

Dr. Anthony Caravaggi

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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

2017-18 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: African Journal of Ecology; Austral Ecology; 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; The European Zoological Journal; Zoo Biology.

Funding review: British Ecological Society Grant Review College; Croatian Science Foundation

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

10 **Caravaggi A**, Plowman A, Wright D, Bishop C (2018) 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*. 6: 41-49.

9 O'Halloran J, Kelly TC, Quinn JL, Irwin S, Fernandez-Bellon 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 Zoology*. 96: 357-365. 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, Mitchen 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. *PeerJ*

Caravaggi A, Cuthbert RJ, Ryan RG, Cooper J, Bond AL. The impacts of introduced house mice on the breeding success of nesting seabirds on Gough Island. *Ibis*

Caravaggi A, Irwin S, Lusby J, Ruddock M, O'Toole L, Mee A, Nagle T, O'Neill S, Tierney D, O'Halloran J. Factors affecting territory site selection and breeding parameters of Hen Harriers, *Circus cyaneus*, in Ireland. *Ibis*

Book chapters

Caravaggi A (2018) Lagomorpha Life History. In: *Encyclopedia of Animal Cognition and Behavior*, Vonk J, Shackelford TK (eds.) doi: 10.1007/978-3-319-47829-6_1206-1

Caravaggi A (*in press*) Lagomorpha Navigation. In: *Encyclopedia of Animal Cognition and Behavior*, Vonk J, Shackelford TK (eds.) doi: https://doi.org/10.1007/978-3-319-47829-6_1164-1

Other publications

Caravaggi A, James K (2017) Twittersphere: Conferencing in 140 characters. *Nature* [Correspondence] 549: 458. doi: doi:10.1038/549458d

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

Project supervision

2018 PhD. *Managing hares at Dublin airport*. University College Cork

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

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

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

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

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

2013 BSc. *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

2018 Funded postgraduate programme (PhD), €96,000, Irish Research Council

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 (animal welfare in research; License no: 09-2018)
 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

2018- UCC BEES Education and Public Engagement Committee
2016-18 University Mammal Challenge, The Mammal Society (coordinator)
2016 Community Ecology session chair, British Ecological Society Annual Meeting
2016 Advisor to National Geographic on red fox ecology
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

2018 UCC BEES Committee for Education and Public Engagement
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 (*7 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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Dr. Sandra Irwin

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