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Conference report 2012

This year's ARC-BHS Scientific Meeting was held on 9th December 2012 and attracted over 110 delegates to the Bournemouth Natural Science Society venue. The contributions made are listed over the next few pages. At the end of the meeting, Prof. Trevor Beebee, BHS President, was presented with a copy of the volume of Amphibian Biology (Vol. 10 - Conservation and Decline of Amphibians: Ecological Aspects, Effect of Humans, and Management) which is dedicated to him. His copy was signed by Series Editor Prof. Harold Heatwole of North Carolina State University and Co-Editor Dr. John W. Wilkinson of Amphibian and Reptile Conservation. The inscription reads – "Presented to Prof. Trevor Beebee… in recognition of his lifelong contributions to herpetology and conservation." We wish Trevor well in his retirement (and fully expect him to open future Scientific Meetings!)

Improving the impact of amphibian conservation programmes

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Developing and optimising strategies to mitigate extinctions of amphibian species presents opportunities for the improvement of future conservation programmes. In addressing key areas currently impeding effective interventions within and across international amphibian conservation programmes, recommendations may be developed that could improve the performance of conservation practice.

Firstly, investigating the relationship between perceived 'success' in species recovery programmes and scientific research on those species will enable a better understanding of how research currently contributes to conservation practice. Using a variety of techniques to examine the relationship between science and practice, information can be gathered on what is published and how this is related to ongoing conservation action. Initially examining the ways in which members of the amphibian conservation and research community perceive "success" in a conservation programme should help explain currently accepted conservation protocols. Taking a wide variety of existing international amphibian conservation initiatives as case studies, the degree to which evidence-based conservation underpins these programmes (both in terms of published and unpublished materials) will be analysed. In addition, exploring the relationship between IUCN threat category and publication number and type will further reveal the nature of current research output on amphibian species and whether there are any trends that indicate a greater academic commitment to conservation-orientated research. Secondly, evaluating the degree to which conservation programmes have been effective in reducing threats and extinctions will provide a useful perspective on the current performance on global amphibian conservation projects. Using accepted conservation programme evaluation techniques to search for both project-specific and unifying indicators of 'success' across the case studies will help delineate possible predictors of effectiveness in conservation programmes. Finally, building awareness forms an essential foundation for future conservation action. The EDGE of Existence programme at the Zoological Society of London is a conservation prioritisation tool based on evolutionary distinctiveness and threat that has been actively used to support and catalyse conservation initiatives for amphibians globally. Experiences from the EDGE programme could help provide useful case studies in how to use public engagement as a means of promoting amphibian conservation.

Interactions between spectacled and black caiman: exploring microhabitat use and niche overlap

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Within a national reserve in Peru the black caiman (*Melanosuchus niger*) is considered a flagship species and an indicator of species recovery. After a decline during the commercial skin trade, recovering populations of black caiman have been documented across Amazonia, including Peru. Nonetheless, while black caiman may be widespread in the region today, in most areas they are not abundant. It is thought that the recovery of black caiman within the reserve is currently impeded by illegal hunting and through increased competition with the more numerous spectacled caiman (*Caiman crocodilus*). Here, we explore the interspecific relationships between the two species. By assessing differences in microhabitat use we hoped to gain insights into potential niche overlap, habitat partitioning and competition. Data were collected using standard crocodilian census methods between 2009 and 2011.

The two species exhibited different microhabitat preferences, indicating that they display some habitat partitioning, a feature often attributed to interspecific competition. Nevertheless, further analyses revealed a high degree of common resource use by the two species within this system.

Examining niche overlap and resource partitioning does not provide direct proof of competition. It can, however, help generate hypotheses about interactions among species. It is recommended that further long-term investigation should include all niche dimensions (habitat, diet, time) across seasons in order to further explore the interspecific relationship between the two species. Reserve managers must take these interactions into account when establishing management plans for the black caiman to ensure the continued recovery and long-term persistence of this charismatic species.

Terrestrial ecology of the great crested newt (*Triturus cristatus*) in a woodland area

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The terrestrial ecology of juvenile great crested newts (*Triturus cristatus*) is poorly understood. This study examined the ecology of juvenile great crested newts within Epping Forest from March to October over four years. A total of 63 cover objects (concrete slabs, logs and stones) in a 1 ha area of deciduous woodland were checked weekly for the presence of juveniles. Measurements of snout-vent length (SVL) and weight, and digital photographs of unique belly pattern markings were taken. Growth rates were calculated as mm per month. Body condition indices (BCI) for each individual were calculated using the residuals (y) from an ordinary least squares regression of mass against SVL after log transformation. Apparent annual survival, detection and estimated population sizes were calculated for each year using program MARK which utilises the live-recapture Cormack-Jolly-Seber (CJS) model and uses the maximum likelihood approach to build and select models.

Findings indicate that patterns and incidence of capture varied seasonally and annually. Juveniles appeared to utilise cover objects either as a temporary refuge before emigration or on a semi-permanent basis whilst occupying a small home range close to natal ponds. Numbers of captures were significantly positively correlated with mean minimum monthly air temperature but not rainfall. Juvenile growth rates were significantly higher in the SVL size class 35 to 39 mm compared to the four categories encompassing snout-vent lengths of 40 to 59 mm. Body condition indices varied significantly with season, with the highest values in spring and lowest in summer. Analysis in program MARK estimated that juvenile apparent annual survival was constant at 0.19 while population size fluctuated between years. Results highlight the importance of the juvenile phase in the life history of great crested newts and provide more information on the ecology of this species.

A short update on the survey protocols project

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Following a series of regional workshops and consultations, guidelines for standardising methods for assessing amphibian and reptile populations are being produced and disseminated. The guidelines cover a range of survey levels and encompass presence-absence, population indices, population densities and population size. Recommendations are provided for the design and analysis of surveys at these different levels, ranging from studies on single populations to national surveys. Power analysis is starting to provide information about the survey effort required to detect changes in population status at national and regional scales. Catch depletion modelling may provide information about whether removing animals from a site results in significant depletion of that population, as well as important covariates of detection. Resources for trainers and practitioners will be made available via a new webpage to be hosted on the ARC website.

The systematics, fossils and biogeographical history of salamanders

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Living salamanders are represented by over 600 species within ten families, and occupy both aquatic and terrestrial niches as adults. Some degree of consensus has been reached within the last century regarding the interrelationships of this diverse and abundant clade of lissamphibians. There is, however, still disagreement on the position of some clades (e.g. sirenids) within the phylogeny, perhaps due partly to widely prevalent paedomorphosis. With new methods that combine morphological and molecular evidence, there is now strong support for several interrelationships, e.g. the internally fertilising Salamandroidea as the sister clade to the Cryptobranchoidea. Salamander systematics can be further elucidated by adding fossil taxa to a phylogeny of living families. Although incorporating fossils is difficult, due to missing data and problems of interpretation, it is crucial for a better understanding of early biogeography and radiation patterns.

Although the majority of living salamanders are found in the northern Hemisphere, two relatively recent southward migrations into South America and Africa have been documented. Known fossils show similar northern Hemisphere distribution patterns leading workers to suggest a Laurasian origin for the group. Over the last few decades, however, there have been occasional discoveries of enigmatic Cretaceous and Palaeogene salamander fossils in Bolivia, Sudan, Morocco and Niger. These appear to belong to a single clade and raise questions as to how these salamanders might have arrived on Gondwana and whether salamanders were

originally more globally distributed, as are frogs. The goal of my work is to build a global phylogeny with both living and fossil taxa and to use this to test biogeographical hypotheses.

Winning away: dominant influence of donor population size on success of a common toad translocation

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Translocation of species to new locations is a widespread procedure in conservation biology. Conventional wisdom suggests using large numbers of donor stock from sites as close and as ecologically similar to the recipient location as possible to minimise risks from maladaptation and outbreeding depression. We investigated translocation success of common toads (*Bufo bufo*) over the period 1977–1999 to a Sussex garden. Two translocation periods (1977–1982 and 1989–1992) used spawn from local Sussex sites (Brighton Crematorium in the first attempt and Offham marshes in the second) but both failed to establish a garden population. The third period (1998, 1999) used spawn from a distant population (Merseyside dunes) and from a local site (Offham), following which a garden toad population developed within a few years. In 2009, the new population retained a genetic signature (allele frequency distributions at microsatellite loci) almost identical to animals from Merseyside whereas an adaptive genetic locus (MHC class II allele frequencies) in the garden resembled local Sussex genotype distributions. This suggests that the new population was derived entirely (or almost entirely) from the Mereseyside stock but that an immune gene locus changed rapidly to reflect local selection pressures (presumably pathogens). Other factors (phenology, habitat structures, climate) were relatively consistent throughout the period 1977–2009 and therefore could not readily explain the success of the distant translocation source. We postulate that the eventual translocation success was due to the very large size of the donor population compared with local sources, implying that high levels of mean fitness or adaptive variation can be more important than local factors when considering translocations, at least in some circumstances.

Influences of habitat structure on the restinga herpetofauna of northeast Bahia

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Habitat selection in reptiles and amphibians is influenced by a complex interplay of factors affecting life history and the ability to maintain optimal fitness. The north coast of Bahia contains a large proportion of Brazilian herpetofauna which is under threat from anthropogenic habitat degradation. Little has been published on the habitat selection of this region's restinga herpetofauna, thus the aim of this research was to identify the habitat components that influence habitat use.

Collection of habitat data and visual searches for herpetofauna were carried out every two months between 2010 and 2012, across 180 sample units along the north coast of Bahia. Surveys resulted in 12,327 records across 44 genera, totalling 82 species. Habitat data were analysed via principal components analysis and yielded four main habitat components; structural complexity, low-lying vegetation cover, microhabitat complexity and anthropogenic disturbance. Discriminant function analysis was used to test the influences of these components on the presence and absence of different species, and multiple regressions were used to examine relationships with abundance, richness and diversity.

Factors affecting species presence and abundance were similar. Four species were found to prefer disturbed areas, with one genus and three species being negatively affected by disturbance. The Bahian sand dune whiptail (*Cnemidophorus abaetensis*), a locally threatened and endemic species was among those exhibiting negative impacts from disturbance, thus improvements to legislation and the protection of its coastal habitats are recommended to safeguard its future. Disturbance may also be making habitats accessible to locally invasive species, resulting in increased competition. Most anurans were found to occupy both restinga and coastal forest habitats, suggesting that frog diversity can be maintained through conservation of vegetationally complex habitats. Greater diversity overall was found within more complex habitats, advocating conservation efforts to be focused on forest and scrub ecotypes.

The effect of chytrid fungus on natterjack toads – results and conclusions

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The chytrid fungus *Batrachochytrium dendrobatidis* (*Bd*) has been blamed for amphibian declines around the world. This project was designed to investigate the effect of *Bd* on natterjack toads (*Bufo/Epidalea calamita*), following the discovery of *Bd* in natterjack populations in the UK in 2004.

The effect of *Bd* on natterjacks was assessed by fieldwork and experiments. Wild adult natterjacks were tagged and repeatedly tested for *Bd* at three Cumbrian sites during 2009–2011. Capture-mark-recapture (CMR) data from adult natterjacks revealed a weak negative correlation between *Bd* score and survival in the wild. Males had higher *Bd* scores than females but survival did not differ between sexes and there was no correlation between *Bd* score and growth. Experiments showed *Bd* could kill natterjacks if they were kept wet for several days but such conditions may be unusual in the wild. Bd did not appear to have a dramatic effect on natterjack populations in this study. Breeding has continued at sites in the UK and Spain where *Bd* has been present for several years.

The standard test for *Bd* infection (swabbing) was not reliable when toads had spent time on dry land. Immersion in water appeared to trigger *Bd* zoospore release. An experiment with natterjack toadlets showed *Bd* infections were retained over winter and reactivated upon immersion in spring. Natterjacks may act as a reservoir of *Bd*, with negative consequences for other European amphibians. *Bd* isolated from natterjacks in this study was found to belong to the global panzootic lineage (GPL) of *Bd* which may have achieved a global distribution as a result of human activities.

The conservation and landscape genetics of the sand lizard in Great Britain

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The sand lizard (*Lacerta agilis*) is a widespread lizard which reaches the western edge of its range in Britain where it is restricted to three geographically separated areas. Recent habitat loss and fragmentation has resulted in its significant decline and it is now a UK conservation priority. Lizards from across the British range were genotyped at 15 microsatellite loci and the resulting dataset used to address questions regarding the conservation genetics, phylogeography and influence of landscape on patterns of genetic diversity.

Genetic diversity of Dorset populations compared favourably to European examples but diversity was significantly lower in Surrey and lower still in Merseyside. Significant genetic structuring occurred across small geographical distances even in relatively unfragmented landscapes. *Lacerta agilis* colonised Britain via a land bridge across the North Sea and reached the limits of its current distribution approximately 5,000 years BP. Subsequent climate cooling has resulted in a range contraction to areas where the habitat is suitable for the successful incubation of eggs.

A resistance surface was used to investigate the effect of landscape configuration on patterns of genetic diversity at multiple spatial scales in Dorset. At a local scale, habitat type and natural barriers such as rivers were the best predictors of genetic diversity. At a regional scale, natural barriers were most important, whereas habitat cover and artificial barriers (roads) were less important. Artificial barriers may be more significant than the results suggest as their true effect has not yet been realised due to a genetic time lag.

Male lizards from Merseyside exhibit significant differences in colour and pattern to the Dorset and Surrey populations. Despite these differences in colour, all populations were equally green, which is in keeping with the importance of 'greenness' as a sexual signal.

The implications of these findings for the conservation of *L. agilis* are discussed in the context of global climate change.

The Uzungwa Scarp Amphibian Project: hyper-endemic amphibians in a Tanzanian biodiversity hotspot

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The Eastern Arc Mountains of Kenya and Tanzania are not well known amongst the general public, or many conservationists, and yet represent some of the richest areas in the world for endemic and threatened species. Sometimes referred to as the Galapagos of Africa, the Eastern Arcs are actually far more diverse than those islands, with suites of new species being described regularly. This is particularly true for reptiles and amphibians, many of which are found only in single forest blocks or mountain ranges. Furthermore, several narrow endemic species have only ever been recorded from single sites less than 1 km^2.

We refer to these highly restricted species as 'hyper-endemics' and launched the Uzungwa Scarp Amphibian Project in 2010 to investigate the conservation status of three such species: Wendy's forest toad *Nectophrynoides wendyae* (Critically Endangered), Poynton's forest toad *N. poyntoni* (Critically Endangered) and Kihanga reed frog *Hyperolius kihangensis* (Endangered). The Uzungwa Scarp Forest Reserve is one of the largest areas of closed-canopy forest in the Udzungwa Mountains, the southernmost Eastern Arc Mountain range. Although it has been proposed to upgrade the legal status of the forest to Nature Reserve it is currently poorly protected and highly disturbed by illegal hunting and logging.

Apart from initial training, all fieldwork has been conducted by Tanzanian university graduates with local assistants. As the survey teams did not include formal herpetologists we have developed a system of post-hoc species identification based on photographic and GPS records. This paper will present results from the first two years of field surveys (2011–12) including new records for several Eastern Arc endemics, including the Critically Endangered Wendy's forest toad. The latter species was detected in both years at its historical location and also at a new site 0.5 km away in a separate valley. Poynton's forest toad and Kihanga reed frog were not encountered, despite surveying the known distribution areas for both species. This result is especially concerning for Poynton's forest toad as the only known site was surveyed on numerous occasions throughout the study period. As the chytrid fungus *Batrachochytrium dendrobatidis* has been recorded in the Udzungwa region we also present preliminary results from screening amphibians encountered during 2012.