

Grass Snakes (*Natrix natrix*) in Scotland

Chris Cathrine

Caledonian Conservation Ltd, Unit 5 Hillhouse Workshops, 37 Argyle Crescent, Hamilton, South Lanarkshire, ML3 9BQ

E-mail: chris.cathrine@caledonianconservation.co.uk

ABSTRACT

It is generally believed that grass snakes (*Natrix natrix*) do not occur in the wild in Scotland. However, recent confirmed records of grass snakes in Dumfries & Galloway encouraged a re-evaluation of existing data of the species in Scotland. The results demonstrate that the grass snake is present in Scotland, and provide a preliminary Scottish distribution for the species, with the known core range apparently being within Dumfries & Galloway and the Scottish Borders. Data also suggests that the grass snake may have been present in Scotland for some time, and is not a new arrival as a result of recent climate change or movements of agricultural material during the 2007 foot and mouth outbreak. The work has also proven a useful case study for biological recording, identifying a number of common sources of error even for a distinctive large vertebrate with relatively few records. Further research is required to clarify the status – both historical and current – of the grass snake, Scotland's rarest native reptile.

INTRODUCTION

It is generally believed that grass snakes (*Natrix natrix*) do not occur in the wild in Scotland, although they are sparsely distributed in both northern Cumbria and Northumberland (Beebee 2013; Inns 2009; Arnold, 1995; Arnold, 1983). While there are a number of records in Scotland, grass snakes were popular pets during the 20th Century, and records from the Central Belt have been attributed to captive escapees (Arnold, 1995).

However, on 10th May 2010 while undertaking great crested newt (*Triturus cristatus*) surveys for Caledonian Conservation Ltd on behalf of Amphibian and Reptile Conservation Trust (ARC) as part of a predictive habitat modelling project supported by Scottish Natural Heritage (SNH), Chris Cathrine recorded a grass snake in Dumfries & Galloway. The grass snake was flushed during newt egg searches, and Chris had excellent views of the distinctive pale neck collar as it swam into the pond, confirming the identification. The pond in which the grass snake was recorded was far from any population centres, and located at the border of semi-natural mixed

woodland and agricultural land, meaning it cannot be readily explained as an escaped pet, and is likely to be wild or feral. It is interesting to note that grass snakes had previously been reported where Chris Cathrine made his record in 2010, but had been dismissed out of hand without further investigation as they were not believed to be present in Scotland.

This find encouraged Caledonian Conservation Ltd to research other grass snake records in Scotland in partnership with Clyde Amphibian & Reptile Group (CARG), and an outline of results are provided here. As well as reconsidering the status of the grass snake in Scotland, this research also provides a useful case study of biological recording.

METHODS

Analysis of records

Original grass snake record data were gathered from as many sources as possible, including the National Biodiversity Network (NBN), Scottish Natural Heritage (SNH), Amphibian & Reptile Conservation Trust (ARC) and other charities, Biological Records Centre (BRC – including Arnold's 1995 atlas data), local records centres, local authorities, Amphibian & Reptile Groups and individuals. In addition, an appeal for additional records was made through media, with a dedicated Scottish Grass Snake recording scheme website being launched as part of the Record Pool online recording system (www.scottishgrasssnakes.org). Record Pool (www.recordpool.org.uk) is a joint project between Amphibian & Reptile Groups of the UK (ARG UK) and ARC, with the development of the Scottish Grass Snake recording page financed by Caledonian Conservation Ltd.

These data were then plotted in ArcGIS 10 (Fig. 1), and thoroughly verified. Verification involved checking grid references, notes, descriptions, habitat, context (with other Scottish and English grass snake records), local knowledge and provenance/recorder. In some cases recording schemes or original recorders were contacted for further information.

In total, 96 records of grass snake in Scotland have been collated, of which 32 were collected from the National Biodiversity Network (NBN) database. The process of thorough verification highlighted a number of categories of common data errors (Table 1). It was possible to address all sources of record error during this study, with the exception of race, which would require clear photographs and/or DNA analysis to determine.

Revised Distribution

After verification, four records can be confirmed as grass snakes in a wild environment – three from Dumfries & Galloway and one from the Scottish Borders (Fig. 2). These records range in date between 1920 and 2010, although three were recorded between 2009 and 2010. This is not necessarily an indication of recent colonisation however, but more likely reflects the difficulties in confidently verifying older records. None of these confirmed records are included in the NBN dataset.

A further eight remain as possible naturalised records that cannot be immediately explained as erroneous or escapes, and range in date from 1960 to 2004 (Fig. 2). Five of the possible records are from Dumfries & Galloway, and are from less experienced but reliable sources, from appropriate habitat and relatively near confirmed records.

A possible record from Loch Lomond is from a reliable source, but may relate to an introduced population as 200 grass snakes were released here at an unknown date in the late 20th Century.

Two independent records from Aberdeenshire in themselves seem unlikely, but in context become interesting as both are from the same catchment.

These possible records warrant further investigation, while surveys of Dumfries & Galloway will help determine the extent of this population.

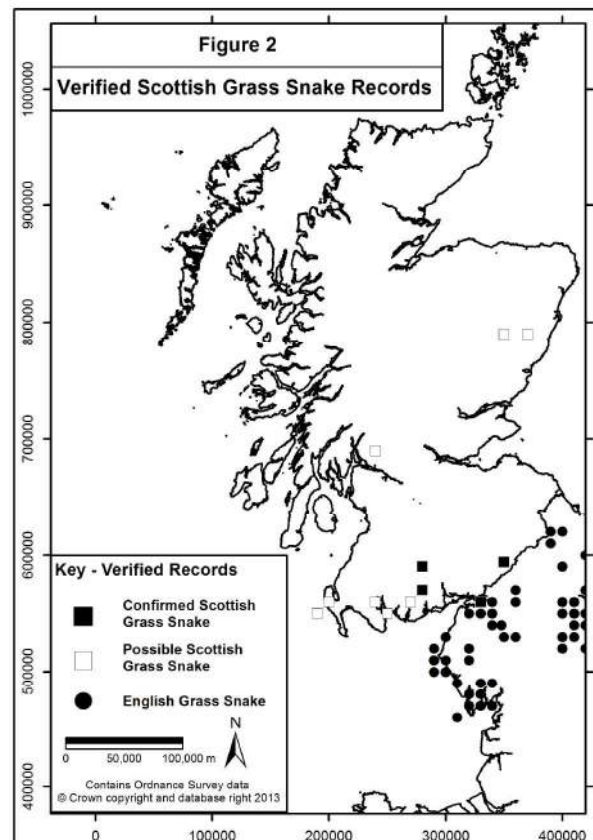
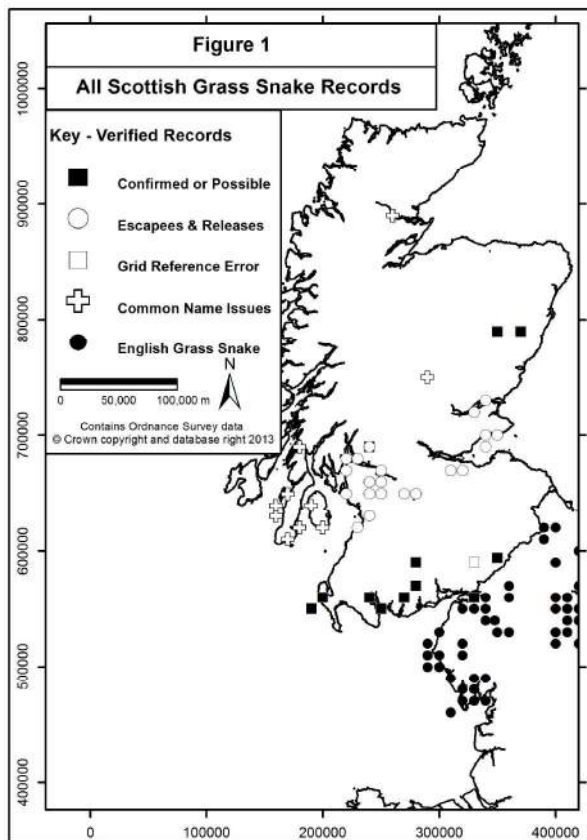


Fig. 1. All Scottish grass snake records and **Fig. 2.** Verified Scottish grass snake records.

Data Error	Description
Escapes	Grass snakes were popular pets during much of the 20 th Century, and there is a possibility that records from before the 1980s relate to escaped pets. Most of these records are from unsuitable habitat (e.g. urban amenity grassland areas). The possibility of escaped pets in populated areas meant that records from such locations during much of the 20 th Century could not be confirmed as wild grass snakes, and so were disregarded.
Releases	During the data search and verification process, this study found that 200 baby grass snakes were deliberately released into Loch Lomond during the late 20 th Century. However, it was not possible to confirm the date of release, and therefore any records from Loch Lomond could not be confirmed as wild grass snakes. As habitat is suitable for the species, there is a possibility that grass snakes may have been present in the wild prior to the release, but this cannot be confirmed.
Grid reference errors	Data entry errors are always a possibility, such as incorrect grid references. The most common error found lies with the unique two letter 100km National Grid square codes. Careful examination of notes and location names often reveals these errors. For example, the fairly well known Langholm population, which can be found in Arnold's 1995 atlas and on NBN, actually refers to a record from Windemere, where 'NY' was entered instead of 'SD', as revealed by the location name data.
Misidentification	A number of records were disregarded where the recorder was inexperienced or known to be unreliable.
Races	12 subspecies of grass snake have been described, although the true number is now widely accepted to be four (Arnold and Ovenden, 2002; Thorpe, 1984). Only one of the four subspecies is known to be native to the UK (<i>Natrix natrix helvetica</i>). Up to 15 distinct races of grass snakes are also thought to occur in Europe. Escaped pets have resulted in non-native races becoming established in the UK. For example, a population of grass snakes of Romanian origin have become established in Yorkshire and North East England (Nash, 2011). It was not possible to control for race in this study.
Common names	The common name 'grass snake' refers to the adder (<i>Vipera berus</i>) in Argyll & Bute, and to the slow worm (<i>Anguis fragilis</i>) in much of Scotland – particularly north of the Central Belt. However, previous recording projects have simply requested records of 'grass snakes' and so some people in Scotland will have submitted records of what they term 'grass snakes' quite genuinely. However, unknown to the organisation receiving these data these records refer to a different species. Some records clearly indicated alternative species based on habitat, description, notes and confirmation from recorders, and so were disregarded.

Table 1. Common record errors encountered during verification of Scottish grass snake records.

DISCUSSION

This study has confirmed that grass snakes are present in the wild in Scotland, with the core range apparently in Dumfries & Galloway and the Scottish Borders (Fig. 2). Given grass snakes are known to occur in Cumbria and Northumberland reaching the border between England and Scotland, this find does not seem surprising. This also appears to offer a more realistic and refined northern edge to the distribution of this species in the UK when compared with the straight line found at the border between these countries in recently published distribution maps (Beebee, 2013; Inns, 2009). Although it is not possible to determine if they are a recent arrival or have been present far longer, records are beginning to suggest grass snakes may have been present as naturalised populations for some time. For example, the lone confirmed record from the Scottish Borders actually refers to several grass snake sightings at the

same location between 1942 and 1945, and a possible record from the Rhinns of Galloway is from 1966. These older records are in remote locations unlikely to be associated with escaped pets, suggesting persistent populations have existed in Scotland for some time, and that grass snakes are not as recent an arrival as some potential explanations of new records would suggest (for example having been introduced with agricultural movements during the foot and mouth outbreak in 2007, or a new colonisation as a result of climate change).

A common reason cited for grass snakes not occurring in Scotland is that the climate is too cold to support the development of eggs, and that this is why the three widespread native reptiles in the country are all viviparous (Buckley and Cole, 2004). However, it should be noted that there is an established introduced population of sand lizards

(*Lacerta agilis*) in the Western Isles – an egg laying species (Beebee, 2013; Inns, 2009; Bowler and Hunter, 2007; Buckley and Cole, 2004). Grass snakes occur at higher latitudes in Scandinavia, where they are known from 58°12'N in Sweden, which is further north than the Aberdeenshire records (Löwenborg *et al.* 2010). Elsewhere the northern extent of the range of this species has been found to be at least 64°24'N, which is more northerly than the limit of mainland Scotland (Löwenborg *et al.* 2010). Grass snakes become an increasingly synanthropic species further north in their range, relying on anthropogenic features such as compost heaps and manure piles for egg laying sites (Hagman *et al.* 2012; Löwenborg *et al.* 2010). Although this study cannot confirm whether grass snakes are presently breeding in Scotland, it is interesting to note that all confirmed records and most possible records are in or near areas offering semi-natural woodland, freshwater habitats and agricultural land that may provide manure piles and compost heaps for egg laying.

There is no inherent biological or ecological reason that grass snakes would not occur naturally in Scotland. Post-glacial colonisation of the UK by some animals involved multiple events following different routes, or successional waves with different races persisting in the north after they had been replaced in the south (Searle *et al.* 2009; Piertney *et al.* 2005). The habitat and climate has also differed historically, allowing animals to establish populations throughout the country which have subsequently become isolated as conditions changed – for example great crested newts in the Inverness area have recently been found to represent a native population which has become isolated (Jehle *et al.* 2013). These possibilities should not be dismissed when investigating grass snake distribution in Scotland, as the species may potentially have colonised the country during a period with more favourable climatic conditions. However, if grass snakes are a recent arrival to Scotland, it is possible that topography and habitat may prevent the Dumfries & Galloway population from expanding north.

Further research is required to clarify the range and origins of Scottish grass snakes. In particular, photographs and/or DNA studies may help address the race question, while targeted surveys may determine whether grass snakes are breeding in the wild in Scotland. Encouraging further recording amongst experienced biological recorders and the wider public will also help provide a clearer picture of the distribution and status of this species in Scotland.

The study has also highlighted that record errors go unnoticed and can become part of widely referenced datasets such as NBN and atlases (e.g. Arnold's 1995 atlas of amphibians and reptiles) even in relatively small datasets. It has also shown that common names can be a confusing issue even for a

charismatic and easily identified vertebrate such as the grass snake, and so the importance of using scientific names when recording cannot be stressed enough. It is essential that records are thoroughly verified, particularly in the case of datasets that are often used to inform the decisions of ecological consultants and Planning Authorities.

Further work is clearly needed to clarify the status – both historical and current – of what is Scotland's rarest native reptile. It is hoped that surveys in the Scottish Borders and Dumfries & Galloway will be undertaken in 2014 to gain a better understanding of the current Scottish range of the grass snake.

ACKNOWLEDGEMENTS

A great many individuals and organisations have provided both records and support during this work, and it is not possible to list them all here – needless to say reconsideration of a species distribution, even one so poorly recorded as the grass snake in Scotland, is a huge collaborative undertaking. Those who have provided particular support, encouragement and insight, and who deserve particular thanks, include John Baker, Frank Bowles, Jon Cranfield, Chris Gleed-Owen, Pete Minting, Erik Paterson and John Wilkinson. In addition, Caledonian Conservation Ltd, Amphibian & Reptile Groups of the UK, Clyde Amphibian & Reptile Group, Amphibian & Reptile Conservation Trust and Buccleuch Estates have provided invaluable support.

This research and the distribution maps include data provided by ARC, BRC, British Trust for Ornithology/ARC, CARG, Dumfries & Galloway Environmental Resources Centre (DGERC), Environmental Records Information Centre North East (ERIC), Fife Nature Records Centre (FNRC), Frank Bowles, Glasgow Museum Resource Centre, John Durkin, NBN/BRC, NBN/National Trust for Scotland (NTS), North East Scotland Biological Records Centres (NESBReC) and Cumbria Biodiversity Data Centre at Tullie House Museum. In addition, records have also been provided by individuals through direct correspondence and via Record Pool.

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