Bovine Tuberculosis in the African Buffalo:
The role of models

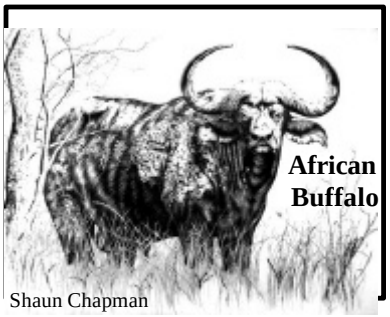
The Players

Field & lab effort

University of California at Berkeley University of Pretoria (MRI, OVI)
University of Witwatersrand
Princeton University
Kruger National Park
Hluhluwe-Umfolozi Park

Modeling effort

Wayne Getz
Paul Cross
James Lloyd-Smith
Sadie Ryan
Craig Tambling



Shaun Chapman

The Model

1. **Demography**
2. **Epidemiology**
3. **Spatial herd structure**
4. **Movement**
5. **Ecology**
6. **GIS (environ. heterogeneity)**

Big Question:

"What are the primary differences with and without the presence of M. bovis in a buffalo-centered ecological complex confined to a nature reserve?"

Applied Questions:

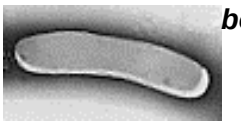
1. ***Does a problem exist?***
2. ***Can the problem be managed?***

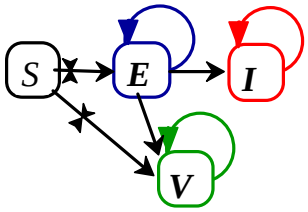
Necessary Model Elements:

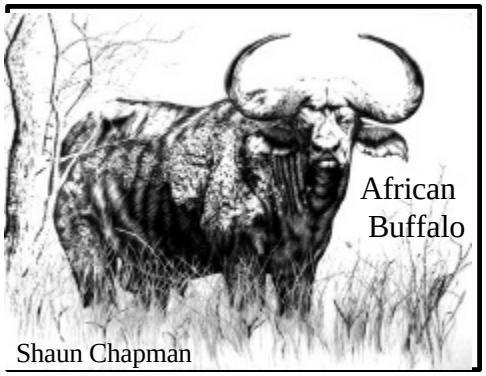
1. Disease class structure

Susceptible
Exposed
Infected
Vaccinated

Mycobacterium bovis

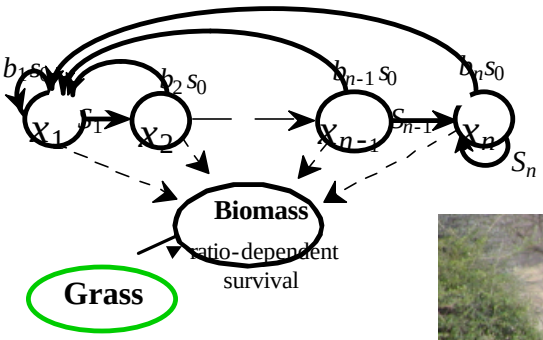






Necessary Model Elements:

2. Age class structure



Separate male and female components

Necessary Model Elements:

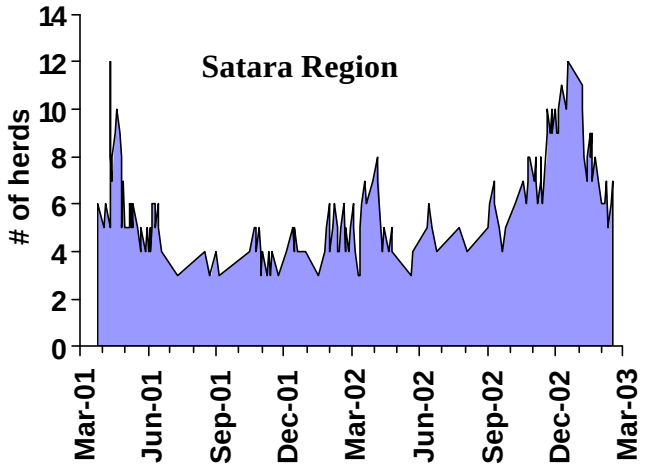
3. Spatial structure: movements of individuals

Separate male and female rules

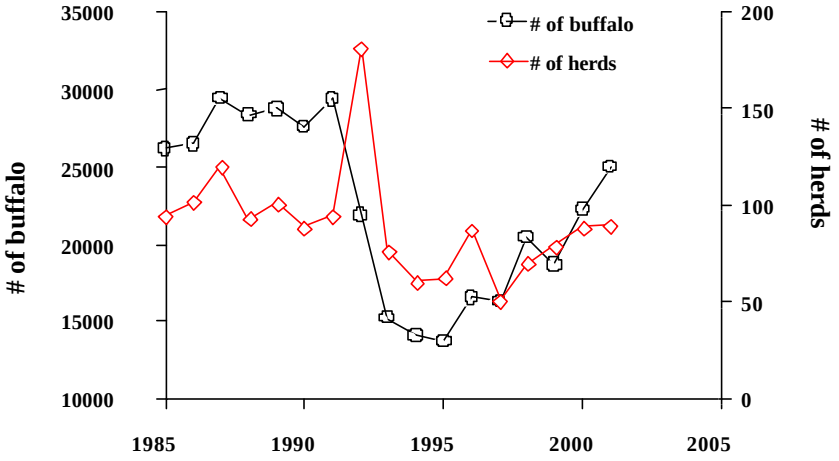
QuickTime™ and a
Cinepak decompressor
are needed to see this picture.

Necessary Model Elements:

3. Spatial structure: fission-fusion

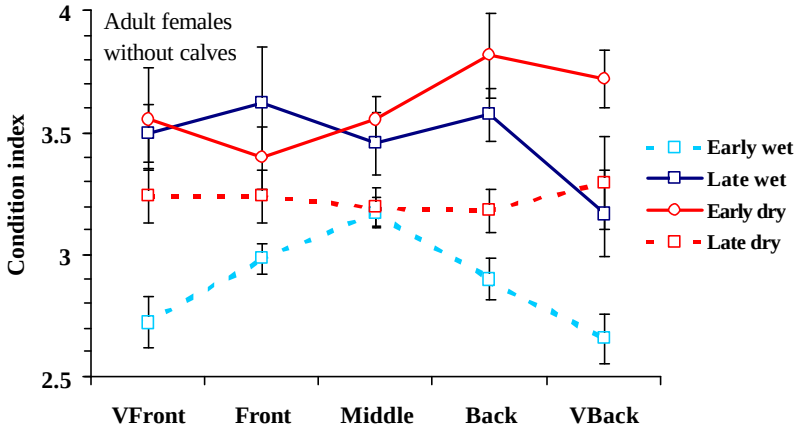


Long term buffalo and herd counts in Kruger



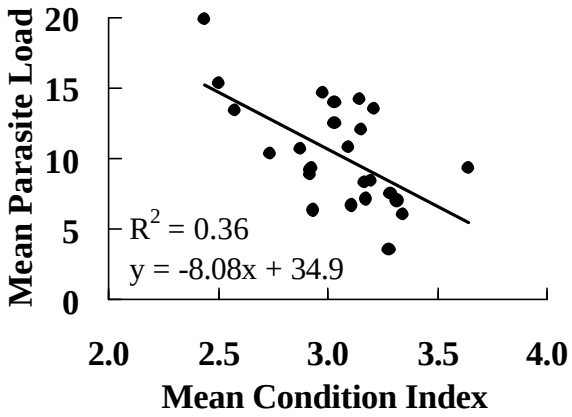
Factors of possible importance:

1. **Position in herd might be a factor**



Factors of possible importance:

1. Position in herd might be a factor
2. **Susceptibility to disease depends on body condition**

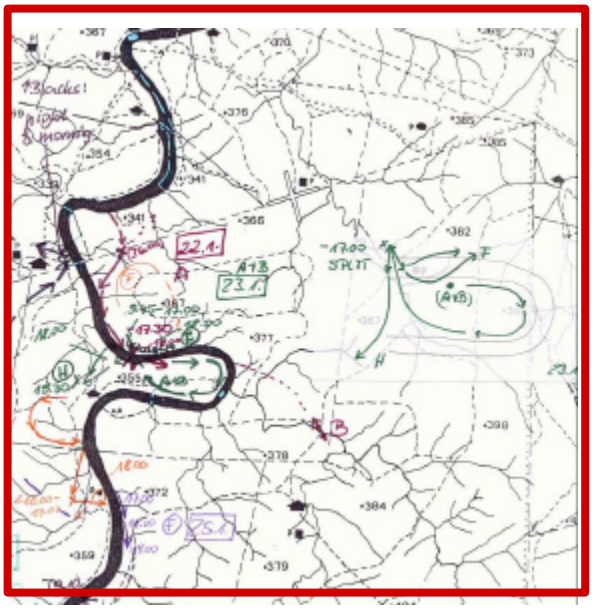


Factors of possible importance:

1. Position in herd might be a factor
2. Susceptibility to disease depends on body condition
3. **Calve survival depends on precipitation**

Factors of possible importance:

1. Position in herd might be a factor
2. Susceptibility to disease depends on body condition
3. Calve survival depends on precipitation
4. **Susceptibility to lion predation depends on disease status**

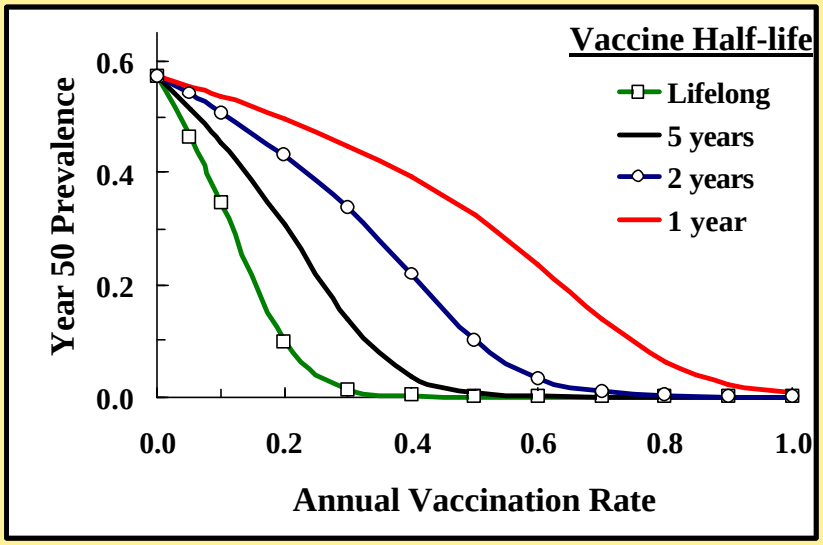


GIS based model

Christiane Knechtel's Klaserie Data

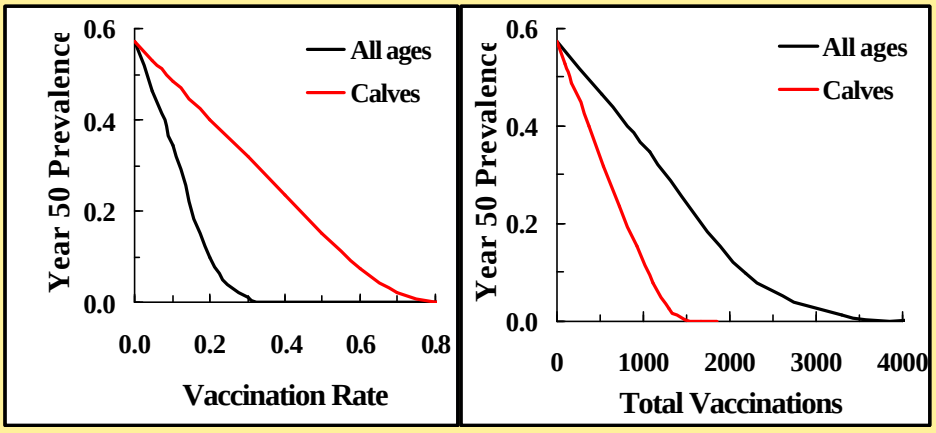
Age-structured Disease Model

Importance of vaccine duration



Age-structured Disease Model

Comparing vaccination strategies



Future Models

1. Improved demographic model with better data
2. Spatially-explicit/herd-explicit BTB model
3. Impacts of lions on spread of BTB
4. Impacts of BTB on lions
5. Spatially explicit model - KNP GIS vegetation underlay

Thanks