



Newsletter

ISEC 2014



4th International Statistical Ecology Conference
Montpellier, France
1-4 July 2014

ISEC 2014 was a rousing success using any number of metrics: number of delegates (344), number of countries represented (31); number of contributed talks (209). The size of ISEC (measured either in terms of delegates or contributed talks) has more than doubled in the six years since its inaugural meeting in 2008. In addition to the conference itself, there was a well-attended set of five training workshops conducted prior to the conference. The conference also included a stimulating set of plenary talks.

One of the highlights of the conference included the [first on-line video interview](#) of David Borchers by David Warton. The gala dinner included many accolades to celebrate the career of co-director of NCSE, Byron Morgan. Further information may be found on page 4.

First, 2nd and 3rd prize winners of the competition for the best student talk were Ben Swallow (St. Andrews), Allan Clark (Cape Town) and Théophile Lohier (IRSTEA), respectively, with special mentions for Dorine Jansen (Cape

Town), Guillaume Lagarrigues (IRSTEA) and Enrico Pirotta (Aberdeen). Winners of the student poster competition were Catherine Horswill (Glasgow) and Jaime Ashander (California-Davis).

Abstracts for ISEC 2014 will remain available at isec2014.sciencesconf.org/conference/isec2014/pages/Book_of_Abstracts_ISEC2014_Montpellier.pdf for the indefinite future. Likewise, abstracts from previous ISECs (2008, 2010 and 2012) are still available on websites; just use Google to find them.

Forthcoming Conferences and Meetings

Forthcoming meetings and conferences include:

ISEC 2016—Squamish, British Columbia, 25-30 June; see www.stat.sfu.ca/~cschwarz/ISEC2016.

IBC 2016—Victoria, British Columbia, Canada, 10-15 July; see www.biometricsociety.org.

Euring analytic meeting and workshop 2017—Barcelona, Spain, see www.phidot.org/

[euring/](#).

SEEM 2015—Queenstown, New Zealand, 22-26 June; see www.maths.otago.ac.nz/SEEM2015 and page 3 for further information.

NCSE publications

NCSE members are encouraged to send titles and abstracts of newly-published papers to ncse-all@st-andrews.ac.uk, both to allow colleagues to keep abreast of

NCSE research and to ensure that the publications page of the NCSE web site (<http://ncse.org.uk/publications/>) can be kept up-to-date. When you send details to ncse-all, please

include a url; this link will be added to the entry on the publications page. Remember to ensure that the url does not break copyright rules!

November 2014

Special points of interest:

- New books in the fields of capture-recapture and modelling population dynamics
- EPSRC grant funding: Modelling spatial distribution and change from wildlife survey data
- A warm welcome to new PhD students
- Byron Morgan's retirement acknowledged by the IBS and NCSE

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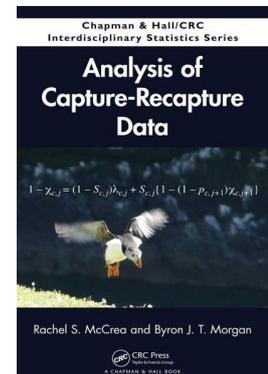
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Analysis of Capture-Recapture Data

Rachel McCrea and Byron Morgan, both based at the University of Kent, have recently published a new book with Chapman and Hall/CRC Press. *Analysis of capture-recapture data* provides an overview of modern statistical methods for the analysis of capture-recapture and related data. The text describes recent advances, as well as traditional approaches, and co-

vers aspects of model diagnostics such as model selection, goodness-of-fit assessment and parameter redundancy. The book has an associated website, www.capturerecapture.co.uk which includes access to data sets, example R code, solutions to exercises and also a comprehensive set of links to available software for capture-recapture model fitting.



Modelling Population Dynamics: Model Formulation, Fitting, and Assessment using State-Space Methods

Modelling Population Dynamics: Model Formulation, Fitting, and Assessment using State-Space Methods, (MPD), a newly published book in Springer's Methods in Statistical Ecology series, is a slender and concise treatise (215 pp) that provides a unifying framework for a variety of approaches to quantifying animal population dynamics. MPD is a sequel to *Estimating Animal Abundance: Closed Populations* (2002; Borchers, Buckland, and Zucchini) in that the state-space model (SSM) framework sketched in that book is considerably expanded upon in MPD and open populations are now included. The book's authors are nine NCSE researchers who have applied SSMs over the past 20 years to a wide variety of animal populations including red deer, coho salmon, gray seals, Soay sheep, and gray herons, and have used a variety of model fitting techniques including classic Kalman filtering with maximum likelihood, MCMC, and particle filtering.

The book's contents can be split into three groupings: (1) matrix models as building blocks (chapter 2), (2) a methodological core (chapters 3-5), and (3) particular aspects of population dynamics in a SSM framework (chapters 6-9). The matrix model chapter serves as a bridge, for ecologists and others who are comfortable with classic Leslie and Lefkovich matrices, to the authors' perspective on how matrices can be used for formulating models for population dynamics in general, not just SSMs. The decomposition of dynamics into survival, birth, movement, sex and genetic category assignment is a useful "divide and conquer" approach to formu-

lating comprehensive population dynamics models. Just as structured programming simultaneously constrains the construction of computer programs while providing a framework for organized creativity, the matrix building block approach imposes structure on model construction while being a catalyst for generating a variety of alternative formulations, e.g., density dependence in the survival sub-process with density independence in the birth sub-process, and vice versa. If anything, there may be a danger with the matrix building blocks of readily generating too many combinations of possibilities.

The methodological core begins by defining SSMs. It starts with the most basic case, two parallel time series, one unobserved, in this context the reality of the animal population, and one observed, e.g. population abundance estimates, which is mathematically linked to the other. Complexity, and generality, are added by layering in environmental variation in parameters, Bayesian formulations, and model uncertainty. Methods for fitting SSMs follow, beginning with the Kalman filter and maximum likelihood, as applied in particular to the specific SSM of a normal, dynamic linear model, and then discussing in some detail computer intensive procedures such as MCMC and particle filters. The sometimes overlooked problem of exactly how one formulates an SSM in the first place is next discussed, first from the scientist's or resource manager's objective of answering a particular question and then from a more mathematical, and pragmatic, perspective of determining exactly what parameters can be

estimated. Similar to chapters in typical regression books, questions of model adequacy, diagnostics, and model selection conclude the core section.

Four standalone chapters use SSMs as a framework for specific classes of problems. The use of closed population methods, e.g., distance sampling, which can be chained together in sequence to thereby model open population dynamics, is discussed. Population dynamics models for two examples, wildebeests and gray whales, are formulated in non-SSM and SSM frameworks. The next chapter discusses how SSMs can be used to model survival probabilities with mark-recapture data. This is followed by a chapter which shows how mark-recapture data can be used in SSMs to estimate animal abundance, SSM versions of Jolly-Seber type models. The final chapter in this block looks at integrated population models, where data from multiple sources which provide information about different population components or processes are analysed with a single model, and which can include a SSM component.

Online material includes computer programs, in R, Win-BUGS, and Matlab, which were used to produce examples in the book. The interested reader can run the programs to duplicate the results as well as study the code to perhaps modify it for new problems, or at least gain some understanding of how to write customised code for other applications.



Modelling spatial distribution and change from wildlife survey data

David Borchers, Janine Illian and Steve Buckland at the University of St Andrews and Finn Lindgren at the University of Bath were awarded a 3-year EPSRC grant entitled *Modelling spatial distribution and change from wildlife survey data*. The grant runs from March 2014 to March 2017 and is split between St Andrews (£320K) and Bath (£230K), with one postdoctoral researcher at each university: Joyce Yuan at St Andrews and Fabian Bachl at Bath.

The grant aims to develop innovative methods for fitting realistically complex spatial and spatio-temporal models to wildlife survey data. It will on the one hand extend distance sampling (DS) and spatially explicit capture-recapture (SECR) methods to incorporate the powerful spatial modelling methods developed by Integrated Nested Laplacian Approximation (INLA) researchers and on the other hand extend these spatial modelling methods to deal with unknown stochastic observation processes.

It is an international collaboration between scientists at seven separate organisations:

- researchers developing DS and SECR methods in the Centre for Research into Ecological and Environmental Modelling (CREEM) at St Andrews and the US Geological Survey's Patuxent Wildlife Research Centre,
- researchers developing spatial modelling methods in ecology at CREEM,
- developers of INLA spatial modelling methods at the University of Bath, the Norwegian University of Science and Technology in Trondheim and the Arctic University of Norway in Tromsø,
- the US National Oceanic and Atmospheric Administration's Southwest Fisheries Science Centre which runs the Eastern Tropical Pacific line transect survey program (<https://swfsc.noaa.gov/>

[program.aspx?program_id=12](#); the most extensive DS cetacean survey program on earth) and

- Pantera's Jaguar Corridor Initiative camera-trapping study in Belize (<http://www.panthera.org/programs/jaguar/jaguar-corridor-initiative>).

The methods and software developed in the project will provide more powerful statistical tools than are currently available to researchers interested in monitoring spatial and temporal trends in wildlife abundance and distribution and understanding what drives them, in managing wildlife populations and identifying suitable locations for protected areas, in biodiversity monitoring, in identifying biodiversity hotspots and in assessing spatial impacts of human interventions.

You can find out more about the project and progress on it at the project website: <http://www.creem.st-andrews.ac.uk:8082/ESSMod>.

Statistical Ecology and Environmental Monitoring Conference, 2015

This is the first announcement for the Statistical Ecology and Environmental Monitoring (SEEM) 2015 conference to be held in Queenstown, New Zealand, from 22 - 26 June, 2015. The conference will bring together experts in statistics, ecology and environmental sciences.

It is a privilege to have Bryan Manly as our honorary speaker, along with a world-class

list of invited speakers:

Murray Efford (NZ); Kerrie Mengersen (AUS); Shirley Pledger (NZ); Ken Pollock (USA); Andy Royle (USA); David Warton (AUS).

For further details about the conference, including information about Queenstown, please visit www.maths.otago.ac.nz/

[SEEM2015](#).

We will continue to add details to the website with registration and abstract submission opening soon.

We hope that you will come and join us.

The SEEM2015 Local Organizing Committee

NCSE welcomes . . .

The following PhD students: Anita Jeyam, University of Kent, working on a project entitled *New methods of model-selection and assessment for complex capture-recapture models*; Ming Zhou, University of Kent, working on a project entitled *Statistical development of ecological removal models*; Eric Howe, University of St Andrews, working on a project applying SECR methods to chimpanzee camera trap data;

Richard Glennie, University of St Andrews, working on a project developing general distance sampling models; Esther Jones, University of St Andrews, working on a project entitled *Space-use and behavioural insights of sympatric top marine predators*; Louise McMillan, University of Auckland, working on a project entitled *Genetic tools for studying population connectivity*; Joey Wei Zhang, University of Auckland,

working on a project entitled *A study of equilibrium distributions in genetic models*; Alison Parton, University of Sheffield, working on continuous-time movement modelling; Chris Griffiths, University of Sheffield, working on combining movement modelling and marine population dynamics; Alun Jones, University of Sheffield, working on the construction of marine biodiversity indices over time.



Fieldwork experience at the Tour du Valat (France)

Anita Jayem, University of Kent

During the 1st year of my PhD, I had the great opportunity to do fieldwork for a couple of weeks at the Tour du Valat (FR). This research centre focuses on the conservation of Mediterranean wetlands; the problems and species studied are therefore very diverse. I took part in ring-reading on flamingos based on an island with their chicks, in the Salins d'Aigues-Mortes. Antoine, who does most of the ring-reading, mentioned that we should go there before it got too hot. I thought this was a "comfort measure" but it wasn't long before I encountered some "opponents" of ring-reading: the heat haze which rendered all the ring IDs fuzzy through the telescope, while even minor gusts of wind resulted in a very jumpy image, making it impossible to focus on the rings. Ring-reading through a telescope required a bit of practice, I realised, but flamingos are luckily very "compliant" birds: they mostly stand straight and still, just stomping their feet to get food. Slender-billed gulls, on the other hand, kept flying and jumping around, making the rings very hard to read for a beginner.

I also had the chance to take part in a bird-ringing session for slender-billed gulls. First, different teams surrounded the chicks, which couldn't fly away, and pushed them towards the corral. In order to be as efficient and quick as possible, everyone was given a specific task beforehand. Some would see to it that the chicks did not squash each other while in the corral. The carriers would pass the bird from corral to ringer and from ringer to measurer while secretaries would note the relevant information. Most of the chicks seemed very stressed, their hearts hammering away, leaving us to wonder how much the process affects them.

The teams also gave me the opportunity to take part in other activities such as insect trapping for a mosquito-control study and capture-recapture on cistudes turtles. The turtles had been marked with notches on their carapace, which corresponded to a numeric code. This was the most physical day of the experience: I waged a constant battle with mud that constantly succeeded in entrapping me (I barely managed 2 steps while the intern in charge collected the traps from 3 neighbouring ponds). This made me a perfect target for *arabis*, biting flies that made mosquitoes seem lovely in comparison. They caused no lasting harm, just lots of swelling/itching...

Thanks to this experience, I have gained a better understanding of an area I usually study on paper. I also learnt that it was essential to be fit, preferably well covered when working in ponds and to have a very acute sense of direction, the most blatant example being work in a reed bed, where, in no time, you find yourself surrounded by reeds towering over you from their 2.5 to 3 m height. Last but not least, the proximity to the animals/birds was just amazing! Whether it was looking straight into a turtle's eye, seeing a baby flamingo safely tucked under its mum's wing or watching flamingos fly. They ran on the water, spread their wings, revealing black feathers at the border of their pink wings and up they went, majestically flying in the sky, such a beautiful and mesmerizing sight!



Flamingos departing from Pont de Gau Ornithological Parc (Saintes Maries de la Mer, France) © Anita Jayem



Slender-billed gull chicks grouped in corral © Sébastien Garcia, LPO PACA



Weighing of a ringed slender-billed gull chick © Sébastien Garcia, LPO PACA

Byron's retirement acknowledged at ISEC 2014

Byron's retirement was recognised during the gala dinner at ISEC 2014. A considerable number of current and former students and colleagues contributed memoirs which were collated to form an informal "Byronmetrics" paper. The overwhelming willingness of people to contribute demonstrates the incredible effect that Byron has had on many academic careers. Byron,

who knew nothing prior to the presentation, was clearly surprised! A copy of the paper and poster are available from www.capturerecapture.co.uk/links.html

Byron looking through his Byronmetrics paper at ISEC 2014 © Eleni Matechou





International Biometric Conference, Florence, Italy

The 27th International Biometric Conference took place in Florence, 6-11 July, 2014. Although physically close to Montpellier, it posed logistical challenges and opportunities to ISEC participants travelling between the two meetings. One marathon trip was the delayed flight route via Paris, which left Montpellier at 13.35 and did not arrive until 03.40 the next day.

The meeting was roughly three times the size of the ISEC meeting. NCSE members were active in a range of talk sessions, including two contributed sessions and an invited paper session on Modern Developments in Statistical Ecology. Mark Brav-

ington presented the JABES showcase talk based on the best 2013 JABES paper, on *A model-based approach to designing a fishery-independent survey*. Emily Dennis and Chen Yu were awarded two of the four best student talk prizes, for their respective talks, *Spatio-temporal models for British butterfly data*, and *Parameter redundancy of mixture models in capture recapture*.

During the meeting, Byron Morgan was awarded honorary life membership of the International Biometric Society.

Byron receiving honorary life membership of the IBS from Past President Clarice Demetriou and President John Hinde.



Congratulations

To Ben Stevenson, St Andrews, who gave a presentation at the Research Students Conference in Nottingham and was voted into 3rd place for "best presentation". All the "winners" were invited to give a talk at the RSS 2013 International Conference in Newcastle. The title of Ben's talk was *Spatially explicit capture-recapture with imperfect information on animal location*.

To José Lahoz-Montfort, Melbourne, whose joint paper with Byron Morgan, Stephen Freeman et al, *Breeding together: modeling synchrony in productivity in a seabird community*, was selected to feature on the front cover of [Ecology, January 2014](#).

To Hannah Worthington, St Andrews, whose poster, *Integrated stopover models - a mark-recapture study on grey seals on the Isle of May*, won a prize for the best student poster at the Channel Network Conference.

To Emily Dennis, Kent, who was highly commended in the 2013 Robert May Prize for her joint paper entitled *Indexing butterfly abundance whilst accounting for missing counts and variability in seasonal pattern*. The paper was based on her MSc dissertation, completed with CEH. Emily was also selected to participate in the SET for Britain event at the House of Commons for her work in *Mixture models for multi-*

brooded butterfly species.

To José Lahoz-Montfort and Gurutzeta Guillera-Aroita, Melbourne, whose video entitled *Now you see it, now you don't! Imperfect detection and species distributions* was rewarded with 2nd prize in the Environmental Decision Group Science Video competition 2014. The Environmental Decision Group (EDG) is a network of conservation researchers working on the science of effective decision making to better conserve biodiversity. Members are largely based at the University of Queensland, the Australian National University, the University of Melbourne, the University of Western Australia, RMIT and CSIRO. Click on the screenshot below to watch the video.

To Eleni Matechou and Emily Dennis, whose joint paper with Stephen Freeman and Tom Brereton, *Monitoring abundance*



"NCSE celebrates the successes of its members"

and phenology in (multivoltine) butterfly species: a novel mixture model, was selected to feature on the front cover of the [Journal of Applied Ecology, June 2014](#).

To Ian Boyd, a member of the original NCSE Steering Group, on being awarded a Knighthood.

To Rachel McCrea on receiving a NERC Fellowship.

To Simon Wood on receiving an EPSRC Fellowship.

To David Borchers on being appointed to a Chair at the University of St Andrews.



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Mission Statement and Objectives of NCSE

NCSE's Mission Statement:

To develop, apply and communicate innovative statistical methods for collecting and analysing ecological data, thereby improving the understanding and management of wildlife populations and their environment.

The objective's of NCSE:

NCSE was set up in October 2005 as a joint venture between the Universities of Kent, Cambridge and St Andrews, with funding from the EPSRC. Its original objectives were:

- To be a Centre of international repute for the development and application of novel statistical methods in population ecology, integrating the partner Universities' research programmes and activities in statistical ecology.
- To develop novel statistical methodology for the analysis of complex data sets arising in ecology and to apply these methods to a broad collection of topical and important data sets.
- To train PhD and postdoctoral researchers to work as statistical ecologists.
- To develop a computer software system to enable ecologists to use cutting edge statistical methodology on their own data.
- To train end-users in the use of methodology and accompanying software developed by NCSE.
- To build upon and create new collaborations with relevant

stakeholders.

- To develop and deliver a programme of workshops and conferences.

In 2010, NCSE was expanded to include the Universities of Bath, Bristol, Exeter, Glasgow and Sheffield, together with the Centre for Ecology and Hydrology, and the University of Cambridge dropped out, following departure of staff. This expansion was achieved with the aid of a new five-year joint EPSRC/NERC grant. Four further organisations are Project Partners: Biomathematics and Statistics Scotland; the Centre for Environment, Fisheries and Aquaculture Science; the Game and Wildlife Conservation Trust; and Marine Scotland.

NCSE is steadily broadening its areas of research expertise and activities. Active areas of research include:

- 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.



Snippets!

Movements:

Michael Spence took time out of his PhD to take up a 4 month research position in the Department of Animal and Plant Sciences at the University of Sheffield. Mike worked with Dr Julia Blanchard on size-based models of fish populations. He has now been appointed as a research associate on the Marine Ecosystems Research Programme, a recent consortium grant funded by NERC and Defra; Mike will be based in Sheffield, working mainly with Paul Blackwell and Julia Blanchard on ensemble modelling and prediction.

Eleni Matechou and Rachel McCrea have taken up posts as lectur-

ers in Statistics at the University of Kent.

Roland Langrock has taken up a post as a lecturer at the University of St Andrews.