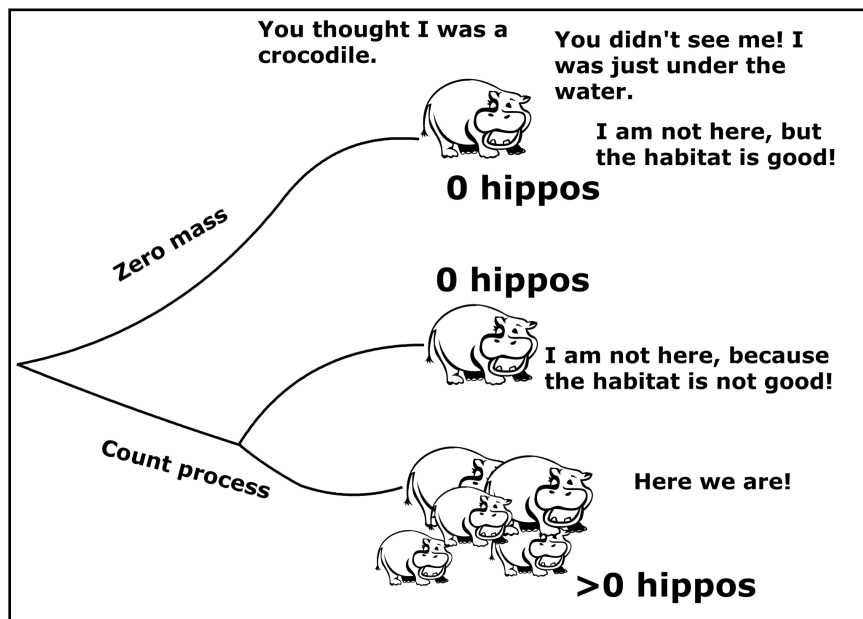# Introduction to Zero Inflated Models with R

- Frequentist and Bayesian approaches -

Provided by: Highland Statistics Ltd
In cooperation with: Dr Ezequiel M. Marzinelli, UNSW, Sydney, Australia

Date & Venue

Date and venue:
- 25 - 29 July, 2016
- UNSW, Sydney, Australia

Price: £500 GBP

Instructors: Dr. Alain Zuur
             Dr. Elena Ieno
Authors of 8 books and providers of over 250 courses

What is zero inflation?

Suppose you want to study hippos and the effect of habitat variables on their distribution. When sampling, you may count zero hippos at many sites and therefore zero inflated models should be used.

During the course several case studies are presented, in which the statistical theory is integrated with applied analyses in a clear and understandable manner. Zero inflated models consist of two integrated GLMs and therefore we will start with a revision of GLM.

Zero inflated GLMMs for nested data (repeated measurements, short time series, clustered data, etc.) are discussed in the second part of the course. We focus on zero inflated count data, and zero inflated continuous data.
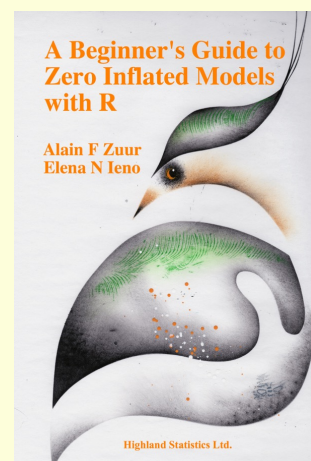
KEYWORDS

Zero inflated GLM (ZIP, ZINB, ZAP, ZANB). Zero inflated GLMMs with random effects. Bayesian statistics, MCMC and JAGS. `lme4`, `glmmADMB`, `JAGS`. Overdispersion and solutions. Poisson, negative binomial, gamma, and binomial distributions. Count data. Continuous data.

COURSE CONTENT

Throughout the course frequentist and Bayesian techniques will be compared and used. The reason being, the software for zero inflated GLMMs is limited and therefore we use Bayesian approaches (using JAGS). R code for all exercises is provided before the start of the course.

Monday:
- General introduction.
- Short revision Poisson and negative binomial GLMs for count data and Bernoulli GLM for absence/presence data. Two exercises.
- Models for zero inflated count data (theory session). We discuss mixture models and hurdle models.
- Two exercises on the analysis of zero inflated count data using `pscl`.

Tuesday:
- Models for zero inflated continuous data (e.g. biomass data).
- One exercise.
- Revision linear mixed effects models and GLMM. How to fit these models in `lme4` and `glmmadmb`.

Wednesday:
- Introduction to Bayesian statistics and MCMC using JAGS. JAGS is similar to WinBUGS and OpenBUGS.
- One exercise: Fitting a Poisson GLM in JAGS.

Thursday - Friday
- Fitting zero inflated GLMs in JAGS.
- Zero inflated GLMMs for the analysis of count data using `glmmadmb` and JAGS.
- Three exercises.
- Catching up and further exercises.
- Time allowing: Zero inflated models for proportional data.

GENERAL INFORMATION

COURSE FEE: £500
Credit card payments are charged in GBP currency. UK participants are subject to 20% VAT. EU participants (but non-UK) are not subject to UK VAT, but need to provide their institutional VAT number. Non-EU participants are not subject to VAT.

COURSE TIMES AND DETAILS:
- 09.00am to 16.00pm including 1 hour lunch break and a 20 minutes break both morning and afternoon
- The course fee does not contain refreshments or lunch.

COURSE MATERIAL:
- Chapter 10 (Introduction Bayesian statistics) in Zuur & Ieno (2016). A *Beginner's Guide to Zero Inflated Models with R.*
- Various chapters from:
  - *A Beginner's Guide to GLM and GLMM using MCMC with R.* (2013).

- A *Beginner's Guide to Zero Inflated Models with R.* (2016)
  - A copy is not included in the course fee.
- Pdf files of powerpoint presentations are provided
- The course can be followed without purchasing these books. These books are only available from www.highstat.com.

This is a non-technical course. **You need to bring your own laptop**. Terms and conditions see: www.highstat.com/statscourse.htm

PRE-REQUIRED KNOWLEDGE:
R, data exploration, multiple linear regression, and generalised linear modelling (Poisson, negative binomial, Bernoulli). A short revision is provided. Working knowledge of mixed modelling is recommended but a short revision is provided.

REGISTRATION AND INFORMATION ON COURSE CONTENT

http://www.highstat.com/CourseReg1.htm

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