PhD-course
Modelling demographic processes in populations

Date: 28 August – 8 September 2017

Venue: Centre for Biodiversity Dynamics, NTNU, Trondheim, Norway

Computers: Bring your own laptop with latest R and JAGS

Registration: NOK 5000 (normal rate), NOK 2500 (student rate)

Contents:

The course is composed of the two semi-separate workshops, "Stochastic population dynamics" and "Bayesian integrated population modelling (IPM) using JAGS", given 28th August – 1st September and 4th September – 8th September 2017 at the Centre for Biodiversity Dynamics, Norwegian University of Science and Technology, Trondheim, Norway. To get 7.5 ECTS the course participants are required to attend both workshops as well as pass a written assignment. It is of course possible to attend one or both of the workshops without applying for the PhD course (see announcements for the workshops below).

Ecologists have become increasingly aware of the benefits of thinking in terms of separating their models into an observational process and a state process, when estimating parameters from data.

The first workshop of the full PhD course will introduce theoretical models for stochastic population dynamics as well as state-of-the-art applications of the theoretical framework. Participants will also get hands-on experience in performing related statistical analyses. While workshop 1 of the PhD course focuses on the theory behind population dynamical processes, such as the influence of stochasticity and age structure on demographic processes, workshop 2 will focus on how state-of-the-art Bayesian Integrated Population modelling (IPM) may allow and improve estimation of parameters of such processes. IPM allows great flexibility in construction of statistical models that simultaneously account for the specifics of the various data available and the population dynamical process studied.

To apply for the PhD course you need to send your application to Vidar Grøtan (vidar.grotan@ntnu.no), with CC to Michael Schaub (michael.schaub@vogelwarte.ch) and Marc Kéry (marc.kery@vogelwarte.ch) describing your general background and in particular your knowledge in statistical modeling, R and BUGS software and capture-recapture, by 31 May 2017 at the latest.

Workshop 1
Stochastic population dynamics

Instructors: Steinar Engen, Bernt-Erik Sæther, Vidar Grøtan, Aline Lee, Otso Ovaskainen, Bob O'Hara,

Jarle Tufto, Centre for Biodiversity Dynamics, NTNU

Date: 28 August – 1 September 2017

Venue: Centre for Biodiversity Dynamics, NTNU, Trondheim, Norway

Computers: Bring your own laptop with latest R

Registration: Free

Contents include the following topics:
- Environmental and demographic stochasticity
- Density-independent and density-dependent models
- Age-structured population dynamics
- Predicting future population dynamics
- Spatial population dynamics (dispersal, spatially structured environmental noise, meta-populations)
- Ecological data: observations, sampling error, introduction to hierarchical models and Bayesian models

The contents will be a mix of lectures on theoretical concepts, hands-on training in associated statistical methodology and presentation of empirical studies utilising the theoretical and statistical concepts introduced in the workshop.

Send your application to Vidar Grøtan (vidar.grotan@ntnu.no) describing your background by 31 May 2017 at the latest.

Workshop 2
Bayesian integrated population modeling (IPM) using JAGS

Instructors: Michael Schaub & Marc Kéry, Swiss Ornithological Institute

Date: 4 –8 September 2017

Venue: Centre for Biodiversity Dynamics, NTNU, Trondheim, Norway

Computers: Bring your own laptop with latest R and JAGS

Registration: NOK 5000 (normal rate), NOK 2500 (student rate)

Integrated population models (IPMs) represent the powerful combination, in a single Leslie-type of model, of multiple data sources that are informative about the dynamics of a population (Besbeas et al. 2002; Schaub et al. 2007). Typical IPMs combine one or more time-series of counts with another data set that is directly informative about survival probabilities, such as ring-recovery or capture-recapture. However, many other sources of demographic information may be envisioned instead or in addition, including age-at-death data, occupancy or replicated point count data. Currently, for non-statisticians the only practical way to develop and fit IPMs is by using BUGS software (JAGS, WinBUGS, OpenBUGS, Nimble).

      This course is a practical and hands-on introduction to developing and fitting integrated population models using BUGS software. It is based on the successful book by Kéry & Schaub, *Bayesian Population Analysis using WinBUGS* (Academic Press, 2012), which will be handed out as part of the course.

      Beyond IPMs, the course also provides an introduction for ecologists and wildlife managers to a wide variety of models fit using BUGS software and as documented in the BPA book.

Contents include the following topics:

1. Basic introduction:
   - Hierarchical models as an overarching theme of population modeling, including IPMs
   - Bayesian analysis of hierarchical models
   - Introduction to BUGS software in the context of generalised linear models (GLM) and traditional random-effects models
2. Ingredients of Integrated Population Models:
   - State-space models in population dynamics
   - Cormack-Jolly-Seber models for estimating survival probabilities
   - Multistate capture-recapture models for estimating survival and transition probabilities
3. Integrated Population Models (IPMs)
   - Introduction to matrix population models and their analysis with BUGS
   - Theory of integrated population models
   - IPM case studies which differ in complexity and in the data types combined

About 80% of the time is spent on lecturing and 20% on solving exercises. No previous experience with BUGS software, or Bayesian statistics, is assumed. However, this is **not** a beginner's, but an intermediate-level workshop and **a good working knowledge both of modern regression methods (ANOVA, ANCOVA, GLMs, GLMM) and of program R is required**. Moreover, **a basic understanding of capture-recapture and/or occupancy models and of matrix projection models (Leslie matrices) is desirable**.

      Send your application to Michael Schaub (michael.schaub@vogelwarte.ch), with CC to Marc Kéry (marc.kery@vogelwarte.ch; describing your background and knowledge in statistical modeling, R and BUGS software and capture-recapture, by 31 May 2017 at the latest. Workshop invitations will be sent out immediately afterwards.