II Workshop on Hierarchical Modeling for Ecologists

- Abundance and Movement Estimation -

Date: February 1-7, 2014

Lecturers: Marc Kéry, Swiss Ornithological Institute, Sempach, Switzerland
Juan Manuel Morales, Universidad Nacional del Comahue, Bariloche, Argentina
Gonçalo Ferraz, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

Assistants: Jérôme Guélat, Swiss Ornithological Institute, Sempach/Switzerland
Murilo Guimarães, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil
Thiago Couto, Universidade de Brasilia, Brazil
Heloíse Pavanato, Londrina, Brazil

Location: Pousada Haras Cambará, Porto Alegre, Rio Grande do Sul, Brazil

Language: English

Organization: *Programa de Pós-Graduação em Ecologia*, *Instituto de Biociências*, *Universidade Federal do Rio Grande do Sul* (UFRGS) in partnership with the *Programa de Pós-Graduação em Ecologia da Universidade Federal de Viçosa* (UFV), and the *Associação Brasileira de Ciência Ecológica e Conservação* (ABECO).

Room & Board: All meals and accommodation at the the family-run Haras Cambará lodge at a cost of R$870 for the whole week.

Course Fee: Suggested R$500 in addition to room and Board, for anyone who is not a graduate student in Latin America

This workshop is a sequel to the 2013 *Workshop on Hierarchical Bayesian Modeling for Ecologists*. It is the second of what we hope will become a series of annual workshops on *Hierarchical Modeling* to be offered by the UFRGS Graduate Program in Ecology. In 2014, we presented a broad introduction to linear and related models in ecology and their implementation in the Bayesian framework. We also gave an overview of some related and more specialized statistical models that are useful for ecologists, such as models for occupancy and survival. In 2015 we will focus on individual-based models of demographically closed populations with an emphasis on abundance and movement estimation. Future workshops will focus on other themes. The content of this workshop will be based largely on two successful applied statistics books co-authored by Marc Kéry and published by *Academic* Press (2010 and 2012). After a one-day introduction to hierarchical models, the first part of the workshop will present four different approaches to abundance estimation: closed-population mark-recapture models, distance sampling models, N-mixture models, and spatial capture-recapture models. In the second part, we will present an introduction and some applications of random walk models

of animal movement. Most models will be implemented in a Bayesian framework and ample time will be given for solving exercises. Participants must have some experience in R or another programming language. We encourage participants to bring their own research problems for discussion during the workshop and welcome both new applicants and people who attended last year.

HOW TO APPLY: Send a CV and short letter describing former experience with ecological modeling and R (and possibly with BUGS software), as well as your main reasons for wanting to attend. This course is geared towards an audience of Latin American graduate students but we welcome applications from anywhere in the world. Please send materials by email to Silvana Barzotto at ppgecol@ufrgs.br by 25 November 2014 and write "Hierarchical Modeling Workshop Application" in the subject of your message. Indicate the names and email addresses of two potential references and please let us know if you want to apply for a travel grant. We will review applications promptly and get back to you no later than November 30th, 2014. For more information please visit http://www.ferrazlab.com/LabSite/Teaching.html or write directly to goncalo.ferraz@ufrgs.br.

Syllabus

Monday – Introduction

9:00 - 11:00	General Introduction (Gonçalo/JMM/Marc): 15' Workshop Introduction (Gonçalo): 15' Introduction to linear models (LM, LMM, GLM, GLMM) (Marc): 90'
11:00 - 11:30	Break
11:30 - 13:00	Basics of Bayesian statistical modeling (Marc)
14:00 - 15:30	Intro to workshop tools: Running WinBUGS and JAGS from R (LMs, GLMs; Jérôme/Murilo)
15:30 - 16:00	Break
16:00 - 17:30	Fitting mixed models and GLMMs in BUGS and R (Jérôme)

Tuesday – Abundance estimation from traditional mark-recapture data

9:00 - 11:00	Estimation of abundance from non-spatial mark-recapture data I (Marc)
11:00 - 11:30	Break
11:30 - 13:00	Estimation of abundance from non-spatial mark-recapture data 2 (Marc)
14:00 - 15:30	Closed vs. open population mark-recapture models and the robust design (Marc, Gonçalo)
15:30 - 16:00	Break
16:00 - 17:30	**Consulting** on participants' own projects (All)

Wednesday – Abundance estimation from data on unmarked individuals

9:00 - 10:30 Estimation of abundance from distance-sampling data (Marc)
10:30 - 11:00 Break
11:00 - 13:00 Simulation and analysis of distance-sampling data with BUGS and with the R package unmarked (Marc)

14:00 - 15:30 Estimation of abundance from counts of unmarked animals I (Marc)
15:30 - 16:00 Break
16:00 - 17:30 Estimation of abundance from counts of unmarked animals II (Marc)

Thursday – Spatial capture-recapture (SCR)

9:00 - 11:00 Introduction to spatial capture-recapture (SCR) models (Gonçalo)
11:00 - 11:30 Break
11:30 - 13:00 Data simulation and estimation of abundance with a SCR model (Gonçalo)

14:00 - 15:30 More SCR exercise OR Basics of movement modeling (Gonçalo, JM)
15:30 - 16:00 Break
16:00 - 17:30 **Consulting** on participants' own projects (All)

Friday – Movement

9:00 - 11:00 Introduction to the study of movement with random walk models (JM)
11:00 - 11:30 Break
11:30 - 13:00 Movement data simulation and analysis (JM)

14:00 - 15:30 Estimation of abundance and movement from SCR data (JM)
15:30 - 16:00 Break
16:00 - 17:30 **Consulting** on participants' projects and workshop conclusion (All)
18:00 - Closing Barbecue