The Glasgow Naturalist (2024) Volume 28, Part 2, 43-47 https://doi.org/10.37208/tgn28218

The Glasgow Natural History Society Scottish Herpetological Conference, June 2023: origins, organisation, experience and proceedings

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INTRODUCTION

In June 2018, the Glasgow Natural History Society (GNHS) organised a conference as part of the Glasgow Science Festival entitled *The Amphibians and Reptiles of Scotland: Current Research and Future Challenges*, whose proceedings were published in a supplement issue of Volume 27 of *The Glasgow Naturalist* (https://www.biodiversitylibrary.org/item/274374).

The 2018 conference was the third herpetological conference to be held in Scotland, with the previous two being in Glasgow during November 2011, and Edinburgh during October 2014, both part of the series of Herpetofauna Workers meetings which occurred annually at various venues across the country.

The 2018 conference was prompted by the publication in 2016 of *The Amphibians and Reptiles of Scotland* (McInerny & Minting, 2016) by the GNHS, which had stimulated much discussion about areas of Scottish herpetological interest that needed further study and research. By 2023 it was thought that the time was right to revisit the status of herpetological study in Scotland, and the idea of a follow-up conference was proposed to the GNHS Council, who supported the proposal.

A committee comprising the authors along with Ehm Downie, Deborah McNeill and Erik Paterson then put the idea into action. The committee meetings proceeded via Zoom, with correspondence through e-mail; JRD chaired and minuted the meetings.

The committee first agreed that the conference would be a contribution to the 2023 Glasgow Science Festival, identifying the date as Saturday 3rd June. This also allowed conference rooms and space within the University of Glasgow's new and well-equipped Advanced Research Centre (ARC) to be used (Figs. 1 and 2). The committee realised that making the conference a "hybrid", delivered in-person but also with online Zoom attendance an option, would maximise attendance, and the technical support offered by the ARC made this feasible.

JRD wrote and submitted a funding application to GNHS's Blodwen Lloyd Binns Bequest (BLB) grants committee who awarded the conference up to £1,000 to cover speaker expenses, refreshments (so that these could be free to all attendees), speakers' lunches and Glasgow Science Festival registration. JRD also obtained donations from the British Herpetological Society, Froglife, Amphibian and Reptile Conservation, Amphibian and Reptile Groups UK, and the Friends of Angus Herpetofauna to support conference expenses. As the conference was a contribution to the Glasgow Science Festival there was no room hire charge or janitorial costs.

Fig. 1. The Scottish Herpetological conference welcome and introduction. (Photo: Andy Wilson)

Fig. 2. The Scottish Herpetological conference atrium with stands and posters in the ARC, University of Glasgow. (Photo: Andy Wilson)

Gathering a set of high-quality speakers was the responsibility of JRD, along with inviting the contribution of stands by the sponsoring organisations (Fig. 2). ND managed and supported the submission of poster presentations, short talks, and advertising

material for the conference. Although the focus of the conference was on herpetology in Scotland, a few presentations of broader relevance were included, especially if they contained useful lessons for Scotland, such as the work on the impacts of Eurasian beavers (*Castor fiber*). The organising committee also felt that it would be useful to include herpetological topics for discussion, to give attendees an opportunity to air their views on relevant current issues: JRD wrote introductory texts for two alternative topics: (1) Should the international trade in wild-caught amphibians and reptiles be banned? and (2) The threats facing Scotland's herpetofauna, and what can be done about them. JRD also liaised with the ARC and the Glasgow Science Festival, whose EventBrite booking system was used to register members of the public wishing to attend the conference.

Thirteen speakers agreed to give standard length (20 minutes) talks on the day and four to give short (5 minutes) presentations. Angela Julian gave her talk remotely live through Zoom while Daniele Muir and Jenny Tse-Leon provided pre-recorded talks which were projected on screens. Unfortunately, neither Chris Cathrine nor Colin Dunlop was able to give a talk on the day, although the former was later able to provide a paper based on what he had hoped to talk about, and this has been included in the Proceedings. Most speakers provided talk titles and abstracts in advance for the printed conference programme. The short presentations were supported by posters in the ARC atrium (Fig. 2). The atrium was also the location for stalls brought by five organisations. Over 80 people signed up to attend in person: many on the EventBrite list could not make it, but others did, resulting in a total of 81 attendees on the day. A further eight signed up for attendance online, though the remote link did not work well.

Scottish Environment Link organises a Nature Champions scheme which invites Members of the Scottish Parliament to act as champions for particular species or habitats. At the time of organising the conference, most Scottish species of amphibians and reptiles, and one relevant habitat had champions (Table 1). JRD wrote to the champions inviting them to participate in the conference in some way, by sending messages of support or attending and speaking. The response was limited and disappointing, but some did send messages and Brian Whittle agreed to attend and give a short presentation.

Several members of GNHS and two University of Glasgow students volunteered to staff the registration desk and the refreshments stall. Andy Wilson (GNHS photography convenor) generously agreed to take photographs of the event (Figs. 1 and 2). Twenty three attendees completed Festival feedback forms, with 70% rating the event as excellent, and 30% as very good.

CJM and ND chaired the morning and afternoon sessions of the conference, with CJM providing a welcome and introduction and JRD the closing remarks. CJM and JRD led the afternoon discussion sessions, with Martha Stone-Shepherd and Ehm Downie acting as scribes.

Regarding the assembly of the conference proceedings published in this issue of *The Glasgow Naturalist*, not all speakers were able to provide written-up versions of their talks, usually because the work reported on was at too early a stage, or because it was scheduled for publication elsewhere. Where this is the case, we provide below only the abstract (or an extended version of the abstract) that was included in the printed conference programme.

The providers of posters at the conference were also encouraged to develop their presentations into Short Note format papers to be published as part of the proceedings, and these, where completed, have become valuable permanent accounts. JRD, ND and CJM have acted as referees for all these papers and shorter contributions, with additional oversight by the Editor.

Species/Habitat	**MSP**
Adder (*Vipera berus*)	Martin Whitfield
Common lizard (*Zootoca vivipara*)	-
Slow worm (*Anguis fragilis*)	Daniel Johnson
Leatherback turtle (*Dermochelys coriacea*)	Brian Whittle
Common frog (*Rana temporaria*)	Shirley-Anne Somerville
Common toad (*Bufo bufo*)	-
Natterjack toad (*Epidalea calamita*)	Fulton McGregor
Great crested newt (*Triturus cristatus*)	Emma Harper
Smooth newt (*Lissotriton vulgaris*)	Jenny Gilruth
Palmate newt (*Lissotriton helveticus*)	Murdo Fraser
Ponds, small lochs	Emma Harper

Table 1. Scottish Environment Link Nature Champions (herpetofauna), 2023.

PROGRAMME

Talks:

10.00 Chris McInerny: Welcome and introduction (Fig. 1).

Chair: Chris McInerny

10.05 Brian Whittle MSP: Scottish Environment Link's Nature Champions scheme for the leatherback turtle.

Summary

Brian began by explaining what had stimulated his interest in marine turtles: the experience of sub-aqua diving in the Red Sea where he swam close to green and loggerhead turtles. He then summarised the threats that marine turtles face worldwide: by-catch in the longline fishing industry, global warming's effects on the sex ratio of hatchling turtles (due to their temperature-dependent sex determination system), plastic pollution in the seas, where turtles can mistake plastic bags for jellyfish prey, and touristic development of nesting beaches, making them unsuitable for turtles (a problem because most turtles species tend to show high natal beach fidelity, returning to nest at the beach where they hatched out). As well as being nature champion for the leatherback turtle, now recognised as a regular visitor to Scottish waters, Brian is Shadow Minister for the Environment, Biodiversity and Land Reform, and is keen to encourage better environmental protection in Scotland, on several fronts. He concluded by speaking briefly on the Nature Champions scheme (to which over 80 MSPs are signed up) (Table 1), and wishing success to the conference.

10.10 John Howieson (University of the West of Scotland): Citizen Science and eDNA for the targeted detection of amphibians in coastal environments.

Abstract

Amphibians are negatively affected by salt water, with effects ranging from mortality to developmental delays and abnormalities. With rising threats associated with climate change, such as increased incidences of extreme weather events and seawater inundation due to flooding, amphibians within coastal environments are at risk from freshwater salinisation. However, numerous reports of amphibians inhabiting brackish water suggest that some species may display an evolutionary resilience to saline conditions. The evolutionary mechanism of this resilience is largely unknown, with the nature of these molecular mechanisms (adaptive or plastic responses) being predominantly unexplored. Here, we sought to investigate the presence of U.K. amphibians (common toad, *Bufo bufo*; natterjack toad, *Epidalea calamita*; common frog, *Rana temporaria*; great crested newt, *Triturus cristatus*; palmate newt, *Lissotriton helveticus*; and the invasive alpine newt, *Ichthyosaura alpestris*) in saline sites using eDNA-targeted detection methods to identify which species are demonstrating salt resilience. Through the development of species-specific primers, we have established and optimised an eDNA assay for the detection of these species (alongside widely-established *T. cristatus* primers). Species distribution data from eDNA-targeted detection will be used alongside water quality parameters to infer which U.K. species are more frequently found in brackish environments.

10.30 Catherine Whatley (University of the West of Scotland): Development and validation of biomonitoring techniques for studies on pollution in wild common frogs (*Rana temporaria*).

Abstract

The aim of this DEFRA-funded Ph.D. project is to develop non-destructive biomonitoring techniques for endocrine-disrupting chemicals (EDC) in wild common frogs across the central belt of Scotland. The presentation gave an overview of the project and the different ways in which EDCs can be detected in the wild, and how their effects on common frog reproduction and development will be studied.

10.50 Fairlie Kirkpatrick Baird (NatureScot, Inverness): Drought in Scotland?! Combining models and field observation to predict impacts of drought on Scottish amphibians.

Abstract

Climate change is already leading to an increase in extreme events, including drought. Drought is projected to increase in both frequency and severity, even in temperate countries in Europe (Baird *et al*., 2023). Amongst the animals most vulnerable to these changes are amphibians, as most species rely on water bodies for at least one life stage. Scotland provides an example of a country that is projected to experience substantial increases in drought in the near future, with likely impacts on its amphibian populations. While some species such as the natterjack toad (*Epidalea calamita*) are well adapted to summer drought and may benefit, the remainder of native species are likely to be negatively impacted. Using data on pond water levels and desiccation rate, we found evidence of drought during the breeding season (April to June) between 2014 and 2022. Our analyses combine drought models with field observations and suggest that drought is already a significant concern for amphibian conservation and resilience. Further, the changes are occurring sooner than expected, potentially turning otherwise healthy ponds, including those in nature reserves, into trap habitats for several species. Conservation initiatives, therefore, need to take drought increases into account when designing interventions.

11.15 Ehm Downie: Clyde Amphibian and Reptile Group's Greater Glasgow pond surveys, 2022.

11.35 Daniele Muir: Tayside Ponds Project.

Abstract

The aims of the project are to deliver positive effects for biodiversity and enhance local ecosystems, to promote the health and well-being of local communities, and to reduce inequalities. This is very much a partnership project, led by the Tayside Biodiversity Partnership together with the Tayside Amphibian & Reptile Group, and working directly with Perth & Kinross Council, the British Dragonfly Society and Amphibian & Reptile Conservation. Funding has been kindly provided by the

Scottish Government's Nature Restoration Fund allocation to local authorities.

Phase 1 (Winter 2021/22) – the project improved ponds for wildlife and provided volunteering opportunities at six ponds, several of them SuDS ponds (Sustainable urban Drainage Systems) namely the Elm Drive SuDS, Blairgowrie; Craighall SuDS, Rattray; Davie Park Pond, Rattray; Murthly SuDS pond; Scone Park Pond; and the Norrie Miller Pond, Perth.

Phase 2 (Winter 2022/23) – we returned to some of the ponds partly improved in phase 1 and also worked with volunteers at Aberdalgie, the North Inch SuDS pond, Perth and the Guildtown SuDS pond. As well as improving the habitat for amphibians and other watery wildlife, we planted native wildflowers for pollinators.
The final phase of the project (Winter 2023/24) will see us again returning to some of the larger ponds which still need help (including the North Inch SuDS, Murthly; Elm Drive SuDS, Blairgowrie). We will also be working with local volunteers at both the Abernethy and Barratts Huntingtower housing developments, together with the SuDS at the West Park development in Blairgowrie.

In 2023, we had a few new groups of volunteers helping out including a John Muir Award group from Perth Academy & Perth and Kinross Council's Biodiversity Ambassadors. We also had some corporate volunteers in the shape of Studio Alba Architects, who funded some amphibian ladders to go into gullypots close by. We look forward to welcoming more volunteers at ponds for puddocks this year!

Chair: Nicole Digruber
13.20 Jenny Tse-Leon: Protecting Britain's wildlife laws.

13.40 Angela Julian: The Scottish national adder survey (SNAS) 2022-24.

14.00 Kathy Wormald: Froglife's Come Forth for Wildlife project.

14.20 Myles O'Reilly (SEPA): Marine turtles as vectors of exotic fauna to Scottish waters.
Abstract
The history and occurrence of marine turtles in Scottish waters is briefly reviewed. Some recent cases of loggerhead turtles stranded with numerous goose barnacles are discussed and compared with a stranding of a leatherback turtle with embedded acorn barnacles. The ecologies of goose barnacles (*Lepas anatifera*) and cheloniphilic acorn barnacles (*Stomatolepas dermochelys*) are compared, including their attachment modes and how turtles rid themselves of barnacles. The occurrence of turtle debilitation syndrome is outlined. Records of exotic turtle barnacle species in Scottish and nearby waters are summarised and other exotic faunal species which accompany turtles are discussed. Much of this work has been published in O'Reilly *et al*. (2022).

14.40 Jude Wilson: The short-term impact of Eurasian beavers (*Castor fiber*) post reintroduction on amphibian abundance and diversity in a lentic environment.

15.00 John Smout (University of Glasgow): The molecular evolution of viviparity: analysing selection across the squamate family tree.
Abstract
The evolution of viviparity (live birth) from oviparity (egg-laying) has occurred more frequently in the Squamata than in any other vertebrate group: over 100 times. However, the genetic basis of viviparity in the squamates and other vertebrates, and the extent to which the evolution of viviparity is driven by convergent or parallel evolution at the genomic level is poorly understood. Natural selection drives the evolution of traits associated with viviparity and signals of these selective pressures are detectable at the genomic level. Here, I present preliminary results from our analysis of signals of selection in the molecular evolution of the Squamates. I include over 100 squamate species, harnessing the increasing availability of whole genomic sequence data for a wide range of squamate taxa. This analysis will reveal which genes change consistently across multiple squamate groups during the evolution of viviparity.

15.40 Short Talks and Posters:
Liam Templeton: Species on the Edge - coastal treasures of the eastern Solway.

Janet Ullman: Champhibians - a Scottish pond adoption scheme for schools.

Alexia Hesten (Liverpool John Moores University): Wildlife trade of reptiles and amphibians.
Abstract
The talk described the trade of reptiles and amphibians in the U.K. including investigating the risks of disease spill-over to native wildlife through swabbing of animals, and the use of questionnaires and interviews aimed at key stakeholders in the trade. In addition it outlined how the trade in herpetofauna has changed over time, in terms of supply chain, structure and sustainability, by analysing import data from the CITES database and other sources. Through this approach, it is hoped to shed light on a large, but poorly understood industry, and help to better inform both policy-makers and stakeholders in the trade, with the aim of improving the trade in the long-term.

Lauren Jeffrey, Tom Major & Wolfgang Wuster (Bangor University, north Wales): Habitat selection during movement pathways in the Aesculapian snake (*Zamenis longissimus*) in North Wales.
Abstract
The Aesculapian snake (*Zamenis longissimus*) is a widespread European species with two introduced populations in Regents Canal, London, and Colwyn Bay, North Wales in the U.K. The population in North Wales was introduced in the 1970s and is the northernmost extant population. Despite being present in the area for over 50 years, we still know very little

about their ecology due to their secretive behaviour. Snakes can also exhibit a high degree of individual heterogeneity in behaviour which complicates predicting their movements. The aim of this study was to investigate the movement ecology of the Aesculapian snake in their introduced range in North Wales to identify possible dispersal routes and constraints. Firstly, we wanted to identify which habitat features were selected along movement pathways. Secondly, we aimed to determine if snakes had a preference for anthropogenic features and hedgerows. Lastly, we set out to establish if roads act as a possible dispersal barrier constraining their ability for range expansion. We radio-tracked a total of seven adult male Aesculapian snakes five times daily between May and August 2022 using VHF telemetry and transmitters that were surgically implanted under anaesthesia. We used Integrated Step Selection Functions (ISSF) to estimate the relationship between movement and habitat selection by comparing used against available locations. Our findings showed snakes to have high individual heterogeneity. At the population level, Aesculapian snakes were positively associated with hedgerows, buildings, and scrub. Continued research and monitoring are needed to fully understand the capabilities, potential impacts, and to respond rapidly to any future changes.

16.15 Discussion Sessions:
Roger Downie (Lead): Topic 1: Should the international trade in wild-caught amphibians and reptiles be abolished?

Chris McInerny (Lead): Topic 2: The threats facing Scotland's herpetofauna, and what can be done about them.

17.00 Martha Stone-Shepherd and Ehm Downie: Report on Discussion sessions.

17.15 Roger Downie: Closing remarks.

Posters
Species on the Edge; Champhibians; Wildlife trade of amphibians and reptiles; Movement ecology of non-native Aesculapian snakes in north Wales (Fig. 2).

Stands
Froglife; Glasgow Natural History Society; Clyde Amphibian and Reptile Group; Amphibian and Reptile Conservation; British Herpetological Society; Friends of Angus Herpetofauna (Fig. 2).

ACKNOWLEDGEMENTS
We wish to thank all the speakers and poster providers for their presentations on the day and particularly those who wrote them up as a permanent record; also all helpers on the registration desk and refreshments table; the BLB grants committee, the British Herpetological Society, Froglife, Amphibian and Reptile Conservation, Amphibian and Reptile Groups UK, and the Friends of Angus Herpetofauna for providing funding to support the conference and for providing stands; Deborah McNeill for Glasgow Science Festival interactions, and ARC staff for assistance on the day.

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