

Phylogeographic Patterns of the Common Frog (*Rana temporaria*) in the UK



Grimason, N^{1*}, Martin, R¹, Maddock, ST^{1,2,3}

¹ Faculty of Science and Engineering, University of Wolverhampton, UK.

² Department of Life Sciences, The Natural History Museum, London SW7 5BD, UK.

³ Island Biodiversity and Conservation Centre, University of Seychelles, Seychelles.

* Corresponding author: N.grimason@wlv.ac.uk



INTRO AND AIMS

- Genetic approaches are increasingly used to address questions in evolutionary ecology and conservation [1,2].
- There are very few previous studies investigating the genetic diversity of common frogs (*R. temporaria*) in the United Kingdom [3,4].
- Rana temporaria* are widespread in Europe and the UK.
- The aim of this study was to investigate genetic diversity in *Rana temporaria* from across the UK.

RESULTS

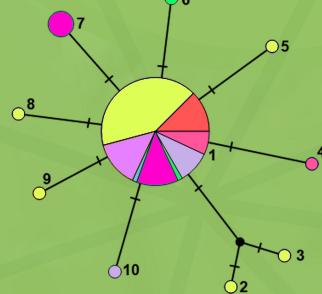


Fig 2 – Haplotype network based on the analysis of DNA sequences (541 bp) of the cyt b gene in 94 samples of *R. temporaria*. Colours correspond to each region as defined in fig 1. (1) UK wide haplotype, (2+3) Connemara, Scotland, (4) Cublin Forest, S Scotland, (5) Auchincarrow, S Scotland, (6) Bristol, SW England, (7) Kent, SE England, (8) The Mammes, S Scotland, (9) Dundee, S Scotland, (10) Telford, W England.



METHODS

- DNA samples were collected using buccal swabs to collect samples from across the United Kingdom.
- Samples were extracted using a Qiagen DNeasy Blood and Tissue Kit and the McHale's Salting-out method [5].
- PCR was used to amplify cytochrome b and 16s sequences.
- Haplotype networks were generated using PopART version 1.7 [6].

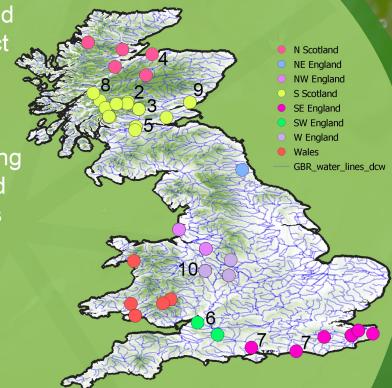


Fig 1 – A map of the UK (excluding Ireland) illustrating the distribution of the main regions of *R. temporaria*. Colours correspond to those used in fig 2.

DISCUSSION

- Little genetic diversity was observed across the UK, similar to findings from a previous study [4].
- The haplotype network identified nine unique haplotypes. All major populations were contained within the UK widespread haplotype.
- Complex geological features likely lead to higher genetic diversity in Scotland.
- Germany, France, Switzerland and Ireland all share haplotypes with the UK in the widespread haplotype. The UK and Spain also share two haplotypes.

RESULTS



Fig 3 – A map of Europe. Colours of countries on map correspond with colour in fig 4.

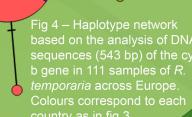


Fig 4 – Haplotype network based on the analysis of DNA sequences (543 bp) of the cyt b gene in 111 samples of *R. temporaria* across Europe. Colours correspond to each country as in fig 3.



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References

- Bates, K.A., Clare, F.C., O'Hanlon, S., Bosch, J., Brookes, L., Hopkins, K., McLaughlin, E.J., Daniel, O., Garner, T.W., Fisher, M.C. and Harrison, X.A. (2018) Amphibian chytridiomycosis outbreak dynamics are linked with host skin bacterial community structure. *Nature Communications*, 9(1): 1–11.
- [2] Hunter, P. (2018) The genetics of domestication: research into the domestication of livestock and companion animals' sheds light both on their "evolution" and human history. *EMBO reports*, 19(2): 201–205.
- [3] Muir, A., Biek, R., Thomas, R. and Mable, B.K. (2013) Local adaptation with high gene flow: Temperature parameters drive adaptation to altitude in the common frog (*Rana temporaria*). *Molecular Ecology*, 22(3).
- [4] Teacher, A.G.F., Garner, T.W.J. and Nichols, R.A. (2009) European Phylogeography of the common frog (*Rana temporaria*): routes of postglacial colonization into the British Isles, and evidence for an Irish glacial refugium. *Heredity*, 102: 490–496.
- [5] McHale, M. (2009) DNA extraction – Salting Out. Available at: https://openwetware.org/wiki/DNA_extraction_-_Salting_Out (Accessed date: 30/08/2022).
- [6] Leigh, J.W. Bryant D (2015) PopART: Full-feature software for haplotype network construction. *Methods Ecol Evol* 6(9): 1110–1116.

