



Newsletter

March 2013

Announcement: ISEC 2014



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

ISEC 2012

ISEC 2012 was held from 3rd to 6th July 2012 in Sundvollen, Norway. Over 225 participants from 35 countries participated in this third ISEC, sponsored by the National Centre for Statistical Ecology. A large number of NCSE members were in attendance, many of them serving as session chairs, along

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- 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.

with Len Thomas and Rachel Fewster as plenary speakers.

Hannah Worthington (partially funded by NCSE) earned one of the awards for best student presentation.

A wonderful time was had by all, and a tip of the hat to our

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/>

Norwegian hosts (including NCSE members Tore Schweder and Geir Storvik) for providing a perfect conference venue and outstanding weather.

The traditional conference photo of participants is available to view at <http://www.cees.uio.no/isec2012/>

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

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Psychic animals and the missing specie problem

Jon Barry, Cefas

The use of psychic animals to predict results at international football championships is becoming increasingly popular. For example, an octopus was used to predict results (with some success) at the 2010 world cup. For the recent European championships a variety of different species were getting into the act (footballing pigs, rat-eating pythons). I'd been thinking about this for some time (as you do) and an article in the Guardian newspaper led me to work out some simple maths. Perhaps more pertinent to the NCSE, the problem is very similar to problems in ecology about unobserved species. More on that later.

The Guardian article reported concerns from animal welfare charities about the numbers of psychic animals (PAs) being used for prediction. So, an obvious question is: "How many PAs would you need if you wanted to make sure that the probability was high (say 90%) that at least one PA would correctly predict all 31 results in the championships?"

Taking the role of a PA sceptic, let's assume that PAs choose the outcomes at random and that all predictions are independent. There were 24 group games in the championships and, for a particular team, each game could result in a win, loss or draw. Thus, the probability that these are chosen by a PA is 1/3 for each of these outcomes. In the knockout stages there were seven games and each of these could be a win or a loss.

Pr(single PA is unsuccessful in predicting all 31 results)

$$= 1 - (1/3)^{24} (1/2)^7 = H$$

So, out of N PAs, the probability that at least one of them succeeds in all 31 predictions is 1 minus the probability they all fail. That is

$$P = 1 - H^N$$

So, to answer the question above, we need to set P to 0.9 and solve for N . This gives

$$N = \frac{\log(1 - P)}{\log(H)} = 8.3 * 10^{13}$$

(1)

Assuming that R has coped with the small numbers properly, this is a lot of PAs. It is difficult to check the answer by simulation because the numbers are so big: but I did try 10,000,000 virtual psychic animals and none of them managed to predict all of the games. Of course, if the PAs perform better than random then the number needed in (1) will reduce. And if we could find a PA with perfect prediction powers then we could dispense with the other 83 trillion PAs.

In terms of conventional statistical ecology, I first met a similar problem to this in the early 1990s. A survey had been undertaken to search for patches of the Manila clam in Poole harbour. This was done to try to resolve a dispute between local fishermen (who claimed that the Manila clams being bred in cages were escaping and forming colonies which were seeing off all the local British clams) and MAFF (the forerunner of DEFRA). The fishermen (or fishers as they are now called in these more politically correct times) said that there were escaped Manila clams present in the harbour, MAFF said there weren't. The survey consisted of taking point samples from the seabed and checking to see if there were any Manila clams present. The survey didn't find any. MAFF said: "we told you so"; the fishermen said "you didn't look hard enough".

Doing the maths for this involves questions like "Given a particular pattern of sampling design (e.g. random, square lattice, triangular lattice) and that a single (circular) patch of Manila clams potentially exists, what is the radius of the patch such that if you don't observe it in N samples, you can be 90% sure that the patch radius is less than some value X ." Or, from a design perspective, how many negative samples do we need to take to ensure that there is a probability of at least 0.9 that there are no patches of Manila clam with radius greater than X ." (Barry and Nicholson, 1993). This second question is similar to the psychic animal problem from above where a PA corresponds to a sampling point. At its simplest level, the probability calculations involve working out the abilities of different sampling schemes to detect the patch and there are a few "1 minus" bits involved be-

cause you only need at least one point to hit the patch.

The problem can get more complicated if you start to make assumptions about the distribution of any particular patch size, the number of potential patches and even whether it/they exist or not. As you can imagine, this can lead to Bayesian approaches (Nicholson and Barry, 2005). And, as illustrated above, there's always the design/inference thing to get your teeth into. For design: how many samples shall we take and in what pattern? For inference: we did what you told us and we didn't find any – what does this tell us? (Nicholson and Barry, 1998).

Other applications of this include looking for hotspots of pollution, archaeology (how many excavations on a site do we need to make sure we find something interesting) and even the search for weapons of mass destruction in Iraq (we've searched for them in N places and we've not found any yet ...). Along with a former colleague, Mike Nicholson, we milked this one pretty much dry and we eventually gave up in 2005 (this last paper was a particular achievement for Mike as he was, sadly, killed in a cycling accident two years earlier).

References

- Barry J and Nicholson M D (1993) Measuring the probabilities of patch detection for four spatial sampling schemes. *Journal of Applied Statistics*, **20**, 353-362.
- Nicholson M and Barry J (1998) Inferences from Spatial Surveys about the Distribution of Patch Size of an Unobserved Species, *The Statistician, JRSS D*.
- Nicholson M and Barry J (2005) Target detection from a classical and a Bayesian perspective. *Journal of Applied Statistics*, **32**, No. 5, pp 1-8.



NCSE prepares for 2013 Summer Meeting

This year's NCSE Summer Meeting will be held from 15th to 19th July at the Lowestoft laboratory of the Centre for Environment, Fisheries and Aquaculture Science (Cefas - <http://www.cefas.defra.gov.uk/>). Cefas is now a government agency, but still has strong links with DEFRA and provides the majority of public support for fisheries and sea-related issues. There is a slightly smaller laboratory at Weymouth that specialises in fish diseases and the aquaculture side of things.

Workshops offered during this meeting include:

- Hidden Markov models and their application in ecology, led by Roland Langrock, University of St Andrews
- Multilevel modelling using Stat-RJ, led by Bill Browne, University of Bristol
- A decade of species occupancy modelling: from start to current developments,

led by Guruzeta Guillera-Arroita and José Lahoz-Montfort, University of Mebourne

- Camera trapping: recent developments and future challenges, led by David Borchers, University of St Andrews, Marcus Rowcliffe, Institute of Zoology, and Greg Distiller, University of Cape Town.

There will also be two days of contributed paper sessions and a poster session. The deadline for submission of abstracts and further details are available on the [NCSE website](#).

Two options are offered for the Wednesday afternoon trip—a coach will run to Southwold, where those who would like to relax can take in the local surroundings, whilst those who wish to be more energetic can embark on a walk back to Pakefield, taking in the delights of the old church of St An-



Cefas Lowestoft Laboratory

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drew at Cove Hithe, a hide from the bird reserve at Benacre Broad, the coastal heath area approaching Kessingland (to spot the Dartford Warblers), nesting little terns on the beach at Kessingland and numerous Sand Marten colonies in cliffs along the way.

Successes for NCSE researchers

Congratulations to Richard Arnold, Ivy Liu and Shirley Pledger in New Zealand on the award of a three-year Marsden research grant, starting in 2013, for their project 'Cluster Analysis for Ordinal Categorical Data'. This topic is an extension of the papers presented by Richard Arnold, Shirley Pledger and Michael Pocock at ISEC 2010 in Kent, on biclustering of binary and count data, with applications to ecological communities and networks. The extension to ordinal categorical data will have wide

applications, including to ecological data (e.g. trees recorded as low, medium or high, insects in different life stages, or plant-pollinator links recorded as absent or having low, medium or high frequencies).

Congratulations also go to Rachel McCrea who has been awarded a NERC fellowship, Simon Wood who has been awarded an EPSRC fellowship and Ed Codling who has been awarded a BBSRC grant entitled 'Assessment of dairy cow welfare through

predictive modelling of individual and social behaviour'.

NCSE has recently celebrated the award of a number of PhDs—congratulations go to Guruzeta Guillera-Arroita, José Lahoz-Montfort, Beth Norris and Lauren Oliver (University of Kent); Calum Brown, Glenna Evans, Danielle Harris, Theoni Photopoulos and Angelika Studeny (University of St Andrews).

Integrated Population Modelling

On 24th September 2012, ecologists and statisticians participated in a joint meeting of the Environmental Statistics Section of the Royal Statistical Society, British and Irish region of the Biometric Society and the Computational Ecology Special Interest Group of the British Ecological Society.

The meeting on Integrated Population Modelling started with a tutorial talk on Integrated Population Modelling by Takis Besbeas, Athens University of Business and Economics and the University of Kent.

Over lunch 8 posters were presented, cov-

ering both the theoretical and applied aspects of integrating different data sets.

In the afternoon four speakers presented their work. Takis Besbeas gave another talk, on Recent Developments in Integrated Population Modelling, Fitsum Abadie, Centre D'Ecologie Fonctionnelle & Evolutive, spoke on Combining Demographic and Population Count Data to Estimate Immigration Rate and the Strength of Density Dependence, Jason Matthiopoulos, University of Glasgow, spoke about how state-space modelling reveals the proximate causes of harbour seal population declines

“Joint meeting showcases NCSE research”

and Allan Tucker, Brunel University, spoke on Dynamic Probabilistic Models for Predicting Regime Shifts in Fish Populations.

The meeting ended with a discussion led by Byron Morgan, University of Kent.



4th Channel Network Conference

The International Biometric Society Channel Network Conference is being held from Wednesday 3rd to Friday 5th July 2013 at the University of St Andrews. For further conference information see:

<http://bir.biometricsociety.org/events/channelnetworkconference>

One of the invited sessions of this meeting is on Statistical Ecology (with speakers, David Borchers, University of St Andrews, Eleni Matechou, Oxford University, and Jerome Dupuis, Université Paul Sabatier, Toulouse), with further invited sessions on

Mixed Modelling and Advances in Genomics. There are two pre-conference half-day workshops on Parameter Redundancy (Diana Cole, University of Kent) and Current Methods in Mixed Modelling (Peter Diggle, University of Lancaster). The keynote speaker is Geert Verbeke, KU Leuven, and the conference will also include the Fisher Memorial Lecture by David Spiegelhalter, Cambridge.

“Further details of the 4th Channel Network Conference are available on the [IBC website](#)”

International Biometric Conference, Kobe, Japan

NCSE was well represented at the XXVIth International Biometric Conference, held in Kobe, Japan, August 26-31, 2012.

Speakers in the session Novel Statistical Methodology and its Application in Marine Ecology and Fisheries Research, included Mark Bravington (Close-kin genetics for fisheries assessment and management: two examples), Hans Skaug (Inferring demographic structure of whales from DNA profiles) and Simon Wood (Spatial components in smooth ecological models).

Byron Morgan organised the session New

Developments in Statistical Ecology, and the speakers were Simon Bonner (Mark-recapture of whale sharks with multiple, natural marks), Janine Illian (Complex spatial and spatio-temporal point process modelling with applications in ecology), Martin Ridout (Effect of early-life covariates on meerkat longevity), and the discussant was Rachel Fewster.

Participants are welcomed to the Conference dinner
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Euring Analytical Meeting and Workshop, 2013

The next Euring Analytical Meeting and Workshop will be held in Athens, Georgia, USA, 28 April - 4 May, 2013.

The list of sessions and plenary speakers is given below.

- Spatial Models (Plenary speaker: Chris Wikle) - includes spatially explicit mark-recapture
- Population monitoring (Plenary speaker: John Sauer) - includes monitoring change in population size using marked and/or unmarked individuals and methods to address variation in detectability
- Uncertain states and covariates (Plenary speaker: Simon Bonner)
- Individual variation (Plenary speaker: Olivier Gimenez)
- State-space modelling (Plenary speaker: Takis Besbeas)
- Occupancy modelling (Plenary speaker: Larissa Bailey)
- Methodological advances (Plenary speaker: Matthew Schofield)
- Large-scale spatial analysis of encounter data (Plenary speaker: Kasper Thorup) - includes estimation of migration routes/dispersal/connectivity between

“For further details of the Euring meeting, see <http://www.phidot.org/euring/>”

breeding and wintering populations while addressing differential detectability.

For further details, see: <http://www.phidot.org/euring/>



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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!

Congratulations:

To José Lahoz-Montfort et al, whose paper 'Breeding together: modeling productivity synchrony at a multi-species community' was published in the January 2013 edition of Ecology, and was the subject of the cover photograph— a Kittiwake taken on the Isle of May.

To Rachel McCrea on the safe arrival of Emma and Sarah.

Welcome to:

PhD students supported by NCSE: Matteo Fasilio and Alex Griffiths (Bath); Emily Dennis, Natoya Jourdain and Chen Yu (Kent), Amanda Minter and Michael Spence (Sheffield), Greg Distiller, Ben

Stevenson, Ben Swallow and Hannah Worthington (St Andrews).

Marcus Rowcliffe, Institute of Zoology, Kate Searle, Centre for Ecology and Hydrology, Jorge Vazquez Disodado, University of Essex, and Yuan Yuan, University of St Andrews.

Movements:

Ian Boyd, member of the NCSE Steering Group from 2005 to 2010, has taken up the role of Chief Scientific Adviser at DEFRA.

Guruzeta Guillera-Aroita and José Lahoz-Montfort, formerly PhD students at the University of Kent, have taken up research posts at the University of Melbourne.

