



First records of the greater white-toothed shrew *Crocidura russula* from Great Britain



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First records of the greater white-toothed shrew *Crocidura russula* from Great Britain

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ABSTRACT

The presence of the greater white-toothed shrew has been confirmed from two sites in the borough of Sunderland in North East England. These represent the first records of the species in Great Britain. Dated photographic evidence indicates that the species has been established in that area since at least 2015. Research is required to ascertain the extent of its current distribution in Great Britain and its impacts on native small mammals and ecosystems more generally.

INTRODUCTION

The greater white-toothed shrew (*Crocidura russula*) has a primary distribution range in North Africa and western Europe as far north as the Netherlands (Aulagnier et al, 2009). In the British Isles, it only occurs naturally on the Channel Islands of Guernsey, Alderney and Sark, though there is some debate as to whether even those occurrences reflect its natural distribution or an early introduction (Churchfield, 2008). There are no historical records of it having ever existed in Great Britain or Ireland

in the post-glacial period, but in 2007, it was discovered in Ireland when barn owl (*Tyto alba*) and kestrel (*Falco tinnunculus*) pellets were analysed for their small mammal contents (Tosh et al, 2008). Subsequent modelling inferred that it may have been present in Ireland since the early 2000s (McDevitt et al, 2014). The means of its introduction remain speculative but accidental transport via the horticultural trade from France is thought to be a likely pathway (Gargan et al, 2016).

SPECIMENS

In September 2021, one of the authors (MY) posted a photograph on Facebook (Meta © 2022) showing the head of a shrew that her cat had caught in Easington Lane, a town in North East England (Figure 1 e). At that point, the shrew was alive and was tentatively identified from the photograph by another of the authors (IB) as a white-toothed shrew. The specimen, which subsequently died, was kept frozen until examined by IB in September 2022, who confirmed the identity as a *Crocidura* species of shrew based on the diagnostic features of long, wispy hairs on the tail and the white-tipped incisors (Churchfield, 2008). Identification to species level was subsequently determined using DNA from a sample of belly skin, with the analysis undertaken by the company Ecotype Genetics. Species identification was initially confirmed using a species-specific real-time PCR approach targeting the cytochrome *b* gene (O'Meara et al, 2014) and was then further confirmed by sequencing a

small region of the 12S rRNA gene following Xie et al, (2015). A BLAST search of the sequence returned a 100% match to *C. russula*.

Independently of the above record, in August 2022, ecologists working for Wardell Armstrong collected unidentified droppings from a sandstone retaining wall on a site in Houghton le Spring, approximately 5 km to the northwest of Easington Lane. These faecal samples were sent to SureScreen Scientifics and a small region of the cytochrome c oxidase subunit 1 was amplified and sequenced following Walker et al, (2016) and returned a 100% match to *C. russula*. The ecologists working on the site could hear shrews audibly and noted that the calls came from gaps in the sandstone wall (Tim Palmer, pers. comm.)

The locations of these confirmed records are shown in Figure 2.

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Figure 1. The Easington Lane specimens from July 2015 to July 2022, presenting the thicker snout, prominent ears and thinner, less hairy tail of *Crocidura* shrews that distinguishes the genus from *Sorex* shrews.

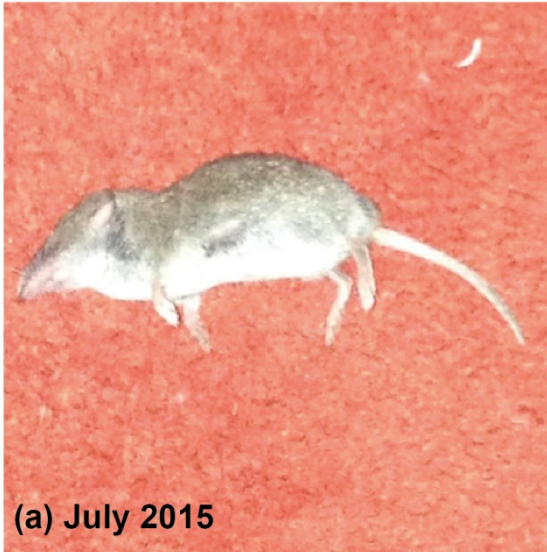
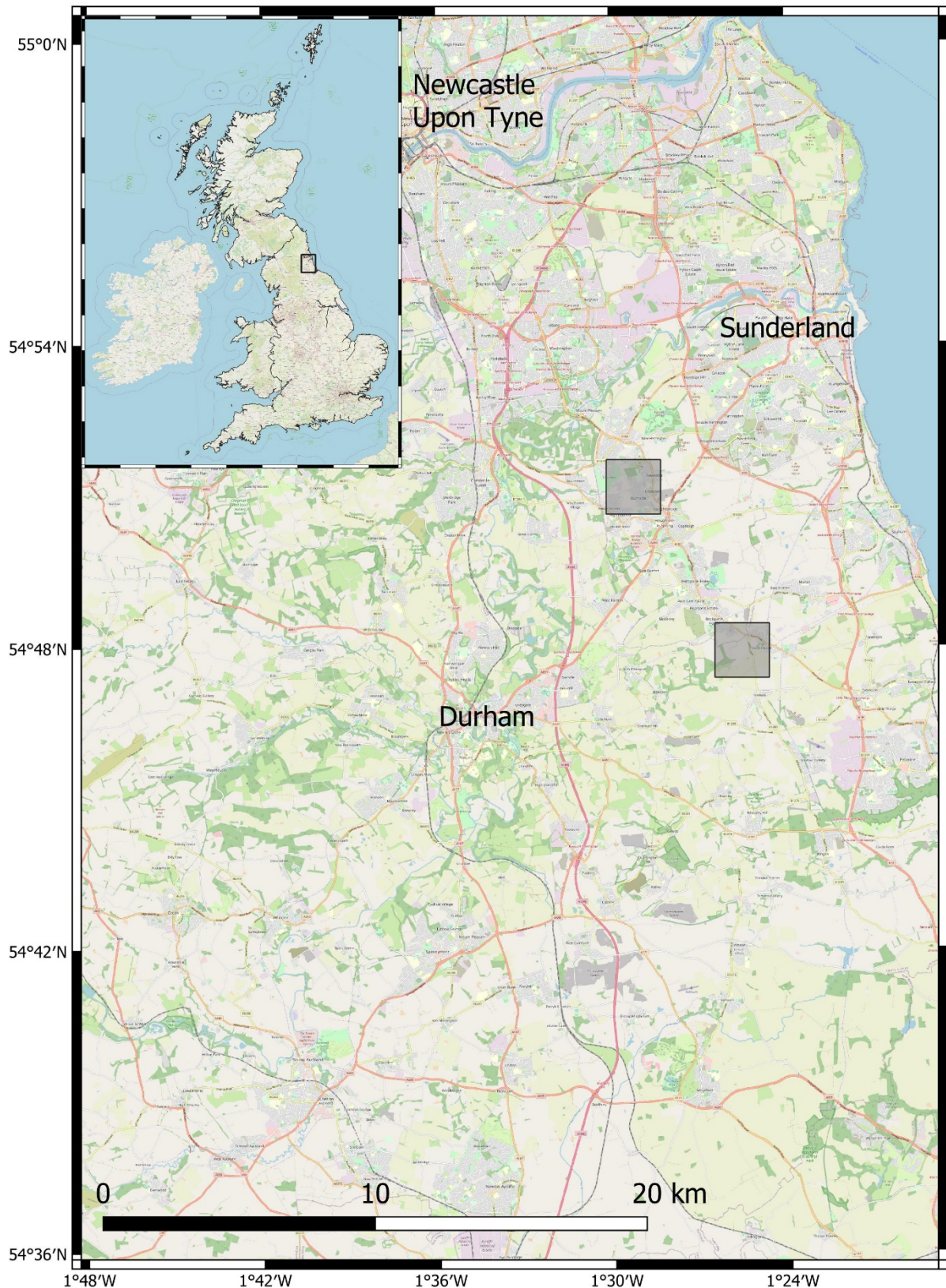


Figure 2. Locations of DNA confirmations of *Crocidura russula* presented as 2 km ordnance survey grids.



Following the identification of the Easington Lane specimen, MY produced further photos of shrews caught by her cats that she had posted on Facebook. These also clearly resembled white-toothed shrews and based on the dates of the posts, spanned a range of years, from July 2015 to July 2022 (Fig. 1). As the cats are kept

exclusively indoors all shrews were caught in the house or garage. The cats had also caught a shrew in 2014, which was not photographed, that may also have been *C. russula*. The species has therefore been present in North East England for at least seven years and potentially longer, depending on the time of introduction.

DISCUSSION

The identification of genetically confirmed *Crocidura russula* records represents the finding of a new species in Great Britain. If this species becomes established it would represent the first non-native (non-volant or non-marine) mammal to do so since the American mink *Neovison vison* in the 1950s (Lever, 2009). In its native range, *C. russula* is sympatric with species found in the small mammal community of Britain and Ireland and its addition to the native fauna could be predicted to be relatively innocuous. However, in Ireland, this has not been the case. Since its discovery in 2007, *C. russula* has spread rapidly in Ireland, with estimates of 5.5 km/yr with additional 'jumps' aided by human-mediated dispersal (McDevitt et al 2014). This establishment is strongly associated with the local disappearance of the pygmy shrew *Sorex minutus* (Montgomery et al, 2012; McDevitt et al, 2014). Evidence from DNA metabarcoding of their respective gut contents now points to dietary competition between these shrews being the main driver of this species replacement (Browett et al, 2023). In addition to the impact on *S. minutus*, the addition of *C. russula* to the small mammal community of Ireland may also affect other species through synergistic interactions (Montgomery et al, 2012).

Whether such impacts would be experienced in Great Britain is currently difficult to predict. In Ireland, *S. minutus* was previously the only species of shrew and until the early twentieth century, it, and the wood mouse *A. sylvaticus* were the only non-commensal members of the small mammal community (Yalden, 1999). It has been speculated that this reduced exposure to competition may have left *S. minutus* unable to co-exist with another species of shrew (McDevitt et al, 2014; Browett et al, 2023).

In Great Britain, the small mammal community is more complex than in Ireland. *S. minutus* has co-existed with two other species of shrew throughout the Holocene and partial resource partitioning between species has occurred, for example between *S. minutus* and the Common Shrew *S. araneus* at upland sites in northern England (Butterfield et al, 1981). While *C. russula* is known to displace other shrews on islands (Cornette et al, 2015), on the island of Belle Ile, France, *S. minutus* continues to co-occur with *C. russula* (McDevitt et al, 2014). In continental Europe, Guelet et al (2008) found no evidence of competitive exclusion between *C. russula*

and Millet's Shrew *Sorex coronatus* (a sister species to *S. araneus*) where the two species co-occur.

A further factor to consider when comparing the potential impact of *C. russula* in Great Britain with Ireland is the different geographical and climatic aspects, for instance, the greater latitudinal distribution of Great Britain.

Crocidura species have a more southern distribution than *Sorex* species (Churchfield, 2008) and *C. russula* is more associated with human habitation at the northern edge of its distribution (Guelet et al, 2008). In an area of Norway, with a similar latitude and small mammal community to North East England, a *C. russula* population first recorded in 2012 was not found to have any significant effects on the occupancy of either *S. minutus* or *S. araneus* (Talleraas, 2021). Subtle differences between shrew populations (Browett et al, 2023) and climatic gradients (Neves et al, 2021) are also likely to have significant effects on species co-existence, but how these differences would play out in Great Britain is unpredictable, and the potential for a negative impact similar to that in Ireland is a possibility.

As noted above, *C. russula* has been present in North East England for at least seven years. Assuming a similar dispersal rate to that which has occurred in Ireland then it could have potentially colonised most of County Durham. The fact that it has gone for so long without discovery reflects how small mammals are relatively under-recorded (Crawley et al, 2020). As Griss (2012) observed, *S. minutus* is probably the most under-recorded mammal in North East England, with post-2000 records covering only 28 out of 120 hectads. Baseline data on native small mammals must be obtained, not just on their distribution but also on relative abundance and species assemblages. Without this data, it would be impossible to ascertain what impact the introduction of *C. russula* will have on the distribution and abundance of native small mammals. To this end, the Mammal Society encourages the submission of records of all shrew species via the Mammal Mapper App (<https://www.mammal.org.uk/volunteering/mammal-mapper/>), which should be accompanied by a photograph ideally showing some of the features illustrated in Figure 1. This is needed as much in areas where *C. russula* currently does not occur as in those where it does as the one element that is predictable with this introduction is that the species will continue to spread.

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