Koi herpesvirus disease spread among carp populations: a modeling approach

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Background

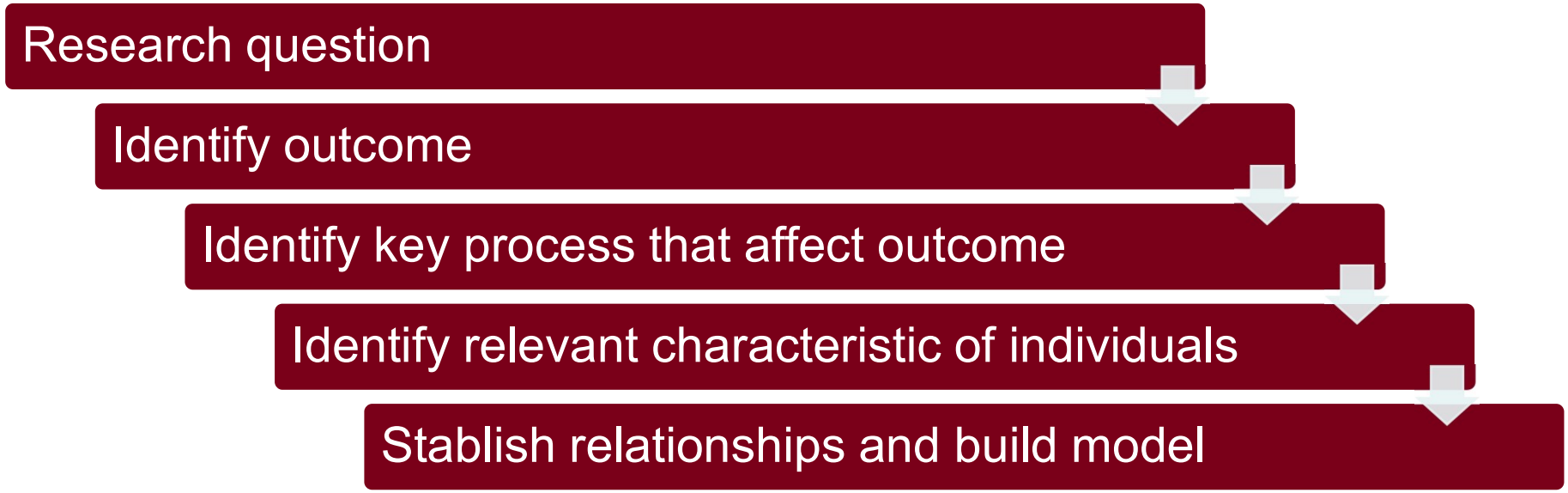
- KHVD caused by aquatic herpesvirus
  - Cyprinid herpesvirus 3 (CyHV-3)
- Affect cyprinids
  - Principally *Cyprinus carpio* – wild and ornamental
- Distributed worldwide – except Australia
- Detected in wild carps in Minnesota in 2017

Klafack et al. 2017; Bergmann *et al.,* 2020

Objectives

- The effect of KHV in the carp population is in overall unknown
- Modeling the KHV dynamic
  - Agent-based model
  - Theoretical population

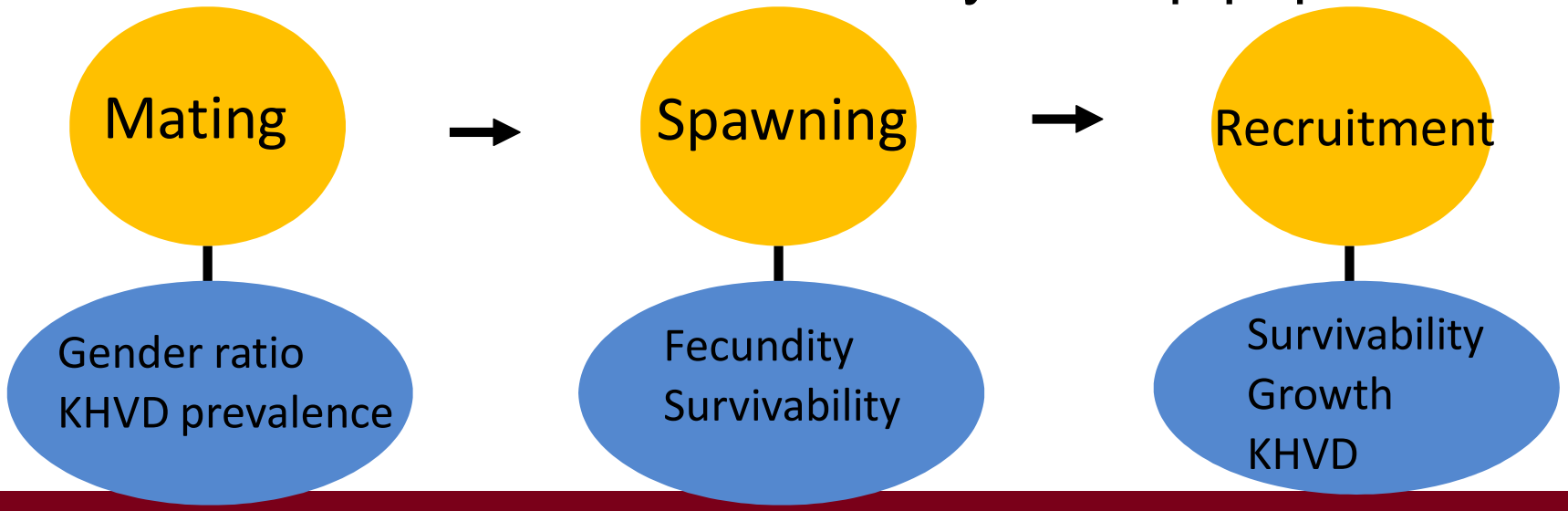
Modeling workflow



Pulliam, 2017

Model building

- *"Impact of KHVD in the carp mortality"*
- Outcome: KHV-related mortality in carp population



Model world

- Parameters

β transmission coef.

ϕ incubation period

σ KHV mortality rate

λ Latency

κ Spawning effectivity

μ Natural mortality

T° Temperature

- State variables

S Susceptible

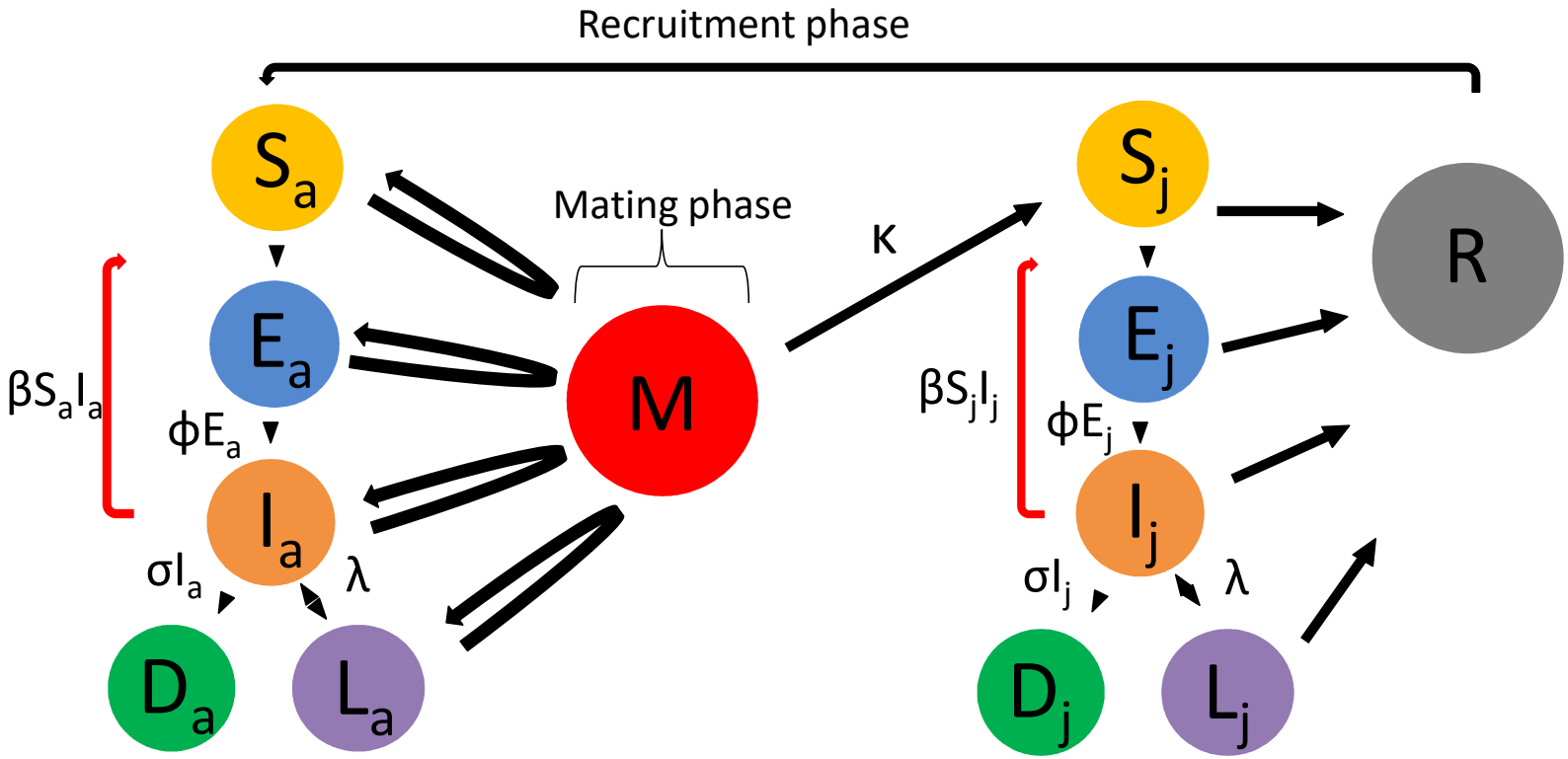
E Exposed

I Infected

D Dead

L Latency

Model building



References

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- Bergmann, S. M. *et al.* Koi herpesvirus (KHV) and KHV disease (KHVD) – a recently updated overview. *J. Appl. Microbiol.* **129**, 98–103 (2020).
- Pulliam, Juliet Creating a Model World to Address a Research Question. figshare. Media. (2015). https://doi.org/10.6084/m9.figshare.5080390.v3