Statistical ecology comes of age

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NCSE talk, Kent

Outline

1. NCSE
2. ISECs
3. Space: the ultimate frontier
4. ADMB
5. Citizen Science
6. State space models/ Hidden Markov models/Integrated modelling

- The National Centre for Statistical Ecology, NCSE
- was established in 2005 as a joint research centre between the Universities of Kent, Cambridge and St Andrews, with the aid of a mathematics Multidisciplinary Critical Mass Award from EPSRC.
- In 2010, it was expanded to include the Universities of Bath, Bristol, Exeter, Glasgow and Sheffield, together with the Centre for Ecology and Hydrology, with an award from EPSRC/NERC.
- Project Partners:
  - Biomathematics and Statistics Scotland;
  - the Centre for Environment, Fisheries and Aquaculture Science;
  - the Game and Wildlife Conservation Trust;
  - Marine Scotland.
- The current grant ends in September 2015.

Areas of research

- modelling population dynamics,
- animal movement models,
- metapopulation models,
- community models,
- distance sampling,
- mark-recapture,
- biodiversity monitoring,
- random effects models in ecology,
- modelling ecological point process data,
- parameter redundancy in ecological models.

- Mission statement To develop, apply and communicate innovative statistical methods for collecting and analysing ecological data, thereby improving the understanding and management of wild populations and their environment.
- website: ncse.org.uk
  - People
  - Publications and reports
  - Consultancy
  - Seminars
- email lists
- Videoconferences and seminars
- Newsletters

NCSE Newsletter

National Centre for Statistical Ecology

Volume 1, Issue 1

October 2006

NCSE celebrates its first birthday

NCSE is now a year old.

Staff and students of the Centre have been busy over the last 12 months, recruiting new members, setting up research projects and making excellent progress towards a unified Centre for research in statistical ecology.

This summer NCSE students have been involved in fieldwork in locations as far afield as the Pacific northwest, where Ella Marley-Zagar took part in an ongoing photo-recognition study of resident killer whales, and the Nature Reserve at Nunnery Lakes, where Vanessa Cave was involved in the British Trust for Ornithology's Constant Effort Site ringing activity. You can read more about their experiences and how this fieldwork is influencing their research projects in this edition of the Newsletter.

Kelly Moyes previously spent a year on the island of Rum as part of her project to study the local red deer colony. Her expertise is currently being put to good use as she assists the BBC with their Autumnwatch programmes, being televised from the island. We will invite Kelly to tell us about her experiences in the next issue of the Newsletter.

To find out who has joined the Centre or moved on to pastures new, take a look at 'Snippets!' on page 5; here you'll also find information on forthcoming opportunities and seminars.

The next issue of the Newsletter is scheduled for the New Year. Contributions are always welcome, so please start thinking. Photos to illustrate articles are particularly welcome!

A killer whale breaching during Ella Marley-Zagar's fieldwork trip to the Pacific Northwest © Ella Marley-Zagar

Special points of interest:

- An update on research projects
- NCSE presents a workshop on Bayesian computation for population ecology
- The first annual NCSE workshop is held in St Andrews
- NCSE attendance at the IBC conference
- Arrivals, departures, and appointments
- Forthcoming opportunities
- NCSE seminar—29th November

Inside this issue:

First annual workshop at St Andrews

ncse

National Centre for Statistical Ecology

Newsletter

March 2013

Announcement: ISEC 2014

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The International Statistical Ecology Conference (ISEC) 2014 will take place from 1st to 4th July 2014 at Montpellier SupAgro, France, as a satellite meeting of the International Biometric Society meeting being held in Florence from 6th to 11th July. The local organising committee for ISEC 2014 is being led by Olivier Gimenez. Pre-conference workshops will take place from 28th to 30th June.

The following invited speakers will be presenting during the conference:

- Jean-Dominique Lebreton, CNRS, France
- Nicholas Gotelli, University of Vermont, U.S.A.
- Benjamin Bolker, McMaster University, Canada
- Simon Wood, University of Bath, U.K.
- Marti Anderson, University of Auckland, New Zealand
- Chris Wikle, University of Missouri, U.S.A.
- Mark Beaumont, University of Bristol, U.K.
- Perry de Valpine, University of California, Berkeley, U.S.A.

Three sessions of invited talks will focus on Movement Ecology, chaired by Juan Manuel Morales and Nicolas Bez, Indicators and measures of biodiversity, chaired by Sandrine Pavoine and Carlo Ricotta, and Species distribution models, chaired by Wilfried Thullier and Bob Dorazio .

Further details can be found on the conference website: http://isec2014.sciencesconf.org/

Bookmark this web address for further developments: http://www.cefe.cnrs.fr/

Special points of interest:

- NCSE celebrates the successes of its members
- Psychic animals and the missing specie problem
- Forthcoming meetings and conferences: International Statistical Ecology Conference 2014, NCSE's 2013 Summer Meeting, 4th Channel Network Conference, Euring Analytical Meeting and Workshop 2013

Inside this issue:

Categories and structure

- Steering committee
- Executive committee
- Research students
- PDRAs
- Members
- International members
- Support staff; web site and computing
- Annual workshops

Illustrative case study: Rachel McCrea

- PhD student
- Twice PDRA
- Prizewinner
- NERC research fellow

Research students

ISECs

1. Began in 2008, in St Andrews; it rained
2. $\rightarrow$ Kent, 2010 $\rightarrow$ Oslo, 2012 $\rightarrow$ Montpellier, 2014 $\rightarrow$ British Columbia, 2016 $\rightarrow$?
3. How have things changed?!

The first ISEC, at St Andrews

The second ISEC, at Kent

Keywords

- Citizen science
- Hidden Markov Models
- Hierarchical models
- movement models
- software package
- spatially-explicit capture-recapture models
- species distribution modelling
- state space models

Statistical ecology

- Over the past decade, statistical ecology has emerged as a discipline which is moving from describing patterns towards modelling the ecological processes that describe those patterns.
- Research centres:
- the Center for Statistical Ecology and Environmental Statistics (CSEES: http://sites.stat.psu.edu/ gpp/index.htm)
- NCSE
- Journal: Methods in Ecology and Evolution

Trends

- Hierarchical and state-space modelling
- Frequentist and Bayesian frameworks
  - data cloning
- Biodiversity modelling
  - abundance
  - capture-recapture (CR)
  - camera traps; acoustic traps; genetic markers; misidentification error
  - Spatially-explicit CR (SECR); cf distance sampling
- Species distribution modelling
  - impacts of environmental changes on biodiversity
  - point-processes for presence-only data
  - MAXENT
  - hierarchical occupancy modelling
- Movement ecology
  - from phenomenological models to mechanistic models
  - state-space models
  - species interactions
- Integrated modelling
  - now an accepted part of modern statistical ecology
  - goodness-of-fit
  - model selection
  - integral projection
  - independence
  - scaling up from populations to communities

Perspectives

- Citizen science data modelling
  - web and smart-phone technologies
  - bias
- Computational algorithms development
  - automatic differentiation
  - Laplace approximations
  - Approximate Bayesian Computation
  - ADMB; INLA; ABC
- Back to basics
  - sample design
  - covariate selection
  - parameter redundancy
  - goodness of fit
- Model evaluation
  - robustness
  - computational efficiency
- Software development and evaluation
  - RStudio
  - validation

Farewell to Montpellier