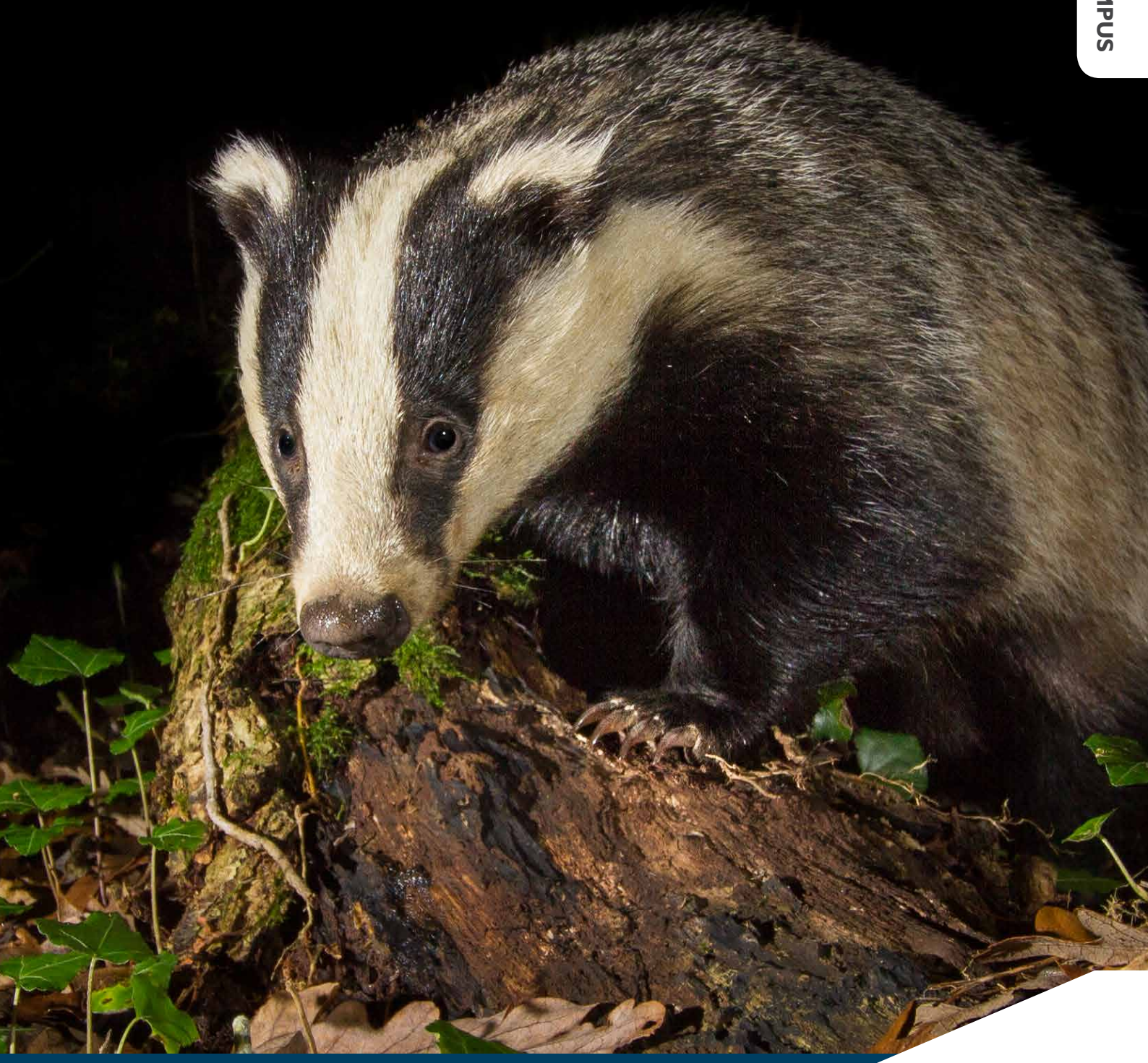
UNIVERSITY OF EXETER

PENRYN CAMPUS



Centre for Ecology and Conservation

Annual Report 2015

Welcome
Waves of Success in 2015

Yet again, 2015 was a year in which, the staff and students of the Centre for Ecology and Conservation (**CEC**) celebrated a long list of achievements in research, teaching and community engagement. Together with our colleagues from the Centre for Geography, Environment and Society (**CGES**; formerly Geography Department) and our interdisciplinary colleagues in the Environment and Sustainability Institute (**ESI**) and European Centre for Environment and Human Health (**ECEHH**) we continue to make the Penryn Campus a globally known locus for world-leading research and teaching with an environmental focus.

Things took on a more marine flavour in 2015. We launched our degree in Marine Biology with 23 excellent students enjoying the course in its first year. We welcomed **Heather Koldewey** of the Zoological Society of London (**ZSL**) as an honorary member of staff. This sees the ZSL's Marine and Freshwater Conservation team physically based here with us in the CEC. Team members will contribute to teaching and augment our research with impact. In 2015, we also began to host the **Marine Ecology and Conservation Network** (www.facebook.com/MECNExeter), a consortium of 54 businesses, governmental and non-governmental organisations focussing on the marine environment. Thus far, we have hosted 2 fora; one general networking meeting and one more focussed workshop exploring the ever-increasing scourge of ocean plastic - a research strength at Exeter.

As has been the case in every year since our inception, we have continued to grow with a number of new research groups joining us and a record number of high quality students being recruited across our degrees. In line with this, we saw some major infrastructure developments. We had an extension to our teaching laboratory to facilitate greater student numbers and we saw the opening of a new building, the Science and Engineering Research Support Facility (**SERSF**). Sitting alongside the Daphne Du Maurier Building, the SERSF houses the research of nine CEC research groups alongside colleagues from the Marine Renewables group and the ever expanding Exeter Business School. We are already planning the next building- it will most definitely be needed!

As we develop, however, we are mindful that we must keep appraising how we operate with regard to fairness, mentoring and support. We were delighted to become the largest department in the university to be awarded an **Athena SWAN** Silver award in April 2015. This speaks volumes for how we have changed our internal culture and processes. We strive to improve further and ultimately attain Gold.

We are a research intensive unit but we are nothing without our students. The tremendous commitment of our staff and students in their co-development of the culture of learning and personal development in the CEC was recognized by our nomination and shortlisting (but alas no

victory) in the Exeter Students' Guild Awards this year. We were runners up for both "Best Department" and "Best Research Culture". No other department across any of the four Exeter campuses featured on both shortlists. These accolades are as much about the character of our students as the quality of their academic mentors. The activities of our student body continue to impress as they undertake an ever wider range of extracurricular societies which are so important to the life of the campus and the employability of our graduates (see section on **Student Societies**).

A major ambition of the University is to continue to grow in research. Our research portfolio continues to go from strength to strength, with £3.4 million in new grants in 2015, taking our current grant holdings to over £15 million. Funders included Research Councils (BBSRC, ESRC, NERC), Darwin Initiative, Defra, the European Union, Marine Conservation Society, Natural England, Leverhulme Trust, the Royal Society, Rufford Foundation, Scottish Natural Heritage, Welcome Foundation, Wildlife Conservation Society and the Wissenschaftskolleg zu Berlin. For some detailed examples see **Funding Awards**. We also continue to publish well, often in the most prestigious journals in our respective fields; examples of recent publications are featured in the **Research Highlights** and **Selected Publications** sections later in this report.

In addition to the many plenary addresses and guest lectures our staff have delivered around the world, we also have a very strong record of liaising with local schools (see **Science in the Community**). Further, this year also saw us reaching out to the wider community at the Royal Cornwall Show, our now annual "Science in the Square" event during Falmouth Week and our second "Science of Christmas" at the Royal Cornwall Polytechnic Society. Two of our student endeavours are pass-remarkable in this regard. January saw the launch of **#FieldCourseFortnight** a multi-media (blogs, videos, instagram, twitter and facebook) extravaganza allowing international audiences to follow along with our final-year students during their exciting and immersive capstone field courses to the Bahamas, Borneo, Kenya, South Africa and Tenerife. Another excellent new student endeavour is **Naturewatch**, a high-quality, wildlife-focussed television programme shared freely on the internet (www.facebook.com/naturewatchcornwall).

At the end of my first full year as Director of the CEC, I am happy to say that I am still enjoying collaborating with such a vibrant and industrious group of staff and students. In particular, we are privileged to work with a large number of professional services colleagues who share the mission of the CEC and play an essential role in helping it achieve its goals. The personal achievements of many of our colleagues have been recognised by a large number of promotions and prestigious awards this year (see **Selected Highlights**). 2016 will, no doubt, see ever more success.

Professor Brendan Godley
Director, Centre for Ecology and Conservation
Head of Discipline, CLES Cornwall

Research Highlights

When sex makes you sick

Sexually transmitted infections (STIs) may help to explain the evolution of mating strategies, but host behaviour is, in turn, critical to the transmission and therefore the evolution of STIs. Despite this clear reciprocity, we lack a "co-evolutionary" theory of host mating strategies and STIs. Theoretical research by **Dr Ben Ashby** and **Prof Mike Boots** showed that co-evolution leads to a wide range of previously unseen dynamics, including cycling between more and less virulent STIs and choosy and non-choosy hosts. Crucially, this work resolves a key criticism of previous theory: that STIs will evolve to be less virulent and have little impact on mating strategies. (Published in ***PNAS***)

Constitutive versus induced defences

A study undertaken by **Dr Edze Westra, Dr Stineke van Houte, Prof Mike Boots, Prof Angus Buckling** and colleagues has shed new light on the conditions that lead to the evolution of constitutive (always active) and inducible (triggered upon infection) defences. The authors identified conditions where the two types of the defence are favoured one over another, which helps to explain the observed diversity in defence strategies in nature. The study combines empirical data from a tractable bacteria/virus model system with a theoretical model to generalise the observations. (Published in ***Current Biology***)

Basking butterflies help improve solar cells

In a collaborative study with scientists in the ESI, **Prof Richard ffrench-Constant** has used the humble cabbage white butterfly to help improve the gathering of sunlight for solar cells. Observations of white butterflies in the field revealed that the butterflies improve their efficiency by angling their wings above their bodies, thus acting like V-trap concentrators which focus sunlight on solar cells. Richard is working to use the superior power to weight ratio of the butterfly wing in solar applications in flight and space. (Published in ***Scientific Reports***)

Understanding extinction cascades

Species extinction rates due to human activities are high and initial extinctions can trigger secondary extinctions. A potential major mechanism for secondary extinction cascades is provided by the long-standing theory that the diversity of consumer species is maintained. This is due to the positive indirect effects that these species have on each other by reducing competition among their respective resource species. **Dr Dirk Sanders, Rachel Kehoe** and **Dr Frank van Veen** demonstrate the mechanisms for horizontal extinction cascades at high trophic levels in a field experiment. They show that the loss of carnivores can increase extinction rates of other species at the same trophic level due to indirect population dynamic effects that are rarely considered in this context. (Published in ***Current Biology***)

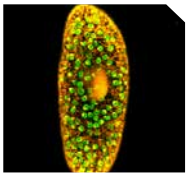
Badger life history promotes disease persistence

Understanding the badger's life history and demography helps to explain its role as a persistent reservoir of bovine tuberculosis. This research, led by **Dr Jenni McDonald** and **Prof Dave Hodgson**, combined long-term datasets to quantify impacts of disease, density and weather on recruitment of cubs and survival. The team discovered that although badger survival declined with increased prevalence of disease, any consequent declines in badger numbers are compensated for by an increased recruitment of cubs. These demographic processes promote population persistence and the coexistence of disease and hosts in a wild population. (Published in ***Ecology Letters***)

Penguins profit from marine protected area

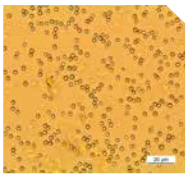
The benefits of marine protected areas (MPAs) that protect the prey of wide-ranging predators are poorly understood. **Dr Richard Sherley** and **Dr Steve Votier** found that chick survival of African penguins improved during 3 years when fishing was banned around their colony, compared to the previous 10 years when it was permitted. Projecting forward suggested a 27% higher population after 10 years without fishing. By demonstrating this tangible benefit, the work contributed to proposals for new MPAs in South Africa, with two declared in part for the conservation of penguins and other threatened seabirds. (Published in ***Biology Letters***)

Do mutually beneficial partnerships really exist in nature?



Throughout evolutionary history symbionts have shaped complex life and allowed diverse host organisms to exploit new environments. The partnerships between species are remarkable in their ubiquity, but also in how partners evolve mechanisms to maximize their own benefits. A study led by **Dr Chis Lowe** aimed to understand the costs and benefits derived by species engaged in symbiosis by studying a symbiotic association between a protist host and an algal symbiont. The study showed that hosts heavily exploit their symbionts and suggests that rather than being cooperative, such associations are likely shaped by antagonism between interacting species. (Published in ***Current Biology***)

Phytoplankton can rapidly adapt to warming



Phytoplankton, tiny autotrophs that absorb as much carbon dioxide as the world's rainforests, are capable of adapting to thrive in warmer waters, a study by **Dr Gab Yvon-Durocher** and **Daniel Padfield** has found. The model freshwater alga, *Chlorella vulgaris*, evolved increased growth rates after just 45 days of exposure to the warmer temperature through increasing the proportion of carbon available for growth. They achieved this though reducing their rate of respiration more than that of photosynthesis. If this mechanism of thermal adaptation is widespread within phytoplankton, it may partially offset the increase in carbon dioxide emissions models previously predicted. (Published in ***Ecology Letters***)

Research promotes wise harvesting and changes turtle fishery legislation

Many countries have substantial legal marine turtle fisheries that can be of great importance to subsistence users who rely on the catch for food and income. For long lived, late maturing species like marine turtles, exploitation needs to be carefully managed, yet biological data on which to base management decisions is often lacking. Researchers from the CEC (**Dr Tom Stringell, Dr Annette Broderick, Prof Brendan Godley**) and Marine Conservation Society used multiple lines of evidence (nesting phenology and magnitude, genetic structure, satellite telemetry data on animal movement, directed take of adults) to inform the management of two marine turtle species under harvest from a small-scale artisanal fishery in the Turks and Caicos Islands (TCI). As a result of this study, new turtle fishery legislation was implemented on 1st July 2014 by the TCI government and included maximum size limits and a closed season. Our work is a key example of successful "science to policy". (Published in ***Biodiversity and Conservation***)

Wild pollinators at risk from diseased commercial bees

Fast evolving viruses, carried by managed populations of honeybee and bumblebees, have the potential to decimate wild pollinator species. A review by **Robyn Manley, Dr Lena Wilfert** and **Prof Mike Boots** concludes that the commercial use of pollinators is a key driver of disease emergence in wild pollinators. In addition, the social behaviour of honeybees, bumblebees and social wasps, provides perfect conditions for disease transmission both within the colony and between different species. (Published in ***Journal of Applied Ecology***)

Offshore wind farms could be more risky for gannets than previously thought

Offshore wind farms which are to be built in waters around the UK could pose a greater threat to protected populations of gannets than previously thought, according to research carried out by **Dr Ian Cleasby, Dr Tom Bodey, Dr Steve Votier** and **Prof Stuart Bearhop**. Data from GPS and altimeter devices demonstrated that gannets fly at heights that would put them at risk of colliding with turbine blades while foraging. Crucially, the study also shows that the birds' feeding grounds overlap extensively with planned wind farm sites, placing them at potential collision risk. (Published in ***Journal of Applied Ecology***)

CASE STUDY

Racehorses are getting faster

Despite heritable variation for performance and putatively intensive selection breeding, racehorse speed has thought to be improving very slowly, if at all – suggesting that the animals may have reached a selection limit. However, using an extensive dataset covering the full range of race distances and accounting for variation in factors such as ground softness, **Patrick Sharman** and **Dr Alastair Wilson** have shown that improvement is in fact on-going. Although this is true for the racehorse population as a whole, improvement is driven particularly by an increase in speed over sprint races. In contrast, speed over middle and long distances, at least at the elite level of racing does appear to be reaching an asymptote. Whether this reflects a real selection limit or whether it is a consequence of a shift in selection focus by horse breeders - from long distance to sprinting - remains to be determined. (Published in *Biology Letters*).

Student Societies

EcoSoc

EcoSoc has had another fantastic year! We've been getting involved with ZSL and Cornwall Reptile and Amphibian Group as well as groups across Cornwall helping out with the badger vaccination project, ecological surveys and habitat management. We've also worked with Swanpool Beach to keep our beautiful coastline clean and the National Trust on conservation and habitat management projects. Alongside this, we've run many events ourselves. Our mammal trapping sessions have seen the biggest turnouts we've ever had and our bird-watching trips have been as successful as ever. We have now started running regular bird ringing events, with our licensed committee members giving our members access to a unique experience that normally takes years of training to be able to observe! Speaking of observing normally hidden events, our camera trapping events have been a big hit, with badger, otter and fox all showing up. Our ongoing moth trapping is continuing well, and the revitalised invertebrate night walks have been a big hit for our members this year. BioBlitz, a 24 hour survey of campus, found hundreds of species again this year, and was a great day enjoyed by all! But the rising star of this year was NatureWatch, a documentary series set up by EcoSoc and now running in collaboration with WildDocSoc, which has had thousands of views and been shared by people all over the world!

BeeSoc

BeeSoc is a small society aiming to raise awareness of bee conservation amongst students and the public. We have had the pleasure of hosting talks from Lewis Bartlett, Ros Shaw and Jess Knapp. Perhaps our biggest success of 2015 was the informative and humorous talk from Dave Goulson, author of 'A Sting in the Tale', which over 150 people attended. Alongside this, Matt, our local beekeeper, has delivered beekeeping lectures; our practical beekeeping sessions are due to run in 2016. We also participated in a podcast with Natural Selection, promoting bee-friendly behaviour.

Expedition Society

The Expedition Society has had another great year leading walks around the South-West, taking our members to Dartmoor, Bodmin, Godrevy and North Devon to name just a few. We have secured affiliations with local outdoor equipment shops Cotswold Outdoor and Hawkshead, providing our members with exclusive discounts and store open evenings with kit talks and deals. A social highlight of the year was the Banff Mountain Film Festival in Truro, showcasing some of the best expedition films from around the world. After summiting Ben Nevis last year in bitter winter conditions as part of our '1 Peak Challenge' (thanks to a broken down minibus), we are picking up the challenge again in June 2016, hoping to climb the three highest mountains in England, Scotland and Wales in under 24 hours in aid of Transplant Links. We've had a thoroughly enjoyable year and can't wait to see next year's committee implement some of their incredible new ideas!

Wildlife Documentary Society

WildDocSoc offers fantastic opportunities for anyone with a passion for wildlife media. We've had a brilliant year, hosting guest speakers including Steve Backshall, George McGavin, Gordon Buchanan and Elizabeth White at our Penryn campus. Our members have particularly enjoyed exclusive careers talks with our guest speakers, who have provided insight and shared experience of their time in the wildlife filmmaking industry. This year we have been actively raising money for wildlife conservation charities chosen by our speakers, including the Trees for Life and the World Land Trust. We have also collaborated with EcoSoc and CLES to create NatureWatch which got off to a flying start, and to organise the first Wild Film Fest which attracted filmmakers from around the world. We were shortlisted for a variety of FXU awards, including "Event of the year", and were delighted to win in the category of "FXU Society of the Year award 2015".

Bioscience Student Employability Committee

The Bioscience Student Employability Committee (BSEC) has had an excellent year providing networking opportunities and the chance for students to receive employability advice from experienced professionals in various different fields. The seminar series has hosted exciting guest speakers such as Tabitha Stokes, a CEC alumna now working for INGWE Leopard Research, and local organisations such as Seaquest Southwest and Camp Kernow that have also offered students great volunteering opportunities. We are currently organising a joint event with EcoSoc hosting Mark Avery, Britain's most popular nature blogger, for a guest lecture on the implications of driven grouse shooting. Working closely with academic staff and the Geography Student Employability Committee (GSEC) we were proud to organise the Centre for Ecology and Conservation's largest careers fair to date. The event hosted 38 stalls, which held external organisations offering advice as well as internship/volunteering prospects and four exciting guest speakers.

Our continuing efforts to improve gender equality have been recognised in the form of an Athena SWAN Silver Award

This award demonstrates that the changes we have brought in to create a level playing field are starting to have effect. 2015 has seen the publication of a new Athena SWAN charter by the Equality Challenge Unit that extends the agenda to wider equality and diversity issues and broadens the focus beyond academic staff.

Our new Athena Swan panel reflects this new vision by having all interest groups and areas of activity represented. **Dr Frank van Veen**, who has taken the Athena SWAN Champion baton from **Prof Stuart Bearhop**, started our drive to raise awareness among students by giving a brief Athena SWAN introduction in all undergraduate and post-graduate freshers welcome lectures, an initiative that will now be extended across the whole university.

We have maintained our 100% completion of Equality and Diversity training among staff and approximately 40 staff attended Unconscious Bias workshops, more of which are planned for 2016.

In December 2015 we said goodbye to Graduate Business Partner **Iris Boudier** who played a pivotal role in implementing our equality agenda. We are proud to see her move on to an excellent new job!

NatureWatch

NatureWatch is a collaborative project hosted by WildDocSoc and Ecosoc. NatureWatch produces a series of short episodes showcasing wildlife in Cornwall. Falmouth and Exeter students gathered together for its creation in late February 2015. After months of preparation, a promo was produced introducing the audience to the premise of NatureWatch and announcing the release of the first episode at the Wild Film Fest in late May. This initial episode was based around the arrival of spring; which included colour-changing crabs, fox cubs and a visit to the Cornwall Butterfly Conservation's AGM. There was a massive response to the release, receiving praise from the likes of Gordon Buchanan. The preview for the second episode included the first famous face, Chris Packham! The second episode was released in October, focusing on the end of summer in Cornwall. After an extraordinary first year for NatureWatch, it's one to 'watch' for next year! **www.facebook.com/naturewatchcornwall** @NWCornwall

Funding Awards 2015

We had another successful year, winning awards totalling £3.4 million. Funders included the Biotechnology and Biological Sciences Research Council (BBSRC); Economic and Social Research Council (ESRC); the European Commission; Leverhulme Trust; Medical Research Council (MRC); Natural Environment Research Council (NERC); Royal Society and Wellcome Trust. There were 36 awards in total, a few examples include: substantial **NERC** funding to Edze Westra (*Identifying ecological factors that drive the evolution of innate versus adaptive immunity in bacteria*), Kevin Gaston and Frank van Veen (*Effects of artificial light on multi-trophic population dynamics*), Dave Hodgson and Jenny McDonald (*Global Analyses of Plant and Animal Demography*); Ben Raymond and Angus Buckling received **MRC** funding (*Rapid assessment of phage for combating antimicrobial resistance in Enterobacter cloacae using a novel insect model*); **Wellcome Trust** funded Edze Westra (*Putative gene regulatory functions of Csy1, a component of the CRISPR-Cas adaptive immune system, in the opportunistic pathogen Pseudomonas aeruginosa*); **Leverhulme Trust** funded Dave Hosken (*Costs of Female Preference*); extensive funding was received from **BBSRC** with awards to: Alistair Wilson (*Combining mechanistic and evolutionary approaches to studying socially-induced stress in vertebrates* and *The role of additive and non-additive genetic effects during animal contests*); Lena Bayer-Wilfert (*Understanding the impact of agri-environment schemes on emerging infectious diseases in pollinators*), Alex Thornton (*The social dynamics of cultural behaviour: transmission biases and adaptive social learning strategies in wild great tits*); **ESRC** made awards to Alex Mesoudi (*Why do people from different cultures think differently?*), Alex Thornton (*The cognitive requirements of cumulative culture: experiments with typically developing and autistic people);* **DEFRA** awarded Darwin Initiative funding to Brendan Godley (*Linking marine biodiversity conservation and fisher prosperity through marketplace innovation*); The **Marine Conservation Society** funded Annette Broderick (*Satellite tracking of turtles in the Turks and Caicos Islands*); Funding from the **Royal Society** was received by Camille Bonneaud and Andrea Dowling (*Developing in vitro methods to provide new insights into pathogen virulence evolution*); Robbie McDonald and Cecily Goodwin received funding from **Peoples Trust for Endangered Species** (*How does woodland management impact on dormouse populations?*); The **Principe Trust Foundation** funded Annette Broderick; Ilya Maclean received Darwin funding from **the Committee on Climate Change**; And Lena Bayer-Wilfert was funded by **the CB Dennis Trust** (*Multi-host pathogens of honeybees and wild bumblebees: Does Varroa change disease dynamics?*).

Science in the Community

Schools Outreach

During 2015 CEC researchers were involved with over 100 outreach events across Cornwall and beyond. We reached over 2000 students through partnerships with 17 schools and colleges in Cornwall. We were also delighted to have presence at large events such as the Cornwall Careers Show and the Royal Cornwall Show, where the University had a stand for the first year, talking about our research and running hands-on science activities. For the first time we ran a Bioscience strand of the new Exeter Progression Scheme, a programme designed for Year 12 students to develop their knowledge and passion for a subject. Twenty students from Devon and Cornwall took part in seven practical lab and field sessions, all led by academics and students from the Centre, and even went on a marine wildlife cruise!

Science in the Square and Street Science

In August, our fourth annual Science in the Square event invited visitors to discover the scarier side of science! The free family event, which is held as part of Falmouth Week, featured talks on Scary Seas, Petrifying Plants, Violent Volcanoes and Perilous Parasites! Visitors were also able to explore seven interactive zones, giving them the chance to learn more about nature by taking part in activities such as examining animal skulls, holding live snakes and studying creatures under the microscope. Alongside Science in the Square, we also ran our first Street Science event which was a huge success! Four of our researchers delivered engaging talks on meerkats, animal tracking, and the weird and wonderful insects to curious passers-by in Falmouth's town centre. Together these events attracted over 2500 guests, including the Mayors of Falmouth and Penryn. A huge thank you to all of our staff and students who helped to make these events happen.

Science of Christmas

We contributed to the second annual Science of Christmas, a family-friendly outreach event that aims to explain the science of the season. Professor Brendan Godley led the crowd in a boisterous singalong while acting as compere and also contributed a presentation on how sea turtles spend their Christmas holiday. Professor Stuart Bearhop discussed adaptations that allow animals to survive cold climates, visiting researcher Professor Rowan Lockwood explained the science of snow, while Professor Dave Hosken explored the neurological underpinnings of belief, and visiting researcher Professor John Swaddle explored the physiology of angel flight. We were thrilled to have such an engaged and enthusiastic audience and are already thinking about what topics we can investigate during next year's event.

Smart Birds

Thanks to funding from a Royal Society Schools Partnership grant, Dr Alex Thornton was able to run a long-term research project with students from Mullion School. These budding students designed experiments to test intelligence in wild corvids and were thrilled to present their work at The Association for Science Education's Annual Conference in Birmingham.

Students As Change Agents

Students As Change Agents is a scheme that allows students to play an active part in improving their student experience. There was a record-breaking number of projects across the university this year, with students within the Centre being particularly engaged with the scheme. Successful projects included: an Athena SWAN video; a campus BioBlitz; practical volunteering opportunities with Cornwall Wildlife Trust; a research blog; and an information evening for students on study abroad programmes.

Wild Film Fest

In June this year, we welcomed the first annual Wild Film Fest. This 1-day event was packed full of speakers and exhibits, as well as screenings of the best films that people around the world had submitted to our Wild Film Fest competition. There was a great turnout, with members of the public, CEC staff and students attending the event to enjoy the fantastic wildlife and nature documentaries on show. We plan for Wild Film Fest to be a firm fixture in the CEC calendar for years to come.

More information about our outreach activities can be found at: http://lifesciences.exeter.ac.uk/outreach/cornwall/

Awards and Prizes

Prize Winners

Dr Ben Ashby won the Thomas Henry Huxley award and Marsh Prize from the Zoological Society of London for the best zoological doctoral thesis in the UK.

See also Selected Highlights for accolades to **Prof Nina Wedell, Prof Mike Cant** and **Dr Gail Reeves**.

Exeter Students Guild Teaching Awards
This awards ceremony formally recognises outstanding teaching and support at the University.

Best subject runner up – *Biosciences (Penryn)*
Best supervisor (research) runner up – *Prof Mike Cant*
Subject with the best research community runners up – *Biosciences (Penryn)*

FXU Awards

Our students were very successful at the 2015 Falmouth and Exeter Students' Union awards as follows:

FXU Society of the Year – *Wild Doc Soc*

Significant Contribution to the Community through Volunteering – *Matthew Davies*

Student Academic Rep of the Year – *Zeya Wagner*

Best Student Council Member – *Zeya Wagner*

Best Overall Contribution to FXU Activities – *Tilda Dunn*

Graduation Awards

Congratulations to the following CEC students who were awarded PhDs in 2015:

Christopher Beirne – The mechanisms of senescence in wild European badgers.

Christopher Coles – Ecological and evolutionary implications of shapes during population expansion.

Rochishnu Dutta – Divergence and reproductive isolation in the bushcricket Mecopoda elongate.

Julian Evans – Group-foraging and information transfer in European shags Phalacrocorax aristotelis.

Dominic Henri – From individuals to ecosystems: a study of the temporal and spatial variation in ecological network structure.

Frances Humber – Exploitation of marine turtles and elasmobranchs in Madagascar.

Siobhan O'Brien – Advances in the social evolution and ecology of bacterial public goods.

Katy Scott – Behaviour and endocrinology of meerkats in zoos.

Matthew Silk – Facebook for geese: the causes and consequences of non-random social associations in a group forager.

Mitchell Weegman – The demography of the Greenland white-fronted goose

Graduation Awards

Undergraduate

Dean's Commendations:
Jack Bedford
Thomas Carlin
Isabel Ester
Lauren Furness
Joanna Goodfellow
Charlotte Martin Taylor
Christopher Rogerson

Centre for Ecology and Conservation Commendations:
Jack Bedford
Tilda Dunn
Celine Gamble
Francesca Hurst
Josh King
Calum Laver
Sarthok Rahman
Lisele Sai Jackson
Ben Yexley

Oxford University Press:
Duncan Gardner-Mctaggart

ZSL Charles Darwin Award:
Zeya Wagner

Postgraduate

Dean's Commendations for exceptional performance (70% + Distinction in all MSc modules):
MSc Evolutionary and Behavioural Ecology 2014/15:
Charlotte Savill

MSc Conservation and Biodiversity 2014/15:
Jarod Benton
Georgina Blow
Cristina Juan Schmidt-Brücken
Hannah Khwaja

Dean's Commendation for Performance Despite Exceptional Circumstances:
MSc Applied Ecology 2014/15:
Simona Kacmarcikova

Centre for Ecology and Conservation Commendations:

MSc Applied Ecology 2014/15:
Simon West – *Best Overall Mark (MSc)*
Thomas Major – *Best Research Project Module Mark*
William Farren – *Best Research Project Report Mark*

MSc Conservation and Biodiversity 2014/15:
Hannah Khwaja – *Best Overall Mark (MSc) and Best Research Project Mark*
Katie Powell – *Best Research Project Module Mark*
Anna John – *Outstanding Contribution*

MSc Evolutionary and Behavioural Ecology 2014/15:
Daniel Swindlehurst – *Best Overall Mark (MSc), Research Project Module and Report Mark*
Matthew Davies – *Outstanding Contribution*
Josephine Plachta – *Outstanding Contribution*

Selected Highlights

Professor Rowan Lockwood and Professor John Swaddle

Sabbatical visitors

We were delighted to welcome Professors Rowan Lockwood and John Swaddle from the College of William and Mary in Virginia, USA for their sabbatical year. Rowan is a professor of geology researching how extinction and environmental change influence the evolution and ecology of fossil marine invertebrates. John is a professor of biology whose research interests focus on the influence of developmental stressors on the ecology and evolution of wildlife.

Professor Mike Cant

Royal Society Wolfson Research Merit Award

Professor Mike Cant has been awarded a Wolfson Research Merit Award from the Royal Society in recognition of his outstanding scientific achievement and potential.

Professor Nina Wedell

European Society of Evolutionary Biology and Tinbergen Lecture

Professor Nina Wedell was elected President of the European Society of Evolutionary Biology (ESEB), and started her 6 year term as president-elect in August 2015. Nina also gave the annual Tinbergen lecture, an academic prize lecture awarded by the Association for the Study of Animal Behaviour (ASAB), and was invited to do a Q&A for *Current Biology* in October.

Dr Gail Reeves

Head of Technical Services

After several years as Assistant College Manager for CLES Cornwall (Centre for Ecology and Conservation and Centre for Geography, Environment and Society) during which she guided us through massive growth in research and teaching with great aplomb, Dr Gail Reeves has been promoted to Head of Technical Services for the University of Exeter. This sees her overseeing technical services for all colleges, across all four of the University's campuses. We will miss her but wish her well!

Congratulations!

This past year saw a number of key promotions: Drs Lena Bayer-Wilfert, Camille Bonneaud, Tom Currie, Shakti Lamba, Alex Thornton and Matt Witt became Senior Lecturer, Dr Frank Van Veen was made Associate Professor, and Dr Dave Hodgson (pictured opposite at Inaugural lecture) was promoted to Professor. Professor Stuart Bearhop became the CLES Associate Dean for International and Development (ADID), Professor Dave Hosken became the Dean for Strategic Development for the Cornwall Campuses and Professor Dave Hodgson became the Associate Dean for Education for CLES.

Selected CEC Publications from 2015

Aplin L, Farine D, Morand-Ferron J, Cockburn A, **Thornton JA**, Sheldon B (2015) Experimentally induced innovations lead to persistent culture via conformity in wild birds. ***Nature*** doi:10.1038/nature13998

Ashby B, Boots M (2015) The coevolution of parasite virulence and host mating strategies. ***Proc National Academy Sciences*** doi:10.1073/pnas.1508397112

Bartlett LJ, Williams DR, Prescott GW, Balmford A, Green RE, Eriksson A, Valdes PJ, Singarayer JS, Manica A (2015) Robustness despite uncertainty: regional climate data reveal the dominant role of humans in explaining global extinctions of Late Quaternary megafauna. ***Ecography*** doi:10.1111/ecog.01566

Beirne C, Delahay R, **Young AJ** (2015) Sex differences in senescence: the role of intra-sexual competition in early adulthood. ***Proc Royal Society B*** doi:10.1098/rspb.2015.1086

Bestion E, Clobert J, Cote J (2015) Dispersal responses to climate change: scaling down to intraspecific variation. ***Ecology Letters*** doi:10.1111/ele.12502

Blount JD, Vitikainen EIK, Stott I, Cant MA (2015) Oxidative shielding and the cost of reproduction. ***Biological Reviews*** doi:10.1111/brv.12179

Brent LJN, Franks DW, Foster EA, Balcomb KC, **Cant MA,** Croft DP (2015) The social value of menopause: postreproductive killer whales share ecological knowledge with relatives. ***Current Biology*** doi:10.1016/j.cub.2015.01.037

Brown AR, Owen SF, Peters J, Soffker M, Paull GC, **Hosken DJ,** Wahab MA, Tyler CT (2015) Climate change and pollution speed declines in zebrafish populations. ***Proc National Academy Sciences*** doi:10.1073/pnas.1416269112

Carter MJ, Head ML, Moore AJ, **Royle NJ** (2015) Behavioural plasticity and GxE of reproductive tactics in *Nicrophorous vespilloides* burying beetles. ***Evolution*** doi:10.1111/evo.12619

Cleasby IR, Wakefield ED, **Bearhop S, Bodey TW, Votier SC,** Hamer KC (2015) Three-dimensional tracking of a wide-ranging marine predator: flight heights and vulnerability to offshore wind farms. ***Journal of Applied Ecology*** doi:10.1111/1365-2664.12529

Cornforth DM, Matthews A, Brown SP, **Raymond B** (2015) Bacterial cooperation causes systematic errors in pathogen risk assessment due to failure of the independent action hypothesis. ***PLOS Pathogens*** doi:10.1371/journal.ppat.1004775

Cram DL, Blount JD, Young AJ (2015) The oxidative costs of reproduction are group-size dependent in a wild cooperative breeder. ***Proc Royal Society B*** doi:10.1098/rspb.2015.2031

Dall SRX, McNamara JM, Leimar O (2015) Genes as cues: phenotypic integration of genetic and epigenetic information from a Darwinian perspective. ***Trends in Ecology and Evolution*** doi: 10.1016/j.tree.2015.04.002

Davies TW, Coleman M, Griffith KM, Jenkins SR (2015) Night-time lighting alters the composition of marine epifaunal communities. ***Biology Letters*** doi:10.1098/rsbl.2015.0080

Devine AP, Stott I, McDonald RA, Maclean IMD (2015) Woody cover in wet and dry African savannas after six decades of experimental fires. ***Journal of Ecology*** doi:10.1111/1365-2745.12367

Engesser S, Crane JM, Savage JL, **Russell AF,** Townsend SW (2015) Experimental evidence for phonemic contrasts in a non-human vocal system. ***PLOS Biology*** doi:10.1371/journal.pbio.1002171

Evans JC, Votier SC, Dall SRX (2015) Information use in colonial living. ***Biological Reviews*** doi:10.1111/brv.12188

Finnegan S, Anderson SC, Harnik PG, Simpson C, Tittensor DP, Byrnes J, Finkel ZV, Lotze HK, Lindberg DR, Liow LH, **Lockwood R,** McClain CR, McGuire JL, O'Dea AO, Pandolfi JM (2015) Paleontological baselines for evaluating extinction risk in the modern oceans. ***Science*** doi:10.1126/science.aaa6635

Fisher DN, James A, Rodrigues-Muñoz R, Tregenza T (2015) Behaviour in captivity predicts some aspects of natural behaviour, but not others, in a wild cricket population. ***Proc Royal Society B*** doi:10.1098/rspb.2015.0708

Greenwood O, Mossman HL, **Suggitt AJ, Curtis RJ, Maclean IMD** (2015) Using in situ management to conserve biodiversity under climate change. ***Journal of Applied Ecology*** doi:10.1111/1365-2664.12602

Hammerschlag N, **Broderick AC,** Coker JW, Coyne MS, Dodd M, Frick MG, Godfrey MH, **Godley BJ,** Griffin DB, Hartog K, Murphy TM, Nelson ER, Williams KL, **Witt MJ, Hawkes LA** (2015) Evaluating the landscape of fear between apex predatory sharks and mobile sea turtles across a large dynamic seascape. ***Ecology*** doi:10.1890/14-2113.1

Hodgson JA, **Bennie JJ,** Dale G, Longley N, Wilson RJ, Thomas CD (2015) Predicting microscale shifts in the distribution of the butterfly *Plebejus argus* at the northern edge of its range. ***Ecography*** doi:10.1111/ecog.00825

Hopwood PE, Moore AJ, **Tregenza T, Royle NJ** (2015) Male burying beetles extend, not reduce, parental care duration when reproductive competition is high. ***Journal of Evolutionary Biology*** doi:10.1111/jeb.12664

Inzani EL, Marshall HH, Sanderson JL, Nichols HJ, **Thompson FJ,** Kalema-Zikusoka G, **Hodge SJ, Cant MA, Vitikainen EIK** (2015) Female reproductive competition explains variation in prenatal investment in wild banded mongooses. ***Scientific Reports*** doi:10.1038/srep20013

Lowe C, Minter E, Cameron D, Brockhurst M (2015) Shining a light on exploitative host control in a photosynthetic endosymbiosis. ***Current Biology*** doi:10.1016/j.cub.2015.11.052

Maclean IMD, Hopkins JJ, **Bennie J,** Lawson CR, Wilson RJ (2015) Microclimates buffer the responses of plant communities to climate change. ***Global Ecology and Biogeography*** doi:10.1111/geb.12359

Manley R, Boots M, Wilfert L (2015) Emerging viral disease risk to pollinating insects: ecological, evolutionary and anthropogenic factors. ***Journal of Applied Ecology*** doi:10.1111/1365-2664.12385

McDonald J, Bailey T, Delahay R, **McDonald R,** Smith G, **Hodgson DJ** (2015) Demographic buffering and compensatory recruitment promotes the persistence of disease in a wildlife population. ***Ecology*** doi:10.1111/ele.12578

Meaden S, Paszkiewicz K, **Koskella B** (2015) The cost of phage resistance in a plant pathogenic bacterium is context dependent. ***Evolution*** doi:10.1111/evo.12652

O'Brien S, Brockhurst MA (2015) Social evolution: slimy cheats pay a price. ***Current Biology*** doi:10.1016/j.cub.2015.03.018

Oliver TH, **Marshall HH,** Morecroft MD, Brereton T, Prudhomme C, Huntingford C (2015) Interacting effect of climate change and habitat fragmentation on drought-sensitive butterflies. ***Nature Climate Change*** doi:10.1038/nclimate2746

Orzechowski EA, **Lockwood R,** Byrnes J, Anderson SC, Finnegan S, Finkel ZV, Harnik PG, Lindberg DR, Liow LH, Lotze HK, McClain CR, McGuire JL, O'Dea A, Pandolfi JK, Simpson C, Tittensor DP (2015) Ecological and environmental determinants of extinction risk in the marine fossil record. ***Global Change Biology*** doi:10.1111/gcb.12963

Padfield D, Yvon-Durocher G, **Buckling A,** Jennings S, **Yvon-Durocher G** (2015) Rapid evolution of metabolic traits explains thermal adaptation in phytoplankton. ***Ecology Letters*** doi:10.1111/ele.12545

Sanders D, Kehoe R, van Veen FJF (2015) Experimental evidence for the population-dynamic mechanisms underlying extinction cascades of carnivores. ***Current Biology*** doi:10.1016/j.cub.2015.10.017

Sanderson JL, Wang J, **Vitikainen EIK, Cant MA** Nichols HJ (2015) Banded mongooses avoid inbreeding when mating with members of the same natal group. ***Molecular Ecology*** doi:10.1111/mec.13253

Shanks K, Senthilarasu S, **ffrench-Constant RH,** Mallick TK (2015) White butterflies as solar photovoltaic concentrators. ***Scientific Reports*** doi: 10.1038/srep12267

Sharman P, Wilson A (2015) Racehorses are getting faster. ***Biology Letters*** doi:10.1098/rsbl.2015.0310

Savage PE, Brown S, Sakai E, **Currie TE** (2015) Statistical universals reveal the structures and functions of human music. ***Proc National Academy Sciences*** doi:10.1073/pnas.1414495112

Sherley RB, Winker H, Altwegg R, van der Lingen CD, **Votier SC,** Crawford RJ (2015) Bottom-up effects of a no-take zone on endangered penguin demographics. ***Biology Letters*** doi:10.1098/rsbl.2015.0237

Stokes KL, Broderick AC, Canbolat AF, Candan O, **Fuller WJ,** Glen F, Levy Y, **Rees AF,** Rilov G, **Snape RT, Stott I,** Tchernov D, **Godley BJ** (2015) Migratory corridors and foraging hotspots: critical habitats identified for Mediterranean green turtles. ***Diversity and Distributions*** doi:10.1111/ddi.12317

Stringell TB, Clerveaux W, **Godley BJ,** Lockhart KJ, Phillips Q, Ranger S, Richardson PB, Sanghera A, **Broderick AC** (2015) Protecting the breeder: research informs legislative change in a marine turtle fishery. ***Biodiversity and Conservation*** doi:10.1007/s10531-015-0900-1

Swaddle JP, Francis CD, Barber JR, Cooper CB, Kyba CCM, Dominoni D, Shannon G, Aschehoug E, Goodwin SE, Kawahara AY, Luther D, Spoelstra K, Voss M, Longcare T (2015) A framework to assess evolutionary responses to anthropogenic light and sound. ***Trends in Ecology and Evolution*** doi:10.1016/j.tree.2015.06.009

Wakefield ED, **Cleasby IR, Bearhop S, Bodey TW,** Davies RD, Miller PI, Newton J, **Votier SC,** Hamer KC (2015) Long-term individual foraging site fidelity – why some gannets don't change their spots. ***Ecology*** doi:10.1890/14-1300.1

Varo-Cruz N, Pikesley S, Hawkes LA, Witt M, Godley BJ (2015) New findings about the spatial and temporal use of the Eastern Atlantic Ocean by large juvenile loggerhead turtles. ***Diversity and Distributions*** doi:10.1111/ddi.12413

Westra ER, van Houte S, Oyesiku-Blakemore S, Makin B, Broniewski JM, Best A, Bondy-Denomy J, Davidson A, **Boots M, Buckling A** (2015) Parasite exposure drives selective evolution of constitutive versus inducible defence. ***Current Biology*** doi:10.1016/j.cub.2015.01.065

Young AJ, Jarvis JUM, **Barnaville J,** Bennett NC (2015) Workforce effects and the evolution of the complex sociality in wild Damaraland mole-rat societies. ***American Naturalist*** doi:10.1086/682048

Yvon-Durocher G, Allen AP, Cellemare M, Dossena M, **Gaston KJ,** Leitao M, Montoya JM, Reuman DC, Woodward G, Trimmer M (2015) Five years of experimental warming increases the biodiversity and productivity of phytoplankton communities. ***PLOS Biology*** doi:10.1371/journal.pbio.1002324

UNIVERSITY OF EXETER

Centre for Ecology and Conservation
Daphne du Maurier building
Penryn Campus
Penryn, Cornwall TR10 9FE

Telephone +44 (0)1326 255822
Email s.bennett@exeter.ac.uk

www.exeter.ac.uk/biosciences/cec

Photography by: Andy Young www.wildimages.org (cover), Stuart Bearhop, Dom Cram, Richard Sherley, Richard Yarnell, Mick Atkins Photography (www.mickatkins.com), Peter Coles, Josie Orledge, Katie Shorey, Freydis Vigfusdottir, Jan Stipala.

Find us on Facebook and Twitter:
www.facebook.com/exeteruni
www.twitter.com/UoExeterCEC

Information is correct at time of going to print.

2016CLES035