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This year's ARC-BHS Scientific Meeting was held on the 7th December 2014 at the Bournemouth Natural Science Society venue. Abstracts of contributions made are listed below.

Habitat use by reptiles on grazed and ungrazed lowland heath

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All six native British reptiles species (smooth snake *Coronella austriaca*; grass snake *Natrix natrix*; adder *Vipera berus*; slow worm *Anguis fragilis*; sand lizard *Lacerta agilis*; common lizard *Zootoca vivipara*) occurring on a 10 ha area of lowland heath in Wareham Forest, Dorset have been studied intensively since 1992 using arrays of artificial refuges. The total number of captures/sightings of each species occurring in each array was recorded annually. In 1997, cattle grazing was introduced into 300 ha of the forest, including the entire reptile study area. In early 2009, approximately half of one array was subject to a controlled burn by the Forestry Commission and in early 2010 a fence was erected to exclude cattle from approximately 6 ha of the original reptile study area with the remaining 4 ha, including the burnt area, continuing to be grazed.

Since 2010, vegetation surveys have been completed in each of the reptile arrays using 2m x 2m fixed quadrats. There were 10 quadrats in each of the 11 arrays, 7 in the area from which cattle were excluded and 4 in the area that continued to be grazed. The height and percent cover of each plant species within each quadrat was recorded annually. The total number of captures of each reptile species was compared with habitat attributes (plant species height and cover) within each array for each year (2010-2013).

Adders were relatively rare and associations with habitat attributes were not feasible for this species. The number of captures of each of the remaining 5 species were, with the exception of the sand lizard, highest in ungrazed arrays and were associated with relatively tall vegetation (heather, dwarf gorse, purple moor grass, bristle bent) and a good litter cover (dead grass). Conversely, the highest number of sand lizard captures occurred in grazed arrays and were associated with relatively short vegetation.

The data suggest that 'conservation grazing', as this from of habitat management is euphemistically called by Natural England and all those promoting its use, has potentially serious negative effects for most reptile species inhabiting heathland in the UK. Cattle grazing damages the habitat structure of heathland, through its effects on plant height and plant cover, thereby reducing its overall carrying capacity for reptiles.

The agile frog: captive breeding, reintroduction and conservation efforts in Jersey

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The Island of Jersey is situated 21 kilometres off the north-west coast of France and 128 kilometres from the English coast. The agile frog (*Rana dalmatina*) is not found anywhere else in the British Isles and the Jersey population has, until recently, been declining in both range and numbers since the early 1900s. Causes of agile frog decline include habitat loss, water quality and pollution events, and predation pressures.

A collaborative programme, incorporating captive-breeding, reintroduction and habitat management, started in the late 1990s in order to try to arrest the decline in wild frog numbers in Jersey. The organisations involved are the Department of the Environment, the Durrell Wildlife Conservation Trust and the Societé Jersiaise.

In the 1970s, the agile frog could be found in seven localities in the south west of Jersey but by the 1980s this had dropped to only two sites. In 1987, a spill of aldicarb (an agricultural pesticide) at one of the sites caused the loss of one of the two remaining populations of frogs. As a result, there is only one site in the Island, a coastal stabilised dune system, which supports an original, wild population of R. dalmatina. A proportion of spawn clumps from this population has been harvested on an annual basis to enable a captive breeding programme to increase productivity, with the aim of reintroducing the species to both newly identified and historically used sites. Two other sites are receiving tadpoles bred in captivity in order to establish sustainable populations and create a network of breeding ponds.

Annual habitat management tasks are now scheduled to maintain the condition of breeding ponds and improve

links between individual ponds. Also, a large amount of data has been collected annually during each breeding season and this dataset is now being analysed to inform future decisions.

A variety of methods and techniques have been used in the past 20 years to improve habitat, protect spawn clumps from predation and to generally increase the population. As a result of various research projects carried out during this period, an effective conservation programme is now in place with the aims of actively protecting all present and potential agile frog sites and continuing with the headstarting and reintroduction programmes. Initial results look promising with a marked increase in agile frog numbers and productivity. Fewer than 10 clumps were found each year between 1997 and 2008 but this had increased to more than 100 clumps in 2014.

Investigating the variation in life-history strategies of marine turtles

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Investigating life-history traits of long-lived, highly migratory and promiscuous marine reptiles often requires novel or indirect methods of assessment. During the past 30 years, a variety of molecular markers have been used to elucidate complex life-history traits including natal philopatry, regional contributions to mixed-stock feeding aggregates, multiple paternity and calculating remigration intervals of males through paternal genotype reconstruction. Furthermore, Stable Isotope Analysis (SIA) has been used to identify foraging areas, often calibrated by satellite telemetry, or differential feeding strategies within rookeries with related implications on individual fitness.

The work presented here brings these two disciplines together to investigate genotypic influence on correlates of reproductive fitness whilst controlling for and investigating interactions associated with differential foraging. For the first time, a pedigree will be constructed using an array of 13 microsatellites for a regionally important and intensely studied rookery of the Mediterranean green turtle (*Chelonia mydas*) in northern Cyprus. Pedigree or family lineage will be investigated to reveal if genotype influences breeding strategy and whether a particular strategy is more successful. Isotopic signatures of carbon and nitrogen will be used to control for and investigate foraging resource with interactions between foraging resource and pedigree explored. These data will be used to disclose drivers behind the recent population recovery of this rookery.

The microsatellite array will additionally be used to construct a relatedness index across north Cypriot beaches to assess fine-scale population structure and to assign cryptic nests to known females improving clutch frequency estimates. The relatedness index will be augmented with a new haplotyping system using the combination of a long sequence read (~800bp) of the 3' end of the maternally inherited mitochondrial DNA control region (mtDNA) in addition to Short Tandem Repeats on the 5' end (mtSTRs). This high resolution haplotyping system, in combination with the microsatellite array, will also be used to investigate genetic structure between Mediterranean green turtle rookeries and the wider Atlantic. If strong genetic structure is found, then the IUCN green turtle classification for these populations could be re-addressed.

Decline and distribution of Jersey's rarest reptile

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Reptiles have received little attention in terms of conservation research when compared with other vertebrate groups. Snakes are linked with their environment at varying spatial scales, and typically exhibit negative responses to anthropogenic habitat change. Moreover they are often top predators within an ecosystem, therefore the decline of a snake population may impact the function of the ecosystem it inhabits, and they can thereby serve as indicators of ecosystem health. Within Europe a fifth of reptile species are thought to be threatened with extinction, however evidence of snake declines is poor due to their cryptic nature, low population densities, solitary lifestyles and unpredictable behaviour with resulting difficulty of monitoring.

The grass snake (*Natrix natrix*) is distributed from North Africa and the Iberian Peninsula, across much of Europe through to Lake Baikal in Central Asia. Although relatively common in mainland Britain, grass snakes are thought to be undergoing declines in some areas due to a dependence on landscape-level features, particularly ovipositicula, whereas in some protected areas populations are thought to be stable.

Within the Channel Islands, grass snakes are only found in Jersey where they have undergone decline, with little known about the causes and the population's subsequent distribution and status. Furthermore they are undoubtedly the rarest of the island's four reptile species. Earlier research had found grass snakes to be abundant in the north-west and south-west of the island and, historically, the species occurred throughout the remainder of the island at a low density with a possible population in the south-east. To assess the current status on the island, a combination of directed transect walks and visual and refugia surveys took place between March and September 2014 at 19 sites. Despite an intensive

survey effort, detectability was low, but the species was present at 58% of study sites. Additionally, a public media campaign was implemented in order to encourage public reporting of sightings. The resulting distributional data from surveys and public sightings suggests the population is largely restricted to the west and south-west of the island. A Maxent species distribution model based upon these data highlights a lack of suitable habitat throughout much of the island, with poor connectivity between quality habitat. Further research is required to elucidate the key features determining grass snake distribution in Jersey, which will then allow appropriate conservation measures to be implemented.

Camouflage and sexual communication in Aegean wall lizards

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Visual signals are often under conflicting selection to be hidden from predators while being conspicuous to mates and rivals. Here, we investigated whether Aegean wall lizards (*Podarcis erhardii*), varying in colour among three different island populations with diverse habitats, exhibit simultaneous camouflage and sexual signals. We examined whether signals appear better tuned to conspecific vision as opposed to that of avian predators, and whether background matching camouflage and sexual signals are partitioned to specific body regions. This could facilitate both covert sexual signalling and camouflage in males according to the viewing perspectives of predators and conspecifics.

We found that lizards typically appeared twice as conspicuous to conspecifics than to avian predators against the same visual background, due largely to lizards' enhanced sensitivity to UV, suggesting that P. erhardii signals are tuned to conspecific vision to reduce detection by predators. Males were more conspicuous than females to both predators and conspecifics. In two populations, male backs were relatively more camouflaged to predators compared to signalling flanks, whereas in females, exposed and concealed surfaces were camouflaged to predators and did not differ in background matching. These findings indicate that lizard colouration evolves under the competing demands of natural and sexual selection to promote signals that are visible to conspecifics while being less perceptible to avian predators. They also elucidate how interactions between natural and sexual selection influence signal detectability and partitioning to different body regions. This highlights the importance of considering receiver vision, viewing perspectives and signalling environments in studies of signal evolution.

Using GIS and species distribution modelling to assess the conservation status of great crested newts in Wales

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The great crested newt (*Triturus cristatus*) has undergone substantial declines in the UK and elsewhere in Europe through habitat loss and fragmentation. As part of the UK's obligations under the EU Habitats Directive, and as a European Protected Species (EPS), great crested newts must be monitored (both within and outside protected sites) and their conservation status must be reported on every six years under the Directive's Article 17. This reporting is carried out at UK level but, as nature conservation functions are devolved to the individual countries of the UK, knowledge of the conservation status of great crested newts at Wales level is therefore now an intrinsic constituent part of the reporting process.

The most recent Article 17 status assessment for the great crested newt in the UK (2007-2012) records a status of "Unknown XX", based on uncertainty about population, habitat and future prospects variables. In order to develop methods to address these uncertainties in Wales, and in contribution to the 2014-2018 Article 17 report, the Countryside Council for Wales (CCW, now Natural Resources Wales) commissioned a series of GIS based studies in order to (i) demonstrate the applicability of GIS techniques to quantification of conservation status parameters and predictive mapping and (ii) produce regional, fine-scale spatial outputs (at 25 m resolution) which could be aggregated to create an objective quantification of spatial metrics for the great crested newt across Wales.

We applied GIS and MaxEnt distribution modelling software to regional GCN presence data, coupled with fine scale habitat maps and environmental variables, to generate accurate and objective range, population and habitat status metrics for GCNs across Wales. Modelling can be repeated to assess possible status changes and applied to other regions and countries of the UK, as well as elsewhere in Europe.

Is the pheasant shooting industry having a negative impact on native UK reptiles?

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UK reptile species are listed on the UK Biodiversity Action Plan as species of principle importance requiring conservation action. Recorded reptile declines at both regional and national scale have been attributed to anthropogenic impacts on habitat. One industry having

a major impact on UK woodlands is the game shooting industry, specifically pheasant shooting. Management of woodlands for the release of approximately 38 million hand reared pheasants each year changes the habitat for reptiles sharing this woodland. This is achieved by reducing canopy cover and increasing the field layer, altering the microclimate. The change in microclimate itself may be enough to affect the reptiles, which rely on external temperatures for survival. The release of 38 million ground predators into woodlands shared by native reptiles may have direct predation effects, either from pheasants themselves, (all evidence so far is anecdotal), or by pheasants supporting unnaturally elevated levels of generalist predators known to predate on reptiles, such as buzzards.

This work compared reptile counts in pheasant release woodland against non-release woodland for the first time. We found a highly significant difference in reptile abundance, with all reptiles found in non-release woodland and no reptiles found in pheasant release woodland. This trend was not explained by prey abundance, thus further work is needed to investigate the cause of this trend. We also looked into the pecking behaviour of pheasants to identify if there was a stronger pecking behaviour towards reptile-shaped objects over random objects. Juvenile and female pheasants have been recorded as having higher protein requirements in diet, obtained from consumption of meat (specifically insect grubs). Results showed a strongly significant higher peck rate for reptile models over random shaped models. Although this does not show predation, this result indicates that direct predation by pheasants is likely, due to their attraction to peck at reptile-shaped objects, especially if this behaviour is reinforced in situ by nutritional conditioning. We suggest further work to understand the cause of reduced reptile abundance in pheasant release woodland.

Newts on Rum: investigating a host-pathogen system

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In the world of amphibian research, diseases such as Chytridiomycosis and Ranavirus have attracted a lot of attention, and with good reason. Amphibian populations are declining globally and emerging infectious diseases have been continually identified as a leading cause of declines and extinctions. However, there are many other amphibian pathogens which are often overlooked and, as a result, we know little about.

One example is Amphibiocystidium. These fungal-like pathogens belong to the class Mesomycetozoea, and are known to infect amphibian species across the USA and Europe. Historically, reported incidents suggested Amphibiocystidium infections were non-pathogenic or that infected animals could recover quickly. However, reports of morbidity and fatalities are increasing with the suggestion that disease caused by Amphibiocystidium may be fatal to some species. At present, we know little of the presence of this pathogen in the UK or what risk it might pose to our native amphibian species.

During this talk I will focus on the Isle of Rum in Scotland, where the presence of Amphybiocystidium was first confirmed in 2006. The disease is endemic amongst the island's palmate newt (*Lissotriton helveticus*) population, the only amphibian found on Rum. The discrete superficial lesions which present on the newts of Rum are typical amongst Amphybiocystidium reports, however, pronounced infections, severe body oedemas and significant mortalities are also observed consistently. This presents an extreme, and possibly unique, circumstance. Here, I will provide a summary of our main epidemiological findings from disease distribution and prevalence, to the observable interactions with environmental factors which may be driving virulence.

Living in paradise: evolutionary patterns in Seychelles caecilians

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The Seychelles archipelago, partially a microcontinent, is unique among isolated island systems because of the occurrence of (probably ancient) radiations of amphibians that have been separated from mainland relatives for 65 million years or more. One of these radiations comprises six nominal species in three genera of a relatively poorly known order, the limbless caecilians (Gymnophiona). The Seychelles species are unique in comprising the only remote island radiation of caecilians worldwide, and for a small group they have high morphological and ecological diversity. However, little previous work has been carried out and the group's internal phylogenetic relationships have defied resolution. As with other amphibians, caecilians are likely intolerant to saltwater, yet all but one Seychelles species occurs on more than one island, raising questions about within- and among-island variation (and gene flow) and potential cryptic taxonomic diversity. Based on extensive fieldwork (> 1,000 person days), we have identified new island records for some species. Analyses of multilocus molecular and external and cranial morphological data indicate that intraspecific variation is differently spatially structured in different species, and that differences do not wholly match predictions from ecology. The patterns of variation have implications for understanding Seychelles caecilian evolution and conservation management.