**Spatial Ecology and Modelling, *Part 3: Population Ecology***

Instructors: Prof. Dr. Tiffany Knight, Martin Andrzejak, Dr. Aldo Compagnoni, Aspen Workman, Konrad Adler

Dates: 3-11 November 2022

Location: Große Steinstraße 79/80, second floor, Halle (Saale)

**Learning goals**

Population ecology is a fundamentally quantitative science, which aims to understand causes of variation in population size and forcast future population size and structure under a variety of scenarios. The learning goal is to learn how to construct population models. To teach this we start with very simple models and build up to more complexity. It is a learning goal of ours for students to understand when simple models are sufficient and when more complex models are needed.

We aim to teach students how to develop and interpret models from start to finish. This includes generating questions, deciding on the appropriate modelling approach, creating the model, parameterizing model, and interpreting and presenting the results

Modelling populations requires programming in R. This is **not** a course on R programming. However, a learning goal we have for students to learn the basics of R that are necessary for population ecology. These include understanding data structure types, operators and functions. Students will learn the common mistakes that are made in the programming language with regards to population models and how to avoid them. Students will learn how to interpret results.

**Grading**

This part (i.e., Part 3 by Knight and colleagues) of the module will count for 25% of the grade for the module (Henrique Pereira 33%, Stan Harpole 25%, Ingolf Kühn 17%).

The grade for this part of the course is:

* Computer lab 1: 10%
* Computer lab 2: 10%
* Computer lab 3: 10%
* Presentation on question/design of project: 5%
* Presentation on project: 10%
* Submit questions on papers: 5%
* Take-home Exam: 50%

**Schedule:**

Thursday 3 November

10.00-10.30: Introduction to Population Ecology section (introduction to instructors, course content, grading, hopes and fears)

10.30-12.00: *Lecture*: Exponential population growth

12.00-13.00: *Lecture*: Stochastic population growth

Lunch

14.00-17.00: Guided lecture and computer lab on exponential growth in Muskoxen

Friday 4 November

10.00-11.30: *Lecture*: Density dependence

11.30-13.00: *Lecture*: Stage structured population growth

Lunch

14.00-17.00: Computer lab 1: Stage structured growth in rare Lupine

Monday 7 November

10.00-13.00: Group project: define question and experimental design, prepare presentation

Lunch

14.00-15.30: *Lecture*: Lupine case study

15.30-17.00: Presentations and feedback

Tuesday 8 November

10.00-11.30: *Lecture:* Stochasticity and stage structure

11.30-13.00: data analysis and prepare presentation

Lunch

14.00-15.00: continue data analysis and prepare presentation

15.00-16.30: Presentation of project

Wednesday 9 November

*Lecture*: Integral projection models

Computer lab 2: Integral projection models

Thursday 10 November

Before class: Read two papers and submit two questions you have on each to Prof. Knight via email (tiffany.knight@idiv.de): Evers et al. 2021 Global Change Biology; Lemmer et al. 2021 Basic and Applied Ecology

10.00-11.00: Presentation: Konrad Adler- effects of climate drivers on vital rates

11.00-13.00: Computer lab 3: effect of climate drivers on vital rates

Lunch

14.00-15.00: finish computer lab

15.00-16.00: Presentation: Martin Andrzejak- effects of climate change and land use on plant populations

Friday 11 November

Take home exam