Distribution of the alpine newt *Ichthyosaura alpestris* in Great Britain updated using social media

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ABSTRACT - The alpine newt (*Ichthyosaura alpestris*) is an alien species in Great Britain. Using location information derived from photographs posted on social media we have updated its known distribution, validated previously unconfirmed populations, and present an updated distribution map. Comparison of the records collected from social media with those in the National Biodiversity Network Atlas indicates eleven new confirmed populations, although three of these had previously been shown as unconfirmed records in the NBN Atlas. The new records have been deposited with NBN.

INTRODUCTION

The alpine newt (*Ichthyosaura alpestris*) is a medium-sized newt that is an alien species in Britain (Speybroeck et al., 2016). In the second half of the twentieth century, alpine newts were popular as pets. It is likely that introductions of this species stem from intentional releases or accidental escapes from private collections (Beebee & Griffiths, 2000). A number of populations are known throughout Britain, from Scotland and Wales to southern England (Beebee & Griffiths, 2000), although it is likely that further populations exist, which are yet to be discovered. The true extent of the alpine newt's distribution in Britain is always changing and it has been some time since the population was assessed, despite some efforts to document where they can be found (Banks, 1989).

The impacts of alpine newts on native species are not currently known, although alpine newts may threaten native newt species through competition, or by acting as vectors of disease (Bell, 2016). Alpine newts are known vectors of the lethal amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), which may be spread to native species through both direct and indirect contact. Alpine newts are also susceptible to a different species of chytrid fungal disease, *B. salamandrivorans*, which is yet to be recorded infecting wild newts in Britain (Cunningham et al., 2019). Being an alien species, alpine newts should be removed from any habitats where they are caught, which would facilitate the taking of samples to check for disease. Management of introduced species is vital to reduce their impact on native species. To assist this, the distribution of a non-native species must be known in order to monitor populations, or control them if necessary.

Digital images posted on the internet are increasingly becoming a source of useful data for conservation science (Chamberlain, 2018; Toivonen et al., 2019). Public user-generated content, uploaded to social media, can provide valuable information about both where and in what context certain species are found, and this method has proven a reliable approach to recording the presence of introduced species, such as terrapins (Allain, 2019). In the current study, online data about alpine newts in Britain were collected from social media websites and, together with pre-existing records, used to plot an up-to-date map of alpine newt distribution to aid the future management of this species.

METHODS

Following the same methodology as Allain (2019), we used a number of standard keyword phrases (Table 1) to search for social media posts that included alpine newt photographs. The searches were for images of newts taken only between 2008 and 2020 on the image-sharing platforms Flickr and Instagram and the social media platforms Facebook and Twitter. On Flickr, the date a photograph was taken was determined with reference to the image metadata; for posts from Facebook, Instagram, and Twitter, the photograph date was assumed to be within two months of the date of the online post. All results from these searches were checked to capture information from photographs taken only in Britain. Any locations stated in the photograph description or metadata were recorded, along with any other metadata, including the photographer's username and the post URL; this was necessary to minimise the chance of duplications within the dataset.

Search results were then subjected to a data cleaning process, which involved manually sorting and removing photographs of captive individuals, duplicate images, and other non-relevant photos. For each keyword search, dozens of hits were returned; however, each search returned only a small number of posts containing relevant photographs. In cases where it was unclear where the photograph was taken, contact was made with the user who had posted the photograph to verify the sighting location. Locations listed were georeferenced, and the location's grid reference, latitude, and longitude estimated using UK Grid Reference Finder (https://gridreferencefinder.com/). In some instances, this was a water body, but in others the location was terrestrial habitat, which would be expected as alpine newts spend part of the year on land.

Using the data collected, a map was created to compare with the dataset available from the National Biodiversity Network (NBN Atlas, 2021). A full listing of the NBN citations can be obtained from the corresponding author on request. Differences between the two datasets were noted, and used to infer new records of the species. Data from Record Pool was omitted from our study, due to a lack of any significant difference from the NBN Atlas data. A standard spatial analysis approach was used to plot photograph location points on a map. All mapping was completed using QGIS 3.12 (QGIS Development Team, 2020).

RESULTS

The searches on Flickr demonstrated a negative relationship between the precision of a search term and the number of results yielded (Table 1). There was considerable variability in the number of records found between the four social media platforms (Fig. 1) with Flickr returning the largest number of posts (20) and Facebook returning the highest proportion of usable posts (75 %). No posts were found that were duplicated between the platforms. Despite our best efforts to contact the photographers of alpine newts on these platforms, individual photographers were not always available or willing to provide the information.

Table 1. Numbers of photographs returned by Flickr in response to various search terms for new British records of alpine newts and the number of photographs that were actually of alpine newts

Search term	Total no. of photos returned by search	No. of photos of alpine newts
Alpine newt*	1353	1131
Alpine newt UK	21	21
Alpine newt Britain	40	39
Alpine newt England	56	1
Alpine newt Wales	55	0
Alpine newt Scotland	63	8
Ichthyosaura UK	1	1
Ichthyosaura Britain	7	7
Ichthyosaura England	0	0
Ichthyosaura Wales	0	0
Ichthyosaura Scotland	8	8

* This search term returned photos of alpine newts within their wider European range, as well as a number of captive individuals
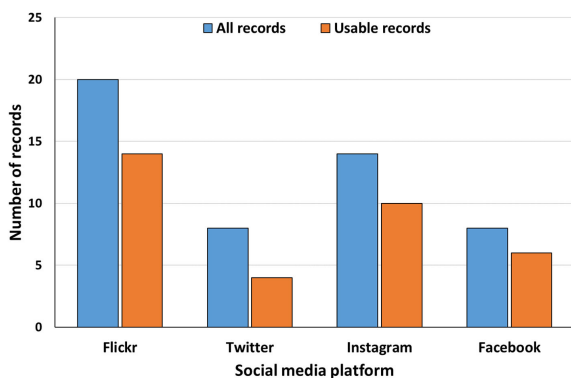

Figure 1. Total number of records and number of 'usable' records of alpine newts obtained from various social media platforms. Flickr provided the most records whereas Facebook provided the highest proportion of usable records.

Considering all observations collected from the four social media sources, the period from 2008 to 2012 yielded no more than a single record per annum, but from 2013 there was a sharp rise with returns averaging 5.4 per annum (range 2 to 9) (Fig. 2). Comparisons of observations collected from social media with records on the NBN Atlas, indicate eleven
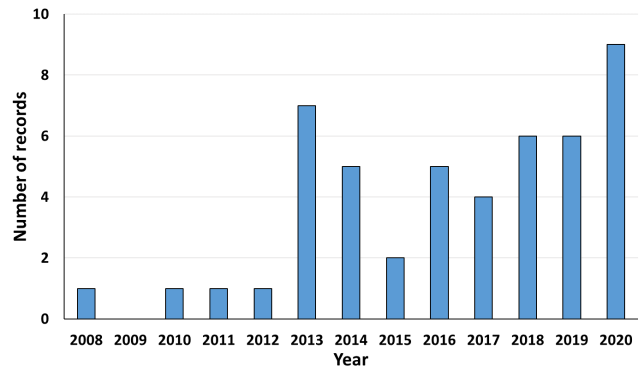

Figure 2. The number of alpine newt records (N = 48) dated from 2008 to 2020 retrieved from four social media platforms in 2020. There was a noticeable increase in records from 2013 onwards. Each of the four single records from 2008 to 2012 represent different populations.
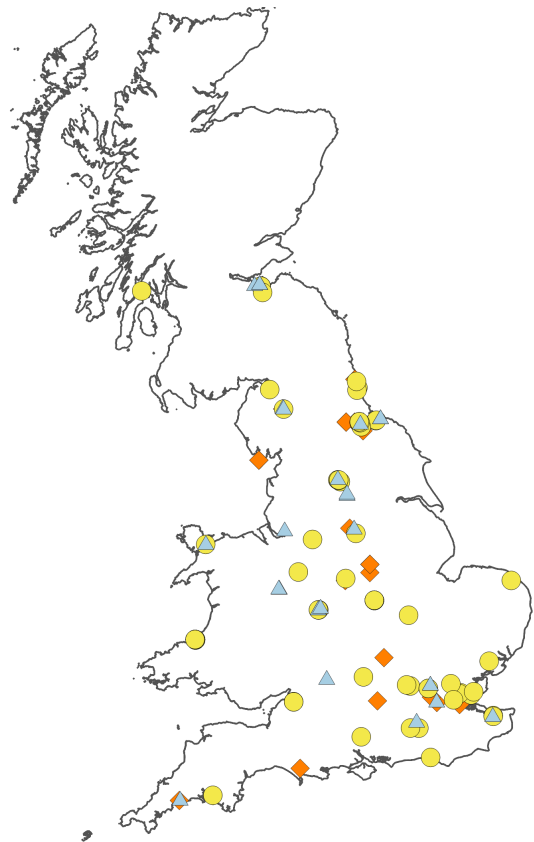

Figure 3. An updated distribution map of alpine newt (*Ichthyosaura alpestris*) populations in Britain: yellow circles – current confirmed NBN records; orange diamonds – current unconfirmed NBN records; blue triangles – new records from the current study. Eight of the 16 populations identified in the current study have no overlap with any previously recorded alpine newt populations.

new populations (Fig. 3). Three of these are at locations that were previously unconfirmed on the NBN Atlas (Barrow-in-Furness, Fowey, and Lewisham). Other newts photographed were all from previously-known populations.

DISCUSSION

Using the methods described above, new alpine newt populations within Britain were successfully confirmed. This additional data highlights the substantial potential of social media as a data source, to identify populations and track the spread of a non-native species. The limitations of this approach include the assumptions that the social media user can correctly identify the animal photographed, and that in the caption or description social media users would employ standard English, English common names, or scientific names, and the correct spelling. In addition, certain search terms, for instance 'Alpine Newt Britain', returned a large number of relevant results. However, a large proportion of these results were multiple photos of a single individual, and therefore these results were not included in the final dataset, after manual data cleaning. The previous scientific names for alpine newts, *Mesotriton alpestris* and *Triturus alpestris*, were not included in searches, because the widespread use of *Ichthyosaura alpestris* predates the earliest year of the study period, 2008 - 2020.

At the time of writing, the National Biodiversity Network (NBN) Atlas held 134 pre-existing British records of *I. alpestris*. However, not all of these records date from within the study search period, 2008 - 2020. Sixteen NBN records between 1972 and 2007 were removed from the dataset before it was mapped. Of the pre-existing records dating from 2008 - 2020, only 86 records had been accepted by NBN, with the further 32 being unconfirmed. The current study increases the number of confirmed records by 40 % and it is hoped this data will assist land managers and conservation organisations in the future, should it be necessary to manage alpine newt populations. With this in mind, it is likely that further populations remain to be identified; conservation organisations must continue to encourage the public to look for and submit records of this species to recording schemes. All data collected in this study were submitted to the NBN Atlas.

Our results indicated that from 2013 to 2020, there were significantly larger annual numbers of posts containing photographs of alpine newts (Fig. 2). This may result from a number of factors, such as increased awareness of alpine newts, or annual conditions being unfavourable to alpine newt breeding and dispersal, therefore making them more conspicuous. The noticeable lack of records before 2013 may be a consequence of older online content being removed by the original content creator. However, this explanation is uncertain, as very little research has examined the patterns of removal of online content. Therefore we feel it is more likely a consequence of the sudden rise in the popularity of social media platforms, among the general public.

Methods for collecting presence-absence data from social media may make use of automation. Such techniques may include automated text mining (e.g. web scrapers),

for analysing photo descriptions and other text associated with each photo (Hernandez-Castro & Roberts, 2015). These could be used to search for a specific phrase such as 'alpine newt', alerting the user to that post on a target website. However, the expertise and time needed to create a web scraper may not be required when targeting a single species, on a single platform (Stringham et al., 2021), and, in this context, a manual search approach would be more appropriate. Automated image classification can be used to filter the search results, helping to speed up the process of data cleaning when coupled with manual image sorting. These methods could be also used to create an 'early warning' system for new uploads of alpine newt photos (or another target species) to social media platforms such as Flickr.

Through this study, it has become apparent that not every social media user is willing or able to provide the data needed to map the distribution of the species they have photographed. If the photographs were taken a significant time ago, it may be that users simply cannot recall the location in which they photographed the individual in question. It is also worth noting that previous website users may no longer be active on websites; this may mean that contacting them for their data is very difficult. These are important considerations when using this methodology for future studies.

Future research should make the most of other national recording schemes, to increase knowledge of alpine newt distribution in Britain. Efforts must continue to record the distribution of alpine newts in Britain, while researchers must also establish the threats they pose to our native amphibians.

ACKNOWLEDGEMENTS

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