

NEWS

Green Week and TCBR Activities

The TCBR hosted a number of activities during the TCD's Green Week including:

- A very well received 'Biodiversity Bingo'. Over 30 people played and 15 biodiversity-themed prizes were awarded. It was a fun interactive night which sparked an interest to learn more about the College's biodiversity.
- A talk by forestry researcher Gerry Douglas (Teagasc) on "Veteran Trees-a nuisance or treasure". Gerry discussed the value of veteran trees and the threats they face.
- A talk by Rachel Creighton (Dublin Zoo) on "21st Century Zoo - Conservation and Modern Zoo Keeping", outlining the diversity of Dublin Zoo's conservation efforts.

Trinity BioBlitz

The MSc in Biodiversity and Conservation students are organising a BioBlitz that will take place on May 22nd in the College grounds. The objective is to increase recording of species within the campus, submit collected information to the National Biodiversity Data Centre and raise awareness both on species commonly found in urban environments and in overall biodiversity conservation.

Contact the TCBR for further information. Join us for a fun day of intense biological surveying!

Successful PhD

Congratulations to Dara Stanley on completing her PhD on 'Pollinators and pollination in changing agricultural landscapes; investigating the impacts of bioenergy crops'.

ENVIRON Best Presentation Award

There was good representation of both PhD students and postdocs from the TCBR at the recent ENVIRON 2013 conference, hosted at the Ryan Institute, NUIG in January. The theme for this years conference was "Environment: From Ecosystem Functioning to Human Health", which featured stimulating workshops, keynote lectures and an open panel debate on "Securing Ireland's Energy Future".

We wish to congratulate Paul Egan on his award of Best Forestry Oral Presentation at the conference, presented by broadcaster Duncan Stewart and sponsored by the Dept. of

Agriculture, Food and the Marine. Paul's presentation was based on his on-going research with TCBR's Dr David Bourke and Dr Jane Stout, featuring European-wide habitat suitability modelling of invasive Rhododendron, with emphasis on the implications of these models for native woodlands and Special Areas of Conservation in Ireland.



Paul Egan with broadcaster Duncan Stewart.

Tree Climbing Course in Trinity

The Trinity Botany Department in collaboration with Canopy Access Limited (CAL) offers students and staff the opportunity to become qualified canopy access technicians. CAL was set up in 1998 to provide camera assistance and technical rigging solutions for the wildlife TV industry and has been providing access, training and consultancy on a full time basis ever since. Rope access techniques are used by scientists, filmmakers and enthusiasts all over the world to explore one of the last frontiers of biological research.



Courtesy of Sven Batke.

The one week intense course that runs from 27th to 31st of May 2013 on campus (€753 per person), will train participants in basic rope skills and rescue - using adjusted industrial climbing techniques. After the successful completion of the Basic Canopy Access Proficiency course, participants will be certified by CAL. For more information visit: www.canopyaccess.co.uk and to book your place contact Sven Batke (batkesp@tcd.ie or 0866652459).

NEWS

New Irish Officer for the BSBI in Ireland

Maria Long, a TCD PhD student and TCBR member, has been appointed 'Irish Officer' for the Botanical Society of Britain and Ireland (BSBI), based at the National Botanic Gardens in Glasnevin, Dublin.

Her role is to support the Vice County Recorders throughout Ireland with their work as volunteer plant recorders.



The BSBI is the leading organisation for people interested in wild plants, their biogeography, and their changing patterns in Britain and Ireland. They produce a range of publication which are invaluable for botanists. The BSBI's network of voluntary plant recorders are behind the publication of the Atlas of the British and Irish Flora (Preston *et al.*, 2002). Thus it is clear that the network of volunteer recorders (there are 38 of them on the island of Ireland) fulfil an absolutely essential role in collecting information on our wild plants. Other publications from the BSBI include a range of ID books (for groups such as sedges, grasses, umbellifers, etc.), along with the Society's journal - the New Journal of Botany, and a newsletter - BSBI News. They organise a large number of field outings each year (there are 12 planned for this year). Some of these are introductory, aimed specifically at beginners/learners; others aim at recording plants from a particular area at more advanced botanical level.

If you want to know more about the BSBI, see: <http://www.bsbi.org.uk/ireland.html>. The website has lots of useful resources such as online identification keys, information on how to press and keep plant specimens, detailed support on the use of recording software, information on training courses and conferences, etc. For further information and queries, you can also contact Maria at: maria.long@bsbi.org.uk.

Recent Research on Medicinal Plants

Fabio Boylan, a TCBR Steering Committee member, belongs to the Natural Products Drug Discovery Group in the School of Pharmacy and Pharmaceutical Sciences, Trinity College Dublin. His scientific interests are in relation to the use of medicinal plants by different ethnic communities around the world (ethnopharmacology), with special attention to plants used in South America, Asia and Europe. His most recent PhD student presented a work with one plant used in Malaysia (*Pereskia bleo* – Family *Cactaceae*) for the treatment of several inflammatory conditions, including rheumatism and

with a Mexican plant collected in Ireland (*Choisya ternata* – Family *Rutaceae*), rich in alkaloids with some activity in platelet aggregation.

At present *Choisya ternata* is being studied by Dr. Boylan alongside with other representatives of the *Rutaceae* family. One minor alkaloid found in the essential oil of this plant was synthesized and this molecule and its derivatives both natural and/or synthetic are showing important activity against depression (Inhibition of Mono Amino oxidase).



Pereskia bleo (left) and *Choisya ternata* (right).

Dr Boylan also has interests in the chemical properties of drugs of abuse, especially the ones designed to be sold by head shops in Europe. The idea here is to try and establish the chemical composition of the new designed drugs /combinations in the market and in collaboration with pharmacology scientists try to envisage the pharmacological and toxicological profile of these new combinations. Special attention is given to the drugs of natural origin or derived from natural products.

Ecology and Evolution Blog

The Ecology and Evolution blog called EcoEvo@TCD (www.ecoevoblog.com) was launched in September 2012. The aim of the blog is to communicate Ecology and Evolution research at TCD more widely to students, alumni, academics and the interested public. Blog contributors come from across the School of Natural Sciences, including members of the TCBR. Entries have been extremely varied, including press releases for new papers on bamboo systematics, debates about the nature of consciousness, dire warnings about the dangers of hippos, reports on human-wildlife conflict in Rwanda, and helpful advice on writing academic CVs. As of February 4th 2013 there are 60 blog posts and the blog has been viewed 3,561 times, often with over 100 views in a day. Why not take a look? You can follow the blog on Twitter (@EcoEvoTCD), like us on Facebook (<http://www.facebook.com/EcoEvoatTCD?fref=ts>), or go directly to the website www.ecoevoblog.com.

RESEARCH HIGHLIGHTS

Biodiversity Loss and Ecosystem Stability

Understanding how species extinctions affect the stability of ecosystems is fundamental to the prediction of future biodiversity loss and to ensuring the reliable provision of ecosystem services.



Led by Dr Ian Donohue of the School of Natural Sciences, a team of researchers from the TCBR including principle investigator Dr Andrew Jackson, together with collaborators from Northern Ireland, Spain and Switzerland, found that the destabilising effect of biodiversity loss is likely to be considerably

greater than thought previously. In their paper published in the leading ecology journal *Ecology Letters* (see 'Recent Publications'), Dr. Donohue and colleagues demonstrate for the first time that different species contribute in different ways to the maintenance of stability in ecosystems. Their research indicates that the overall destabilizing effect of biodiversity loss and the true scale of the global extinction crisis we face are currently significantly underestimated.

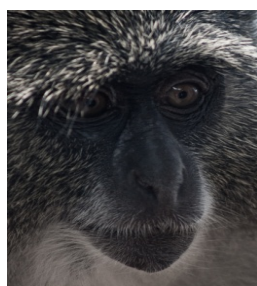
New Website on Ireland's Hoverflies

The National Biodiversity Data Centre has expanded the Irish Pollinator Initiative to include information on Ireland's hoverflies. There are approximately 900 species of hoverfly known from Europe, with 180 of them occurring in Ireland. For more information visit: <http://pollinators.biodiversityireland.ie>.

Primates and Novel Human Diseases

Many devastating human infectious diseases, including HIV and malaria, originated in wild primates. New research by Dr Natalie Cooper, of the School of Natural Sciences and the TCBR, and her collaborators at Harvard aims to use information on how parasites are shared among primate species to determine which diseases may emerge in humans in the future.

In a paper published in the top ecology journal *Ecology Letters* (see 'Recent Publications'), Dr Cooper and colleagues showed that closely-related primate species tended to share the most parasites,



but also that factors such as contact rates were important in determining how parasites were shared. They also found that viruses were far less specific in the types of primates they infected.

This research implies that although novel human diseases are likely to originate in our close relatives, novel viruses may be transmitted by any species we have regular contact with, including domesticated animals and pests.

RECENT PUBLICATIONS

Journal Articles

Abanyie, FA, McCracken, C, Kirwan, P, Molloy, SF, Asaolu, SO, **Holland, CV**, Gutman, J and Lamb, TJ (2013). *Ascaris* co-infection does not alter malaria-induced anaemia in a cohort of Nigerian preschool children. *Malaria Journal*, 12 (1).

Cooper, N, Griffin, R, Franz, M, Omotayo, M and Nunn, CL (2012). Phylogenetic host specificity and understanding parasite sharing in primates. *Ecology Letters*, 15, 1370-1377.

Donohue, I, Petchey, OL, Montoya, JM, **Jackson, AL**, **McNally, L**, **Viana, M**, **Healy, K**, Lurgi, M, O'Connor, NE and Emmerson, MC (In press). On the dimensionality of ecological stability. *Ecology Letters*.

Holland, CV and Hamilton, CM (2013). The significance of cerebral toxocarasis: a model system for exploring the link between brain involvement, behaviour and the immune response. *The Journal of Experimental Biology*, 216: 78 - 83.

Mitchell, SO, Baxter, ET, **Holland, CV** and Roger, HD (2012). Development of a novel histopathological gill scoring protocol for assessment of gill health during a longitudinal study in marine-farmed Atlantic salmon (*Salmo salar*). *Aquaculture International*, 20, (5), 813-825.

Noone, C, Parkinson, M, Dowling, DJ, Aldridge, A, Kirwan, P, Molloy, SF, Asaolu, SO, **Holland, CV** and O'Neill, S (2013). Plasma cytokines, chemokines and cellular immune responses in preschool Nigerian children infected with *Plasmodium falciparum*. *Malaria Journal*, 12, (5).

O'Connor, NE and **Donohue, I** (2013) Environmental context determines multi-trophic effects of consumer species loss. *Global Change Biology* 19: 431-440.

O'Connor, NE, Emmerson, MC, Crowe, TP and **Donohue, I** (In press). Distinguishing between direct and indirect effects of predators in complex ecosystems. *Journal of Animal Ecology*.

MSc BIODIVERSITY and CONSERVATION &

MSc ENVIRONMENTAL SCIENCES DESK STUDIES

The 14 students of the 2012-2013 MSc in Biodiversity and Conservation class have recently submitted their desk studies. Here are some of their conclusions.

Mistletoes and Their Ecological Relationships

by Marcos Moreno

Mistletoes are epiphyte hemiparasitic plants that arose multiple times in different families. Their particular way of life and their high diversity makes them ecologically very interesting. This desk study evaluated if the epiphytic and hemiparasitic conditions were obligated; the findings suggest that epiphytism is facultative but hemiparasitism is obligated. Ecologic relationships established by mistletoes were reviewed in order to clarify their impact on communities. Their phylogenetic relationships were evaluated concluding that mistletoes are a non-valid taxonomic group but rather an ecological state. Recommendations to design more accurate biodiversity and conservational policies were also provided.



Why Are There No Bears in Africa? *by Cormac Price*

Bears (species in the family *Ursidae*) have been present on Earth for about 20-25 million years. In that time the *Ursidae* has witnessed dramatic changes and events, including the arrival of advanced carnivores and of modern man. Today bears can be found in South America, South East Asia, Eurasia and North America.

Fossils of species of bear in the extinct genus *Agriotherium* have been found in the tip of Africa in South West Africa and in the rift valley region of East Africa. There are many reasons why these bears went extinct in Africa. These include competition with more advanced predators like the *Felidae* that are pack hunters compared to the solitary behaviour of bears. This provides advantages in the protection of young



and the ability to chase down larger and more prey. Bears are at disadvantage anatomically as well as behaviourally with their foot posture (plantigrade) being more primitive than modern predator's (digigrade) which allows greater speeds. The Large Mammal extinction event in the Miocene/Pliocene would also have affected bears far more negatively than other smaller, more advanced predators as there are proven correlation between body mass and extinction rates.



Some of the 11 students of the 2012-2013 MSc in Environmental Sciences also carried out desk study research on biodiversity-related topics. Here are their conclusions.

A Critical Review of Remediation Techniques for Groundwater Contaminated by Synthetic Organic Compounds *by Liam Healy*

Critically analyzing available data on groundwater remediation techniques utilized for synthetically manufactured chlorinated organic solvent remediation within contaminated urban, industrial and rural areas, it was found that remediation is highly successful at reducing and removing contamination and instilling protection of human health, wildlife habitats including both plants and animals and also terrestrial health, like the aquifer itself and vulnerable geologic systems. Older ex-situ techniques such as pump-and-treat systems are being phased out for comparably less expensive and just as, if not more efficient in-situ systems, such as zero valent nano iron particles, permeable reactive barriers and various different bioremediation technologies such as dehalogenating microbes.

The Use of Remote Sensing Systems to Identify and Quantify Urban Ecosystem Services

by Martin Hofler

Land use changes in urban areas have weakened urban ecosystem services (UES) worldwide. This has diminished UES ability to provide a variety of regulatory services, including water cycles and biodiversity, that protect urban inhabitant's health and urban area's economic vitality. Fortunately, recent advances in remote sensing's spectral and spatial resolution enable urban planner to monitor urban areas land use and land cover changes. Due to these capabilities, urban planners can now use remotely sensed environmental data to construct UES indicators and ecosystem service evaluations that aid urban planners to develop effective policies and urban development strategies that protect UES.

RESEARCH FOCUS

The Flora of the Future by Paul Egan

Visit the Eco Evolution Blog to read a very interesting article by Paul Egan about how modern ecologist and biodiversity practitioner will work in 2050, what kind of technologies they are likely to use for biodiversity appraisal and conservation and how will the Flora of the Future look and function.

<http://www.ecoevoblog.com/2013/02/06/the-flora-of-the-future/>



Courtesy of Paul Egan.

Unlocking Your Potential with the British Ecological Society by Seán Kelly

At their Annual Meeting in December just gone, the British Ecological Society held a special event for PhD students and Post Docs entitled "Unlocking Your Potential - Keys to a Successful Career in Ecology". The purpose of the meeting, as you might have guessed, was to provide early career ecologists with advice on how to go about attaining and maintaining a career in the diverse field of ecology. This was not a meeting on how to survive your PhD, although as you can imagine, there were some small tips. The meeting, craftily held in a bar, featured a fantastic panel of speakers from a variety of ecological backgrounds, at various stages of their careers. In attendance were Professor Steve Ellner from Cornell University, Professor Georgina Mace from University College London, Jenny Bright from the RSPB, Paul Craze, editor of Trends in Ecology and Evolution, and Franciska De Vries from Lancaster University.

Each member of the panel effectively summarised how they progressed from studying as an undergraduate to where they are today - in around seven minutes! Each spoke very fondly of their current positions and the paths they had chosen in order to get there. What was most interesting was the diversity of career paths taken after each completed their PhDs. While some walked straight into a Post-Doc, otherstook more time, struggling to find a Post-Doc available or that they

were interested in. Another found great opportunities in filling various short-term university teaching roles and never found the need/want (I can't say which) to go for a Post-Doc. And another, knowing exactly where they wanted to work, had to volunteer and persist until finally getting their foot in the door with a contract. The diversity of paths taken directly relate to the type of career each speaker aspired to, as well as their personal interests.

Below are the main points I took from all of this, which I think hold relevance for current PhD and Post-Doc students, as well as those further along in their careers. Although it's not always easy, spend time thinking about where you would like to go next and what you would like to do (i.e. what really interests you). However, remember things won't always go as planned. Sometimes, no matter how well prepared you are, i.e. with the correct skill sets, good connections and an impressive academic history, there are forces beyond your control (e.g. a dip in the economy, changes in funding practices etc.) Of course, other times everything will go exactly as you had planned, if not better! The panel admitted that so much of this progression comes down to luck and the opportunities that present themselves.

In the Q&A that followed, one person asked a great question - "How do I make my own luck?" The consensus from the panel: by recognising a good opportunity when it comes your way and grabbing it. Opportunities will eventually present themselves; you need the ability to differentiate between those that will take you even slightly further in your desired direction and those that won't. One of the major rewards: being able to go to work and effectively just work on whatever it is that really interests you.

The Perks of Zoology: Field Work in the Greek Islands by Sive Finlay

One of the many things I love about Zoology is the opportunity to work away from a desk. As an undergraduate I enjoyed field courses and summer projects in the not so exotic wilds of Ireland and Cambridgeshire – great experiences but not quite a match for the glamour of the recent TCD trip to Kenya! Last summer, I was fortunate enough to expand my zoological horizons by working as a field assistant in the Greek Islands. I travelled to the remote island of Folegandros, one of the quieter tourist destinations in the Cyclades, to assist Kate Marshall, a PhD student in Behavioural Ecology at the University of Cambridge.

RESEARCH FOCUS

Kate's research focuses on the evolution of morphological and colouration phenotypic divergences in Erhard's wall lizards (*Podarcis erhardii*). She is particularly interested in studying the roles of both natural selection (adaptations to avoid predators) and sexual selection (signals to other lizards) in driving the evolution of varied colour patterns in lizard populations on different islands. She is modelling the lizards' colouration from the perspectives of predators (birds) and conspecifics (other lizards). Some of her early results indicate that *P. erhardii* populations have evolved colour patterns and behaviours that are locally adapted to different island environments. Dorsal and head colour patterns seem to be well matched to the lizards' local environments- indicating a possible function in predator avoidance – while the lizards' sides are brightly coloured and may play roles in conspecific signalling and sexual selection.



A male of an island subspecies of Erhard's wall lizard (P.e.mykonensis). The brighter blue colouration along the side of the body, which seems to be involved in conspecific signalling, is clearly visible. Courtesy of Sive Finlay

Some of the most enjoyable parts involved trying out the unusual techniques which form part of Kate's research methods. For example, I helped her conduct a pilot study to assess whether predator attacks on the lizards might vary in different islands. This involved making 3D lizards out of modelling clay, distributing them across line transects and checking them for signs of predator attacks such as rodent bite marks. The whole process attracted a few curious looks from the locals as we marched through town with boxes of clay lizards! However, these glances were nothing compared to the reactions elicited by our lizard wrangling attempts.

Using an extendable fishing rod, dental floss and noose-tying know-how, we patrolled the island's hiking paths trying to catch unsuspecting sunbathing lizards by slipping the noose around their necks. The technique was successful in some of

Kate's other field sites but unfortunately we had no such luck – just some very confused stares from locals and tourists as we slowly “fished” our way down the mountain side!

The project covers an interesting area of evolutionary biology – studying the often conflicting influences of both natural and sexual selection in driving phenotypic divergences within species. It was a great learning experience because it gave me an insight into some of the details and challenges involved in planning a PhD before I started my own project. Finally (and perhaps most importantly), it wasn't all hard work – combining fieldwork with swimming in the clear blue Aegean or afternoons at the beach were just further confirmations that you can't beat the perks of being a Zoology student!

Another Piece in the Trophic Puzzle by David Kelly

The food chain is a concept that many non-biologists are familiar with. Ecologically-speaking, this should be referred to as a food web, because there is rarely one prey species for a given predator or one predator of any given species. The biochemistry of metabolism and digestion means we can reconstruct the diet of a member of a given food web with some basic information about the stable isotopes in its tissues and the stable isotope values of the available prey. Simply put, “you are what you eat”. Carbon isotopes generally reflect the “where” of the diet and nitrogen isotopes generally indicate the “what”.

This overview omits several complications. Firstly, the calculation of diet requires a “conversion factor” (trophic enrichment factor or TEF) for any given tissue of an animal. Animal metabolisms tend to retain ^{15}N , so consumers have greater $^{15}\text{N}:^{14}\text{N}$ ratios than their prey. Secondly, each tissue is likely to have a different TEF, as it is made to perform a different job in the animal. Thirdly, TEFs can only be derived by feeding animals highly controlled diets, ideally a single food for the length of time it takes for the study tissue to be fully replaced. In the case of teeth and bone, this can be months or even years. As there are relatively few TEFs available for animal species, many ecologists “borrow” them from other species for their calculations. Having derived TEFs for carbon and nitrogen in badger blood serum, a tissue that is completely replaced several times a month, it was demonstrated that badger TEFs differ from fox TEFs. This is important, as foxes are similar in size to badgers and have a similar feeding ecology, and ecologists might be tempted to “borrow” fox TEFs to use in badger studies.

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So knowing more about the biochemistry of badgers (in the form of TEFs) will allow us to learn more about their diets. This may be of importance to farmers planning biosecurity measures for their farms, as they will be able to learn if badgers are raiding their crops (in the field or in the barn). It will also help identify when badgers are specialising on different foods and potentially allow farmers to minimise contact between badgers and livestock.

Tenrec Tales by Sive Finlay

Tenrecs are one of the most interesting and fascinating mammal groups, yet many people have never heard of them. They are one of only four mammalian groups to have colonised Madagascar, a land filled with evolutionary curiosities. Tenrecs are a striking example of convergent evolution. From a single colonising ancestor, tenrecs have evolved into incredibly diverse species which resemble moles, shrews, hedgehogs and even otters! Contrary to appearances, tenrecs' closest relatives are actually the golden moles and elephant shrews (*Chrysochloridae*). However, physical convergences are so strong that early taxonomists didn't recognise tenrecs as being closely related to each other, an easy mistake to make when you look at this picture from Richard Dawkin's 1996 book "Climbing Mount Improbable".

In addition to being great species for studying convergent evolution, the tenrec family includes a whole host of quirky traits. For example, the common tenrec (*Tenrec ecaudatus*), an animal which is only around 30 cm and 2kg, holds the record for the largest litter size of any mammal at an astounding 32 babies! My personal favourite tenrec oddity is the unusual means of communication found in the lowland streaked tenrecs (*Hemicentetes semispinosus*). These cute critters are covered in spiny quills, a special set of which are used as a stridulating organ. Reminiscent of grasshoppers or crickets and uniquely among mammals, these tenrecs rub the quills together to produce sound which then allows them to keep in contact with their family group. In short, tenrecs are an awesome family filled with evolutionary oddities yet they remain relatively understudied and poorly understood.

In my PhD work, I'm particularly interested in measuring the extent of convergent evolution in tenrecs and figuring out the reasons why they have evolved to be so similar to unrelated species. I'm also intrigued by early behavioural experiments which showed that 3 species of tenrec use echolocation. I want to test whether other tenrec species also echolocate

and hopefully link this behavioural convergence to genetic similarities in "echolocating genes" which are conserved in whales and bats.

Plant and Environmental Sciences Fieldcourse to Gran Canaria

Whilst it was snowing in Dublin, 17 Plant and Environmental Sciences undergraduate students, along with 3 academic staff and a technician, travelled to Gran Canaria for a Field Skills module. As well as quantifying macro and microscale environmental influences on individual plants and ecological communities, students brushed up on their field identification skills, carried out Environmental Impact Assessment Scoping exercises and carried out independent research projects. These projects included investigations into patterns of nectar secretion in endemic and invasive plants, quantification of ecological communities, stomatal densities and transpiration rates in different species in relation to their environmental context, and how dominant plants can modify the local microclimate.



Plant and Environmental Sciences undergraduate students in their field trip to Gran Canaria.

REQUESTS

Please send in information concerning current research, calls, news, publications and wildlife photos from field trips for inclusion in our next quarterly newsletter.



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