**Outline of course M6-4, Modelling in Conservation Biology, ISATEC, summer 2019**

1. General introductions & course outline
2. The importance of marine conservation
   1. Conservation-Related Differences Between Non-Marine and Marine realms
   2. Principles that transcend Land-Freshwater-Marine Differences
3. Marine Populations: the basics
   1. Reproductive features
      1. Spawning method
      2. Development mode
   2. Fecundity Patterns
   3. Settlement, Recruitment and Dispersal Patterns
4. Applications of modelling in conservation biology: How can we affect population dynamics through management?
   1. Fisheries Biology
   2. Metapopulation Analysis
   3. r- vs. K-strategists and implications for conservation
   4. The realm of Population Viability Analysis (PVA)
5. An Introduction to [R]
   1. Part 1. Practical handbook – setup, basic calculations, working with matrices [Lecture]
   2. Part 2. Practical handbook – plotting [R]
6. Types and potential uses of Population Viability Analysis (PVA)
7. A First model [R]
   1. Deterministic vs. stochastic models [Lecture]
   2. Incorporating variability [R]
   3. Iterative calculations and loops [R]
8. PVA cont. [Lecture]
   1. Types of uncertainty
   2. Risk assessment - needs a probabilistic framework
   3. Risk assessment – terminology
9. Case Study I. White rhinoceros on Ndumu Reserve
   1. Description of the problem [Lecture]
   2. Development of the model, Introduction of various strategies [R]
   3. Task - Risk assessment, interpretation of estimated risks for the Ndumu Reserve - some statistics [R]
10. Case Study II. Loggerhead turtle matrix model
    1. Age-structured population models – the Leslie matrix [Lecture +R]
       1. Practical example, Introduction to matrix calculations
       2. Calculation of eigenvalues
       3. A fisheries example: Whitetip reef shark (*Triaenodon obesus*)
    2. Introduction to the Loggerhead case study [Lecture]
    3. Size- and stage-structured population models – the Usher/Lefkovich matrix [R]
    4. Task - Risk assessment, interpretation of estimated risks for the turtles [R]
11. Considering metapopulations in conservation biology
    1. Metapopulation model example
12. The use of Agent-Based Models (ABMs or IBMs)
    1. When to use
    2. ex. Netlogo platform
13. Additional information and resources for using [R]
14. Review & Questions

|  |  |  |  |
| --- | --- | --- | --- |
| **Day** | **Time** | **Topics** | **Form** |
| Friday, May 24, 2019 | 10:00 - 12:00 | • General introductions & course outline  • The importance of marine conservation  • Conservation-related differences between non-marine and marine realms  • Principles that transcend land-freshwater-marine differences  • Marine Populations: the basics  • Applications of modelling in conservation biology  •The realm of Population Viability Analysis (PVA) | Lecture |
|  | 13:00 - 17:00 | • An Introduction to [R] | R |
| Monday, June 27, 2019 | 9:00 - 12:00 | • Types and potential uses of Population Viability Analysis (PVA)  • A First model; PVA cont. | Lecture & R |
|  | 13:00 - 16:00 | • Case Study I. White rhinoceros on Ndumu Reserve | Lecture & R |
| Tuesday, June 28, 2019 | 9:00 - 12:00 | • Case Study I cont.; Risk assessment explorations | R |
|  | 13:00 - 16:00 | • Case Study II. Loggerhead turtle matrix model  • Age-structured vs stage-structured population models  • Introduction to matrix calculations; Calculation of eigenvalues and eigenvectors | Lecture & R |
| Wednesday, June 29, 2019 | 9:00 - 12:00 | • Considering metapopulations in conservation biology  • Metapopulation model example | Lecture & R |
|  | 13:00 - 16:00 | • Management Strategy Evaluation (MSE) in fisheries  • The use of Agent-Based Models (ABMs or IBMs) - Netlogo platform intro  • Review & Questions |  |
|  |  |  |  |