MODELLING POPULATION CONSEQUENCES OF MULTIPLE STRESSORS: FROM INDIVIDUAL RESPONSE TO POPULATION DYNAMICS

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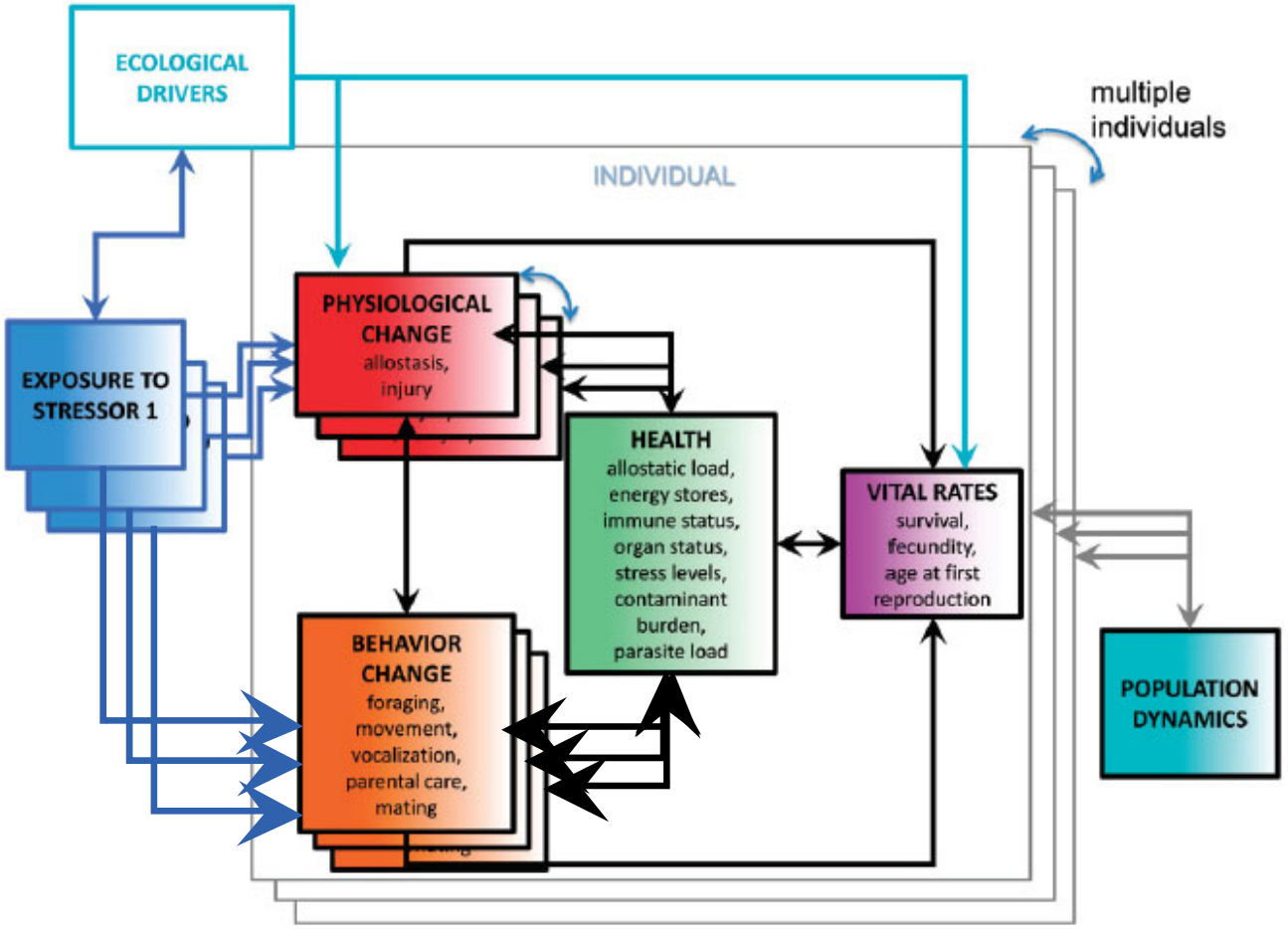
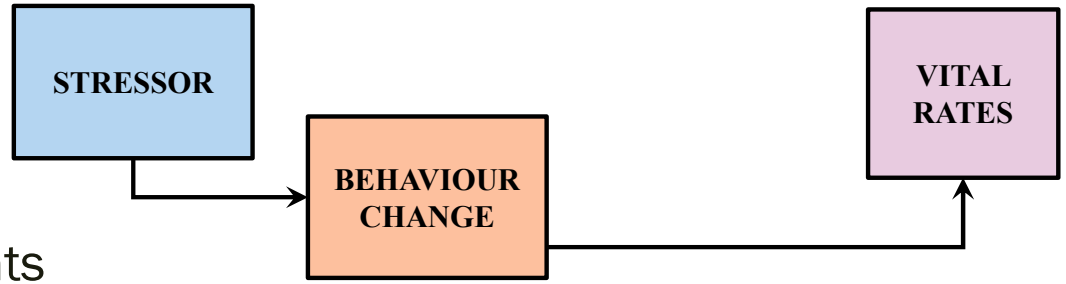
Population Consequence of Multiple Stressors



National Academies of Sciences, Engineering, and Medicine. 2017. Approaches to Understanding the Cumulative Effects of Stressors on Marine Mammals. Washington, DC: The National Academies Press. https://doi.org/10.17226/23479.

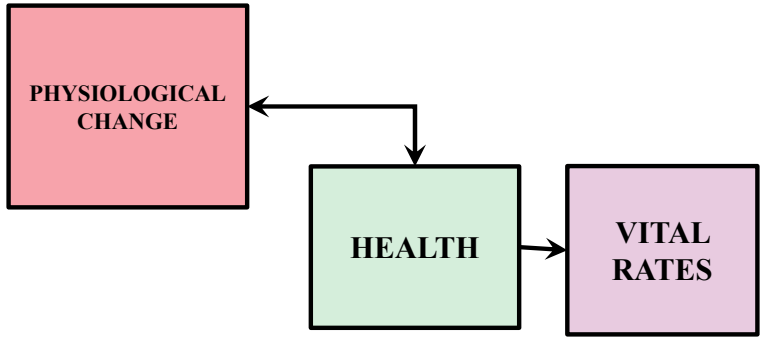
Now: Individual Response

- Visual data
  - Behavior
  - Reproductive events



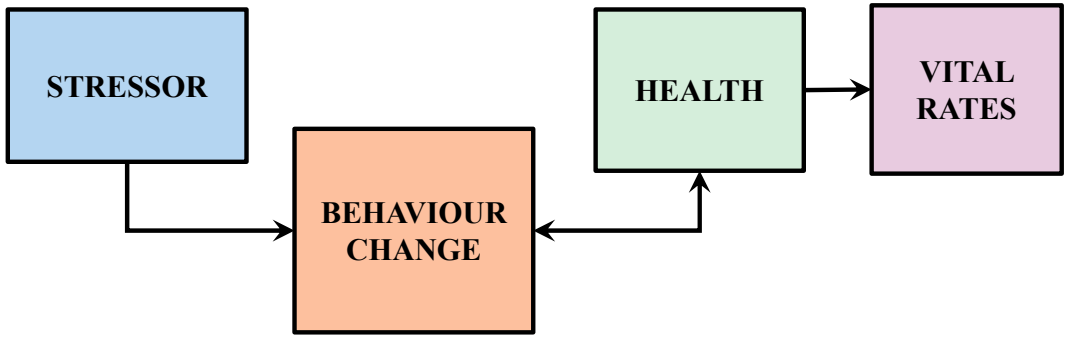
Now: Individual Response

- Visual data
  - Behavior
  - Reproductive events
- Health data
  - Blood
  - Physical examination
  - Health score



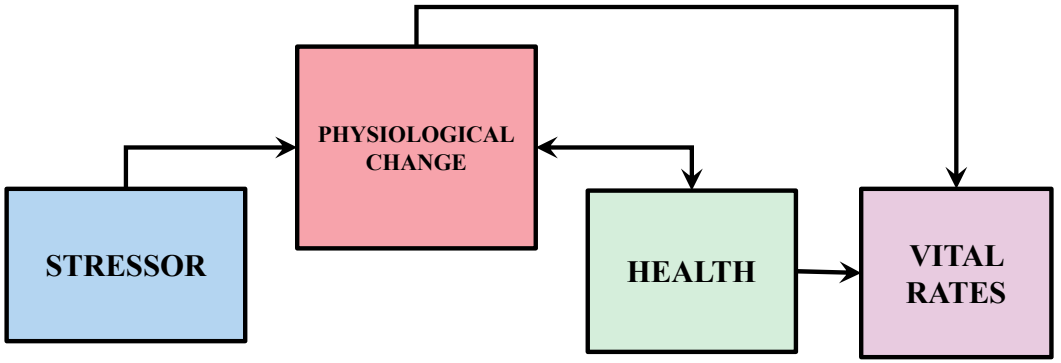
Now: Individual Response

- Visual data
  - Behavior
  - Reproductive events
- Health data
  - Blood
  - Physical examination
  - Health score
- Bioenergetics



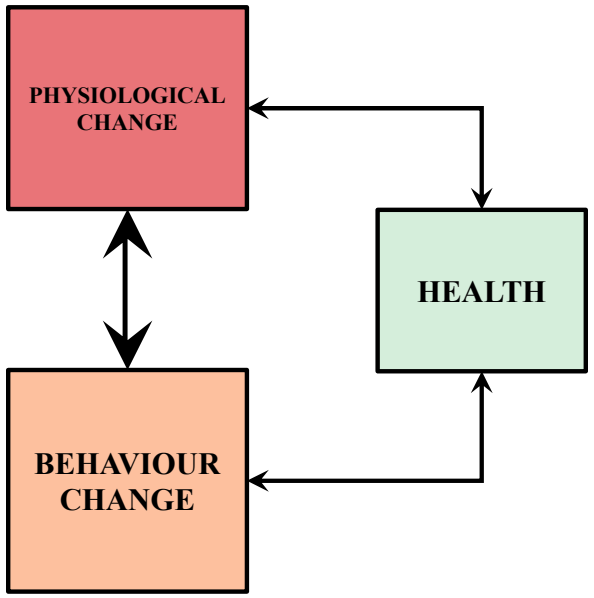
Future: Individual Response

- "New" data sources
  - Endocrinological
  - Respiration, heart rate
  - Isotopes
  - Epigenetics
- Physiological response
  - Glucocorticoids
  - Progesterone
- Allostatic load



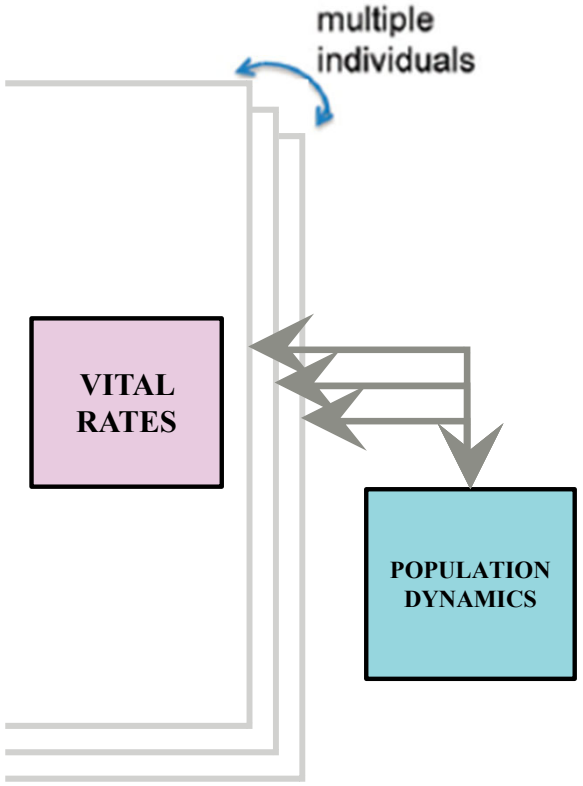
Integrating Behavior and Physiology

- Unstudied
  - Multiple data sources required
  - Behavior-physiology link
  - Both pathways, one model
- Behavior as a proxy?
  - Balance data needs
  - Increased utility of existing data sets



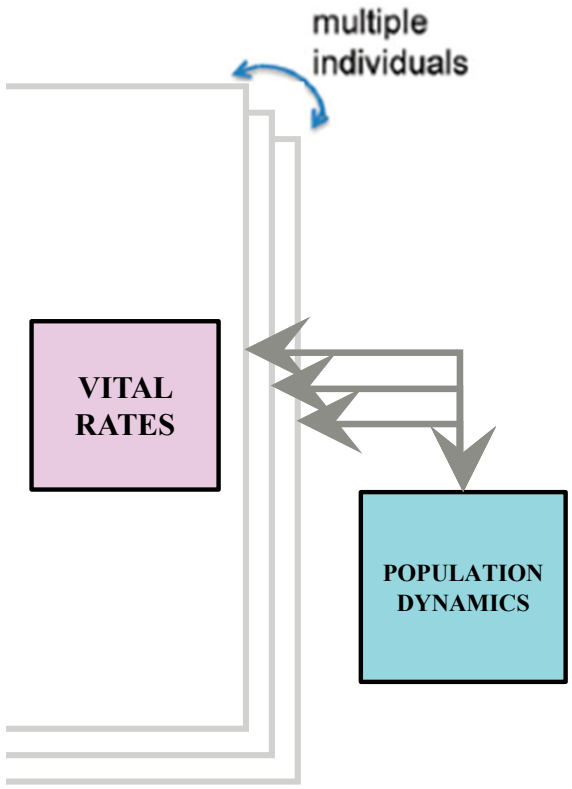
Now: Population Dynamics

- Informed by individual response
- Stressor scenarios
- Established methods
  - PVA
  - IBM/ABM
  - Leslie/Lefkovitch Matrices



Future: Population Dynamics

- Implement them
- Changing conditions with time
- Fully integrate with individual response
  - Propagation of uncertainty
- Validation of PCoMS
  - Historical data
    - Stressors
    - Abundance
    - Reproduction
  - Potential sensitivity



Using PCoMS

- Management and Conservation
- Environmental Impact Assessments
- Stock Assessments
  - Abundance
  - Mortality and Serious Injury
  - Population Trends

Acknowledgements