

# Dr. Anthony Caravaggi

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**GitHub** arcaravaggi.github.io | Google Scholar

## Academic Qualifications

**2016** PhD conservation biology/invasion ecology, Queen's University Belfast

**2011** MRes Biodiversity and Conservation, University of Leeds

**2009** BSc Zoology with Conservation (Hons), Bangor University

## Career History

**2017-** Postdoctoral researcher; Supporting Hen harriers in Novel Environments (SHINE)  
School of Biological, Earth and Environmental Sciences, University College Cork

**2017-** Visiting Research Fellow; movement ecology, invasive species  
School of Biological Sciences, Queen's University Belfast

## Professional activities

**Associate Editor:** Remote Sensing in Ecology and Conservation

**Peer reviewer:** Biological Conservation; Bird Study; Canadian Journal of Zoology; Diversity and Distributions; Global Change Biology; Journal of Natural History; Journal of Zoology; Mammal Communications; Mammal Research; Mammal Review; PLOS One; Remote Sensing in Ecology and Conservation; Zoo Biology.

**Funding review:** British Ecological Society Grant Review College

## Research

I employ field and laboratory-based experiments, along with archival data, to answer specific questions relating to the ecology of species and communities to inform conservation, management and policy-related processes. My current work includes an analysis of mammal activity patterns, landscape-scale habitat and distribution modelling, quantification of the impacts of non-native rodents on insular seabirds and an assessment of wildlife management practises.

**Research interests;** Conservation biology; urban ecology; invasive species; population & community ecology; movement & spatial ecology; rare and endangered species; sustainability; rewilding; citizen science

## Peer-Reviewed Publications

9 O'Halloran J, Kelly TC, Quinn JL, Irwin S, Fernández-Bellón D, **Caravaggi A**, Smiddy P (2017) Current ornithological research in Ireland: seventh Ornithological Research Conference, UCC, November 2017. *Irish Birds*. 10: 598-638.

8 Havlin P, **Caravaggi A**, Montgomery WI (2017) The diet and abundance of an introduced insular population of Red-Necked Wallabies, *Macropus rufogriseus*. *Canadian Journal of Mammalogy*. doi: 10.1139/cjz-2017-0090

- 7 **Caravaggi A**, Montgomery WI, Reid N (2017) Management and control of invasive brown hares (*Lepus europaeus*): contrasting attitudes of selected environmental stakeholders and the wider rural community. *Proceedings of the Royal Irish Academy: Biology & Environment*. 117B: 1-11. doi: 10.3318/bioe.2017.08
- 6 Tennant JP, Graziotin D, Jacques DC, Waldner F, Dugan JM, Mietchen D, Elkhatab Y, Collister LB, Pikas CK, Crick T, Masuzzo P, **Caravaggi A**, et al. (2017) A multi-disciplinary perspective on emergent and future innovations in peer review. *F1000Research*. 6:1151. doi: 10.12688/f1000research.12037.3
- 5 **Caravaggi A**, Banks P, Burton C, Finlay CMV, Hayward M, Haswell, PM, Rowcliffe JM, Wood M (2017) A review of camera trapping for conservation behaviour research. *Remote Sensing in Ecology and Conservation*. doi: 10.1002/rse2.48
- 4 **Caravaggi A** (2017) remBoot: An R package for Random Encounter Modelling. *Journal of Open Source Software*. 2(10). doi: 10.21105/joss.00176
- 3 **Caravaggi A**, Leach K, Santilli F, Rintala J, Helle P, Tiainen J, Bisi F, Martinoli A, Montgomery WI, Reid N (2017) Niche overlap of mountain hare subspecies and the vulnerability of their ranges to invasion by the European hare; the (bad) luck of the Irish. *Biological Invasions*. 19(2): 655-674. doi: 10.1007/s10530-016-1330-z
- 2 **Caravaggi A**, Zaccaroni M, Riga F, Schai-Braun SC, Dick JTA, Montgomery WI, Reid N (2016) An invasive-native mammalian species replacement process captured by camera trap survey Random Encounter Models. *Remote Sensing in Ecology and Conservation*. 2: 45-58. doi: 10.1002/rse2.11
- 1 **Caravaggi A**, Montgomery WI, Reid N et al. (2015) Range expansion and comparative habitat use of insular, congeneric lagomorphs: invasive European hares *Lepus europaeus* and endemic Irish hares *Lepus timidus hibernicus*. *Biological Invasions*. 17(2): 687-698. doi: 10.1007/s10530-014-0759-1

*In review*

- Caravaggi A**, Vallely M-C, Hogg K, Freeman M, Fadaei E, Reid N, Tosh D. Circadian activity, occurrence, and predator-prey relationships of free-ranging mammals revealed by camera traps. To be submitted to *PeerJ*
- Caravaggi A**, Plowman A, Wright D, Bishop C. The composition of captive ruffed lemur (*Varecia* spp.) diets in UK zoological collections, with reference to the problems of obesity and iron storage disease. *Journal of Zoo Animal Research*
- Caravaggi A**, Cuthbert RJ, Ryan RG, Cooper J, Bond AL. The cumulative impacts of introduced house mice on the breeding success of nesting seabirds on Gough Island. *Ibis*

*Book chapters*

- Caravaggi A**, James K (2017) Twittersphere: Conferencing in 140 characters. *Nature* [Correspondence] 549: 458. doi: doi:10.1038/549458d
- Caravaggi A** (*in review*) Lagomorpha Life History. In: *Encyclopedia of Animal Cognition and Behavior*, Vonk J, Shackelford TK (eds.) ISBN 9783319550657

*Other publications*

- Caravaggi A** (*in review*) Lagomorpha Navigation. In: *Encyclopedia of Animal Cognition and Behavior*, Vonk J, Shackelford TK (eds.) ISBN 9783319550657

## Teaching

As a teacher I aim to provide my students with skills, knowledge and confidence critical to their academic and personal development. I take an inclusive approach, developing strong relationships and encouraging discussion. I am currently working towards a Postgraduate Certificate in Teaching and Learning in Higher Education qualification.

### Module development

2017-18 BL6024 *Quantitative skills for biologists using R*

Quantitative skills required by postgraduate students to successfully conduct and publish their research, with a focus on data analysis and graphing, statistics, and basic modelling, as generally implemented by zoologists and ecologists. Supported by a new R Peer Group mailing list and pop-up clinics

### Teaching

2017 BL6024 Quantitative skills for biologists using R

2016 South American rainforest biodiversity and conservation

2015 Introduction to GIS (Teaching Assistant)

2015 Animal Biology (Teaching Assistant)

2014-2015 Undergraduate residential field course

2014 Bird survey techniques

### Thesis supervision

2017 MRes research project. *Threats affecting breeding hen harriers in Ireland*. University College Cork

2017 BSc research project. *Comparing hen harrier chick condition across Europe*. University College Cork

2015 MSc research project. *Behaviour and stress in sympatric hare species*. Queen's University, Belfast

2014 MSc research project. *Activity and behaviour of hares in Mid-Ulster*. Queen's University, Belfast

2013 MSc research project. *Estimating hare population densities*. Queen's University, Belfast

2013 BSc research project. *Resource and habitat partitioning of herbivores*. Queen's University, Belfast

### Instruction and demonstration

2016-17 Course tutor: ornithology, camera traps, social media. Eco-Explore, Cardiff

Developed materials and taught courses on UK bird identification, the use of camera traps in ecology, and social media for scientists

2016 Lecturer and field ornithologist. Operation Wallacea, Ecuador

Co-developed and delivered a 5-part series of lectures focussing on rainforest biodiversity and conservation, and conducted bird ringing studies including demonstrating techniques and training students in biometric data gathering. Also trained an assistant on mist nest extraction and data recording

2015 Otter surveys, MSc, Queen's University Belfast

Trained a Master's student in otter survey techniques and field signs, and advised on camera trap survey methodology

## Fellowships, funding and Awards

2017 Project tender, €174,000, National Parks and Wildlife Service

2015 Emily Sarah Montgomery Travel Scholarship, £200, Queen's University Belfast

2015 Training and Travel grant, £500, British Ecological Society

2012 Research grant, £2,000, People's Trust for Endangered Species

2012 NIEA funded PhD studentship, £82,720, Queen's University Belfast

2010 NERC Master's scholarship, £7,500, University of Leeds

## Presentations

### Conferences (*talks*)

- 12 **Caravaggi A**, Montgomery WI, Reid N (2017) An invasion in progress: Impacts of the non-native European hare on the native Irish hare. International Congress for Conservation Biology, Cartagena
- 11 **Caravaggi A** (2017) The changing face of UK conservation. Mammal Society Student Conference (*invited keynote*)
- 10 **Caravaggi A** (2017) University Mammal Challenge: distributed mammal surveys with student scientists. Mammal Society Spring Conference, Cambridge
- 9 **Caravaggi A**, Montgomery WI, Reid N (2016) Invasion ecology: quantifying the impact of non-native European hares on the endemic Irish hare. British Ecological Society Annual Meeting, Liverpool
- 8 **Caravaggi A**, Hayward M (2016) People and hedgehogs in Wales. North Wales Mammal Symposium, Bangor
- 7 **Caravaggi A**, Montgomery WI, Reid N (2016) Invasion ecology: quantifying the impact of non-native European hares on the endemic Irish hare. Mammal Society Spring Conference, Yarnfield
- 6 **Caravaggi A** 2015 Quantifying endemic uniqueness and ecological equivalency between native and invasive leporids. 7th European Congress of Mammalogy, Stockholm, Sweden
- 5 **Caravaggi A**, Leach K, Santilli F, Rintala J, Helle P, Tiainen J, Bisi F, Martinoli A, Montgomery WI, Reid N (2015) Democratisation of invasive species interventions: assessing attitudes towards lethal control of mammalian invaders. Mammal Society Spring Conference, Lancaster
- 4 **Caravaggi A**, Zaccaroni M, Riga F, Schai-Braun SC, Dick JTA, Montgomery WI, Reid N (2015) Using the Random Encounter Model to estimate spatial patterns in invasive and native hare densities in allopatry and sympatry. Mammal Society Student Conference, Lancaster
- 3 **Caravaggi A**, Montgomery WI, Reid N (2014) Using the Random Encounter Model to estimate spatial patterns in invasive and native hare densities in allopatry and sympatry. Mammal Society Spring Conference, Birmingham
- 2 **Caravaggi A**, Montgomery WI, Reid N (2013) Distribution and differential habitat associations of invasive European and endemic Irish hares. 11th International Mammal Congress, Belfast
- 1 **Caravaggi A**, Montgomery WI, Reid N (2013) Invasion ecology: quantifying the impact of non-native European hares on the endemic Irish hare. Mammal Society Student Conference, Staffordshire

### Conferences (*posters*)

- 10 **Caravaggi A**, Irwin S, O'Halloran JOH (2017) Quantifying habitat associations and factors affecting the breeding success of hen harriers in Ireland. Irish Ornithological Research Conference, Cork
- 9 **Caravaggi A**, Vallely M-C, Hogg K, Freeman M, Fadaei E, Reid N, Tosh D (2017) Activity and temporal relationships of free-ranging mammals revealed by camera traps. Mammal Society Spring Conference, Cambridge
- 8 **Caravaggi A**, Montgomery WI, Reid N (2015) The democratisation of conservation: public attitudes towards lethal control of invasive leporids and implications for species management. 7th European Congress of Mammalogy, Stockholm, Sweden
- 7 **Caravaggi A**, Zaccaroni M, Riga F, Schai-Braun SC, Dick JTA, Montgomery WI, Reid N (2015) Optimising camera trap Random Encounter Model survey effort: A case study using an invasive-native species replacement process. Vth International Wildlife Management Congress, Sapporo, Japan
- 6 Beresford NA, Wood MD, Gaschack S, Gulyaichenko EA, **Caravaggi A** (2015) Use of wildlife camera traps to within the Chernobyl Exclusion Zone. Mammal Society Spring Conference, Lancaster

- 5 **Caravaggi A**, Montgomery WI, Reid N (2013) Estimating hare numbers using camera trapping and the Random Encounter Model. 11th International Mammal Congress, Belfast
- 4 **Caravaggi A**, Montgomery WI, Reid N (2012) Invasion ecology: quantifying the impact of non-native European hares on the endemic Irish hare. 2nd All Ireland Mammal Symposium (AIMS), Dublin
- 3 **Caravaggi A**, Montgomery WI, Reid N (2012) Invasion ecology: quantifying the impact of non-native European hares on the endemic Irish hare. 4th World Lagomorph Conference, BOKU, Vienna
- 2 **Caravaggi A**, Hughes W (2011) Patrilineal inheritance of grooming behaviour and parasite resistance in leaf-cutting ants (*Acromyrmex* sp.). Postgraduate Student Forum, University of Leeds
- 1 **Caravaggi A**, Bishop, C (2009) Dietary and faecal iron levels in captive black-and-white ruffed lemurs (*Varecia* spp.). 11th BIAZA Research Symposium, Blackpool

#### **Invited seminars**

2014 Distribution and differential habitat associations of invasive European and endemic Irish hares. Bangor University

## **Professional Activities**

#### **Conference organisation**

2017 7th Irish Ornithological Research Conference; scientific committee  
 2017 Biotweeps Twitter Conference, #BTCon17; conception and organisation  
 2014-18 Mammal Society Student Conference; principal organiser

#### **Training and workshops**

2017 Postgraduate Certificate in Teaching and Learning in Higher Education, University College Cork  
 2017 NERC Advanced Training, Systematic Review and Meta-Analysis, University of East Anglia  
 2017 Level 3 Teaching Assistant, E-Training Hub  
 2017 Public Outreach, Science Made Simple  
 2016 Mentor Training, British Ecological Society  
 2016 Conservation Ecology Special Interest Group workshop, British Ecological Society Annual Meeting  
 2016 Acoustic Analysis, North Wales Mammal Symposium  
 2014 Using R, Queen's University Belfast  
 2012 Lagomorph Systematics, 4th World Lagomorph Conference

#### **Licenses and Certifications**

2018 LAST Ireland  
 2014 ASPA laboratory animal handling license (TSA/47/14)  
 2014 Emergency first aid; field first aid  
 2009 Bird ringing 'C' license holder, British Trust for Ornithology 2008 Marine mammal medic, British Divers Marine Life Rescue  
 2002 Full manual UK driving license, held without incident or penalty

#### **Societal memberships**

(since)  
 2017 British Ornithologist's Union  
 2015 South Wales Mammal Group; Welsh Ornithological Society  
 2013 Society of Conservation Biology (SCB)  
 2012 The Mammal Society; British Ecological Society  
 2011 Royal Society of Biology  
 2009 The British Trust for Ornithology

## Organisational and Working Groups

(since)

2017 SCB Participatory and Citizen Science  
2016 Committee member, South Wales Mammal Group  
2016 British Ecological Society Review College  
2013 SCB Urban Ecology

## Additional roles

2016 Community Ecology session chair, British Ecological Society Annual Meeting  
2016 Advisor to National Geographic on red fox ecology  
2016-18 Coordinator of The Mammal Society's University Mammal Challenge  
2016 British Ecological Society Women in Ecology (WIE) mentor  
2016 Mammal (hares) consultant for The Mammal Society  
2013 Wildlife consultant, Biological records for the North East of Scotland (NESBReC)  
2013-17 UK STEM Ambassador  
2012-15 EBEE postgraduate representative, Queen's University Belfast  
2012-15 SBS Athena SWAN committee, Queen's University Belfast  
2008-09 Undergraduate student representative, Bangor University Biological Sciences  
2007-09 Founding committee & publicity officer, Bangor University Zoological Society

## Science communication

I am a strong supporter of science communication and outreach. I believe that it is important to encourage an interest in science and the natural world in people of all ages. Moreover, the success or failure of many modern conservation objectives increasingly require a connection with and understanding of the public. I have given talks to over 20 school, local interest, community and natural history groups in the UK, USA and Canada, in-person and via video calls.

### *Contributions*

2017 Sanger Institute 25 Genomes (*species champion* - *St. Kilda wren*)  
2017 Culture Night, University College Cork  
2017 A brief history of an Early Career Researcher, Errant Science  
2017 Rejected by the Rainforest, I F-ing Love Conservation  
2017 Science communication article, CBS (*#bestcarcass, contributor*)  
2017 Rabaiotti D, Caruso N 2017. Quercus books, ISBN: 9781786488275 (*contributor*)  
2017 Student Science Partnerships, USA  
2016-18 Skype a Scientist (*5 calls to date*)  
2016 Is there intelligent life on Earth? Save our Souls magazine (*author*)  
2016 Letters to a Pre-scientist (*correspondent*)  
2015 Nature News (*invited comment*)  
2015 Dear Alice, the hare might be sane after all, QUBio  
2014-16 Various Local Mammal Group newsletters (*invited author*)  
2014 Created @Biotweeps, a science communication Twitter project (>14.5k followers)  
2014 Multi-school careers advice and speed-networking event (*invited expert*)  
2013-18 I'm a Scientist Get Me Out of Here! Enquiry Zone & Careers Zone  
2013 Science outreach event, Techniquet, Cardiff (*presenter for RSPB*)

## Media engagements

### *Radio*

2017 BBC Coventry & Warwickshire, Wallabies in the UK  
2017 Invited guest, The Edgar Ortega Radio Show, Invasive species and urban wildlife  
2016 SciComm podcast Episodes 7 & 8, with Dr. Mike  
2015 BBC Radio Ulster, Hares at Belfast airport  
2015 BBC News School Report for St. Pius X, Magherafelt's Biodiversity Club

2015 BBC Radio Ulster, Good Morning Ulster, Invasive species  
2013 RTE Radio 1, Mooney Goes Wild, Hares in Ireland

#### *Television*

2015 Countryfile, BBC  
2013 River Bann, RTE Television

#### *Other research-related media*

2017 The Washington Post (*interview*) 2016 Biotechnia.asia (*interview*) 2016 Camera traps reveal a hare-raising situation, RSEC blog, ZSL  
2016 On closer inspection, it looks like a hare transplant, QUBio  
2015 Living with aliens. SciLogs (*contributor*)  
2015 Media battle highlights importance of scientific credit. ScienceNews (*interview*)  
2015 Astrotweeps and Biotweeps: rotating Twitter accounts. Crastina.se (*interview*)  
2015 BBC News. Counting Irish hares at Belfast International Airport  
2015 Communities and conservation in developing countries, QUBio  
2015 Putting wildlife in the frame, QUBio  
2015 BBC News (*interview and featured article*) 2015 A call for beautiful prose in papers. Nature News (*Interview*)  
2014 Species profiles: Mountain hare and Irish hare, The Mammal Society  
2014 A receding hare line and a brown toupee, QUBio  
2013 'Hare' raising project in Mid-Ulster, Mid Ulster Mail (*Interview*)

## **Skills**

#### *Data analysis*

R (packages include MuMIn, lme4, ggplot, remBoot, maptools, raster, SDMTools, StatMatch, pdist, glm-multi, metafor), SPSS, Minitab, Distance, MARK, ArcGIS, QGIS, MaxEnt, MAVIS NVC, Patch Analyst, GeneMapper, Microsoft office, GitHub, RMarkdown, graphics packages (e.g. Photoshop, Illustrator), bespoke software

#### *Statistical*

General linear and mixed-effects models, Principal Components Analysis, Species Distribution Modelling, Discriminant Function Analysis, diversity indices, Mahalanobis and Euclidean distance, cross-correlation functions, model averaging, Random Encounter Models, meta-analysis, other parametric and non-parametric tests

#### *Field*

Off-road driving (4x4), multi-taxa (mammal, bird, invertebrate, reptile, amphibian; UK coastal, marine and terrestrial) surveys (e.g. mark and recapture, distance sampling, camera traps, quadrats, scan/focal sampling;) and identification, habitat surveys, animal handling (amphibians, reptiles, invertebrates, and small-to-large birds and mammals), orienteering

#### *Laboratory*

Multi-taxa dissection (mammal, bird, amphibian, invertebrate), species identification via microscopy, ethological studies, tissue sampling, DNA manipulation, electrophoresis, atomic absorption and colourimetric spectroscopy, specimen preparation, soil chemical and biological analysis

## Referees

**Prof. John O'Halloran**

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**Prof. Jaimie Dick**

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