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This year's ARC-BHS Scientific Meeting was held on the 8th December 2012 and attracted over 110 delegates to the (sold-out!) Bournemouth Natural Science Society venue. Abstracts of contributions made are listed below.

Endocrine disrupters in agricultural landscapes

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Endocrine disrupting chemicals (EDCs) are substances that have the ability to alter the function of the endocrine system, and consequently cause adverse effects in individuals or populations. They have been of increasing concern in relation to both human and wildlife health since the 1990s. Over the same time frame, global amphibian declines have rightly focused more attention on the potential role of chemical contaminants, including EDCs, as environmental stressors for amphibians. Chemical safety assessment programs are beginning to address concerns about EDCs, and an amphibian metamorphosis assay has been developed specifically to test chemicals for the ability to interfere with the thyroid system. However, clear evidence of the impacts of EDCs on wild populations of amphibian populations is both limited and controversial. Declines in anuran amphibian populations in the UK in are largely attributed to land use changes arising from agricultural intensification, for example drainage and destruction of aquatic and terrestrial habitat, but the role of anthropogenic chemical stressors, for example agrochemicals, is unclear.

An assessment of the endocrine activity of water samples from nine breeding sites across England and Wales indicated that larvae and adults of the common toad (*Bufo bufo*) were likely to have been exposed to endocrine disrupting chemicals at some of the sites, and these were predominantly in areas of intense agricultural activity. Histological assessment of gonadal morphology of metamorphs, reared in cages in situ at these sites, indicated an inverse correlation between proportion of metamorphs that were male and estrogenic activity of the water in vitro. The sex ratio did not, however, correlate with the predicted surface water concentrations of pesticides, generated in the POPPIE database of the Environment Agency of England and Wales.

Interpreting these findings is difficult in the absence of good baseline data on sex ratio and incidence of aberrations in gonadal differentiation in the common toad. Further research is required to establish the concentration and identity of compounds responsible

for endocrine activity in some of the sites studied, and in the longer term a better understanding of the relative importance of aquatic and terrestrial habitat quality and connectivity will be important in protecting amphibians in the agricultural landscape.

An investigation into the relationship between pheasants (*Phasianus colchicus*) and reptiles as prey

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In the UK, approximately 35 million pheasants (*Phasianus colchicus*) are released into the countryside each year and it has been estimated that up to 16% can survive the shooting season. There are also recent initiatives to encourage the breeding success of this non-native species in the wild. Pheasants are opportunist omnivores and, though their diet mainly consists of plant material and invertebrates, they will also eat small vertebrates including amphibians and reptiles. There is much anecdotal evidence that pheasants are having a negative impact on reptile populations, including the predation of lizards and juvenile snakes and the killing and injuring of adult adders (*Vipera berus*), as well as photographic evidence of particular predation incidences.

The aim of this pilot study was to investigate the potential link between pheasants and three reptile species (slow worm, *Anguis fragilis*, grass snake, *Natrix natrix*, and adder, *Vipera berus*) as prey items through DNA analysis of pheasant faecal samples. Dietary analysis using DNA from faeces has been attempted successfully in a variety of bird species, including gamebirds such as the capercaillie (*Tetrao urogallus*). The method has the advantage of being non-invasive. Fifty samples were collected from Swinyard Hill and Castlemorton Common on the Malvern Hills SSSI, Worcestershire in July 2013. These acid grassland and mixed woodland sites are in close proximity to a nearby shooting estate and contain established populations of slow worm, grass snake, adder and common lizard. The samples were analysed in the laboratory at the University of Worcester using PCR and gel electrophoresis to test for slow worm, grass

snake and adder DNA, as well as pheasant DNA (to avoid confusion with other gamebird species) and wolf spider DNA (*Pardosa* spp.) as a control for prey DNA. Although the method was suitable for detecting prey DNA, none was found for any of the reptile species or wolf spider, so no definitive conclusions can be made. This suggests that the procedure needs refining before more intensive analyses can be carried out. In this talk, I will discuss the study, the issues posed by pheasants for reptiles, the possible limitations to studying their predation effects and proposed future study of this potential conservation issue.

Common toad terrestrial habitat suitability in lowland arable farmland

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Agricultural land use accounts for over 70% of land cover in England. A large proportion of this is managed under agri-environment schemes.

The common toad (*Bufo bufo*) has undergone dramatic and largely unexplained population declines in recent years, particularly in southern lowland England. It has been recognised as a UK Biodiversity Action Plan (UK BAP) priority species due to the need for conservation action in order to prevent further declines. It is notoriously difficult to study in the terrestrial phase and little is known of how it uses the mosaic landscape typical of arable farmland.

We used a relatively novel technique to assess habitat suitability of the largely arable farmland surrounding a breeding lake in Garford, Oxfordshire. Passive Integrated Transponders (PITs) were injected into approximately 900 adult toads and then a portable PIT antenna was used to search for toads over two seasons, once they had left the breeding lake. Locations of recaptured toads were used for habitat suitability modelling using two different programs to create a consensus model. We revealed fine scale preferences for habitat and vegetation types and sex differences in toad movement.

Common toads showed a marked preference for edge habitats close to dense vegetation such as hedgerows or woodland patches. They particularly used uncultivated field margins surrounding arable fields, demonstrating the value of these agri-environment scheme management options. Toads avoided crops, favouring use of semi-natural habitats where they were within easy reach of a water source. This included ponds, wet ditches and small streams. The results of the consensus model have now been combined with cost modelling of roads using genetic techniques to produce insights into habitat suitability and connectivity at the landscape scale. We make recommendations for management based on our findings.

Chytrid in the amphibian trade: what are the implications and what can be done?

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The global decline of amphibians has been heavily researched and well documented. This phenomenon has been attributed to a range of factors including, habitat change, pollution, over-exploitation, introduction of non-native species and disease - specifically *Batrachochytrium dendrobatidis* (*Bd*) the fungal pathogen causing chytridiomycosis. The movement of amphibians via international trade for food, research materials and the pet trade, although largely unregulated, occurs on a substantial scale and has been implicated as one of the major factors associated with disease spread. The detection of chytridiomycosis in wild amphibians across the UK prompted a study to investigate the situation in the trade.

The main markets for amphibians in the UK are biomedical research and the pet trade. The first part of our study involved a collaboration with Heathrow Animal Reception Centre to sample amphibian imports for *Bd*. Shipments were sampled from 12 countries (Ghana, Malaysia, USA, Ukraine, South Africa, Tanzania, Egypt, Indonesia, Switzerland, Madagascar, Canada and China), and nearly 80 species were recorded. *Bd* was detected in about 10% of species. The wide variety of species observed suggested these animals were destined for the pet trade. Further to these findings, we embarked on assessing the disease status in UK pet shops. A telephone survey of over 2,700 establishments listed as pet shops revealed that about 60% routinely sold livestock and about 18% stocked amphibians. To date, over 150 pet shops have agreed to participate in the study and have allowed us to sample their stock. Early results indicate that there is an overall prevalence of *Bd* of around 4.5%, with nearly 20% of establishments showing some degree of infection. Infection was not restricted to wild caught animals, and is clearly persisting in captive bred stock.

This study has raised questions about whether the presence of *Bd* in the trade poses a threat to native amphibians, and what can be done to reduce the potential impacts of emerging infectious diseases for the trade and wild animals. The willingness to co-operate and genuine interest in our study by the vast majority of pet shop owners and staff is a promising start as we begin to tackle amphibian health issues in the trade.

Atlantic forest deforestation and reptile conservation in coastal Bahia, Brazil

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Brazil holds all of the main South American ecoregions, ranging from rainforest to drylands, and from central highlands to coastal sand dune plains. Most of these ecosystems contain a high diversity of reptiles. However, some landscapes are on the threshold of high extinction rates. Deforestation caused by agriculture, fire, flood, pollution, urban development and mining are the main threats. Actual deforestation rates reach 5000 km² per year, according to Brazil's Institute for Geography and Statistics (IBGE). On the other hand, over the past 20 years the country has protected over 700,000 km² of land within federal protected areas.

The country contains 744 reptile species: according to the Brazilian Herpetology Society there are 36 turtles, 6 caiman, 248 lizards, 68 amphisbaenians and 386 snakes. Brazil therefore has one of the highest levels of reptile diversity on the globe. Reptile species are well represented throughout the country, but the state of Bahia in the north-east holds 28% of the country's reptile species (209). One single area of open sand dune habitats on Bahia's north coast (corresponding to around 6,000 km²) holds over half of the state's reptile diversity. Surveys conducted from 2008 to 2013 have recorded 118 reptile species including 52 lizards, 51 snakes, nine turtles and two caiman. Thirteen newly recorded species have resulted in geographic range extensions into the region, and three species are exotic and were illegally introduced. However, all surveyed coastal municipalities and locations are under some kind of threat and most of them suffer from intense habitat loss. Even though the entire region is under strong deforestation pressure, no integral protected area exists within the region's boundary. A network of protected areas can be identified, but because they are of a sustainable use category and losing habitat due to authorised and ongoing human disturbance, they probably fail to totally protect areas of extremely high herpetological importance.

Responding to the urgent need for effective conservation, we have been able to promote private landscape protection by encouraging local landowners to protect their natural landscapes in two different municipalities in Mata de Sao Joao and Conde. This has resulted in the protection of over 400 hectares of Atlantic forest and coastal sand dune ecosystems. In addition, and in partnership with governmental agencies the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) and the Chico Mendes Institute for Biodiversity Conservation (ICMBio), we have also proposed the creation of three federal protected areas, adding protection to over 2,000 hectares and embracing 80% of the region's reptile species.

A genetic monitoring programme for endangered leaf frogs

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The lemur leaf frog, *Agalychnis lemur*, is a critically endangered tree frog found in Costa Rica and Panama. In the last decades, its Costa Rican range has contracted to only 1–2 locations, a decline which goes hand in hand with habitat destruction and the spread of the emerging disease chytridiomycosis. Frogs collected from Costa Rican localities have been maintained in captivity at Manchester Museum and Bristol Zoo since 2001 to safeguard the Costa Rican population from potentially going extinct. However, a genetic monitoring programme to aid management decisions at limited standing amounts of genetic diversity is as yet lacking. Given the small number of founders for the captive population, a genetically-based management plan would, for example, help to avoid inbreeding depression among the captive specimens. To facilitate this, genetic markers (microsatellites) have been developed and employed to study both captive and wild populations. Once genotyping of the captive population has been completed, a genetically-informed studbook and breeding program will be developed. The importance of the captive population has increased by the recent finding that the Costa Rican and Panamanian populations of the lemur leaf frog are genetically distinct, probably representing two separate species.

Does acoustic information affect orientation in the great crested newt (*Triturus cristatus*)?

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Like other amphibians, it is widely believed that great crested newts (*Triturus cristatus*) rely on a number of mechanisms for orientation, but little is known about the effects of acoustic information on their terrestrial migrations. Newts retrieved during the aquatic breeding season (adults), as well as during the terrestrial phase after breeding (adults and juveniles), were subjected to calls from sympatric (*Rana temporaria* and *Bufo bufo*) and allopatric (*Lithobates catesbeianus*) anurans as well as white noise, a white noise envelope mimicking anuran call structure and construction noise (pile driving) playbacks in a circular arena in the laboratory. Both aquatic and terrestrial adults were significantly attracted to *B. bufo* calls, but migrated at random directions

when exposed to calls from other anurans; the lack of orientation towards the sympatric *R. temporaria* parallels a largely non-overlapping breeding season. Remarkably, inexperienced juveniles did not respond to any anuran calls. White noise produced a negative response by adults captured during their terrestrial phase, and the white noise envelope elicited a negative response from newts captured from both life stages; construction noise elicited random orientation by all groups. Taken together the results suggest that heterospecific acoustic attraction may play an important role in terrestrial migrations of crested newts, that unnatural sound might have an adverse effect on migrations, and that phonotactic responses could be learned.

Parc Slip reptile refugia project

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With increasing development pressure impacting many reptile and amphibian species in the UK, surveys and population translocations are becoming more commonplace. These activities often rely on the accepted method of using artificial refugia to encourage reptiles and amphibians as a means of increasing the likelihood of species observations. The advantages of using reptile refugia as an aid to surveys have been well documented, as have the variety of material that can be used as suitable artificial refugia.

The project, which took place at the Parc Slip Nature Reserve in South Wales, looked specifically at whether certain species known to use artificial refugia had a particular preference toward smaller (50cm x 50m) or larger (100cm x 100cm) refugia. The comparison study used 121 sets of corrugated Onduline roofing sheet positioned throughout the nature reserve. Each set comprised one large sheet and four smaller sheets and was checked weekly throughout the year. Species presence, abundance and age class were then recorded to determine whether particular species showed a preference toward a particular size of refuge.

Initial results suggest that, of the 12 species recorded (including mammals), 10 showed a preference toward particular size refugia. Those species that didn't show a preference included the common shrew and great crested newt. As well as identifying refugia size preferences of particular species, the project has highlighted a number of evidence gaps relating to artificial refugia and has posed important conservation questions such as - can the use of artificial refugia actually hinder certain species?

Sooglossid frogs: evolutionary relationships of amphibians on the EDGE

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Sooglossid frogs are a unique group. They are the only anuran family which is endemic to an island archipelago and diverged from their only living relative some 130 million years ago. The islands in the Seychelles on which they are found are unusual in being of continental origin and granitic. Separation from the continental landmass that became India resulted in an isolated evolutionary path for the Sooglossidae for approximately 75 million years, and subsequent changes in sea-level have joined and separated populations; most recently during the last 10-15,000 years. Combined, these factors present sooglossid frogs as a rare opportunity to study evolutionary mechanisms in insular amphibians. All four species of sooglossid frog rank in the top 100 EDGE (Evolutionarily Distinct and Globally Endangered) amphibians and are currently listed as either Endangered or Critically Endangered on the IUCN Red List.

In 2009, a new population was discovered in the Vallée de Mai, a UNESCO World Heritage Site on the island of Praslin, where sooglossid frogs had not been previously recorded. This research set out to verify the origin and potential taxonomic status of the Praslin population of sooglossids using a phylogenetic approach, supported by morphological analysis, an extensive dataset of vocalisations, and an understanding of their ecology. In addition to the Praslin frog, comprehensive sampling of the four recognised species within the family Sooglossidae was undertaken, with a focus on *Sooglossus sechellensis*, the species which most closely resembles the Praslin frog.

Initial phylogenetic analysis has indicated the Praslin *Sooglossus* as being distinct from *S. sechellensis*, a separation further supported by significant differences in their respective vocalisations. Additional analyses are underway and the 2013 ARC-BHS Scientific Meeting will see the first presentation of new data on this understudied group of frogs.