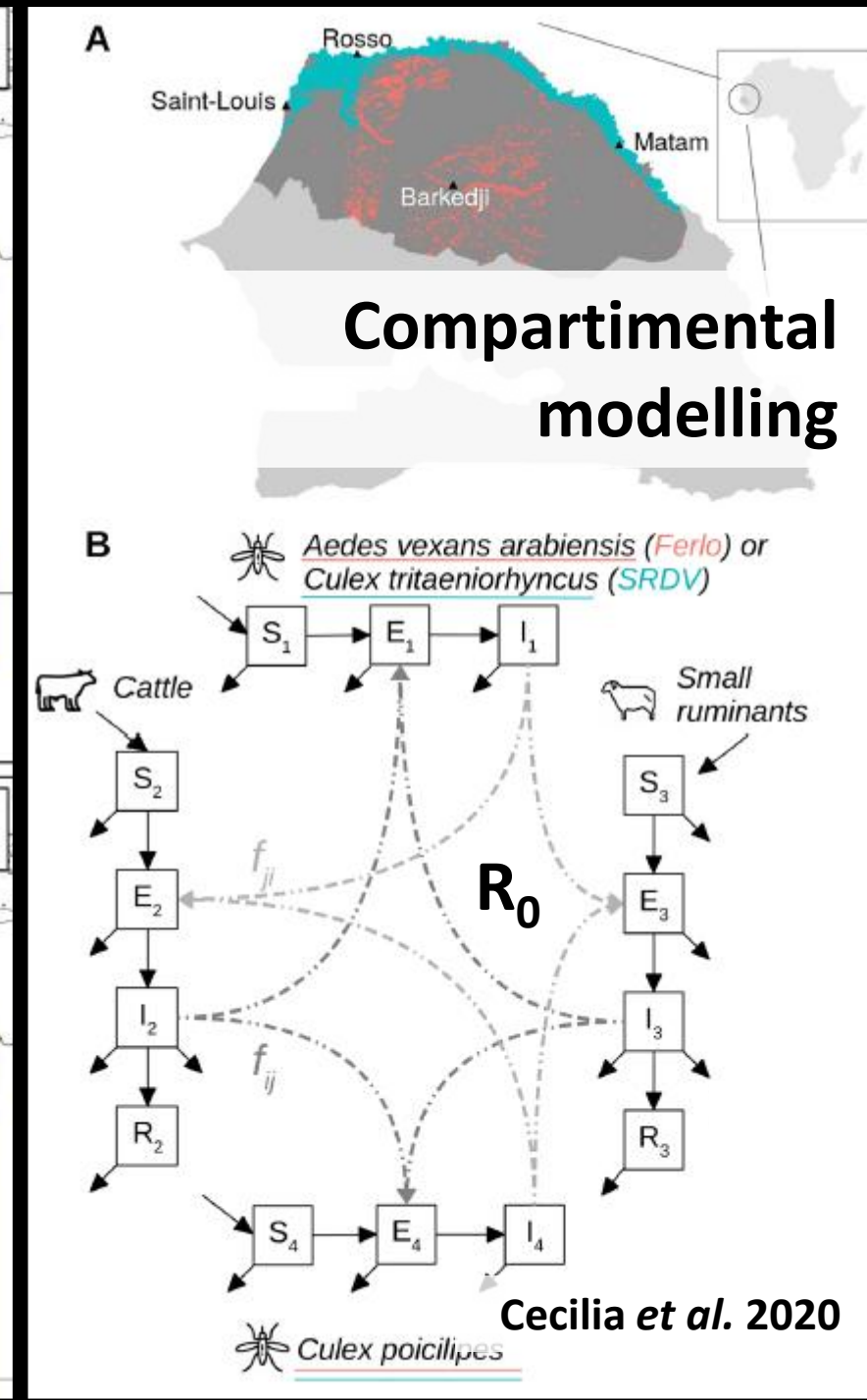
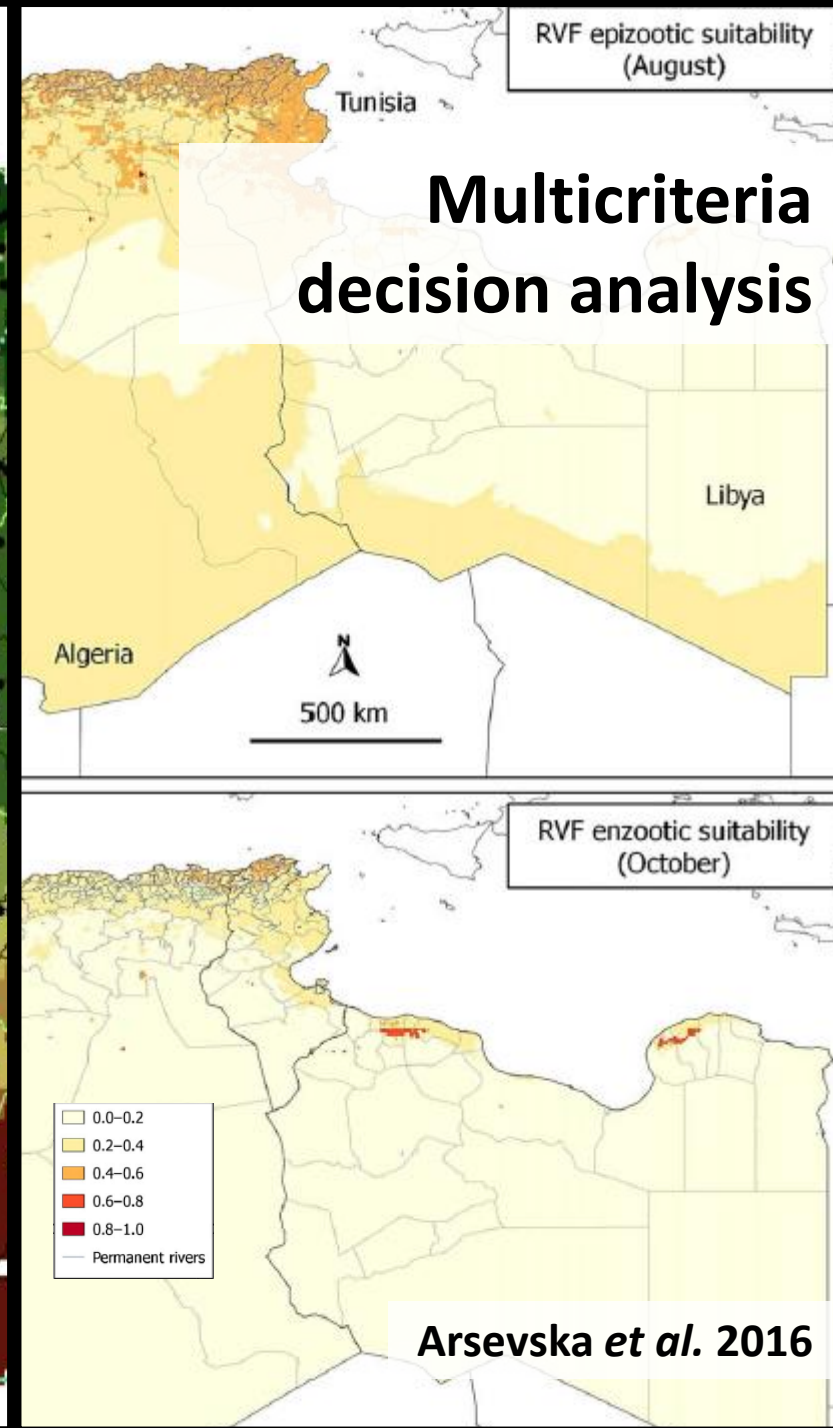
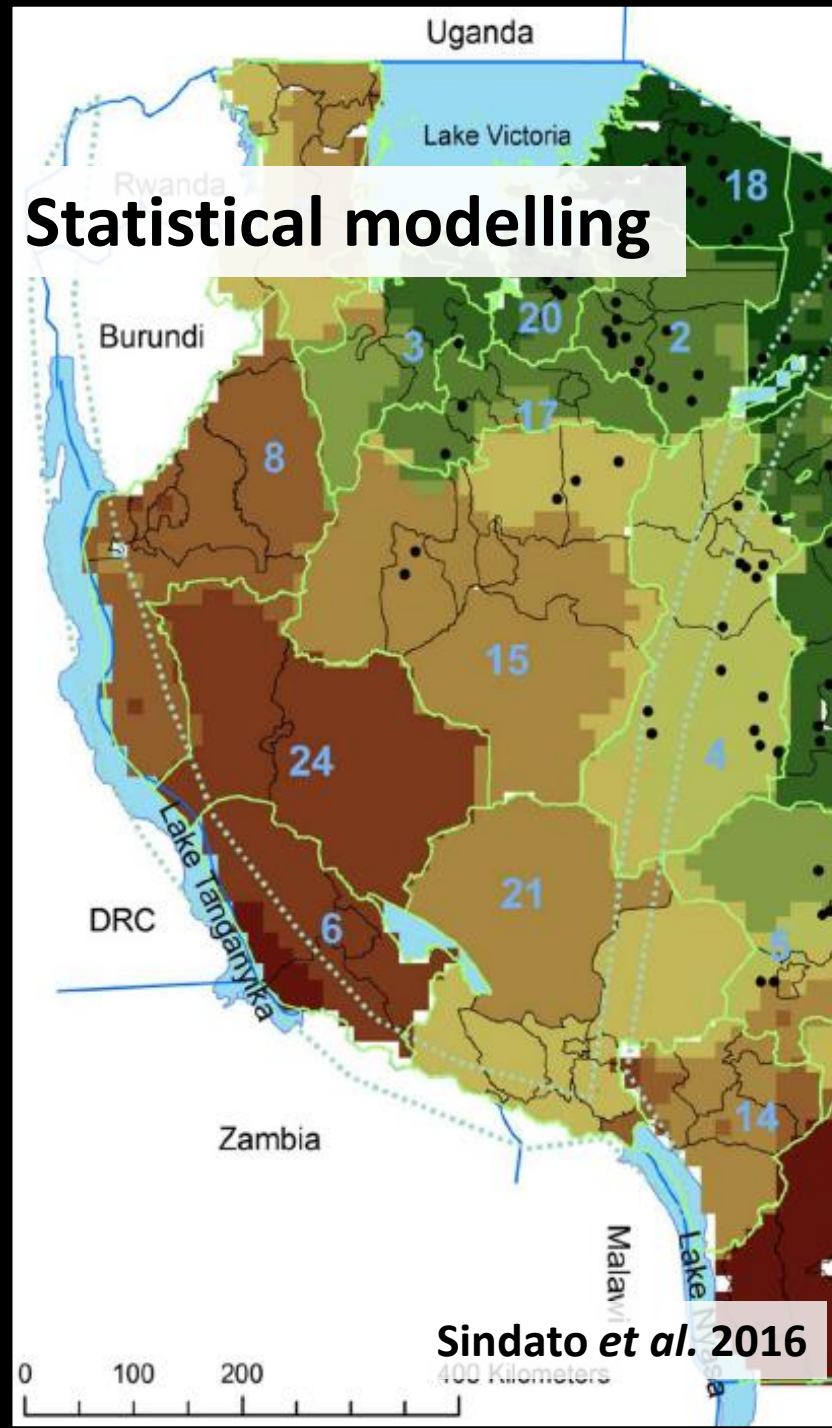


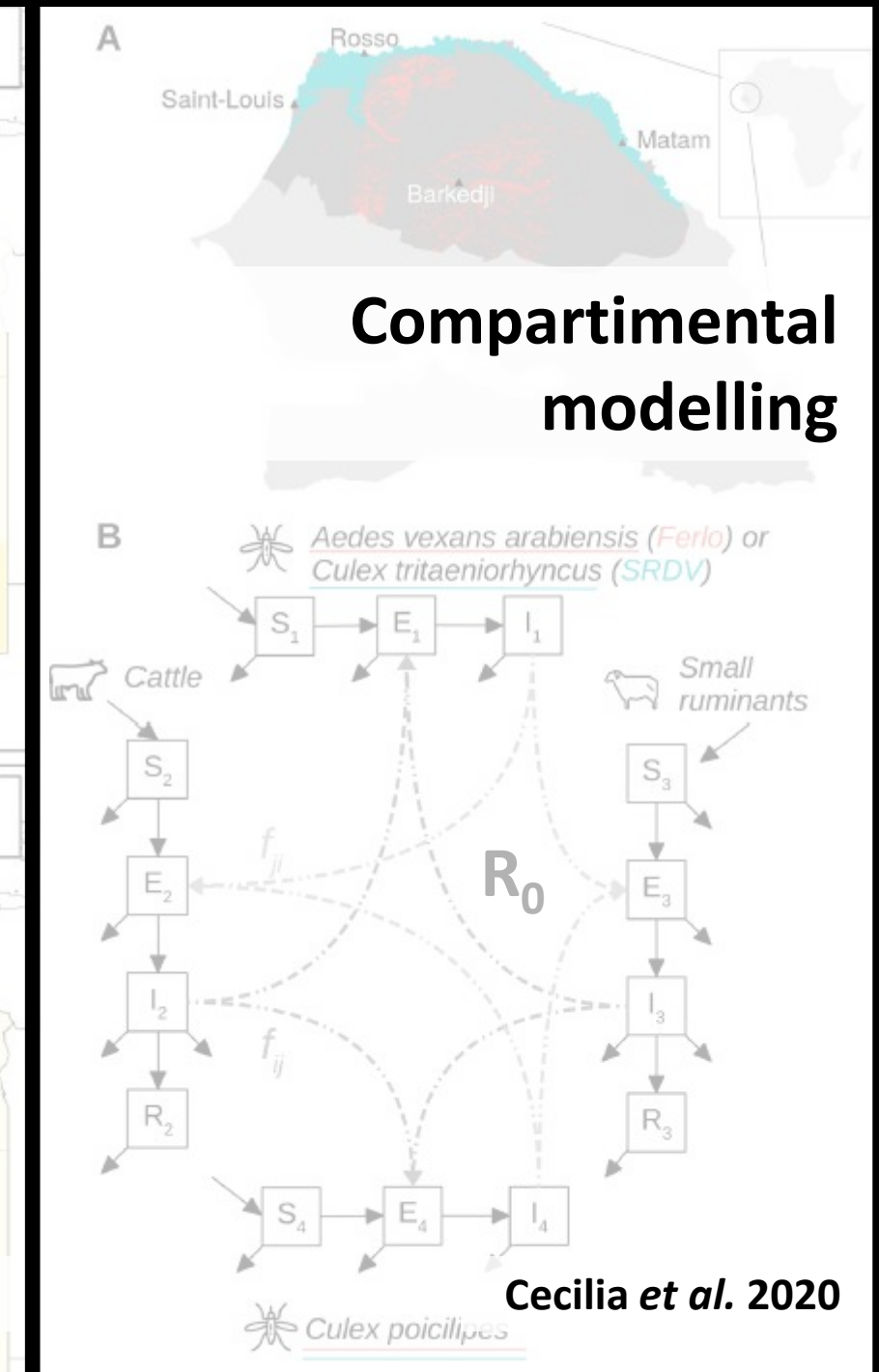
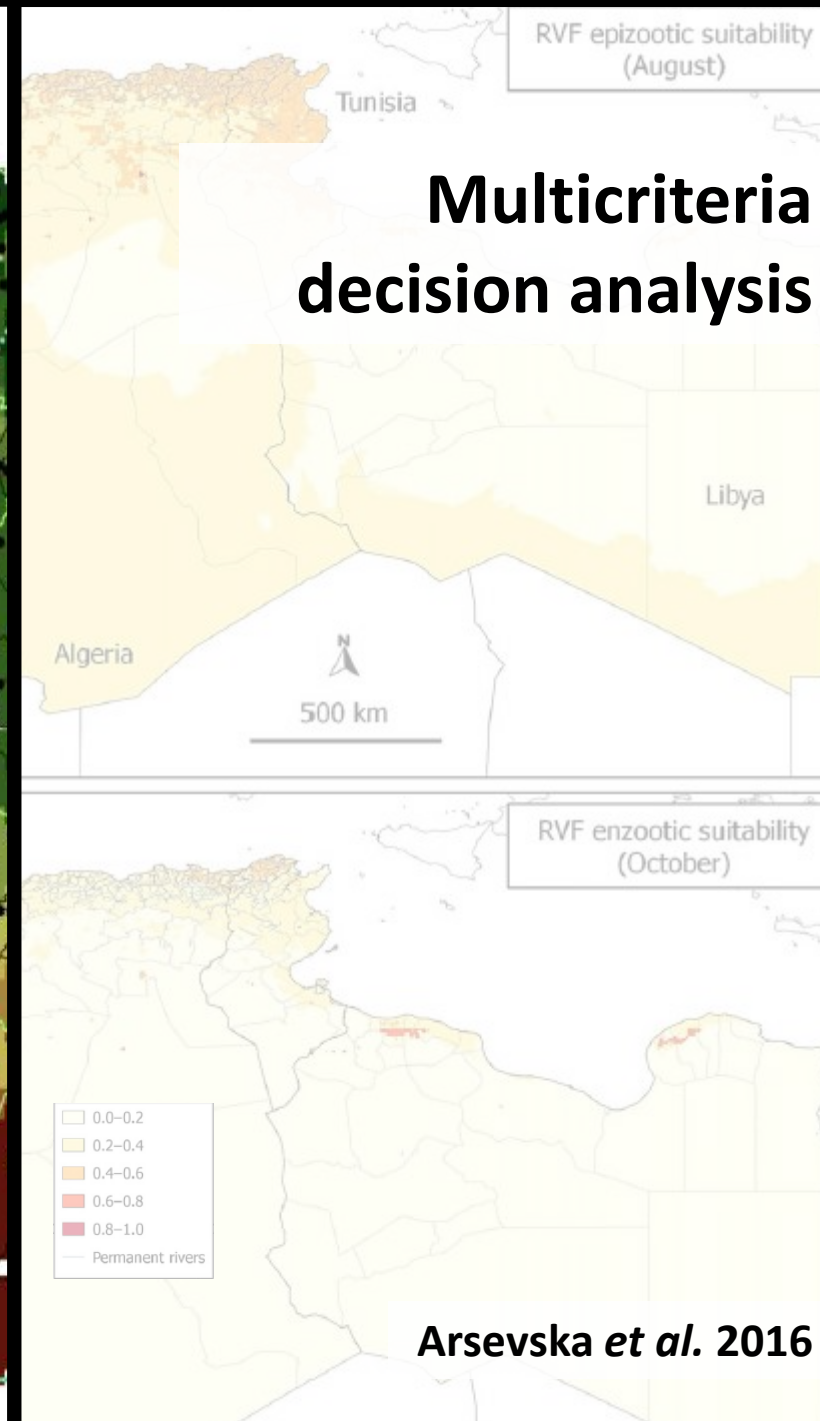
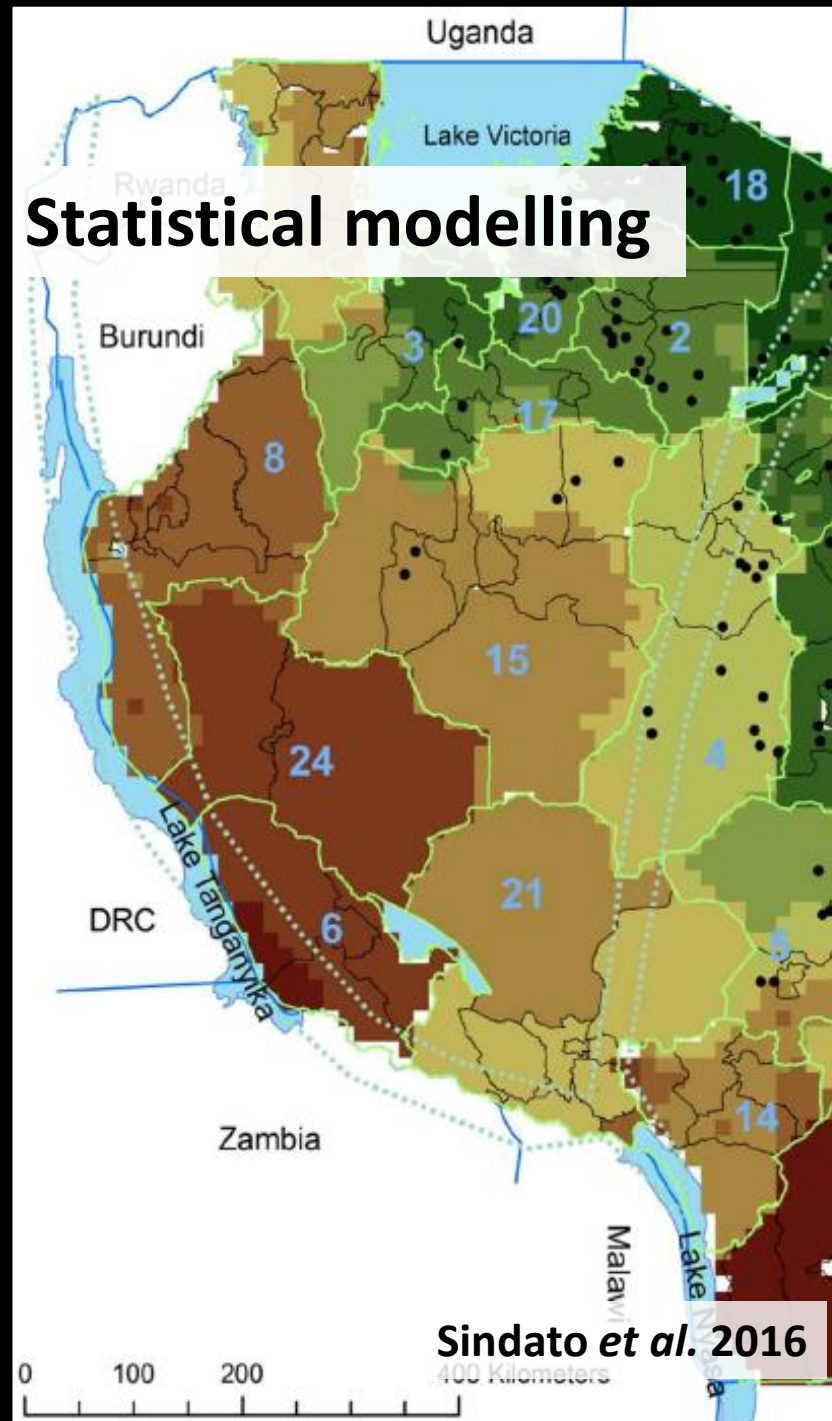
OIE regional meeting on vector-borne diseases
in North Africa

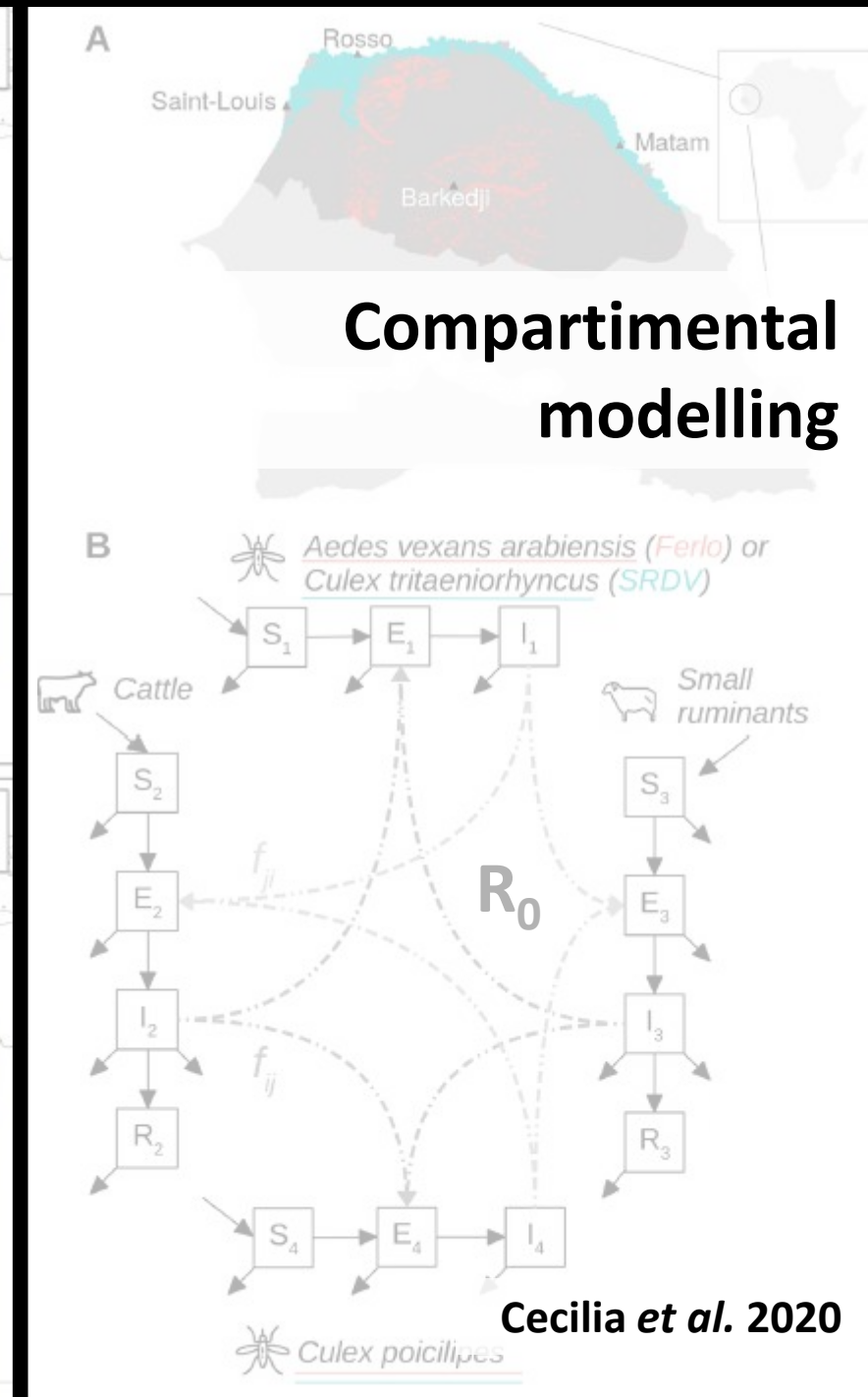
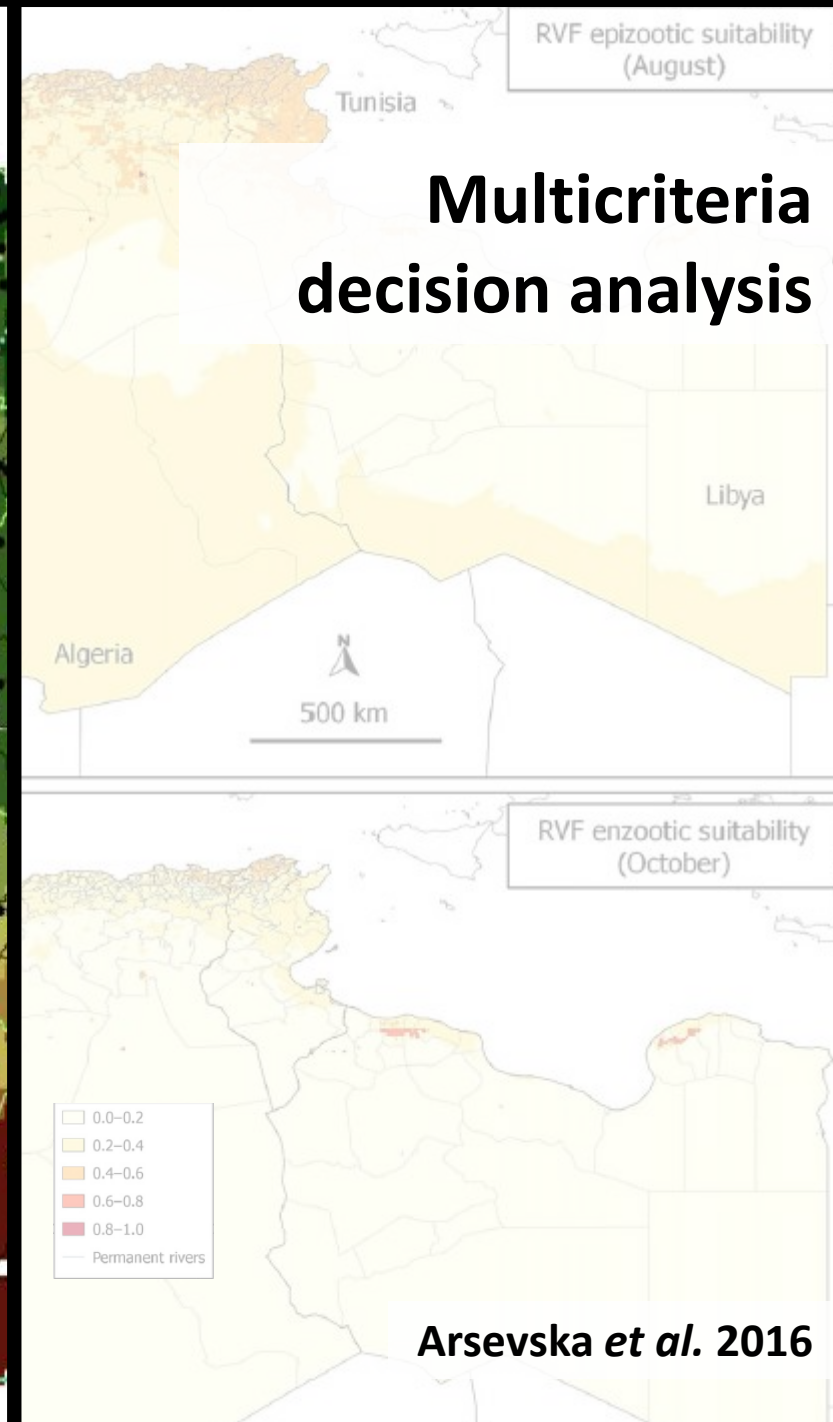
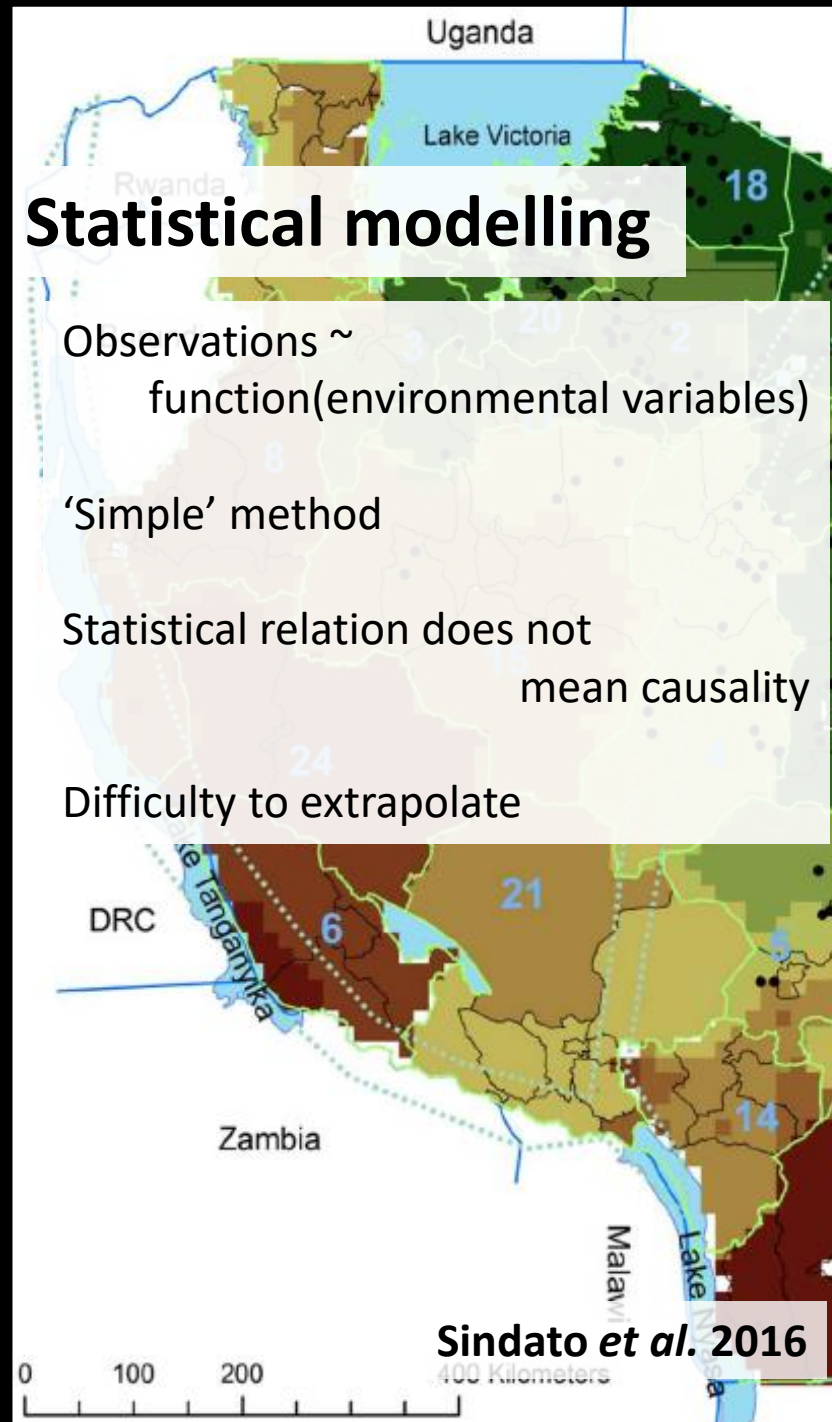
Towards an estimation risk of transmission of Rift Valley fever virus in the Mediterranean: *methods and limits*

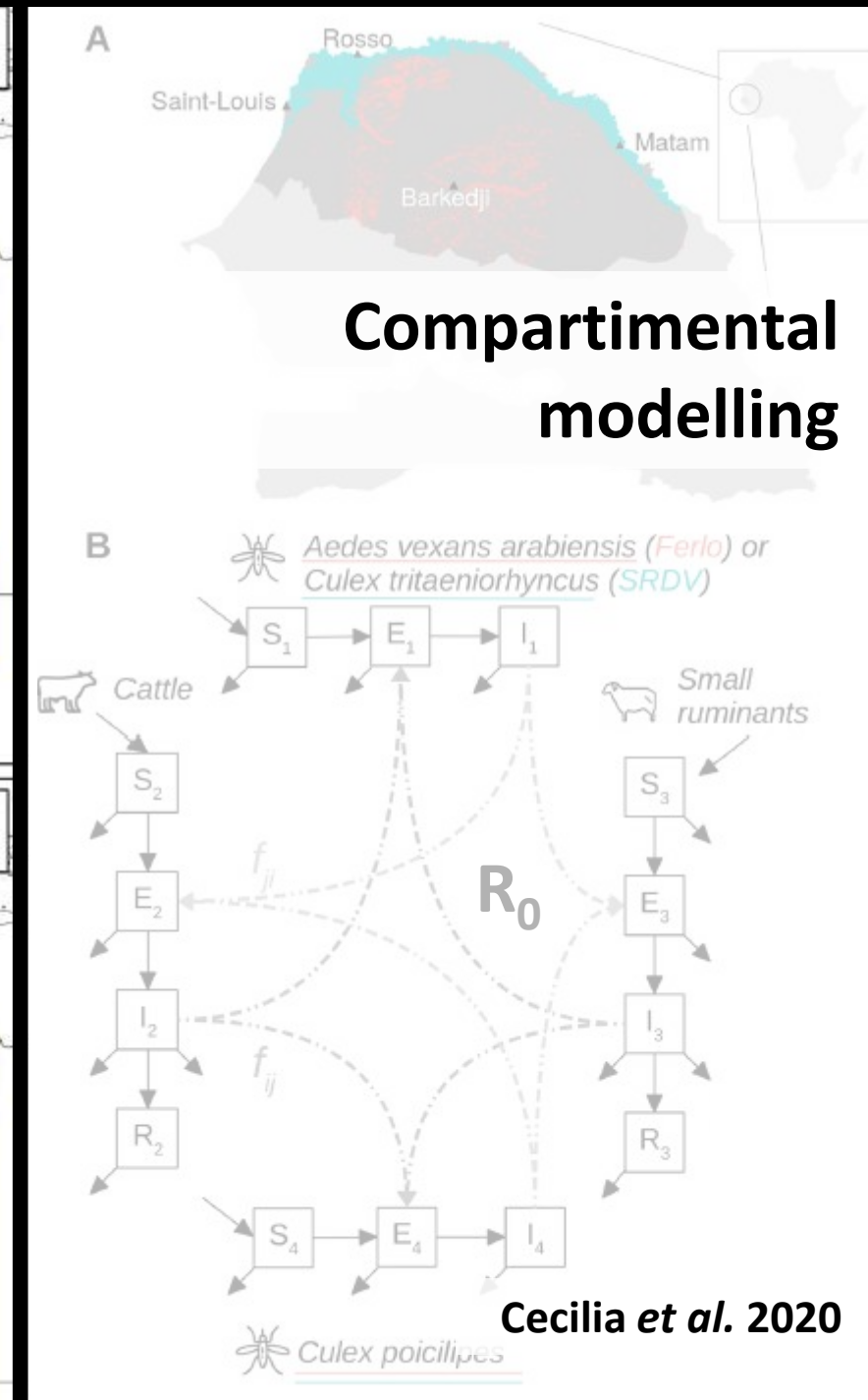
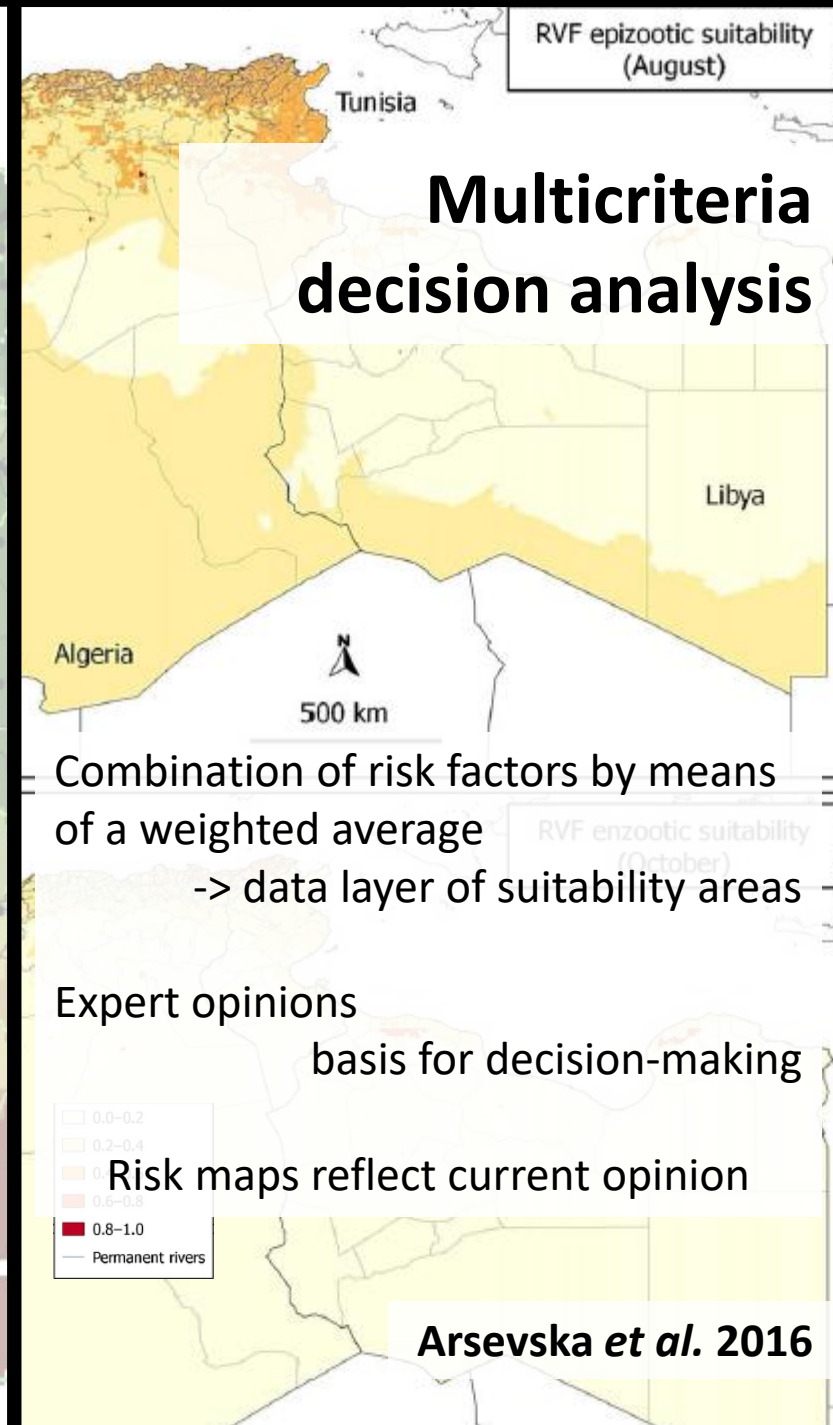
Thomas Balenghien
balenghien@cirad.fr

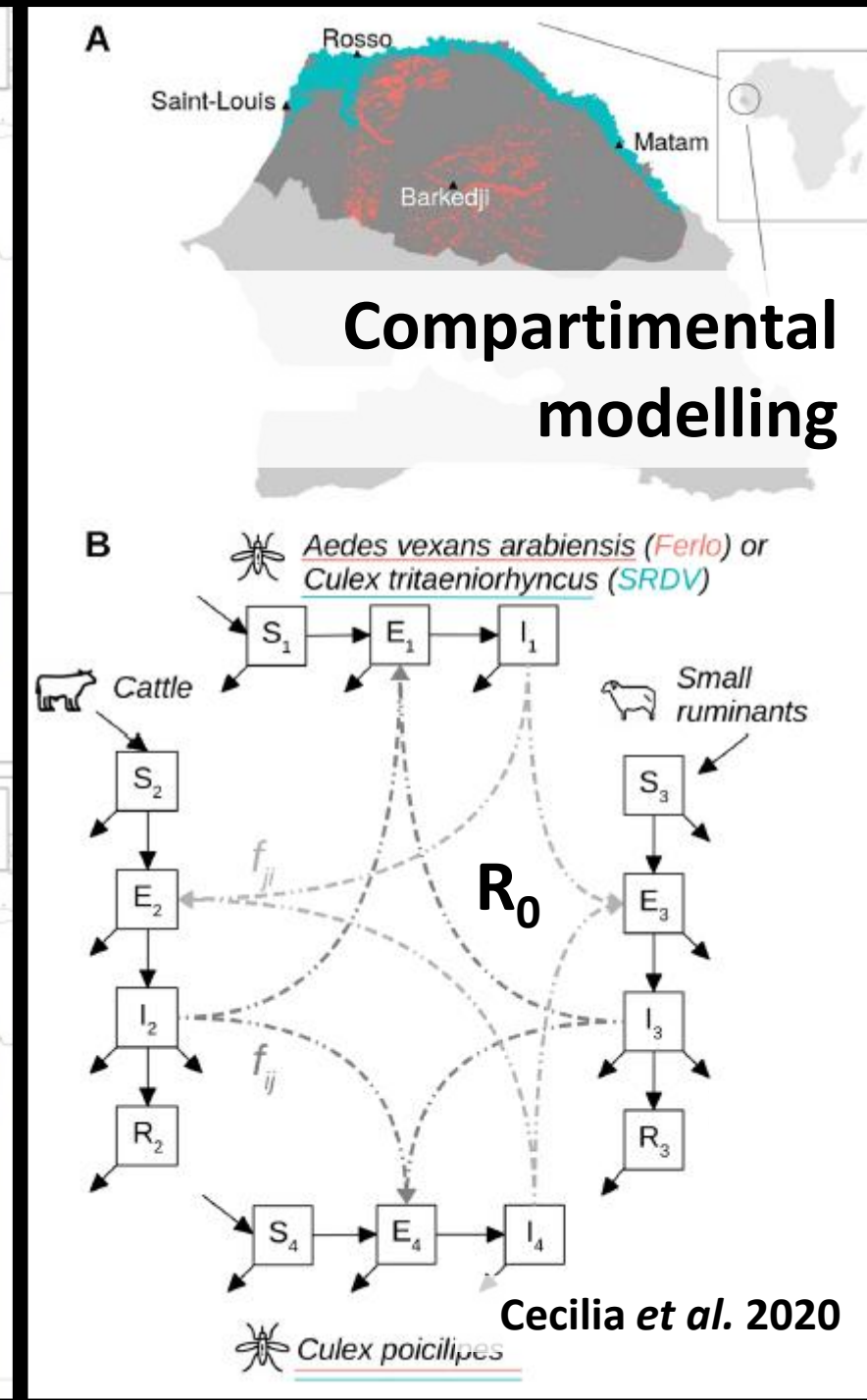
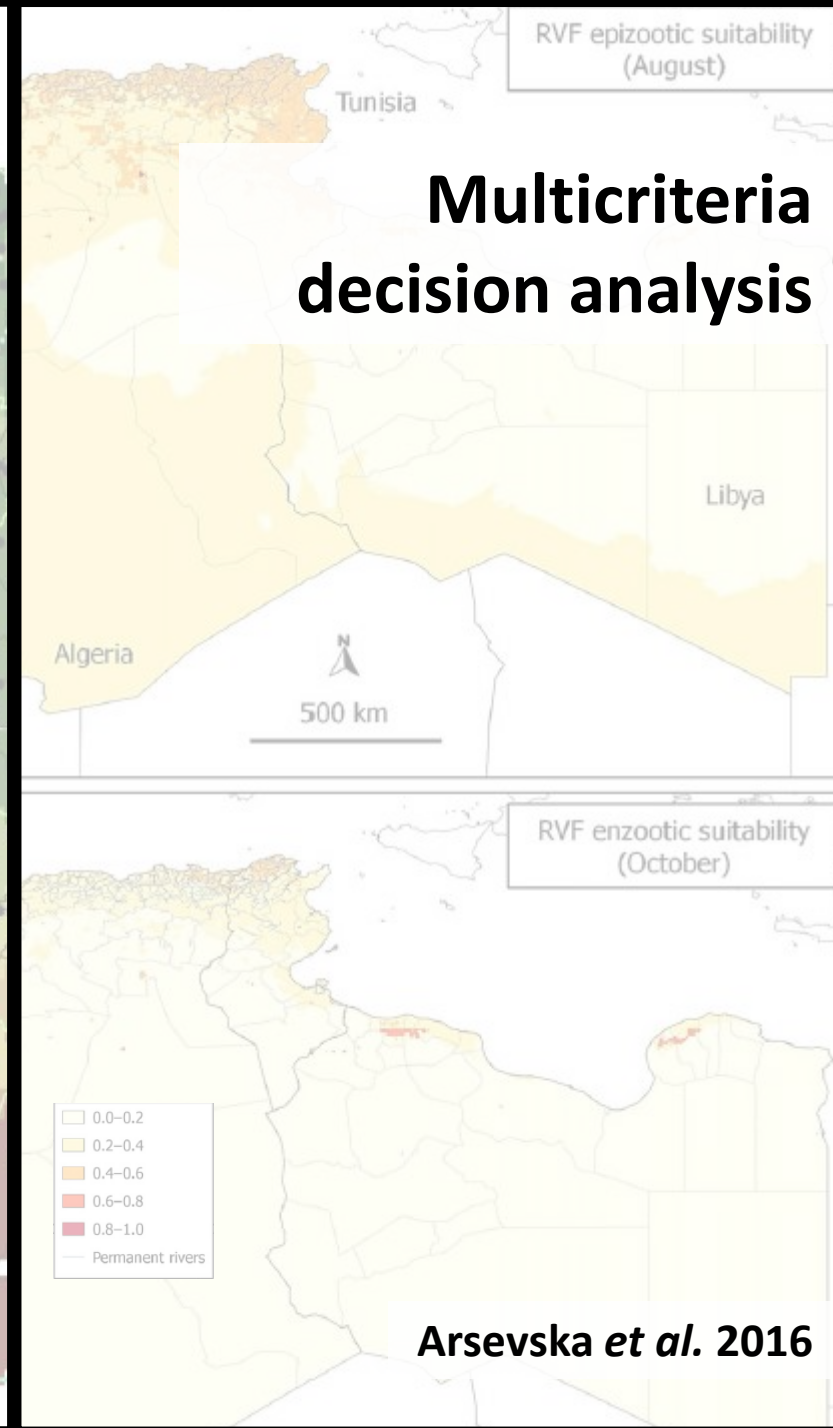


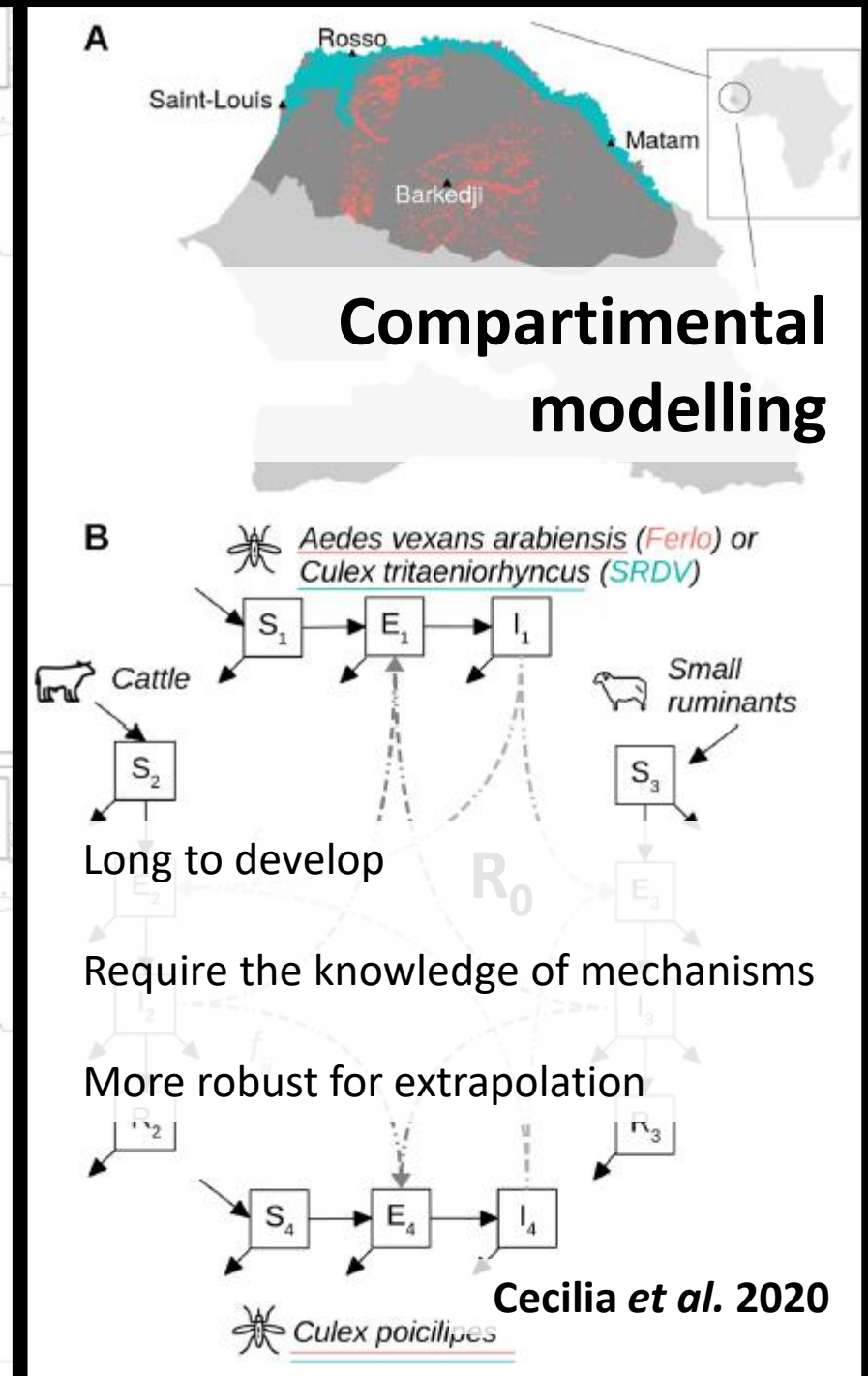
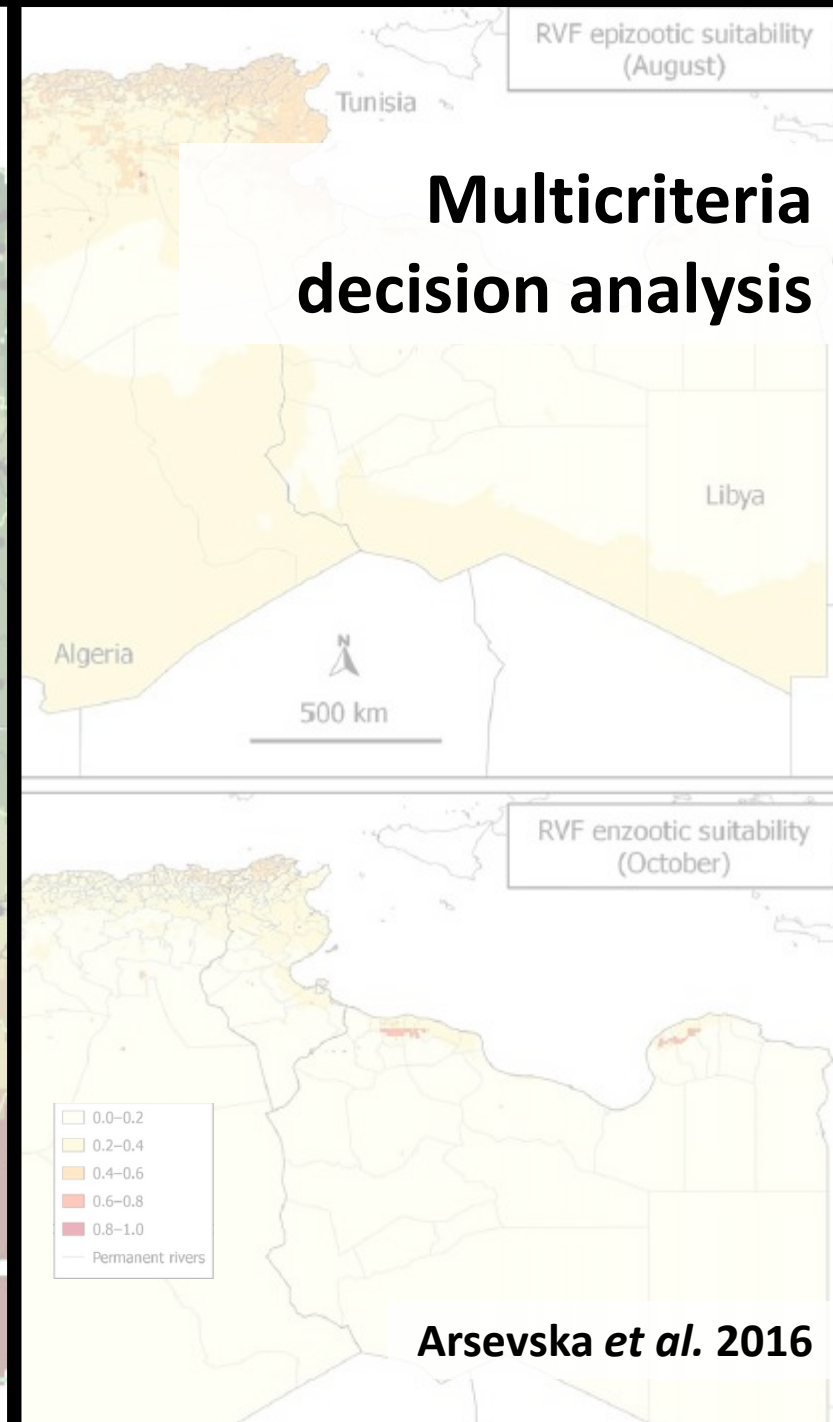
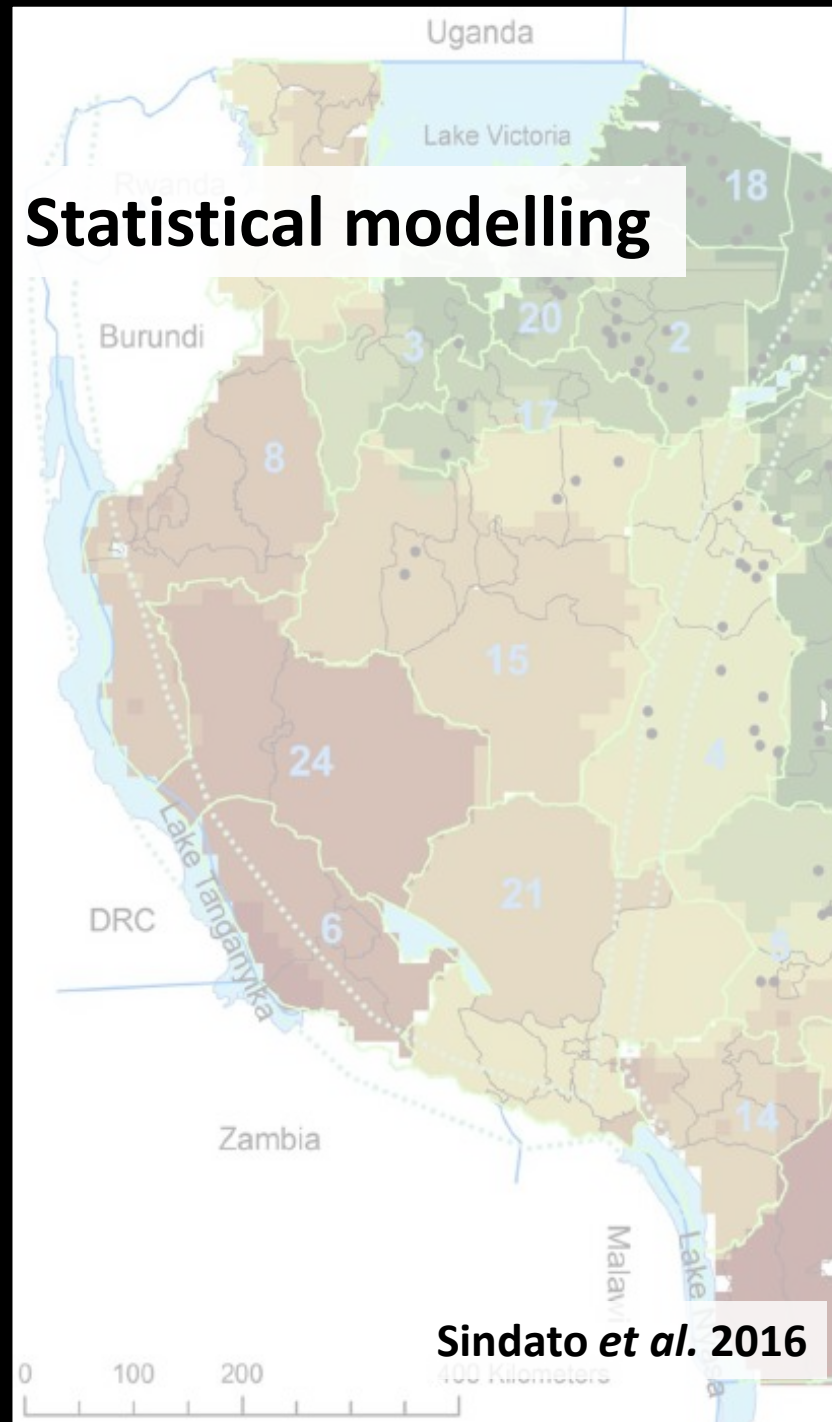






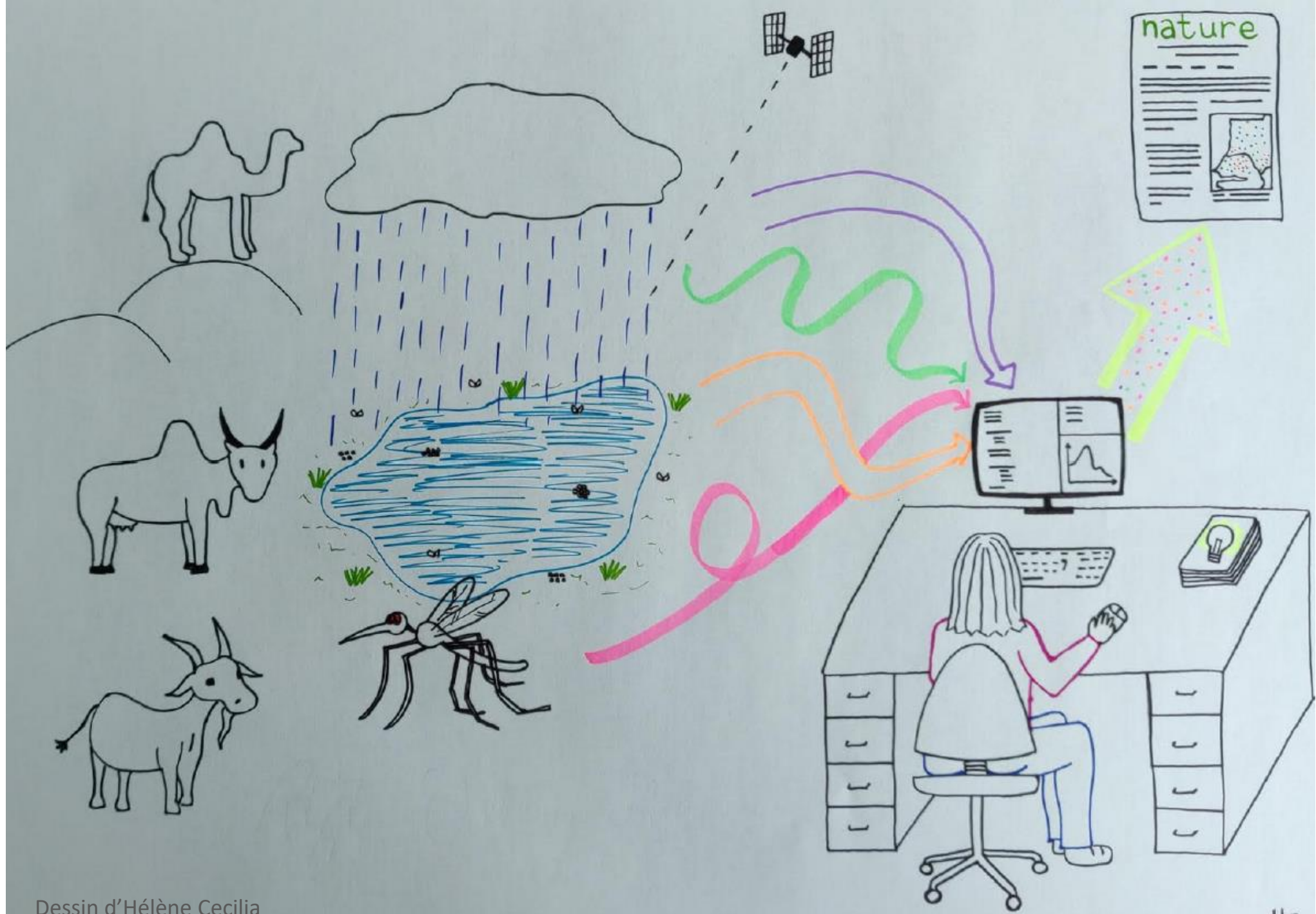








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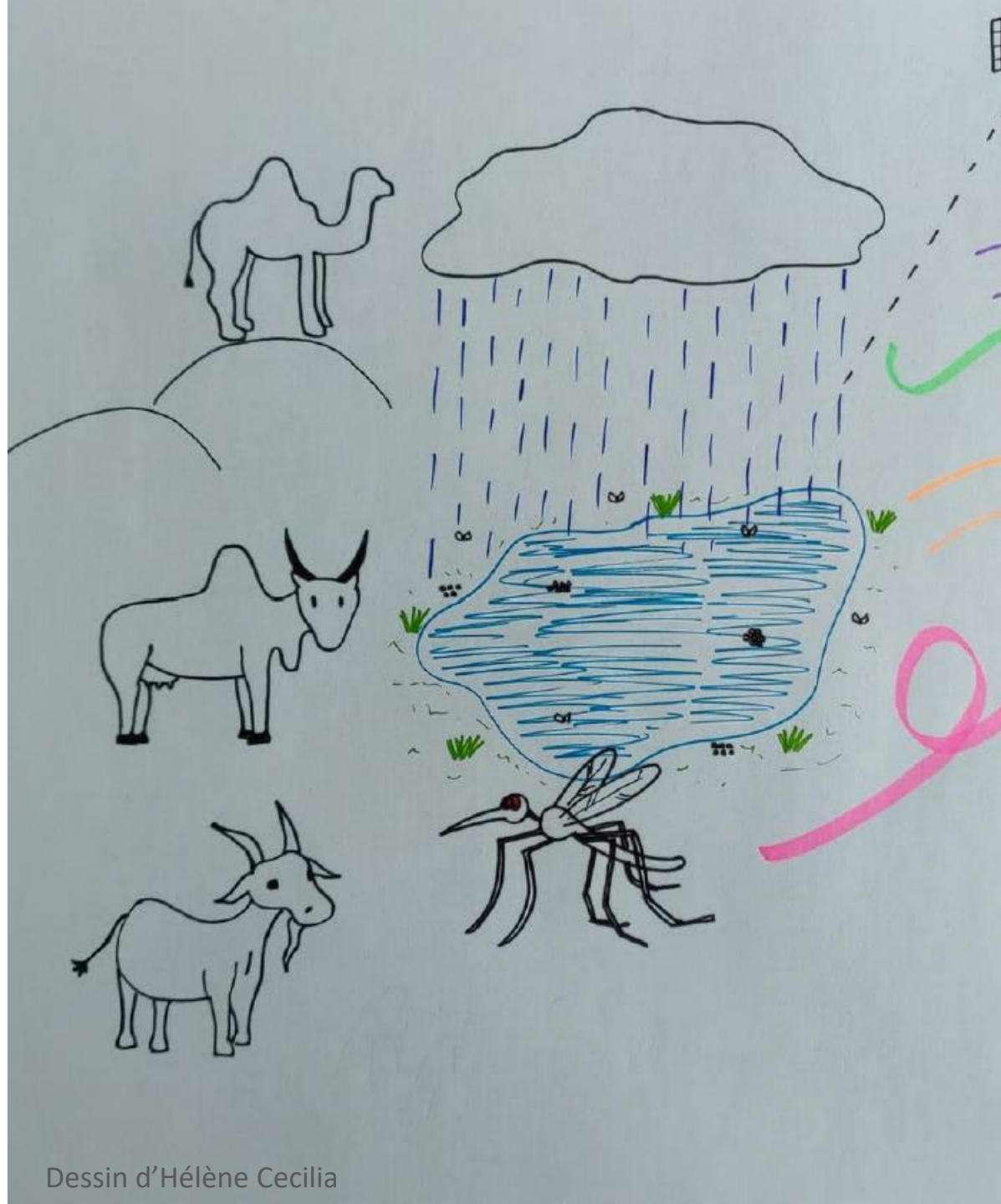


Dessin d'Hélène Cecilia

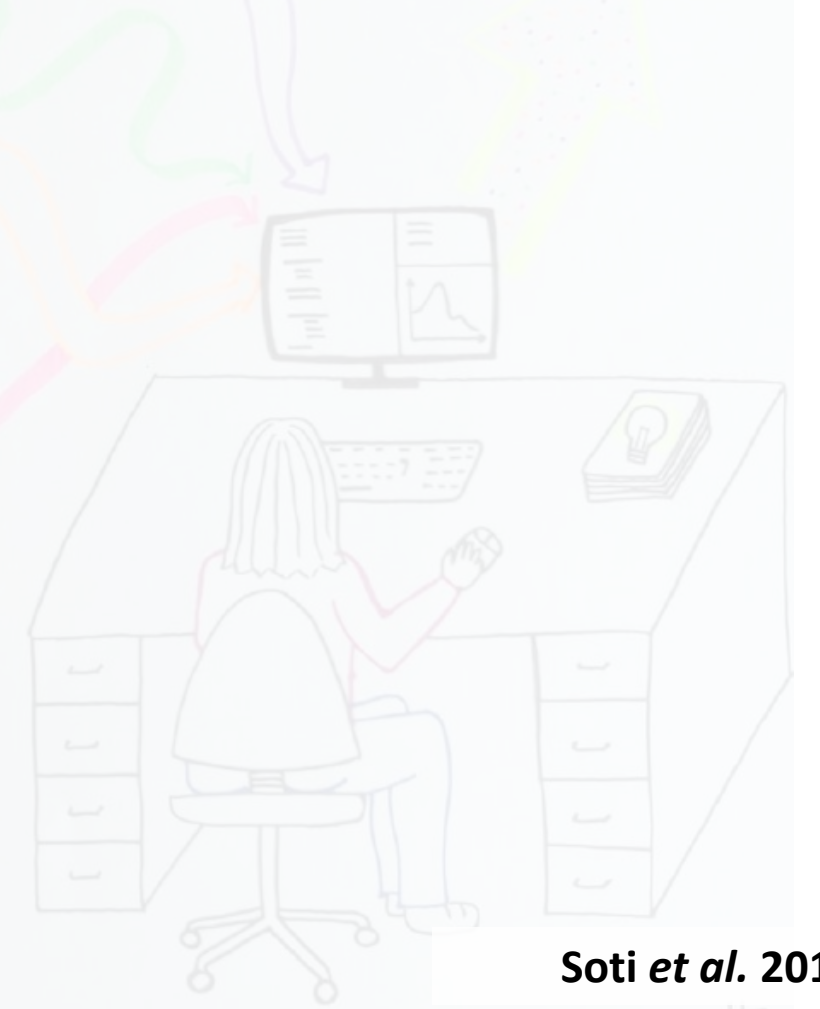
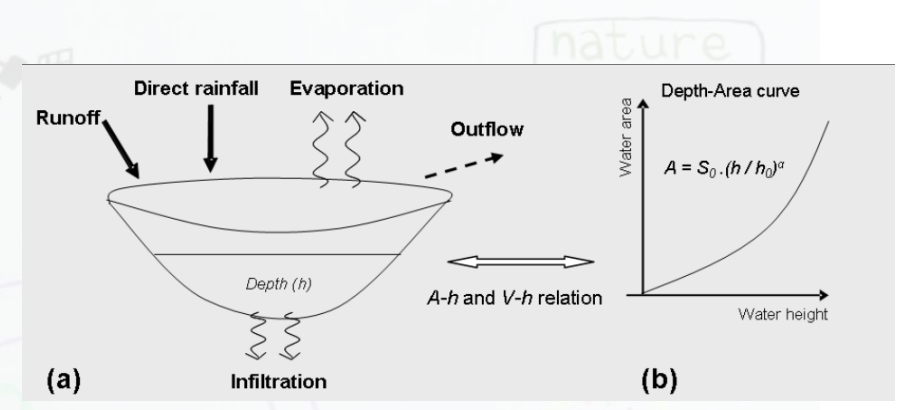
H.C.



F. Schaffner



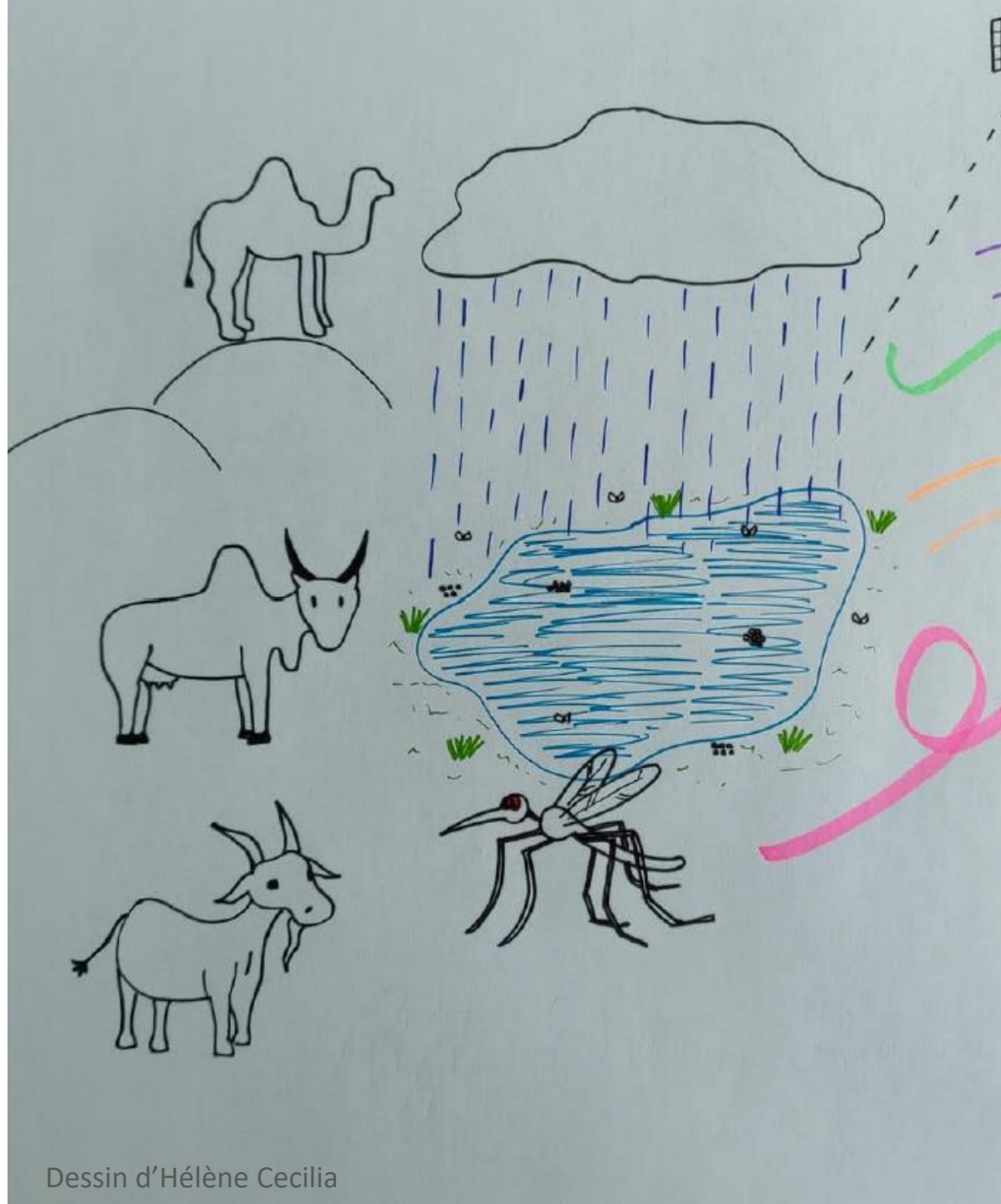
Dessin d'Hélène Cecilia



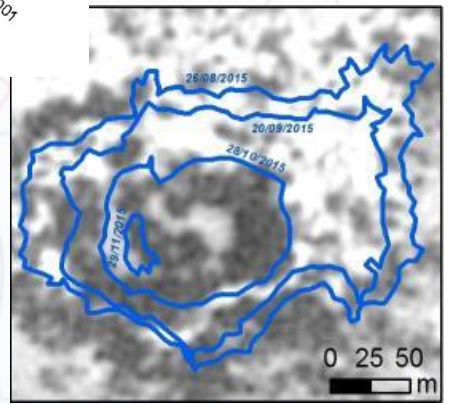
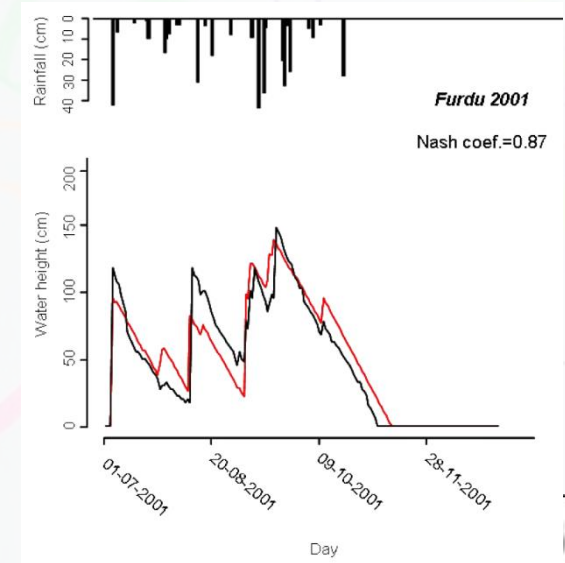
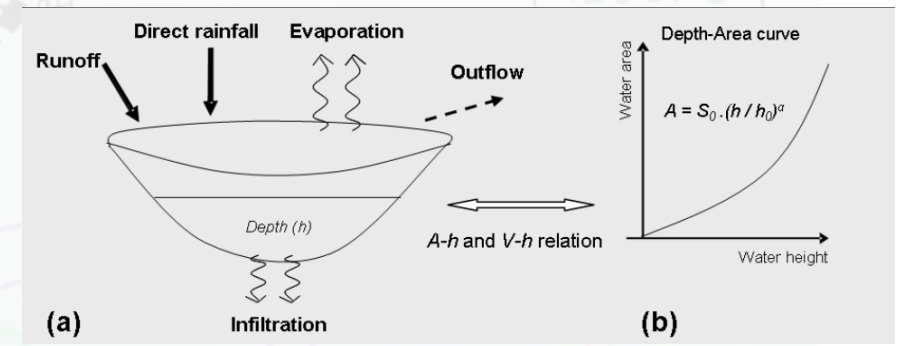
Soti et al. 2010



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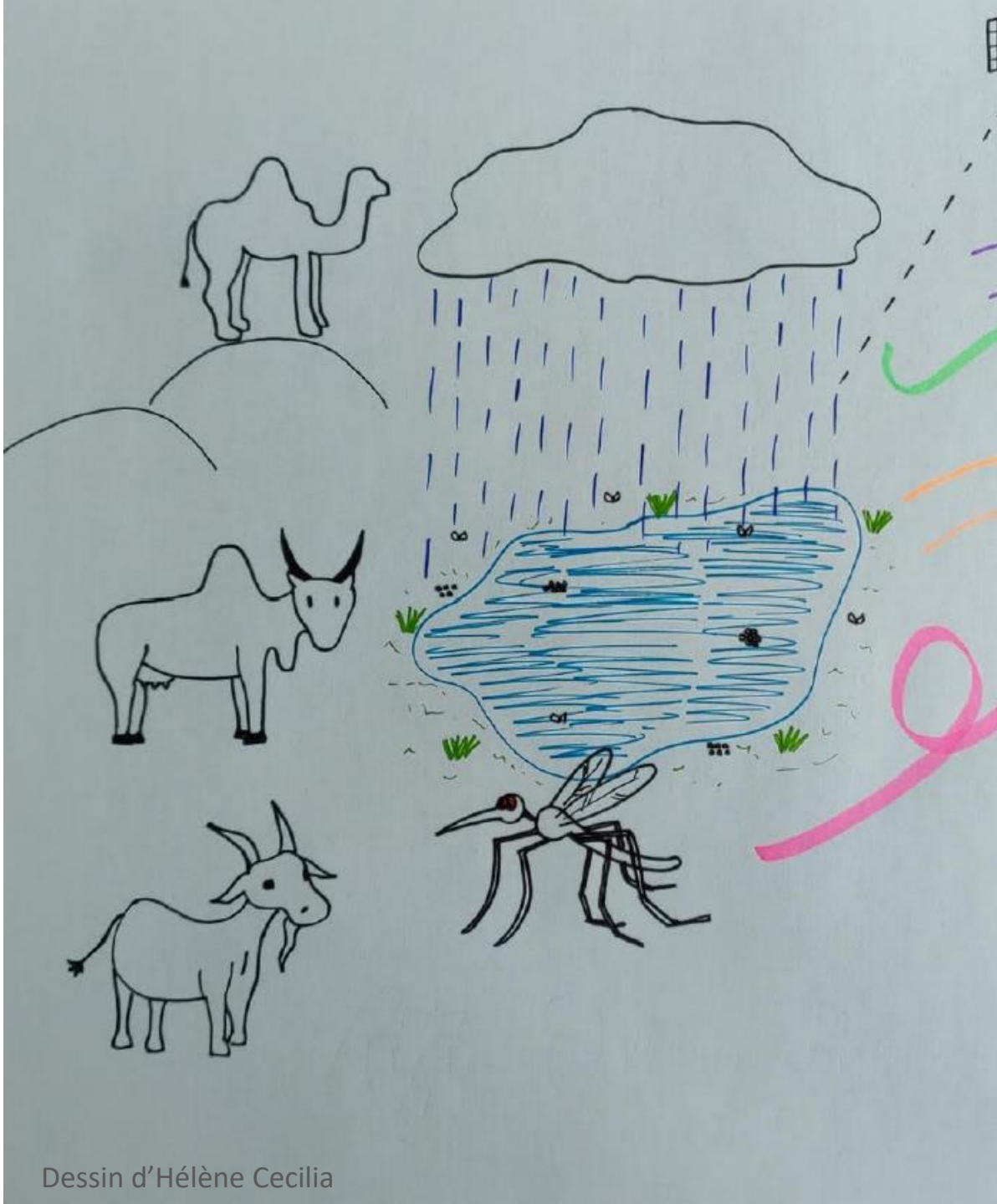
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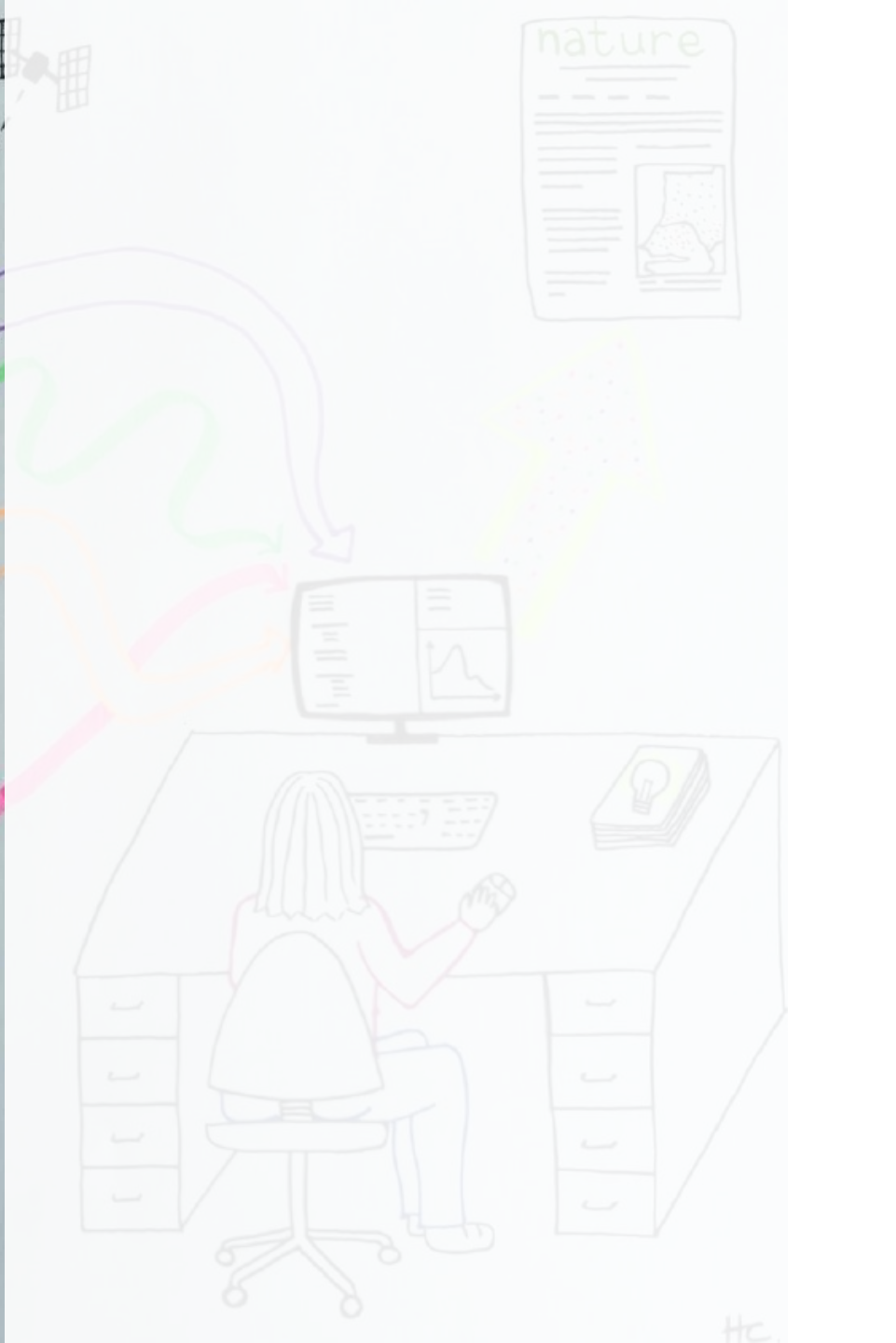
Soti et al. 2010



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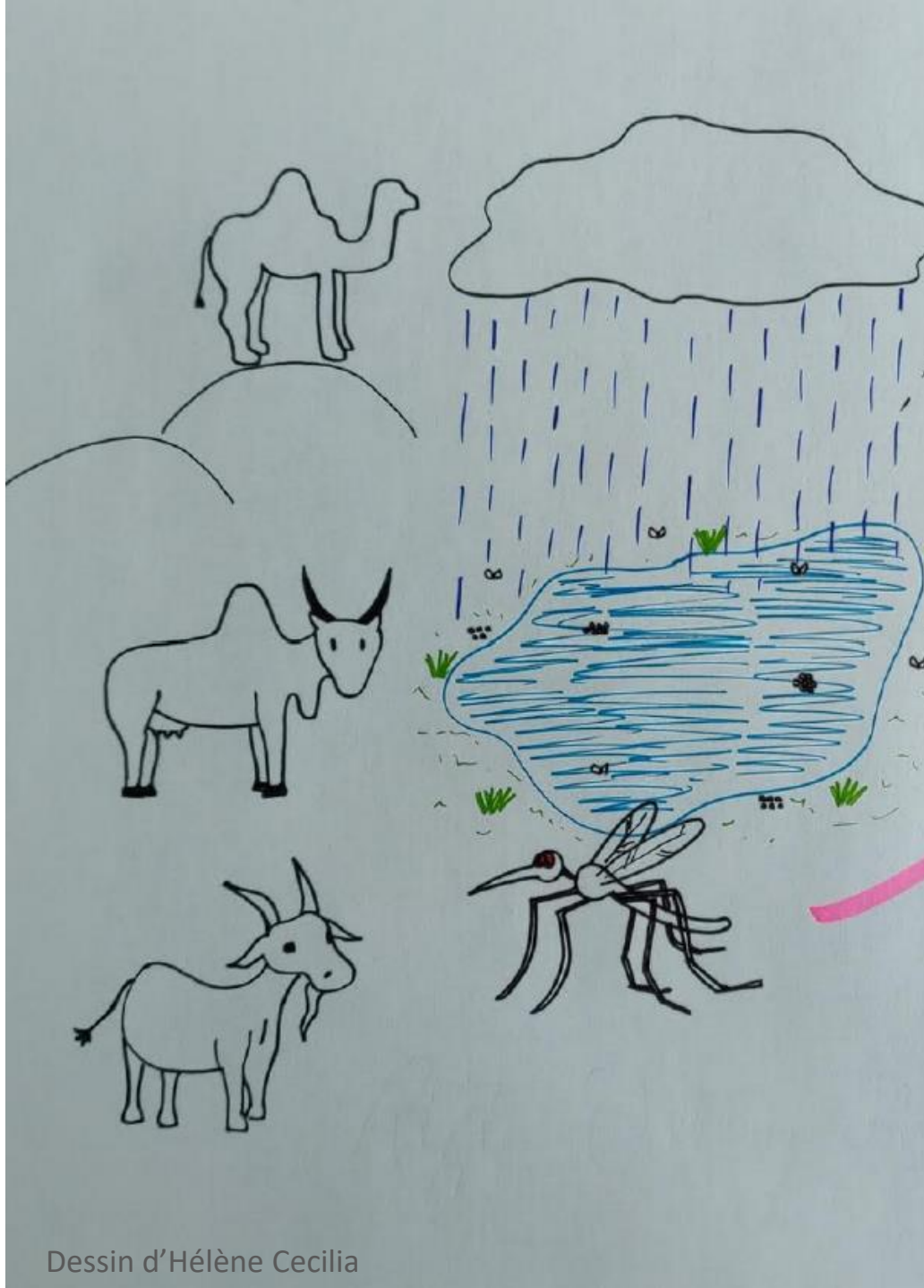
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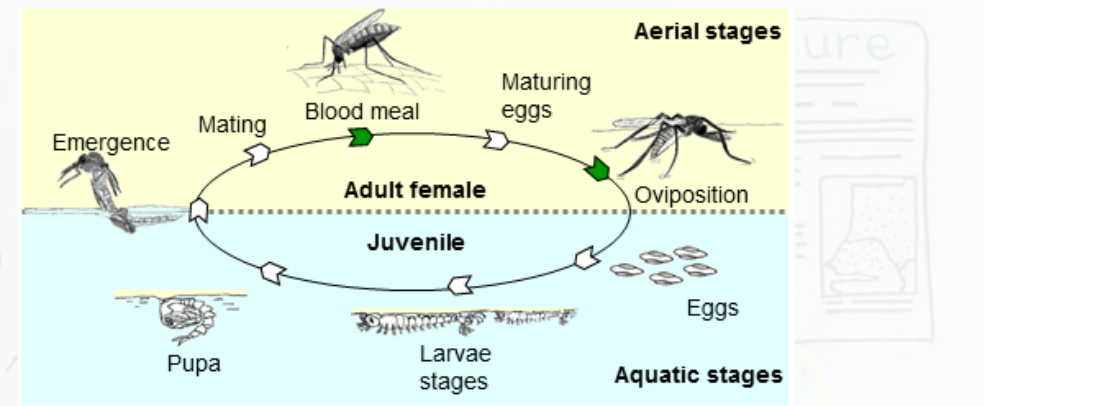
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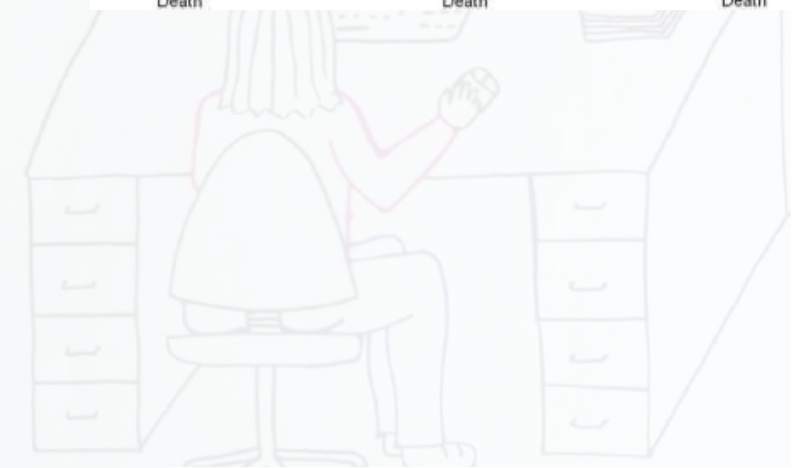
F. Schaffner



Dessin d'Hélène Cecilia



b



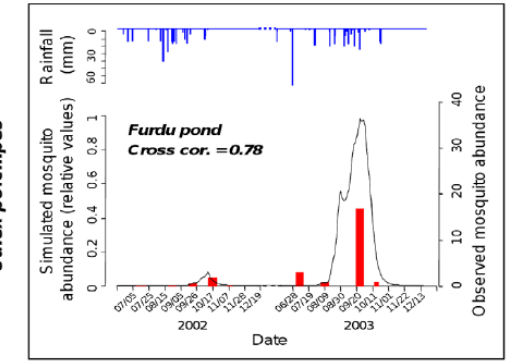
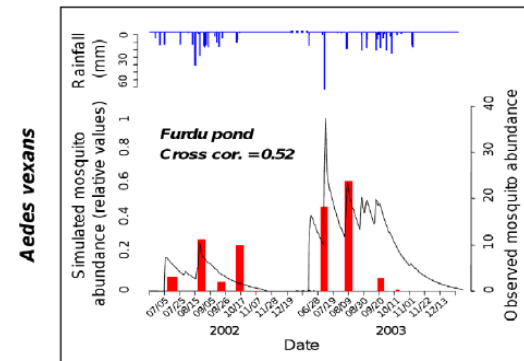
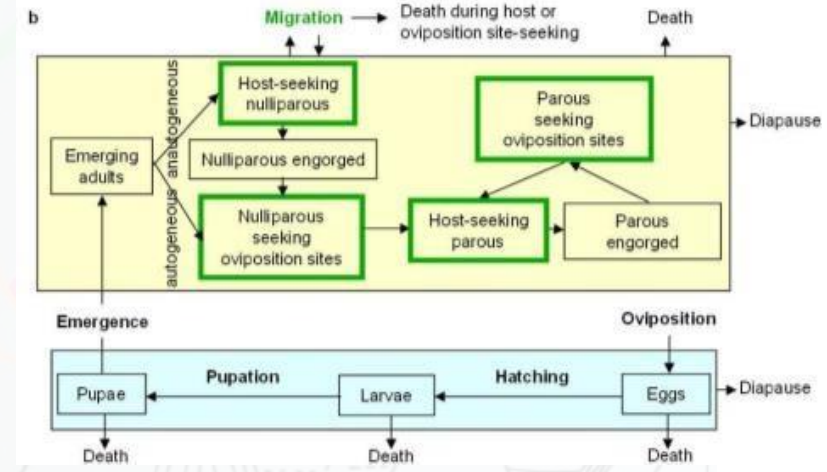
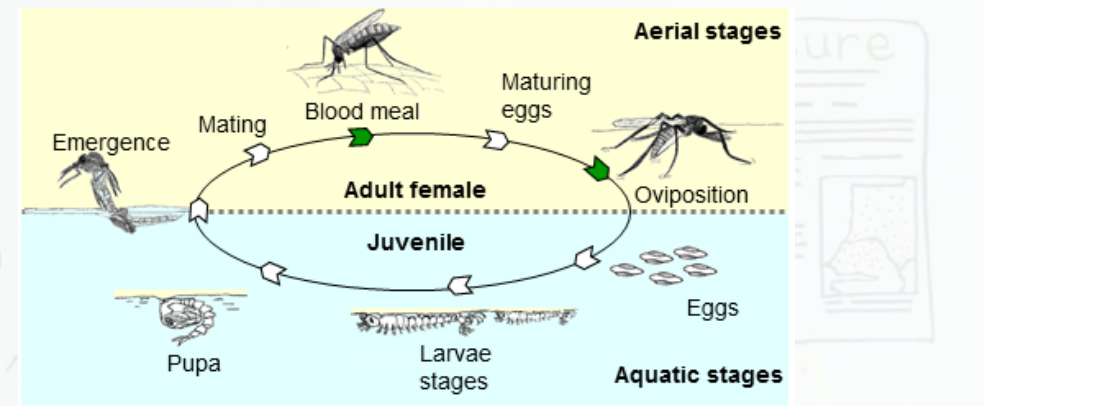
Cailly *et al.* 2012; Soti *et al.* 2012



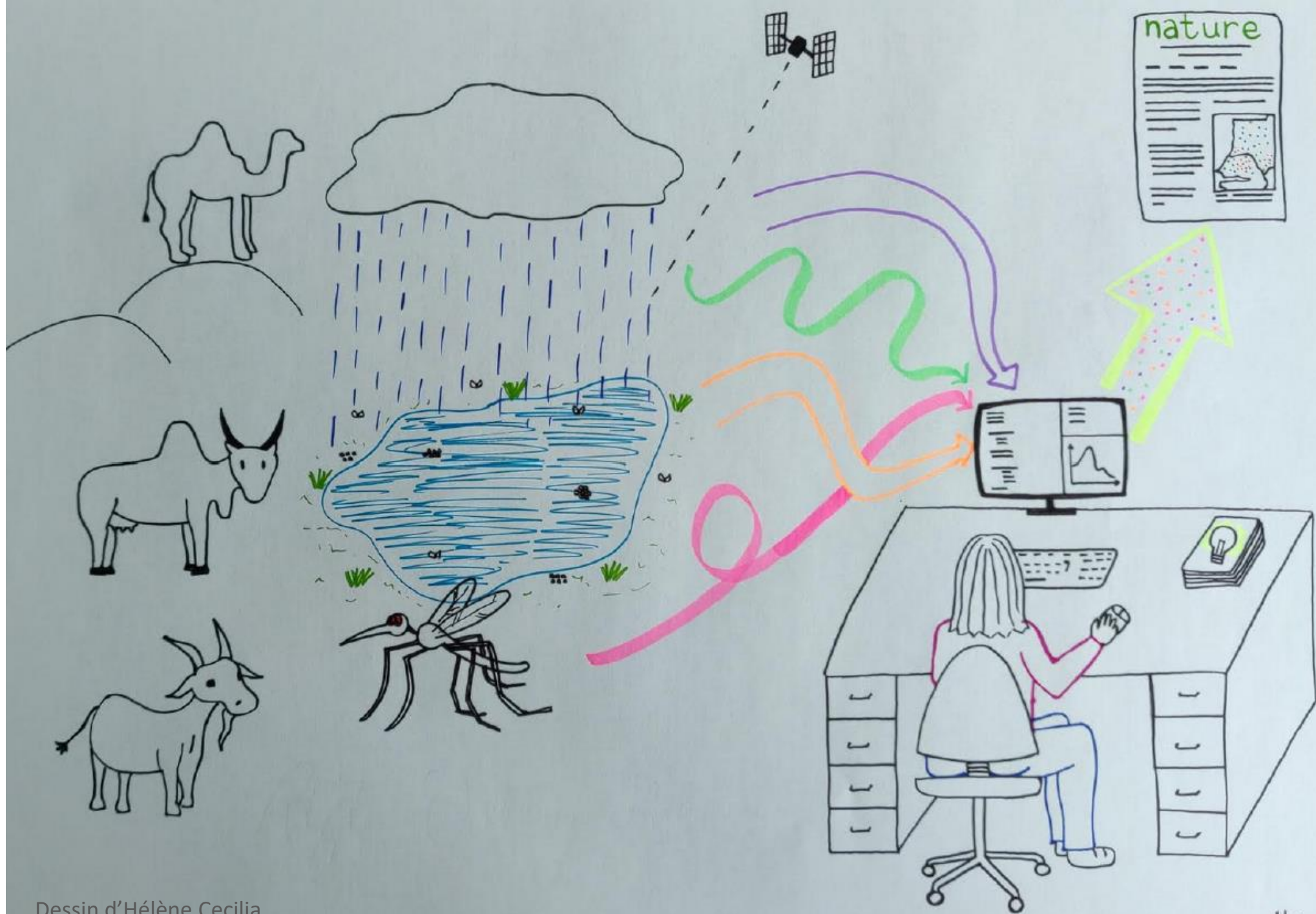
F. Schaffner



Dessin d'Hélène Cecilia



Cailly et al. 2012; Soti et al. 2012



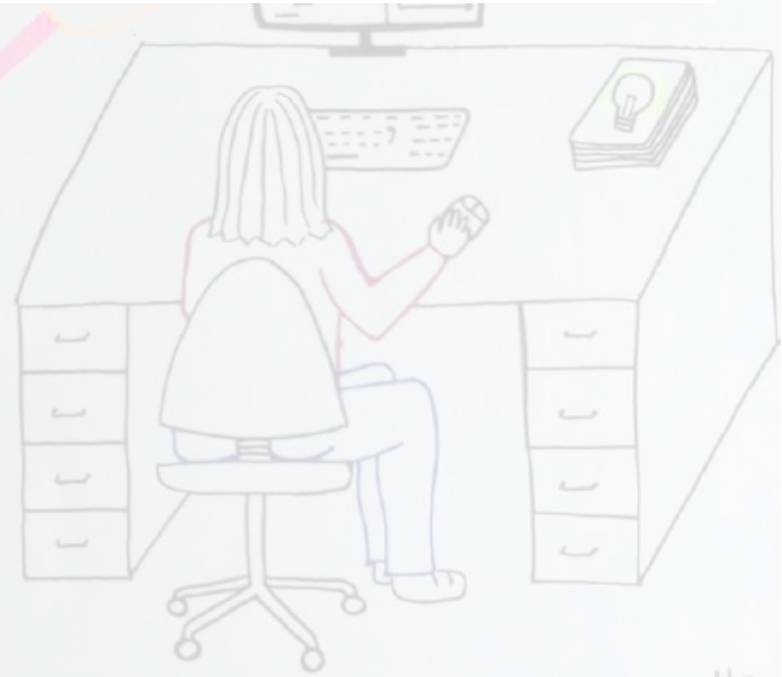
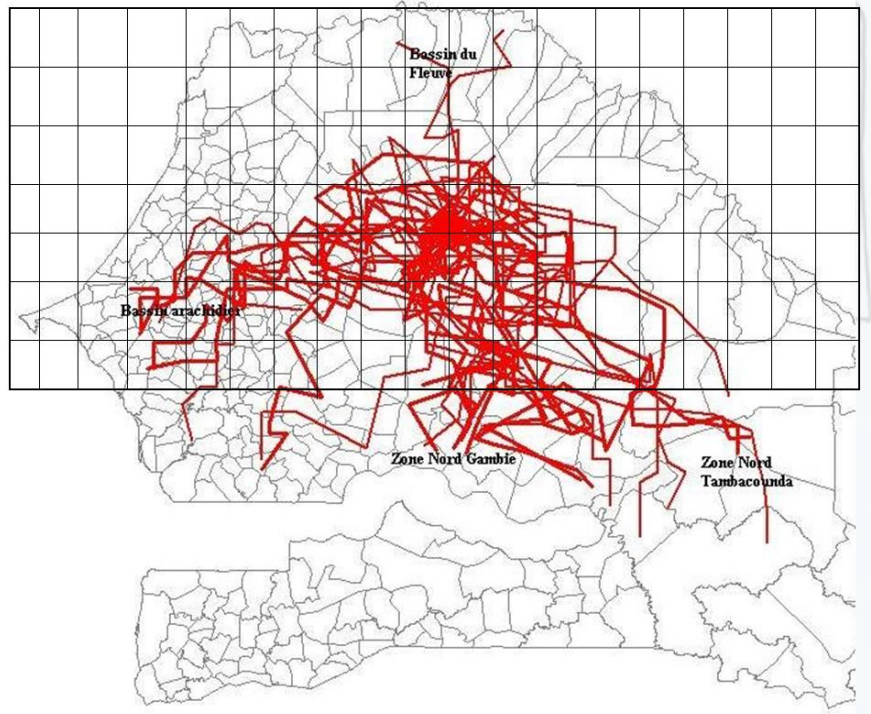
Dessin d'Hélène Cecilia



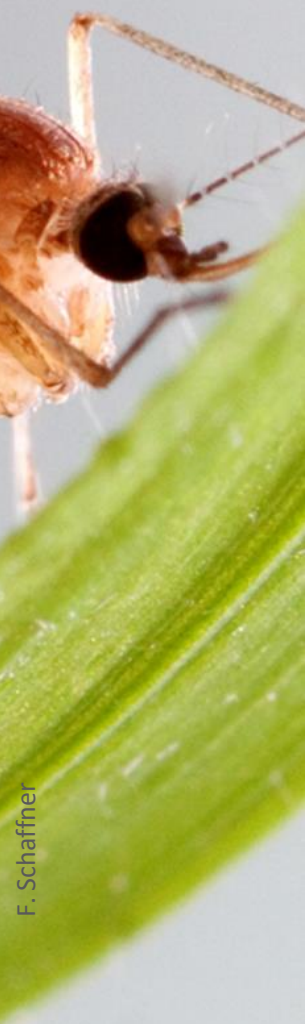
F. Schaffner



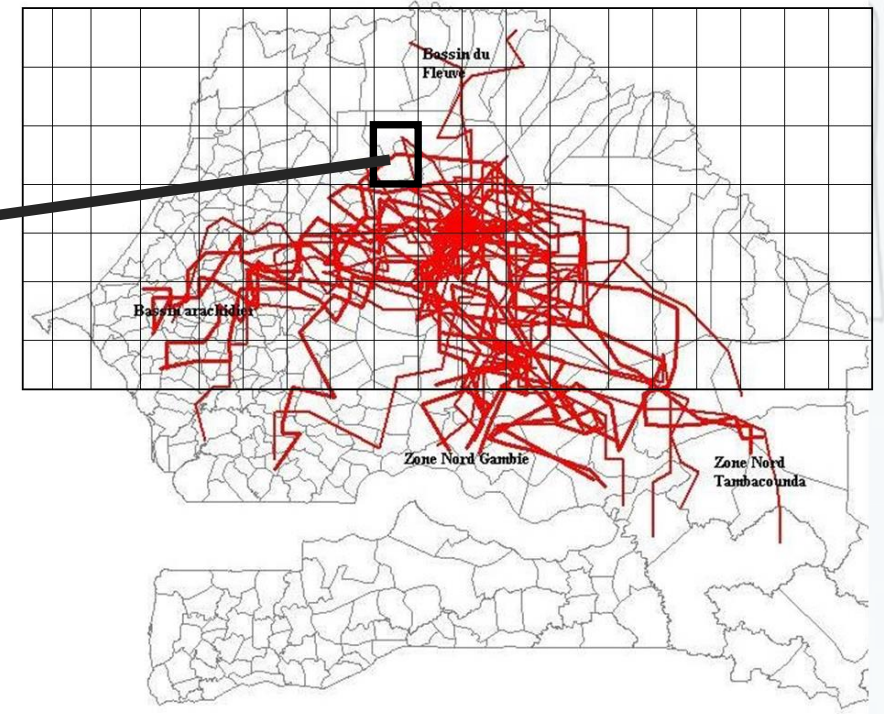
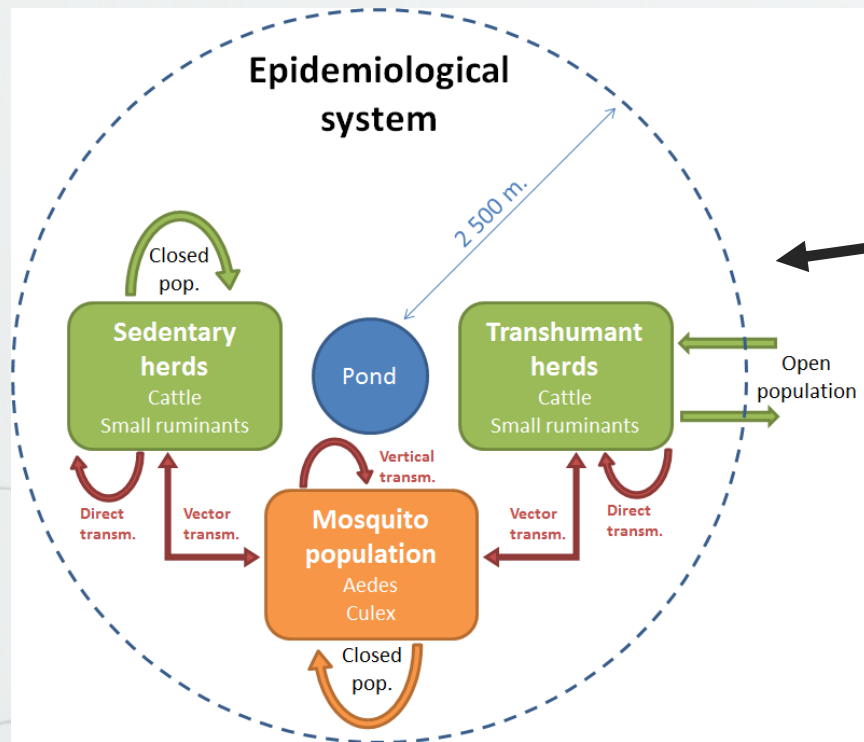
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Hc.



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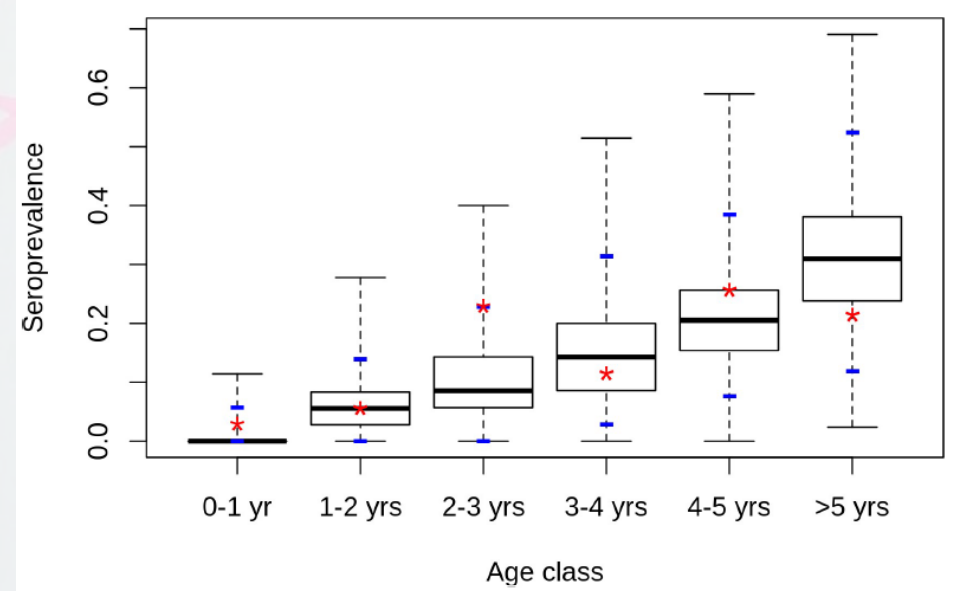
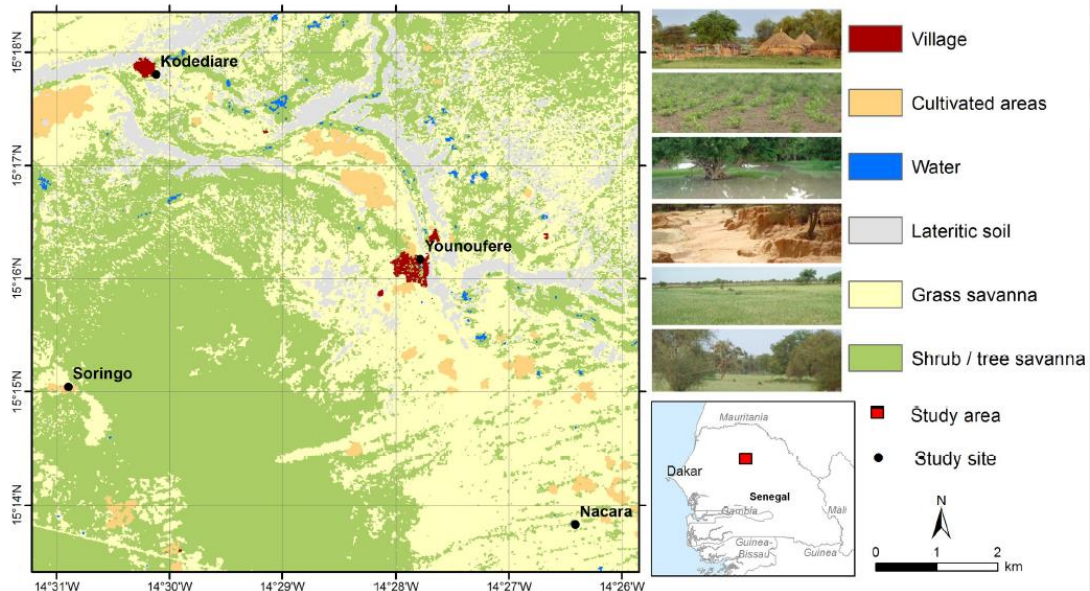
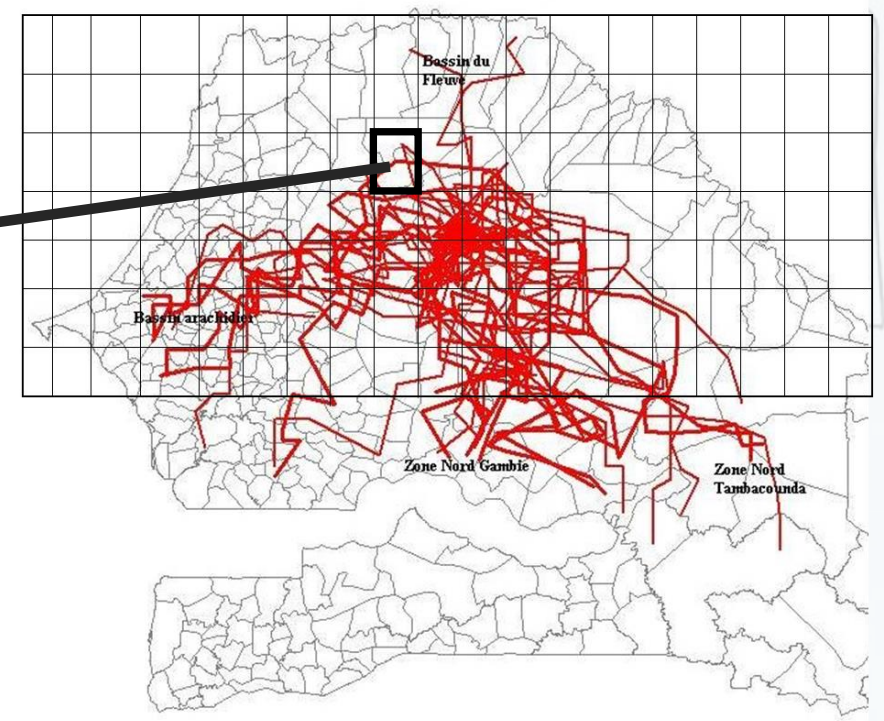
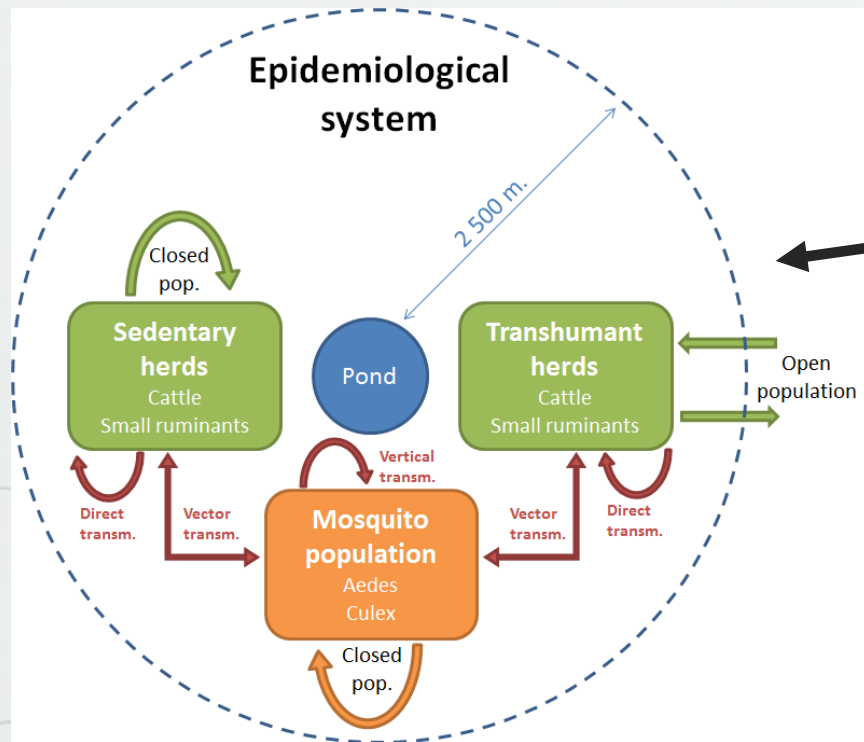


Dessin d'Hélène Cecilia

H.C.



F. Schaffner

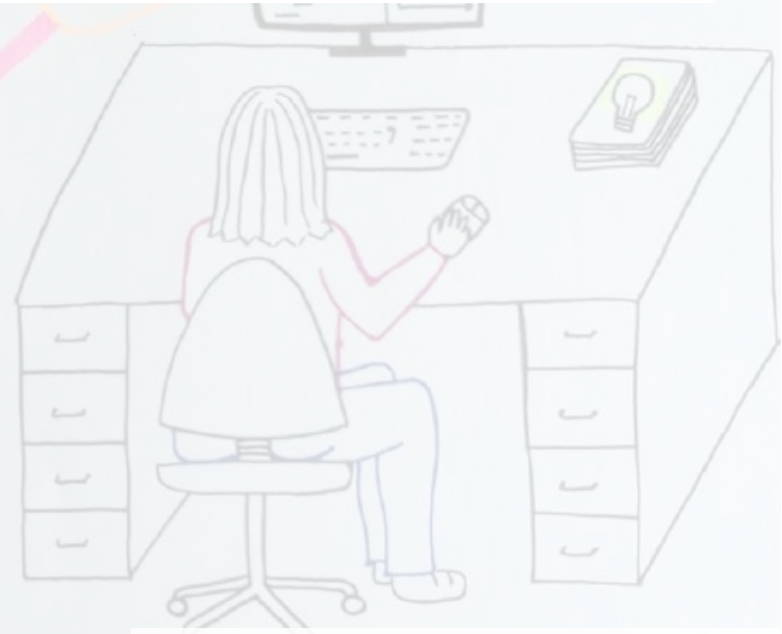
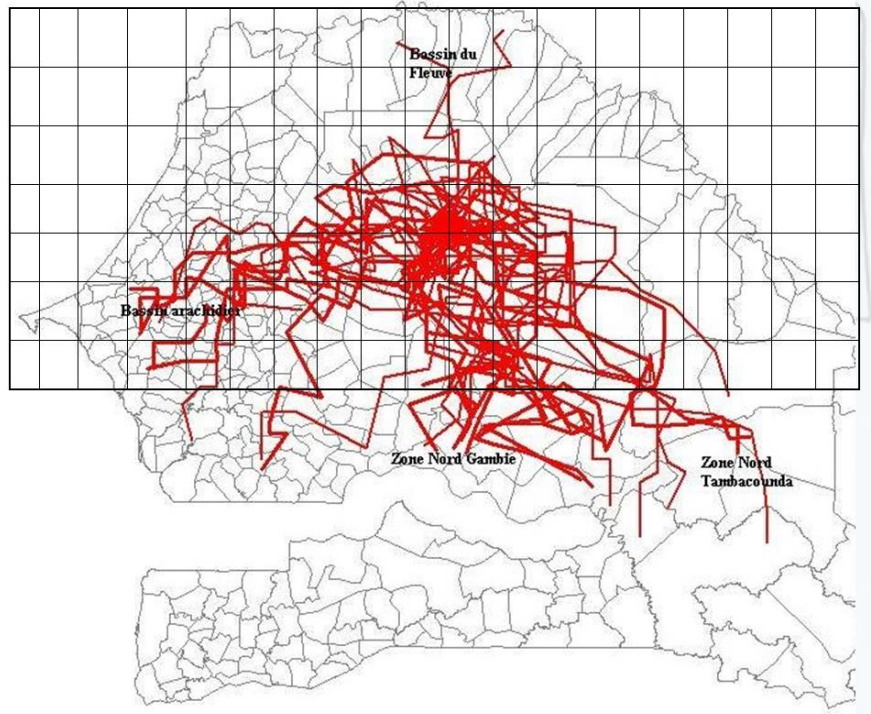




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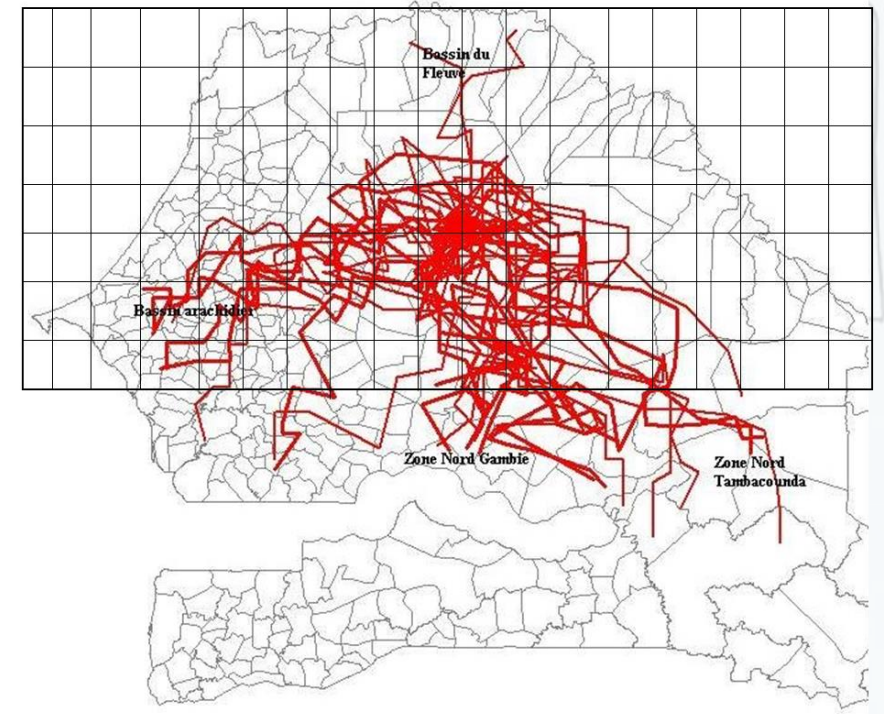
$$R_0 = \sqrt{\frac{1}{2} \left[(R_{11} + R_{44}) + \sqrt{(R_{11} + R_{44})^2 - 4(R_{11}R_{44} - R_{14}R_{41})} \right]}$$

$$R_{11} = \frac{\epsilon_1}{(d_1 + \epsilon_1)d_1} \times \left(\frac{N_1}{N_2} \epsilon_2 \alpha_{21} \alpha_{12} (\phi_{12} a_1)^2 (1 - p_2) + \frac{N_1}{N_3} \epsilon_3 \alpha_{31} \alpha_{13} (\phi_{13} a_1)^2 (1 - p_3) \right)$$

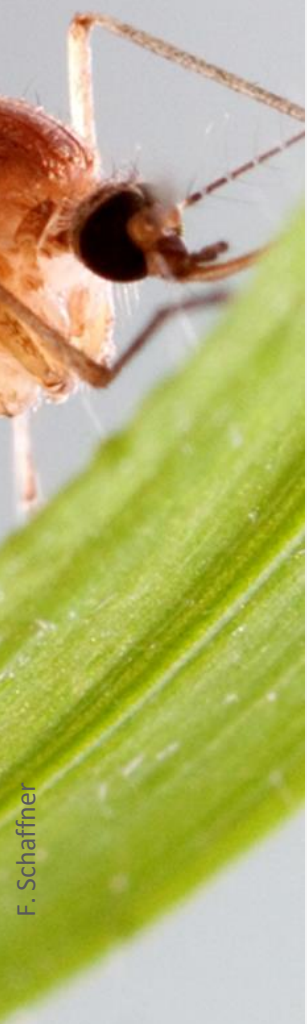
$$R_{44} = \frac{\epsilon_4}{(d_4 + \epsilon_4)d_4} \times \left(\frac{N_4}{N_2} \epsilon_2 \alpha_{24} \alpha_{42} (\phi_{42} a_4)^2 (1 - p_2) + \frac{N_4}{N_3} \epsilon_3 \alpha_{34} \alpha_{43} (\phi_{43} a_4)^2 (1 - p_3) \right)$$

$$R_{14} = \frac{\epsilon_4}{(d_4 + \epsilon_4)d_4} \times \left(\frac{N_1}{N_2} \epsilon_2 \alpha_{21} \alpha_{42} \phi_{12} \phi_{42} a_1 a_4 (1 - p_2) + \frac{N_1}{N_3} \epsilon_3 \alpha_{31} \alpha_{43} \phi_{13} \phi_{43} a_1 a_4 (1 - p_3) \right)$$

$$R_{41} = \frac{\epsilon_1}{(d_1 + \epsilon_1)d_1} \times \left(\frac{N_4}{N_2} \epsilon_2 \alpha_{24} \alpha_{12} \phi_{12} \phi_{42} a_1 a_4 (1 - p_2) + \frac{N_4}{N_3} \epsilon_3 \alpha_{34} \alpha_{13} \phi_{13} \phi_{43} a_1 a_4 (1 - p_3) \right)$$



Dessin d'Hélène Cecilia



F. Schaffner

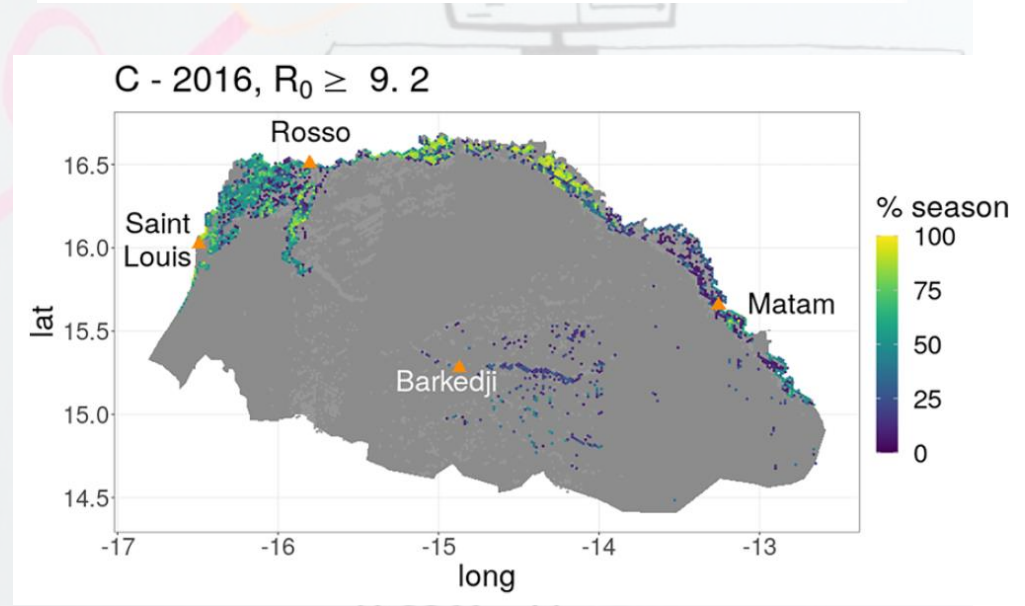
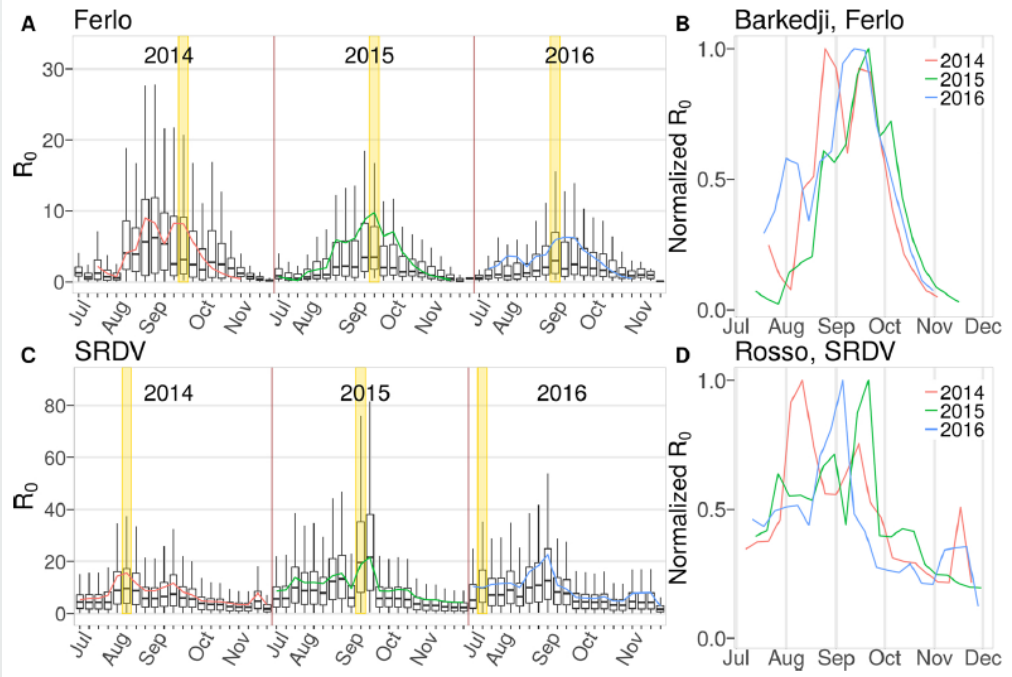
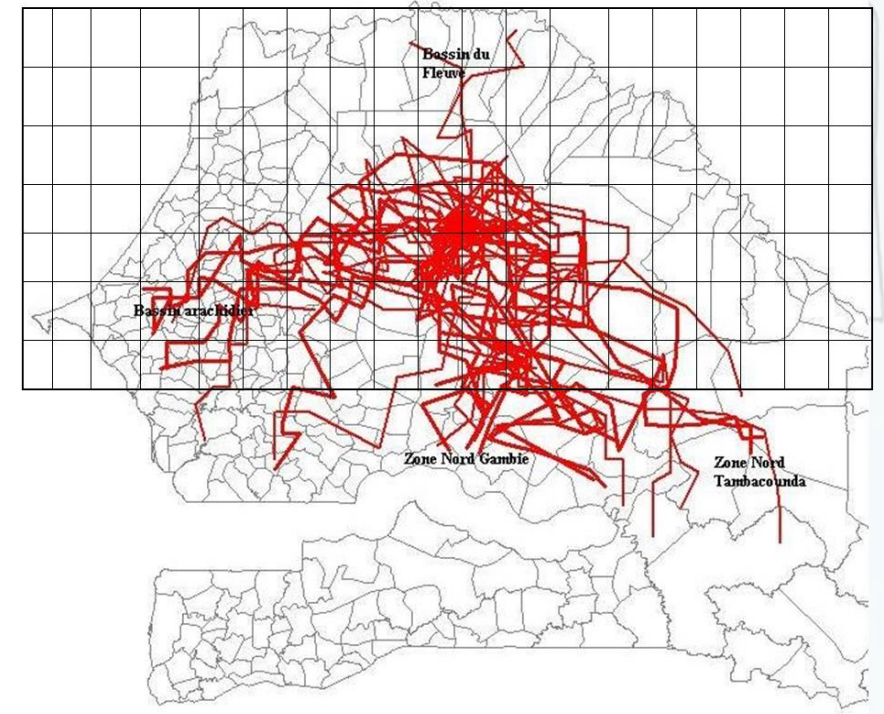
$$R_0 = \sqrt{\frac{1}{2} \left[(R_{11} + R_{44}) + \sqrt{(R_{11} + R_{44})^2 - 4(R_{11}R_{44} - R_{14}R_{41})} \right]}$$

$$R_{11} = \frac{\epsilon_1}{(d_1 + \epsilon_1)d_1} \times \left(\frac{N_1 \epsilon_2 \alpha_{21} \alpha_{12} (\phi_{12} a_1)^2}{(d_2 + \epsilon_2)(d_2 + \gamma_2 + \mu_2)} (1 - p_2) + \frac{N_1 \epsilon_3 \alpha_{31} \alpha_{13} (\phi_{13} a_1)^2}{(d_3 + \epsilon_3)(d_3 + \gamma_3 + \mu_3)} (1 - p_3) \right)$$

$$R_{44} = \frac{\epsilon_4}{(d_4 + \epsilon_4)d_4} \times \left(\frac{N_4 \epsilon_2 \alpha_{24} \alpha_{42} (\phi_{42} a_4)^2}{(d_2 + \epsilon_2)(d_2 + \gamma_2 + \mu_2)} (1 - p_2) + \frac{N_4 \epsilon_3 \alpha_{34} \alpha_{43} (\phi_{43} a_4)^2}{(d_3 + \epsilon_3)(d_3 + \gamma_3 + \mu_3)} (1 - p_3) \right)$$

$$R_{14} = \frac{\epsilon_4}{(d_4 + \epsilon_4)d_4} \times \left(\frac{N_1 \epsilon_2 \alpha_{21} \alpha_{42} \phi_{12} \phi_{42} a_1 a_4}{(d_2 + \epsilon_2)(d_2 + \gamma_2 + \mu_2)} (1 - p_2) + \frac{N_1 \epsilon_3 \alpha_{31} \alpha_{43} \phi_{13} \phi_{43} a_1 a_4}{(d_3 + \epsilon_3)(d_3 + \gamma_3 + \mu_3)} (1 - p_3) \right)$$

$$R_{41} = \frac{\epsilon_1}{(d_1 + \epsilon_1)d_1} \times \left(\frac{N_4 \epsilon_2 \alpha_{24} \alpha_{12} \phi_{12} \phi_{42} a_1 a_4}{(d_2 + \epsilon_2)(d_2 + \gamma_2 + \mu_2)} (1 - p_2) + \frac{N_4 \epsilon_3 \alpha_{34} \alpha_{13} \phi_{13} \phi_{43} a_1 a_4}{(d_3 + \epsilon_3)(d_3 + \gamma_3 + \mu_3)} (1 - p_3) \right)$$





Alex Drouin

Inspecteur de la santé publique vétérinaire (ISPV)
PhD student, Unit EPI (Anses, Maisons-Alfort) &
UMR Astre (Cirad, Montpellier)

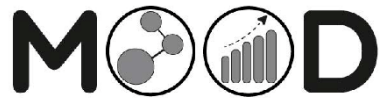
Risk of emergence of the Rift Valley fever in the Mediterranean basin: *modelling the introduction and the spread of the virus*

- 1. Modelling the population dynamics of RVF vectors in the Mediterranean basin**
- 2. Identifying territories at risk of virus transmission in the Mediterranean basin**
- 3. Modelling the spread of the virus in case of epizotics in southern France**



To conclude

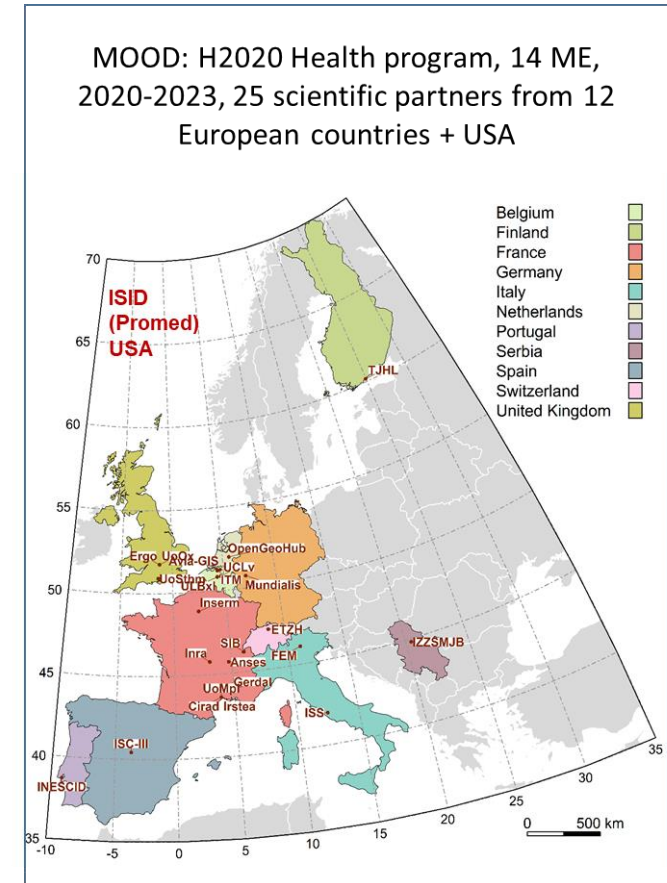
- Development of a modeling framework on the Rift Valley fever in the western Sahelian area
- Apply in the next years on the Mediterranean basin
- The future is not certain
- Better to be prepare to an emergence that happen in an unexpected area, than to not be prepared



Monitoring Outbreaks for Disease
Surveillance in a Data Science Context

Monitoring outbreaks for disease surveillance in a data science context

- **Goals.** Develop innovative tools and services for the early detection, assessment, and monitoring of disease emergence in a One Health context
- **Approach.** Co-construction with end-users : national and supra-national human and veterinary public-health agencies
- **MOOD outputs.** A set of numeric tools and services to facilitate the routine work and preparedness of users to detect emerging diseases, assess, and monitor their spread, and manage operational data
- **Examples:** web platform for text mining, disease spread models, risk mapping, standardized datasets for emergence drivers, training programs...



F. Schaffner



*OIE regional meeting on vector-borne diseases
in North Africa*

Main contributors:

- V Chevalier, R Lancelot, V Soti, A Tran
- H Cecilia, P Cailly, P Ezanno
- A Gueye Fall, M M Lo, MT Seck
- B Durand, A Drouin
- R Métras



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