

The Distribution and Status of the Polecat (*Mustela putorius*) in Britain 2014-2015

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Photograph: Polecat under shed in Essex, September 2014 © Simon Wood.

Summary

- A total of 1761 records of polecats and polecat-ferrets were collected from mainland Britain from January 2014 to December 2015.
- Of the records received, 42% were verifiable on the basis of photos or video footage provided. Of the verified records, 74% were classified as true polecat, 25% were classified as polecat-ferret and 1% were classified as ferrets, based on phenotypic characteristics.
- 50% of records received were road casualties, 36% were live sightings, 5% were animals caught alive in traps, 4% were animals found dead and not obvious road casualties, 4% were animals recorded on camera traps and <1% were from an unspecified or other source.
- Verifiable records of true polecats were received from 370 hectads (10km x 10km squares) in Britain. Verifiable records of polecat-ferrets were received from 145 hectads.
- Verifiable records of true polecats were received from several vice counties where true polecats have not been recorded in previous distribution surveys; these are South Somerset, North Devon, South Devon, East Cornwall, East Kent, East Suffolk, West Norfolk, Cambridgeshire, South Lincolnshire, South Lancashire, South-west Yorkshire, North-west Yorkshire, South Northumberland, Dumfriesshire and Angus.
- Polecats are maintaining their range in their historical stronghold of Wales and the West Midlands. The polecat's range has expanded considerably in south-west England and East Anglia. There has been little change in polecat distribution in much of northern England, although the polecat population in Cumbria is expanding into parts of western Northumberland and a population appears to be present in the eastern Yorkshire Dales. There has been little change in polecat distribution in Scotland. Polecats appear to be re-colonising Dumfriesshire and the reintroduced population in Perthshire and Angus remains established.
- Polecats are now more widespread in Britain than at any time in the last 100 years.
- 266 carcasses were collected for research. Carcasses will be used to investigate anthropogenic hazards to polecats, such as exposure to rodenticides and subsequent secondary poisoning.

1. Introduction

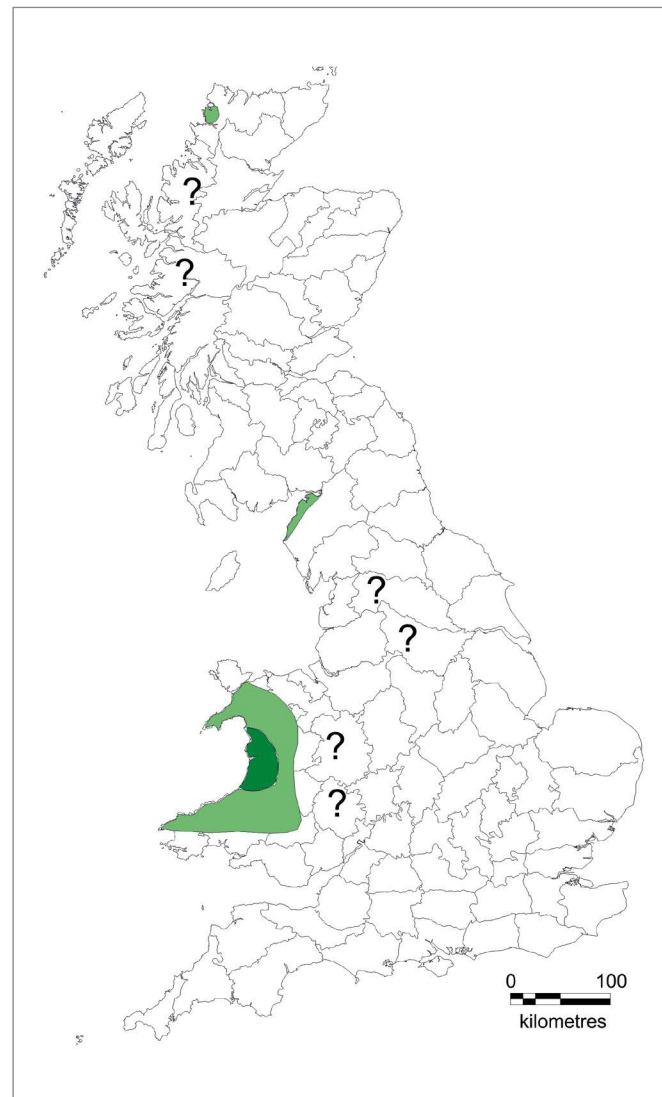
1.1 Introduction to the polecat

The polecat *Mustela putorius* is a native British mammal and a member of the mustelid (weasel) family. It is a similar size to a ferret, with a long slim body, dark fur and a 'bandit-like' mask of dark and light fur on its face. The polecat, a solitary animal, occupies a variety of habitats, from farmland to woodlands to coastal sand dunes, and it typically dens in rabbit burrows, log piles, hay stacks and farm buildings. Its diet principally comprises rabbits, small rodents, amphibians and small birds. Polecats mate during February to March and then gives birth to an average of four to six young (kits) during May to June.

1.2 History in Britain

In the past the polecat was widespread and common in Britain, with an estimated population of 110,055 during the Mesolithic period (Langley & Yalden, 1977; Maroo & Yalden, 2000). The population underwent a severe decline and range contraction during the 19th century, which coincided with the rise in the sporting estate and gamekeeping profession (Langley & Yalden, 1977). By 1915, the polecat had become extinct across much of Britain and confined to a stronghold in mid Wales, with small populations in Herefordshire, Shropshire, parts of northern Scotland, Yorkshire and Cumberland (Langley & Yalden, 1977) (see Figure 1). From the 1930s onwards, the polecat population began to recover in Wales, attributed to a reduction in gamekeeping pressure during and following the First World War (Langley & Yalden, 1977). During the 20th century, polecats expanded their range from Wales into the Welsh borders and parts of the English Midlands (see review of previous surveys in Birks & Kitchener, 1999).

Figure 1: The distribution of the polecat in 1915 (after Langley & Yalden, 1977). Dark green indicates widely distributed, pale green indicates rare, declining or localised, ? = status uncertain but probably extinct, and white indicates extinct or data lacking.



1.3 Previous distribution surveys

In order to map the extent and pattern of polecat range expansion, a systematic distribution survey was undertaken by The Vincent Wildlife Trust (VWT) during 1993-1997 (Birks & Kitchener, 1999). This survey demonstrated that the polecat was well-established and widespread in Wales and had become re-established in the English West Midlands, with a continuous distribution from the southern fringes of Manchester to south Gloucestershire, and from the Welsh borders to the Peak District, Northampton and Oxford (Birks & Kitchener, 1999). Beyond this, populations originating from reintroductions were established in Cumbria, the East Midlands, central southern England and the West and Central Highlands of Scotland (Birks & Kitchener, 1999).

A second survey was carried out during 2004-2006, which confirmed a continuation of the polecat's range expansion (Birks, 2008) (see Figure 2). The polecat remained widely re-established in Wales and central England, with the persistence of outlier populations in northern England and Scotland (Birks, 2008). The main areas of recent range expansion documented by the survey were Derbyshire, Buckinghamshire, Berkshire, North Wiltshire, Dorset, North Hampshire and South Hampshire (Birks, 2008).

1.4 Survey aims

Polecat distribution surveys at ten-year intervals have been recommended in order to monitor changes in polecat distribution (Birks & Kitchener, 1999). The aim of this survey was to gather up-to-date information on the distribution of polecats and polecat-ferrets during the period 2014-2015. An additional aim was to collect carcasses for further research, such as polecat exposure to second-generation anticoagulant rodenticides.

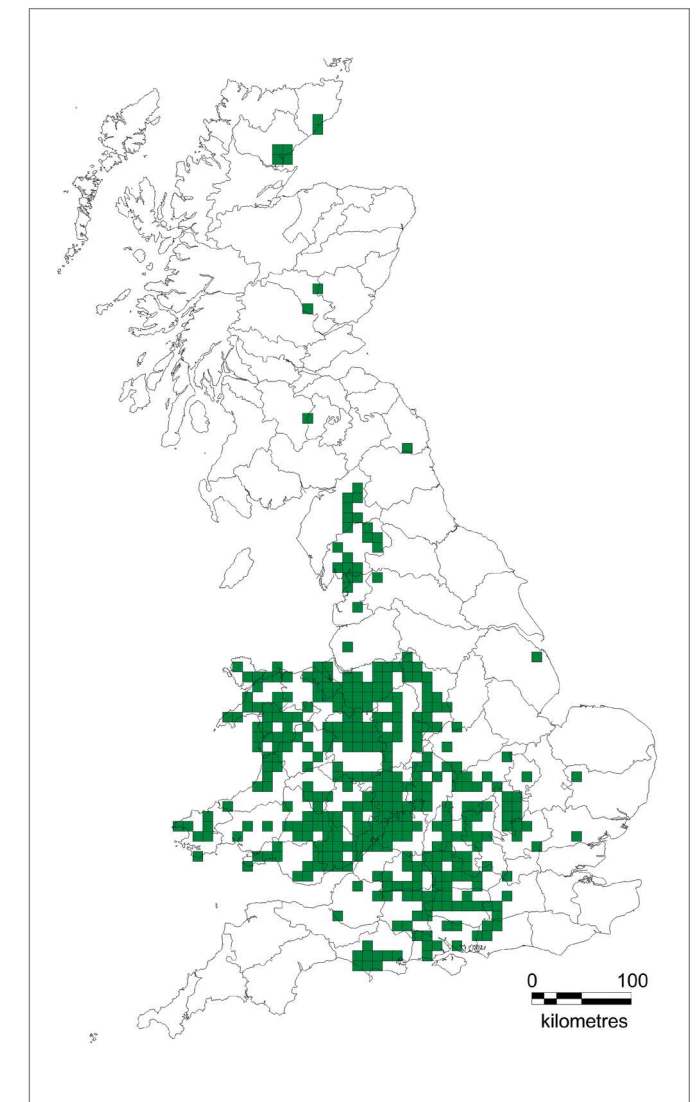


Figure 2: The distribution of verifiable records of true polecats during 2004-2006 (after Birks, 2008).

2. Methods

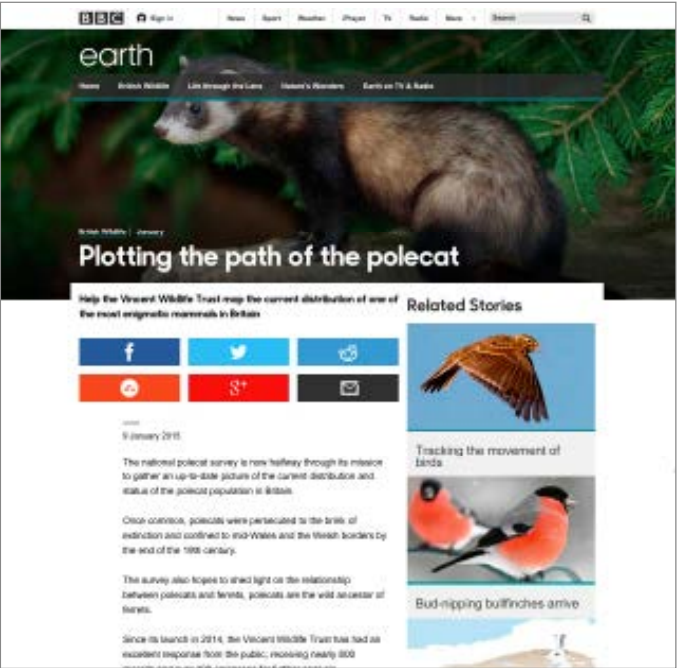
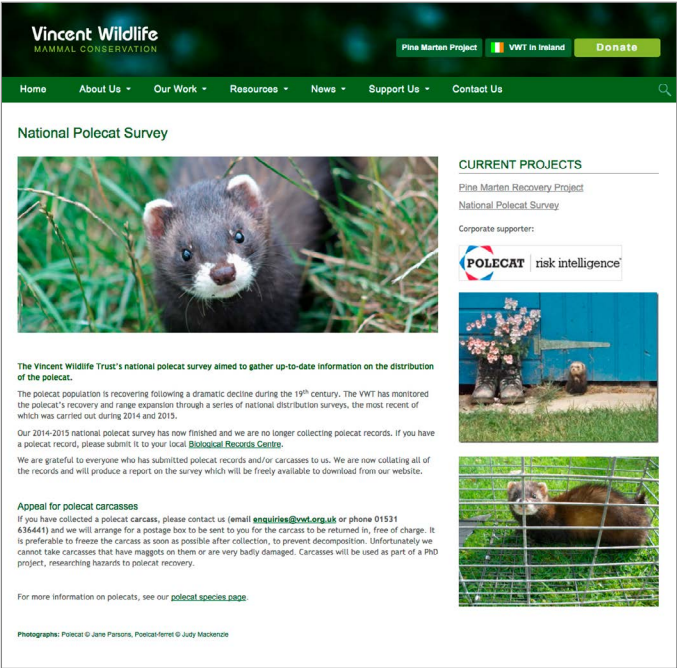
2.1 Record collection

Records of polecats and polecat-ferrets were collected from mainland Britain from January 2014 to December 2015. Several carcasses collected from outside of the survey period (from 2011-2013) were also included in the records. For every record, the location (a six-figure grid reference where possible), date and origin of record (road casualty, live sighting, live trapped, dead (not obvious road casualty), or camera trap) were recorded, and visual evidence (a photograph or video footage) was examined where available.

In addition to records collected directly by the Trust, records were also received by local Biological Record Centres, mammal recorders and other recording organisations and passed onto the Trust.

2.2 Publicity

A project page was set up on the VWT’s website and the survey was regularly promoted on the Trust’s social media (Facebook and Twitter) accounts and in the Trust’s bi-annual e-newsletter. The survey was promoted through county wildlife trusts, local record centres and other conservation organisations, promoted through talks and by distributing flyers about the survey. The survey was featured in several media articles, online and in print, and on a local television and radio programme in south-west England.



Photographs: (left) The National Polecat Survey project page on the VWT’s website, **(right)** Online article ‘Plotting the path of the polecat’ featured on the BBC Earth website.

2.3 Record verification

Where records were supported by visual evidence (a photograph, video footage or a carcass), the animal was classified into a phenotype category on the basis of pelage characteristics. Animals were classified as true polecat, polecat-ferret or ferret (encompassing feral and domestic ferrets).

The pelage criteria for classification were as follows, taken from Kitchener (2002) (see Table 1).

Phenotype category	Pelage characteristics
True polecat	Pelage conforms fully to wild polecat type, with none of the polecat-ferret features listed below present.
Polecat-ferret	One or more of the following pelage characters are present: <ol style="list-style-type: none">1. Body fur paler than the wild polecat type (taking account of seasonal pelage variations)2. Dark fur on face does not reach rhinarium3. Pale cheek patches and frontal band often very extensive and contrast poorly with darker facial mask, which may be absent (taking account of seasonal pelage variations)4. Pale throat patch 50mm or more long5. One or more pale furred paws6. Scattered white guard hairs over body, especially on hindquarters and tail.

Table 1: Pelage criteria applied for classifying records.

Animals that were albino or had very pale pelage or were displaying tame behaviour which suggested a captive origin were classified as ferrets. In some cases, it was not possible to classify the animal from a photo or video, usually because the face was not fully visible. Records that were not supported by visual evidence and thus not possible to classify were categorised as unverifiable.

2.4 Carcass collection

When a carcass was collected, recorders were requested to freeze the carcass where possible or keep it cool. Postage and delivery of polecat carcasses was administered by the Centre for Ecology and Hydrology (CEH), as an extension to their Predatory Bird Monitoring Scheme. A pre-paid postage box with appropriate packaging material was sent to the recorder by CEH. Recorders posted the carcasses to CEH, via next day delivery, and carcasses were frozen upon receipt.

3. Results

3.1 Record collection

In total, 1761 records were received between January 2014 and December 2015. This also includes additional carcasses collected from 2011-2013.

42% (n=740) of records were verifiable on the basis of photos or video footage provided. Of the verified records, 74% (n=543) were classified as true polecat, 25% (n=187) were classified as polecat-ferret and 1% (n=10) were classified as ferrets, based on phenotypic characteristics (see section 2.3).

3.2 Origins of records

The origins of records received are shown in Table 2 and Figure 3.

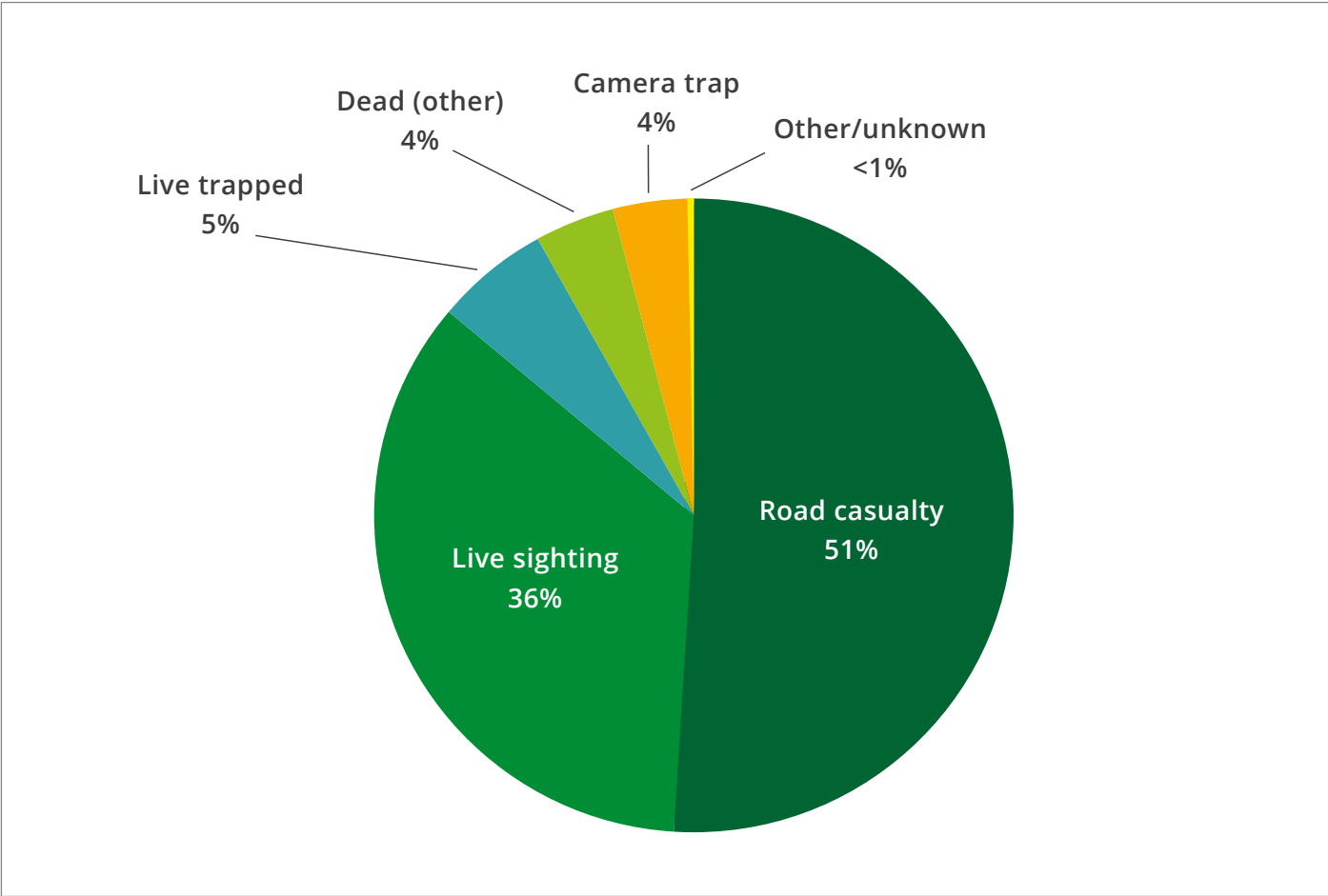


Figure 3: The origins of records received.

Origin of records	% of records
Road casualty	51
Live sighting	36
On road	38
Garden or house	24
Field/farm/hedgerow/woodland/river bank	7
Other/unknown	31
Live trapped	5
Dead (other)	4
Unknown	60
Killed in trap/shot	22
Killed by dog	17
Other	<1
Camera trap	4
Other/unknown	<1

Table 2: The origins of records received.

3.2.1 Road casualties

Road casualties comprised the greatest proportion of records (51%, n=891) received during the survey. This is consistent with previous distribution surveys, where road casualty records dominated the records received (Birks & Kitchener, 1999; Birks, 2008).

A photo was provided for 55% (n=488) of road casualty records, allowing these records to be verified and classified as polecat or polecat-ferret. Of the verified records, 74% were true polecats, 26% were polecat-ferrets and one was classified as a ferret.



Photograph: Road casualty polecat in Herefordshire © Nick Gates.

3.2.2 Live sightings

36% (n=642) of records originated from sightings of live polecats or polecat-ferrets. The greatest proportion of live sightings were animals seen on roads (38%, n=247). These sightings were most commonly of polecats crossing roads, but also included polecats scavenging carrion, foraging, playing/play-fighting and injured polecats rescued and taken for veterinary attention.

Polecats seen in gardens or houses comprised 24% (n=153) of live sightings. This was most commonly during the summer months and often involved a female with kits denning in gardens or outbuildings (e.g. in and under sheds and under garden decking). These records also included polecats taking food that householders had left out (for polecats or other species), catching or carrying prey (including rabbits, rats and birds) and polecats entering houses. Further records of polecats in gardens were gathered from camera traps and these are included in the camera trap category (see section 3.2.5).

A smaller proportion of live sightings (7%, n=45) comprised polecats seen in fields/farms/hedgerows/ woodland/river banks and the remaining 31% (n=197) were unspecified sightings and classed as 'other' (see Table 2).

The number of live sightings for which photos or video footage were provided is low compared with the other categories (17%, n=111). This is due to the opportunistic nature of these sightings and because many people were driving when they observed the polecat(s). Of the verified records, 62% were true polecats, 33% were polecat-ferrets and 5% were classified as a ferret.

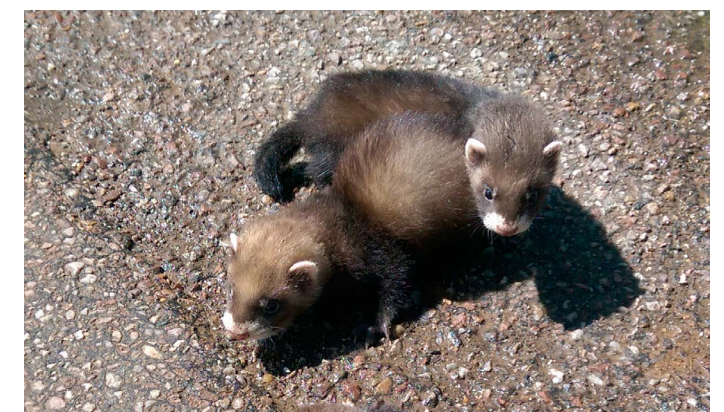
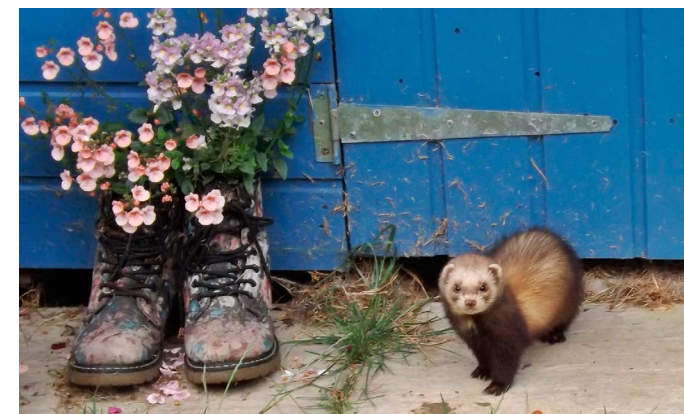
3.2.3 Live trapped

5% of records (n=85) comprised animals caught alive in traps set for other species: rats (*Rattus norvegicus*), rabbits (*Oryctolagus cuniculus*), grey and red squirrels (*Sciurus carolinensis* and *Sciurus vulgaris*), mink (*Neovison vison*) and foxes (*Vulpes vulpes*). These records are cases where the animal was released from the trap unharmed. Records comprising animals killed in traps were included in the 'dead (other)' category (see section 3.2.4).

A photo was often provided of the trapped animal, so the majority of records (69%, n=59) could be verified. Of the verified records, 80% were true polecats, 17% were polecat-ferrets and 3% were classified as ferrets.

Opposite page: A selection of photographs sent during the 2014-2015 survey

(Clockwise from top left) Polecat under garden decking in Cheshire, October 2015 © Clare Griffiths, Polecat visiting garden in Oxfordshire, December 2014 © Layla Dudzinska, Family of polecat-ferrets in a field in Somerset, July 2014 © Clive Sawyer, Polecat-ferret in Cornwall, May 2014 © Mary King, Polecat kits in Devon, May 2015 © Charlie Maddox, Polecat caught accidentally in rabbit trap and released in Herefordshire, August 2015 © Peter Dewhurst, Polecat kit living on a farm in Merioneth, August 2014 © Nikki Charlton, Polecat-ferret denning under shed in Norfolk, May 2014 © Judy Mackenzie.



3.2.4 Dead (other)

4% of records (n=70) comprised animals found dead with no obvious cause of death (i.e. not obvious road casualties as they were found away from roads) or animals killed by dogs or humans; these were classed as 'dead (other)'.

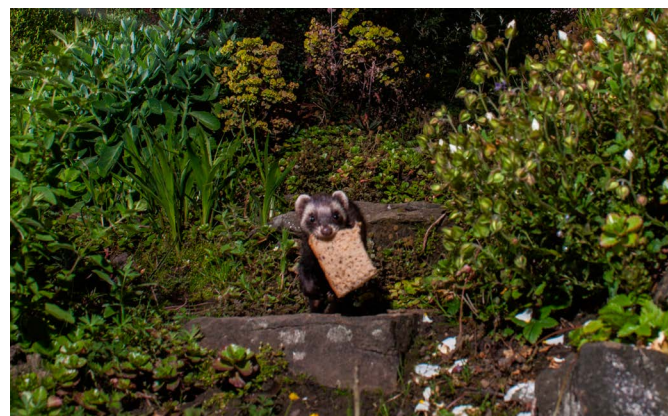
Most of these records (60%, n=42) comprised animals found dead away from a road, most commonly in a field or on a farm, with no signs of obvious injury. It is possible that some animals, especially those found on or near farms which use poison to control rodents, could have died from secondary rodenticide poisoning. It is also possible that some of these animals could have been hit by a vehicle then subsequently died as a result of their injuries. 22% of the records (n=15) were polecats that were killed in traps or shot. These were principally cases where traps had been set for other species such as rats or rabbits, in which polecats were inadvertently caught. There were a couple of records where polecats had been intentionally trapped and/or shot and killed. These records of polecats killed intentionally are probably an underestimate, as most cases would not be reported, due to the partial legal protection of polecats which prohibits certain methods of killing or taking polecats. 17% of records (n=12) were of polecats killed by dogs. This included some records where polecats were killed in the recorder's garden. One record comprised a polecat possibly killed by a cat.

A photo was provided for 63% (n=44) of these records, allowing them to be verified. Of the verified records, 73% were true polecats and 27% were polecat-ferrets.

3.2.5 Camera trap

4% of records (n=66) were photographs or videos taken on camera traps. Where a still photo was provided, it was usually possible to verify the record and classify the animal as polecat or polecat-ferret. Where video footage was provided, particularly if recorded at night in infra-red, it was often difficult to classify the animal as polecat or polecat-ferret. 42% (n=28) of records from camera traps could be verified.

Of the verified records, 90% were true polecats, 7% were polecat-ferrets and one was classified as a ferret.



Photograph: Camera trap photograph of polecat with peanut butter sandwich in Cheshire, June 2015 © Chris Beirne.

Other/unknown

Three records (<1%) comprised polecat hair samples; two were collected from hair tubes used in a polecat study and one was polecat hair found in a fox scat. A further four records (<1%) were of an unknown origin.

3.3 Seasonal patterns

There was a seasonal trend in the origins of records received, consistent with previous polecat distribution surveys (Birks, 2008). The number of road casualty records was low during the winter, then peaked in March, with an almost three-fold increase from February to March (see Figure 4). This is linked with the timing of the mating season, when male polecats are moving and crossing roads to find females. Road casualty records declined during the spring and summer and then experienced a smaller peak during September and October, coinciding with dispersal of juveniles from their mother's territory. The number of live sightings peaked in July followed by June then August, when female polecats with kits are most likely to be seen and polecats may be more diurnal. The fewest live sightings were received during the winter months.

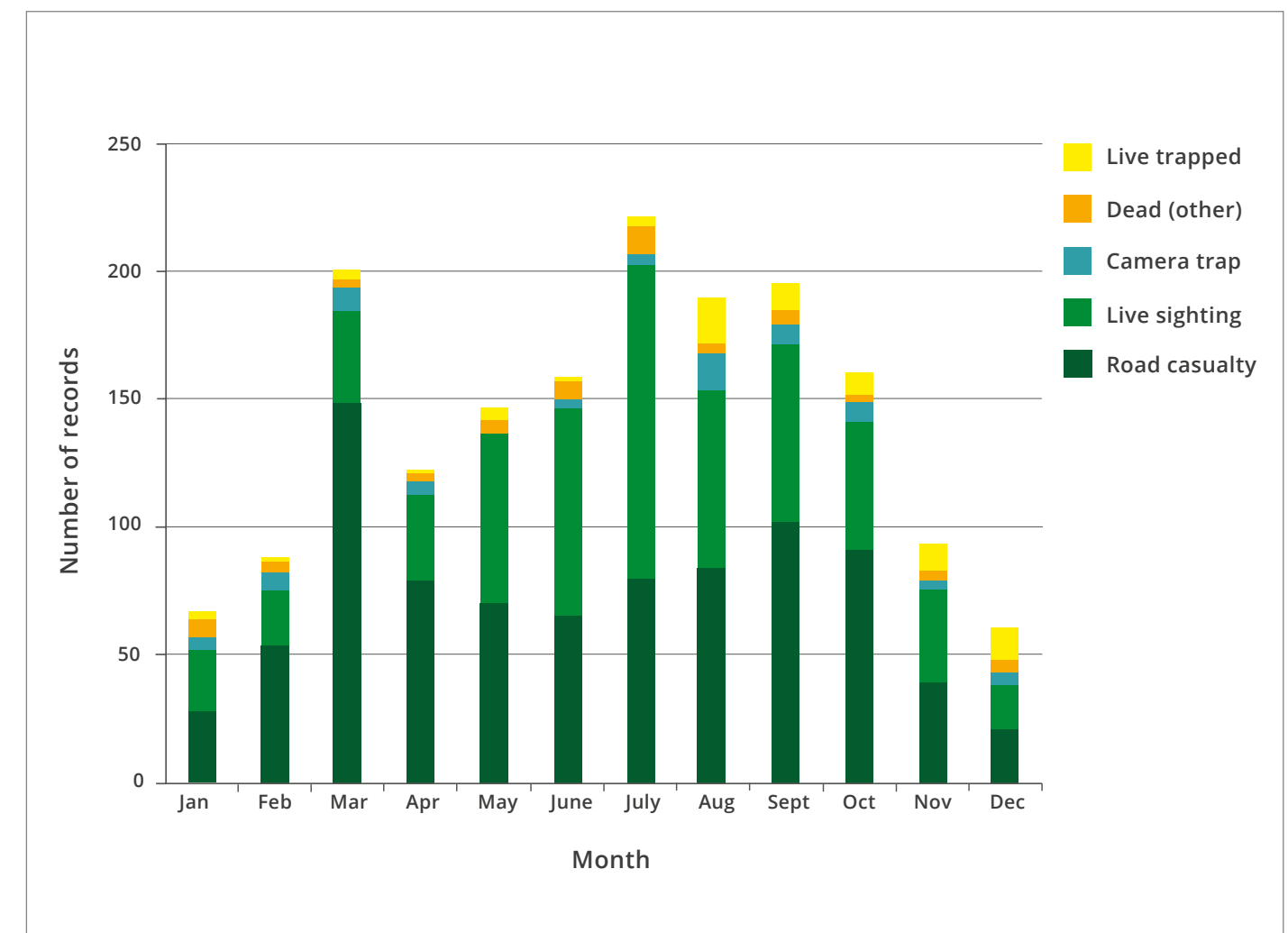


Figure 4: Monthly trends in the origins of records received.

3.4 Distribution of records

Verifiable records of true polecats were received from 370 hectads (10km x 10km squares) in Britain (see Figure 5).

Verifiable records of polecat-ferrets, based on pelage characteristics, were received from 145 hectads in Britain (see Figure 6). These were mostly concentrated in south-west England, East Anglia, and northern England, with only occasional records of polecat-ferrets in Wales and the West Midlands.

The distribution of verifiable records of true polecat and polecat-ferrets is presented in Figure 7. Records believed to be of domestic ferrets were discounted and excluded from the maps.

Unverifiable records were received from throughout Britain (see Figure 8). Unverifiable records are helpful in filling in gaps in hectads where no verifiable records were received. Many unverifiable records were reported by experienced naturalists, so are likely to be accurate records.

The distribution of records is discussed below and presented by regions of the country. A summary of the number of records received for each vice county is present in Appendix 1.

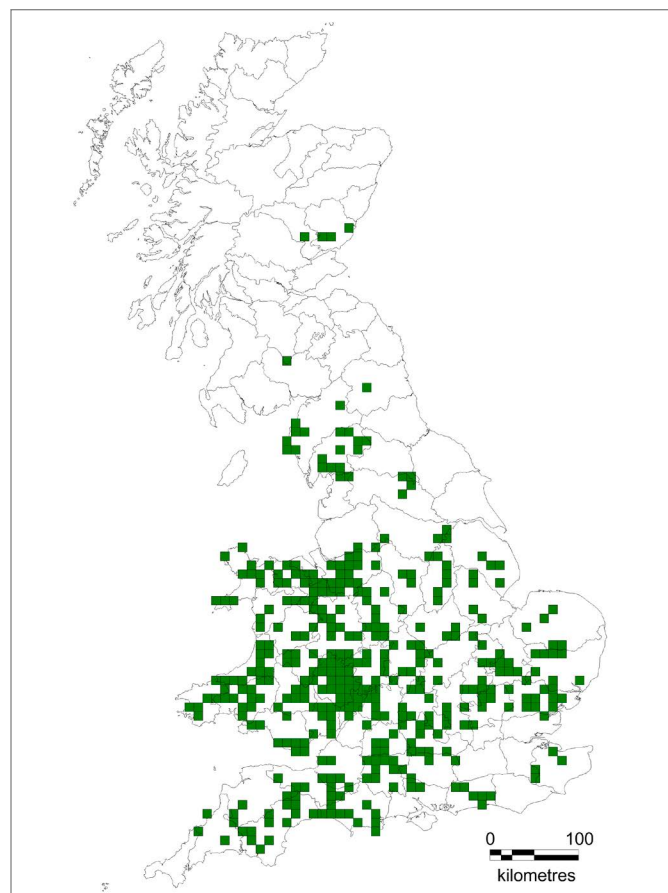


Figure 5: The distribution of hectads in which verifiable records of true polecats were received during 2014-2015.

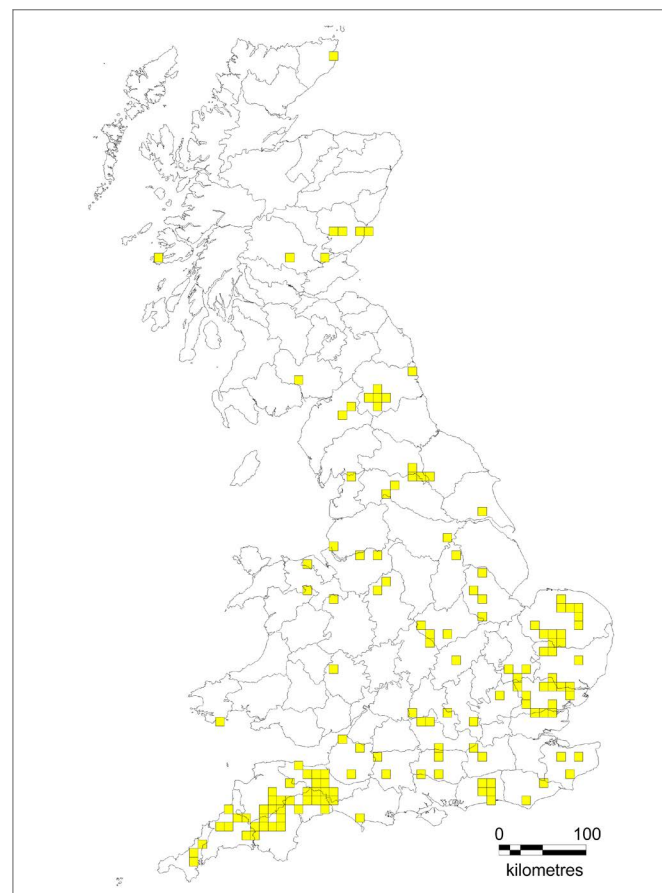


Figure 6: The distribution of hectads in which verifiable records of polecat-ferrets were received during 2014-2015.

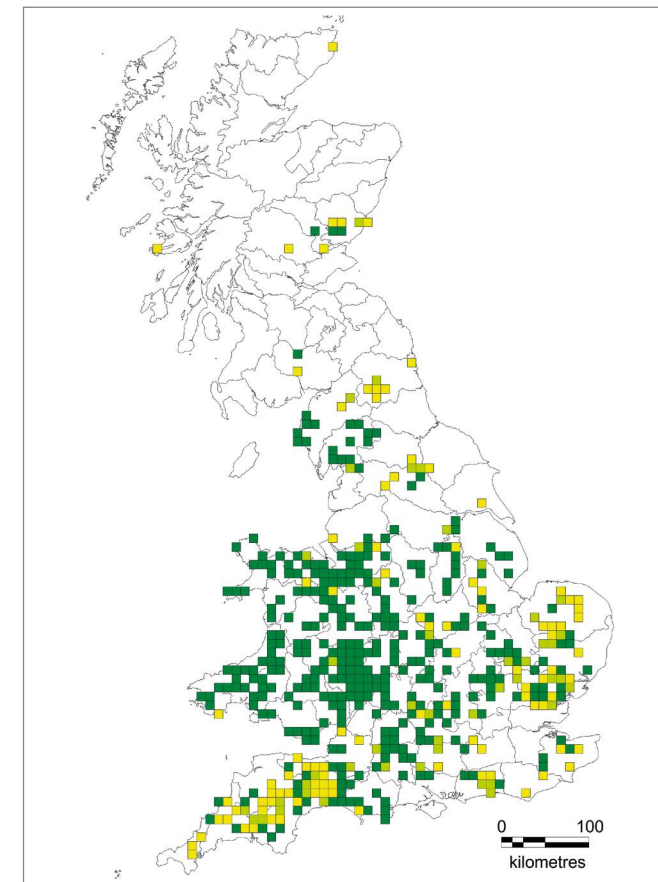


Figure 7: The distribution of hectads in which verifiable records of true polecats (dark green), polecat-ferrets (yellow) and both true polecats and polecat-ferrets (lime green) were received during 2014-2015.

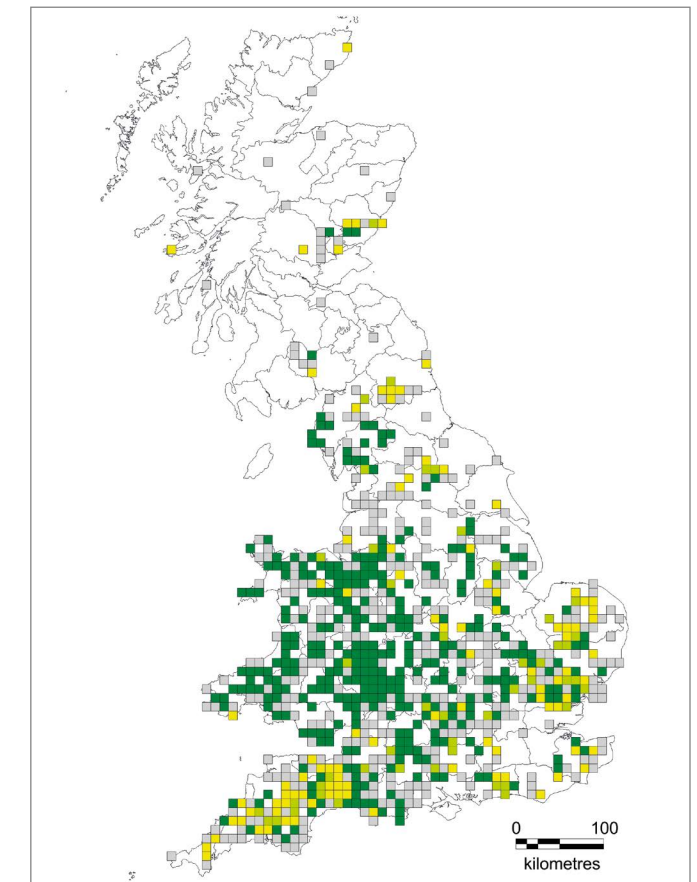


Figure 8: The distribution of hectads in which verifiable records of true polecats (dark green), polecat-ferrets (yellow), both true polecats and polecat-ferrets (lime green) and unverifiable records (grey) were received during 2014-2015.

3.4.1 Wales

A total of 313 records were received from Wales (18% of all records received) and verified records of true polecats were received from all counties in Wales. The counties from which most records were received were Denbighshire, Carmarthenshire and Ceredigion. This, however, is influenced by several staff and volunteers of the VWT living and working in Carmarthenshire and Ceredigion. The records demonstrate that polecats are still widespread in Wales and are maintaining their range in their historical stronghold. However, there are many hectads from which no polecat records were received. These negative hectads were concentrated in the Cambrian Mountains, running from Llandovery to Bala, the south Wales valleys and the Brecon Beacons. The same pattern occurred during the 2004-2006 distribution survey (Birks, 2008). It was suggested that the lack of records in some areas may be due to lower human population density and lower road and traffic densities compared with parts of England, which may reduce the number of road casualty polecats and the number of people recording them (Birks, 2008). Furthermore, because polecats never became extinct in Wales, many naturalists are so accustomed to seeing them that they may not feel inclined to report records (Birks, 2008). Additionally, the uplands of mid Wales may have lower availability of prey so may support a lower abundance and density of polecats than the lowlands.

Of the verifiable records, all were true polecats, with the exception of three which were classified as polecat-ferrets.

3.4.2 England

3.4.2.1 West Midlands

Polecats remain widespread in the West Midlands, with a distribution pattern similar to that recorded during the 2004-2006 survey. Records were widely distributed in Herefordshire, where verifiable records of true polecats were received for all except three hectads. Records were relatively widely distributed in Shropshire, Staffordshire and Warwickshire, although many of these were unverified. The fewest records in the region were received from Worcestershire, where no records were received from a relatively large area in the centre of the county, from Worcester to the southern edge of Birmingham. Of the verifiable records in the West Midlands region, all were true polecats, with the exception of five which were classified as polecat-ferrets.

3.4.2.2 East Midlands

Polecats were recorded from a more extensive area of the East Midlands than during the 2004-2006 survey. Comparatively few records were received from Derbyshire, although they were widely distributed, and of the verifiable records, all were true polecats. Polecats have become more widespread in Nottinghamshire, with records mostly concentrated in the east of the county. Of the verifiable records here, all except one were true polecats. Records were received from a widely spaced area of North Lincolnshire, where all verifiable records were true polecats. In South Lincolnshire, records were only received from the east of the county, and verifiable records were a combination of true polecats and polecat-ferrets. This is the first time true polecats have been recorded in South Lincolnshire in a national survey. In Leicestershire, records were received from the west and south of the county, with an absence of records in the north. Of the verifiable records, there was a combination of true polecats and polecat-ferrets. Records were widely distributed in Northamptonshire; the majority were unverified but four were verifiable as true polecats and one as a polecat-ferret. Records were fairly widely distributed in Huntingdonshire, where all verifiable records were true polecats. In Bedfordshire, records were concentrated in the south of the county, where all verifiable records were true polecats, with a notable absence of records around Bedford and in the north of the county. Overall, the majority of verifiable records in the East Midlands region were classified as true polecats.

3.4.2.3 South-west England

Comparatively few records were received from Gloucestershire. Records were widely distributed in North Gloucestershire with a noticeable gap in the Cotswolds in the north-east of the county. Very few records were received from South Gloucestershire, a pattern which also occurred during the 2004-2006 survey, and is possibly due to limited habitat for polecats in and around Bristol. All verifiable records were of true polecats. Polecats were recorded throughout much of North and South Wiltshire, with records received in the south-east of the county where no polecats were recorded during the 2004-2006 survey. Of the verifiable records, all except one were true polecats. Records were widely distributed in Dorset and all verifiable records except one were true polecats.

A comparatively high number of records was received from Somerset (both North and South Somerset), particularly in the west of the county, in the Quantock and Brendon Hills, and on the border with Devon.

Of the verifiable records, there was a combination of true polecats and polecat-ferrets, with slightly more records conforming to polecat-ferrets than true polecats.

Devon (vice counties North Devon and South Devon) generated the highest number of records (n=164) than any other county in Britain. Records were widely distributed throughout Devon, with clusters of records concentrated around Dartmoor (excluding the higher altitude areas of moorland) and between Honiton, Axminster and Seaton. The only notable gap in records was in the north-west of the county. The majority of verifiable records were polecat-ferrets, although a good number of true polecat records were received from a widely spaced area, particularly in South Devon. Records were fairly widely distributed in East Cornwall, with the majority concentrated near to the border with Devon and on the north coast between Boscastle and Polzeath. Of the verifiable records, the majority were polecats-ferrets, with five records of true polecats received. No verifiable records of true polecats were received from West Cornwall, where the majority of records were unverifiable and two were verified as polecat-ferrets. Records of true polecats in North and South Devon and East Cornwall represent the first recorded in a national survey, as no verifiable true polecat records from these counties were received during the 2004-2006 survey.

Overall, the range of the polecat has expanded extensively in south-west England since the 2004-2006 survey. Whilst it is probable that polecats in east Devon have spread from Dorset, it is perhaps unlikely that the population could have spread as far as Cornwall in the ten years since the previous distribution survey. Given the extensive and relatively rapid range expansion in parts of Somerset, Devon and Cornwall, covert releases of polecats cannot be ruled out.

3.4.2.4 South-east England

Records were widely distributed in the west of this region, largely matching the distribution recorded during the 2004-2006 survey. In Oxfordshire, records were widely distributed, although no records were received from the north-west of the county, and the majority of verifiable records were true polecats, with only two records of polecat-ferrets. Similarly, in Buckinghamshire, records were widely distributed, with a gap in distribution in the centre of the county, around Aylesbury and Buckingham. All verifiable records except one were true polecats. Records were received from throughout Berkshire, with a concentration of road casualty records on the A4 between Newbury and Hungerford, and only two records received to the east of Reading. The majority of verifiable records were true polecats, with only two records of polecat-ferrets. Records were fairly widely distributed in North and South Hampshire, where verifiable records were almost an equal number of true polecats and polecat-ferrets. Records were received from throughout West Sussex and into the western part of East Sussex. Of the verifiable records in West Sussex, these were a combination of true polecats and polecat-ferrets, with a slightly higher proportion conforming to true polecats, but no true polecats were recorded in East Sussex.

A comparatively high number of records were received from East Kent, a county where no verifiable records of polecats or polecat-ferrets were received during the 2004-2006 survey. The verifiable records were a combination of true polecats and polecat-ferrets, with a slightly higher proportion conforming to true polecat. The origin of this population is unclear; it is possible that polecats have spread from Sussex and/or Surrey, but covert releases in this area cannot be ruled out. Three unverified records were received from Middlesex, where polecat re-establishment is likely to be hampered by urbanisation and the high density of road networks.

The extent of the recent range expansion of polecats in parts of south-east England is masked by covert releases of polecats that have occurred. Captive-bred polecats are known to have been released near Haslemere in south-west Surrey in recent years. Interestingly, only eight records were received from Surrey, mostly in the west of the county, with no discernible changes in distribution or range expansion since the 2004-2006 survey. This suggests that the releases may not have been successful and have certainly not led to the complete re-establishment of polecats in the county, although under-recording cannot be ruled out. Of the two verifiable records in the county, both were polecat-ferrets.

3.4.2.5 East of England

In Hertfordshire, records were concentrated in the north and west of the county, away from the dense transport networks and urbanisation of Greater London. Of the verifiable records, all except one were true polecats. A comparatively high number of widely distributed records were received from North Essex, suggesting an extensive re-colonisation of the county since the 2004-2006 survey, when only one verified true polecat record was received. Of the verifiable records, there was almost an equal number of true polecats and polecat-ferrets. Only a few records were received from South Essex, where all of the verifiable records were polecat-ferrets. It is likely that polecat distribution here is limited by unsuitable polecat habitat and dense road networks and traffic around Greater London.

Records were received from a fairly widely spaced area in Suffolk (both West and East Suffolk), with a concentration of records in the south of West Suffolk, on the Essex border, between Sudbury and Ipswich. Of the verifiable records, there was a combination of true polecats and polecat-ferrets, although most were true polecats. The true polecat records were concentrated in West Suffolk, with only one recorded in East Suffolk. Records were fairly widely distributed in Norfolk (both West and East Norfolk). The majority of verifiable records were polecat-ferrets, with a few records of true polecats in West Norfolk only and no records of true polecats in East Norfolk.

A concentration of fairly widely spread records was received from the south of Cambridgeshire, south of the A14 and the city of Cambridge, where polecats have probably spread from Essex and Hertfordshire. There was a complete absence of records in the north of the county, north of Cambridge. Of the verifiable records, the majority were true polecats. Releases of captive-bred polecats into parts of Cambridgeshire have been rumoured to have occurred in recent years, although this is unconfirmed. It is not known where any releases have taken place, but they may account for the concentration of records in the south of the county.

Overall, the range of the polecat has expanded extensively into East Anglia since the 2004-2006 survey, and the vice counties of East Suffolk, West Norfolk and Cambridgeshire now have confirmed records of true polecats for the first time in a national survey, as no verifiable polecat records were received from these counties during the 2004-2006 survey.

3.4.2.6 Northern England

Verifiable records of polecats and polecat-ferrets were received from the majority of vice counties in northern England, with the exception of North Northumberland, Durham and North-east Yorkshire.

Polecats remain widely established in Cumbria, following a number of polecat releases during the 1960s-1980s. Records were widely distributed throughout Cumbria in both Westmorland and Cumberland, with a notable absence in the central fells and the very north of the county. Several records were received from the west of the county, from Seascale to Maryport, where no records of true polecats were received during the 2004-2006 survey, suggesting a westerly range expansion. Of the verifiable records, all were true polecats, with the exception of three polecat-ferrets (10% of verifiable records) which were all recorded in Cumberland.

Comparatively few records were received from Lancashire (vice counties West Lancashire and South Lancashire). Records verified as true polecats were concentrated in the north of West Lancashire on the Cumbrian border, along the A6 road. Records from South Lancashire were mostly concentrated in the centre of the county and on the border with South-west Yorkshire and Cheshire. The majority of these records were unverified with only two verifiable records; one a true polecat and one a polecat-ferret. It is probable that the distribution of polecats in this area is restricted by the conurbations of Manchester and Liverpool and high density traffic and road networks.

Several records were received from western parts of vice county South Northumberland, concentrated along the A69 between Haltwhistle and Hexham. All verifiable records were polecat-ferrets except for one record of a true polecat. Polecats in this area have undoubtedly spread from the Cumbrian population. No records were received from North Northumberland.

Records in Yorkshire were concentrated in the eastern Yorkshire Dales, between Ripon and Harrogate, on the boundaries of vice counties Mid-west Yorkshire and North-west Yorkshire. The verifiable records were a combination of true polecats and polecat-ferrets. No verifiable records of true polecats were received from this area during the 2004-2006 survey. The origins of this population are unclear; if polecats had spread from the Cumbrian population, one might expect to see a greater number of records in the western Yorkshire Dales. Therefore, covert releases cannot be ruled out. A few records were received from South-west Yorkshire (two verifiable as true polecats and one as polecat-ferret), mostly concentrated on the boundaries of Nottinghamshire and North Lincolnshire. Three records were received from South-east Yorkshire; one polecat-ferret and two unverifiable. A small number of records were received from North-east Yorkshire and these were all unverifiable. Only two records were received from Durham, which were both unverifiable. It is possible that the expansion of polecats into Durham from Cumbria is being hampered by the Pennines, where high gamekeeping activity means that polecats are likely to be vulnerable to being unintentionally killed in traps.

The greatest number of records from northern England was received from Cheshire, where records were widely distributed, with no major gaps in distribution. The majority of verifiable records were true polecats, with only three records (9% of records received) of polecat-ferrets.

3.4.3 Scotland

A total of 29 records were received from Scotland (2% of all records received). There was a concentration of records (both verified and unverified) covering 11 hectads in Perthshire, in vice counties Mid Perthshire, East Perthshire and Angus. Polecats were also recorded here during the 2004-2006 survey, probably originating from a release during the early 1990s, and these recent records suggest that the population is well-established. Of the verifiable records, there was a mixture of both true polecats and polecat-ferrets.

A small number of records were received from western Dumfriesshire, an area where no records were received during the 2004-2006 survey. Of the two verifiable records, one was a true polecat and one a polecat-ferret. It is likely that these animals have spread from the population in Cumbria and the re-colonisation of Dumfriesshire will continue in the future. A small number of records were also received from Caithness and East Sutherland, only one of which was verifiable as a polecat-ferret. These records were in a locality close to where records were received during the 2004-2006 survey, so it seems probable that a small population is present in this area, although the true distribution and status of polecats here is unknown. Only one unverifiable record was received from Argyll, although it has been suggested that there is evidence of a population near Kilmartin (Jason Hain, *pers. comm.*). Polecats were re-established in Argyll following a reintroduction during the 1970s and although several records were received over a fairly widely spaced area during the 1990s survey, no records were received during the 2004-2006 survey. It is possible that the population here has reduced to very small numbers, although the lack of records could also be an artefact of under-recording, as the human population and density of road networks here are low.

Other records from elsewhere in mainland Scotland were all unverifiable single records from vice counties East and West Inverness-shire, South Aberdeenshire, Kincardineshire, Midlothian, Roxburghshire and the Isle of Skye. It is likely that these occasional records originate from animals that have escaped or been released from captivity and do not represent viable populations. One verified polecat-ferret record was received from the Isle of Mull.



Photograph: Polecat-ferret in Angus, November 2015 © Andy Wakelin

3.5 Defining 'Polecat Purity Zones'

In order to determine regional patterns in the relative abundance of polecats and polecat-ferrets, as carried out for the 2004-2006 survey (Birks, 2008) three 'Polecat Purity Zones' (PPZ) were defined, based on the proportion of verifiable records of phenotypically true polecats in each vice county (see Figure 9). Counties which generated >95% of verifiable records of true polecats were classed as 'PPZ 1' (most pure); counties which generated 85-95% of verifiable records of true polecats were classed as 'PPZ 2' (intermediate purity); and counties which generated <85% of verifiable records of true polecats were classed as 'PPZ 3' (least pure). Vice counties from which fewer than five verifiable records were received were not assigned a 'PPZ' and are shaded grey on Figure 9.

PPZ 1 – Most Pure

Counties classified as 'PPZ 1' are those in which >95% of verifiable records were classed as true polecats, and are therefore dominated by the 'purest' polecat populations. These vice counties are shaded dark green in Figure 9. The 18 vice counties classified as 'PPZ 1' are Carmarthenshire; Cardiganshire; Denbighshire; Caernarvonshire; Montgomeryshire; Pembrokeshire; Breconshire; Radnorshire; Glamorgan; Monmouthshire; Herefordshire; Shropshire; Worcestershire; East Gloucestershire; North Wiltshire; Huntingdonshire; North Lincolnshire; and Westmorland. These counties are concentrated in the polecat's historical stronghold in Wales and the West Midlands, and also include parts of south-west England, Cumbria and two outlier counties in the East Midlands.

PPZ 2 – Intermediate Purity

Counties classified as 'PPZ 2', those in which 85-95% of verifiable records were classed as true polecats, are shaded pale green in Figure 9. The 10 vice counties classified as 'PPZ 2' are Merioneth; Staffordshire; Cheshire; Warwickshire; Oxfordshire; Berkshire; Buckinghamshire; Nottinghamshire; South Wiltshire; and Cumberland. These counties are concentrated in parts of the West Midlands and central England, with one in north Wales and one in Cumbria.

PPZ 3 – Least Pure

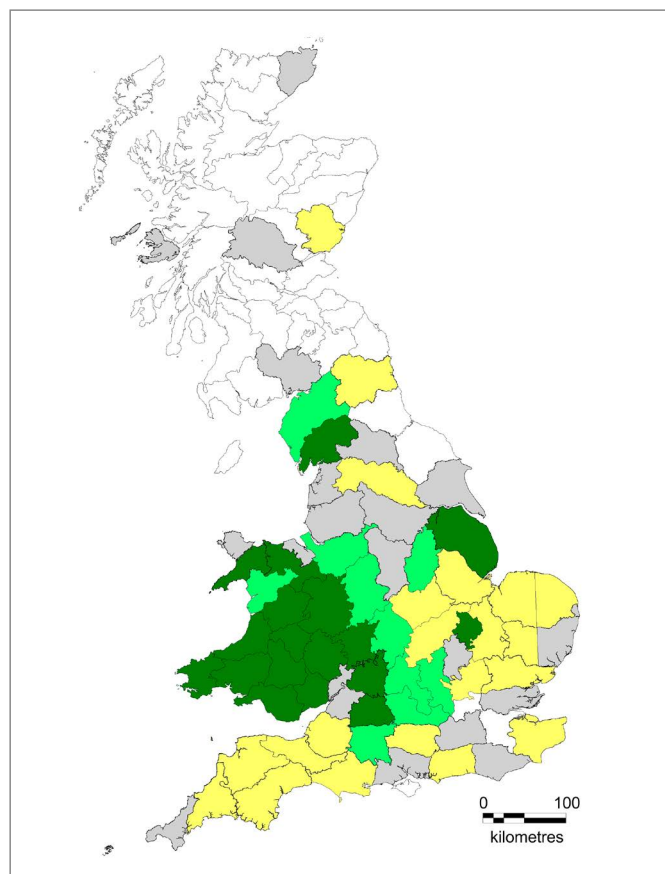
Counties classified as 'PPZ 3', those in which <85% of verifiable records were classed as true polecats, are shaded yellow in Figure 9. The 21 vice counties classified as 'PPZ 3' are North Somerset; South Somerset; North Devon; South Devon; East Cornwall; Dorset; North Hampshire; West Sussex; East Kent; North Essex; East Norfolk; West Norfolk; West Suffolk; Hertfordshire; Cambridgeshire; Leicestershire and Rutland; Northamptonshire; South Lincolnshire; Mid-west Yorkshire; South Northumberland; and Angus. These counties are concentrated on the edge of the polecat's core range (in south-west England and south-east England, East Anglia and part of the East Midlands) with two counties in northern England and one in Scotland.

3.5.1 Changes in 'Polecat Purity Zones' since the 2004-2006 survey

It is interesting to compare the distribution of the three 'Polecat Purity Zones' from the current survey with the distribution in the 2004-2006 survey, to infer how the comparative abundance of polecats and polecat-ferrets may have changed as the polecat population expands.

The distribution of counties classified as 'PPZ 1' (most pure) broadly matched that found in the 2004-2006 survey, with the addition of East Gloucestershire and North Wiltshire and two outlier counties in the East Midlands (North Lincolnshire and Huntingdonshire). This is likely to be a reflection of the polecat's ongoing range expansion southwards and eastwards. Encouragingly, Westmorland was also classified as 'PPZ 1', having been assigned as 'PPZ 3' in the 2004-2006 survey, which demonstrates that the population in Cumbria now has a higher proportion of true polecats than the previous survey, suggesting that the polecat phenotype is out-competing the polecat-ferret phenotype.

Figure 9: 'Polecat Purity Zones' classified by vice county. 'PPZ 1' (where true polecats comprised >95% of records) = dark green; 'PPZ 2' (where true polecats comprised 85-95% of records) = pale green; 'PPZ 3' (where true polecats comprised <85% of records) = yellow. Counties which generated fewer than five verifiable records are shaded grey and counties which generated no verifiable records are shaded white.



Interestingly, three counties in England (Oxfordshire, Buckinghamshire and Cheshire) which were classified as 'PPZ 1' in the 2004-2006 survey were classified as 'PPZ 2' in the current survey, and Northamptonshire, which was also classified as 'PPZ 1' in the 2004-2006 survey was classified as 'PPZ 3' in the current survey, suggesting a higher proportion of polecat-ferrets today than during 2004-2006.

The distribution of counties classified as 'PPZ 2' (intermediate purity) was similar to that in the 2004-2006 survey, with the addition of Nottinghamshire and Cumberland. A more extensive spread of counties were assigned as 'PPZ 3' (least pure) during this survey, mostly on the edge of the polecat's core range and in northern England and Scotland, which reflects the increased opportunities for hybridisation with ferrets that polecats encounter on the edge of their range.

A few counties within the polecat's core range (Flintshire, Anglesey, South Gloucestershire, South Hampshire, Surrey, South Essex, Derbyshire and Bedfordshire) received fewer than five verifiable records so were not assigned a 'PPZ'. This adds an element of uncertainty to the map.

3.6 Carcass collection

A total of 266 carcasses were collected during the survey period (see Figure 10). Carcasses were collected from a wide geographical area covering most of the polecat's core range.

Carcasses will be used to investigate exposure levels of polecats to secondary rodenticide poisoning and dietary preferences.

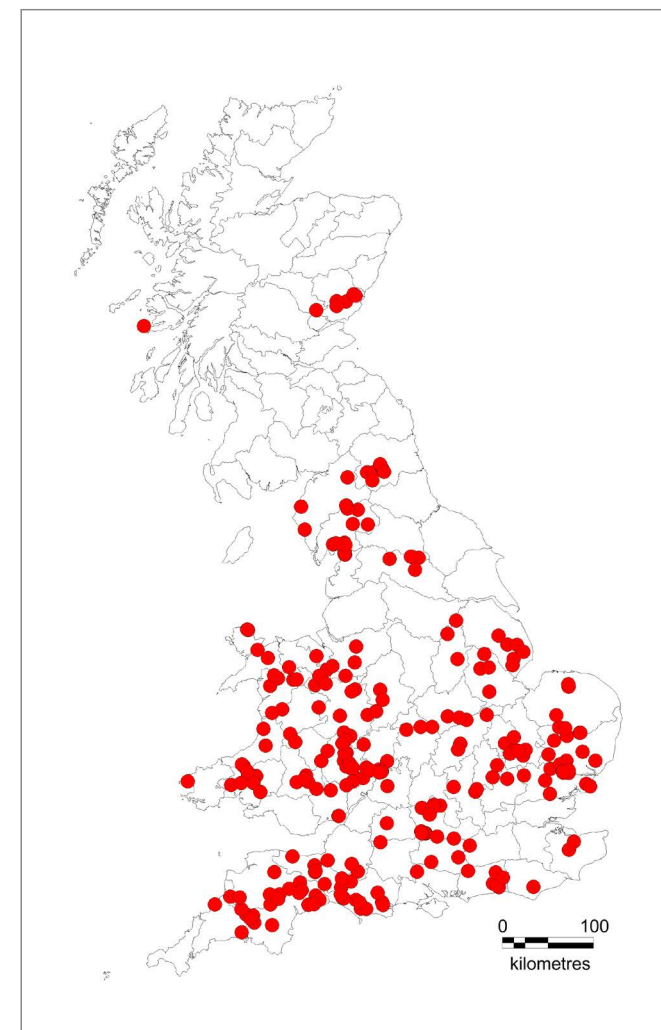
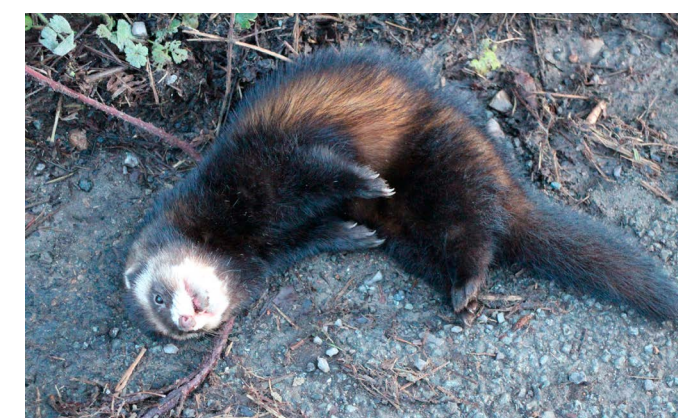
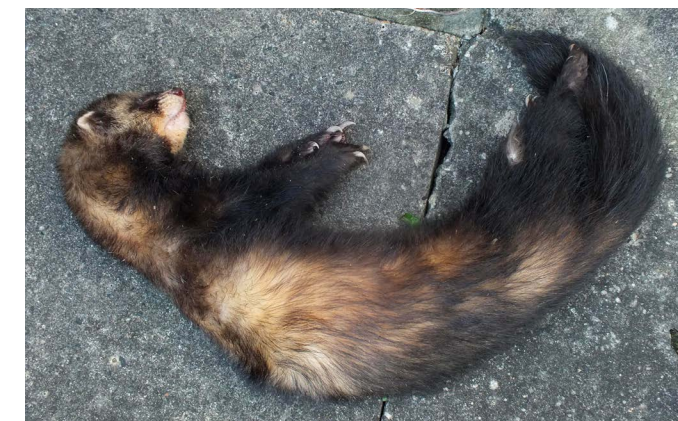


Figure 10: The distribution of carcasses collected during the survey.

Photographs: Polecat carcasses from the 2014-2015 survey (top) © Amy Brocklehurst, (middle) © Natalie Buttriss, (bottom) © Paul Greest.



4. Discussion

4.1 Distributional change since the 2004-2006 survey (Birks, 2008)

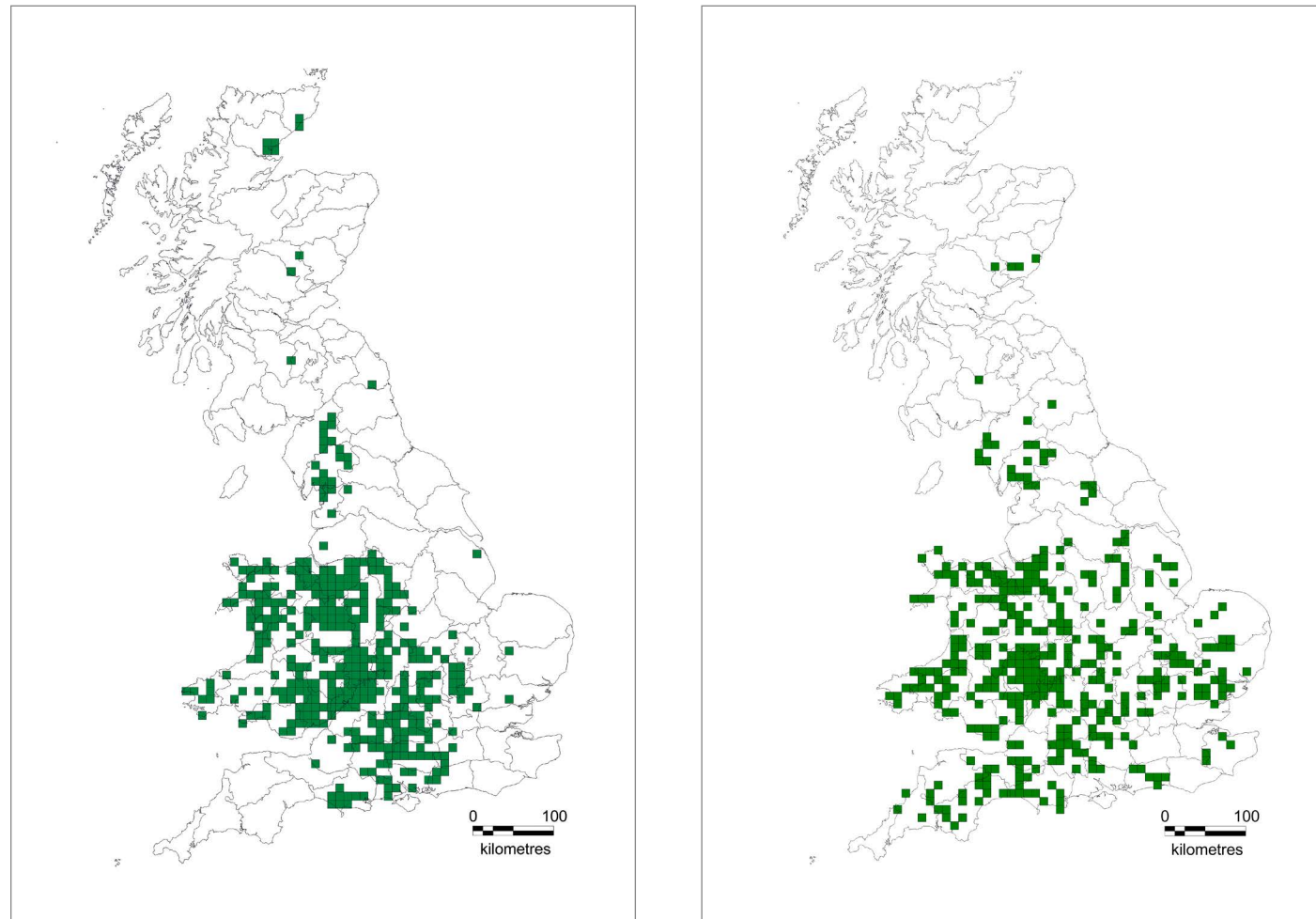


Figure 11: Changes in polecat distribution from 2004-2006 (left) to 2014-2015 (right). The maps include verifiable records of true polecats only and do not include records of polecat-ferrets and unverifiable records.

In the ten years since the 2004-2006 survey, the polecat's range has continued to expand in England. Notably, there has been extensive range expansion in south-west England and East Anglia. Verifiable records of true polecats records were received from several vice counties where true polecats have not been recorded in previous surveys; these are South Somerset, North Devon, South Devon, East Cornwall, East Kent, East Suffolk, West Norfolk, Cambridgeshire, South Lincolnshire, South Lancashire, South-west Yorkshire, North-west Yorkshire, South Northumberland, Dumfriesshire and Angus. Comparatively, there has been limited range expansion from the core population north into parts of Yorkshire and Lancashire, where the population appears to be restricted in Cheshire, to the south of the conurbations of Liverpool,

Bolton, Manchester, Huddersfield and Leeds. It is likely that the urbanisation and high density of road networks and traffic in this area are restricting northerly range expansion of polecats. However, since the 2004-2006 survey, the polecat's core range has expanded north-eastwards from the English Midlands into Nottinghamshire, Lincolnshire and part of South-west Yorkshire. The origins of several records received in the eastern Yorkshire Dales, concentrated around Ripon and Harrogate, are unclear. It seems unlikely that these animals have spread from the south, as there is a considerable gap between them and the core population. Further north, the polecat population in Cumbria is expanding into parts of western Northumberland and possibly northwards into Dumfriesshire. This appears to be a change from the 2004-2006 survey, when there was little evidence of expansion of the Cumbrian population.

Polecats appear to be maintaining their range in their historical stronghold of Wales and the West Midlands. Although there were several hectads in these regions where polecats were not recorded (in parts of mid Wales, the south Wales valleys and the Brecon Beacons and parts of Worcestershire and Staffordshire), it is likely that this is due to under-recording rather than true gaps in distribution.

There has been little change in polecat distribution in Scotland since the 2004-2006 survey. The main change appears to be the beginnings of polecat re-colonisation of Dumfriesshire, likely spreading from the population in Cumbria. The reintroduced population in Perthshire and Angus appears to have a similar distribution as recorded in the 2004-2006 survey. Fewer records were received from Caithness, so the status of this population is uncertain, and the status of the reintroduced population in Argyll, which was recorded during the 1990s survey (Birks & Kitchener, 1999) but not during the 2004-2006 survey, is also uncertain.

4.2 Reasons for polecat range expansion

The polecat's initial population recovery was driven by a reduction in trapping pressure in the early 20th century (Langley & Yalden, 1977), and subsequently by the termination of gin-trapping in the 1950s (Blandford, 1987). Latterly, the partial legal protection afforded to the polecat under Schedule 6 of the Wildlife and Countryside Act 1981 is likely to have also contributed to a reduction in mortality from persecution (but see section 4.3.2). Secondly, a post-myxomatosis increase in the rabbit population has also been attributed as a contributing factor in the polecat's recovery (Birks & Kitchener, 1999; Birks, 2008). Additionally, the polecat's apparent lack of specific habitat requirements has allowed it to repopulate a diverse range of landscapes across Britain (Birks, 2008).

The expansion of the polecat's range has also been aided by releases of polecats, which masks the true extent of natural range expansion in parts of Britain. Covert releases carried out in the 1970s-1990s have led to the re-establishment of polecats in Cumbria, Perthshire, Argyll and Hertfordshire/Bedfordshire, with reported but unconfirmed releases in Berkshire and Hampshire. The populations in central southern England that have arisen from reintroductions have now become contiguous with the polecat's main range. More recently, covert releases of captive-bred polecats are known to have taken place in Surrey and are alleged to have taken place in Cambridgeshire. These releases mask the true extent of natural range expansion in parts of southern and eastern England, as they have taken place towards the edge of the polecat's core range. There is weak justification for releasing captive-bred polecats

into areas where polecats are naturally recovering and expanding their range. Polecats that are captive-bred may survive poorly in the wild and may possess more ferret ancestry than wild polecats, thus risking genetically diluting the wild population. Interestingly, during the current survey, very few records were received from Surrey, where captive-bred polecats have been released, which may indicate that the releases have been unsuccessful, although under-recording cannot be ruled out.

4.3 Prospects and threats to future recovery

4.3.1 Prospects for future recovery

It seems probable that the polecat will continue to expand its range in south-west England and East Anglia, where there has already been considerable range expansion. The re-establishment of polecats in parts of south-east England may be limited by the high density of road networks and traffic volume, particularly around Greater London. The spread of polecats northwards will depend on polecat dispersal through the heavily urbanised conurbations of Liverpool, Bolton, Manchester, Huddersfield and Leeds and the road networks linking them. There has been very limited range expansion north-west from the core population since the 2004-2006 survey, despite polecats now being widespread in Cheshire, suggesting that the conurbations present a significant barrier which may always limit polecat distribution. However, since the 2004-2006 survey polecats have expanded their range north-eastwards from the Midlands into Nottinghamshire, Lincolnshire and part of South-west Yorkshire. It appears that this offers the most probable route northwards for the core population, through South-west Yorkshire and into the Vale of York where, in time, the population may become contiguous with the population that appears to be present in the eastern Yorkshire Dales. For the foreseeable future, polecats are likely to remain scarce in Yorkshire, Lancashire and Durham until the core population can manage to expand northwards and/or the population in Cumbria can expand sufficiently south and eastwards. It appears that there are currently limited prospects for polecat range expansion in Scotland with the exception of Dumfriesshire, which is expected to continue to be re-colonised by the population in Cumbria.

4.3.2 Potential threats to future recovery

4.3.2.1 Trapping mortality

During this survey, several records were received of polecats inadvertently killed or injured, in traps usually set for other species. One particular example is a polecat that was found alive but injured in a Fenn trap on the Pennines. The animal was freed from the trap but it is probable it later died as a result of its injuries. Several other records were received of polecats caught, and either injured or killed, in Fenn traps, often set for rats. Another record received was of a moribund polecat brought to a vet in Cumbria after being found caught in a disused cage trap. The polecat subsequently died, probably from starvation. It is highly probable that these records are an underestimate and represent the tip of the iceberg, as many people would not report such cases, due to the partial legal protection of polecats and the uncertainties about the legality of killing polecats in traps. Similar reports were received during the 2004-2006 survey (Birks, 2008).

There is the risk that high mortality from indiscriminate traps will limit polecat recovery in areas where there is high gamekeeping and trapping activity. In a recent review of illegal killing of birds of prey, the RSPB identified areas associated with driven grouse moor management, notably in the southern Uplands of Scotland and the Pennines, as particular problem areas for bird of prey persecution (RSPB, 2015). This could act as a significant barrier for polecats as they attempt to re-colonise north-eastern England and southern Scotland.

4.3.2.2 Secondary rodenticide poisoning

Additional polecat mortality may arise from exposure to secondary rodenticide poison, which occurs when polecats consume poisoned prey, such as rats (Shore *et al.*, 1996; Shore *et al.*, 2003). Analysis of polecat carcasses collected during the 1990s found that 31% of polecats contained second-generation anticoagulant rodenticide residues (Shore *et al.*, 2003). As polecats expand their range into central and eastern England, where second-generation anticoagulant rodenticides are used more extensively, there is concern that increased exposure of polecats to rodenticides could result in increased mortality (Shore *et al.*, 2003). However, analyses to date have found no evidence that greater use of second-generation anticoagulant rodenticides in England has resulted in increased incidence of contamination of polecats, compared with Wales (Shore *et al.*, 2003). This issue is currently being investigated further with carcasses collected during the current survey.

4.3.2.3 Status of the rabbit population

Another factor which may have a longer-term impact on the polecat population is the status of the rabbit population in Britain. The British Trust for Ornithology's Breeding Bird Survey has reported a 57% decline in the rabbit population during 1995-2014 (Harris *et al.*, 2015). It is not currently known how this reduction in the polecat's key prey species may affect the polecat population. In Britain, rabbits are the dominant prey source for polecats, comprising 85% of prey remains in a study in the English Midlands (Birks & Kitchener, 1999b). Nevertheless, polecats take a variety of prey and in a polecat dietary study in Wales carried out when rabbit numbers were reduced following myxomatosis, mammals (including lagomorphs) only comprised 35% of prey items, demonstrating that polecats are able to switch to alternative prey when rabbits are scarce. Elsewhere in Europe, the polecat's diet is much more varied, comprising mainly rodents, amphibians, lagomorphs, birds and carrion (Lodé, 1997). Therefore, if rabbits were to become scarce in Britain, polecats could switch to alternative prey, providing it was abundant.

4.3.2.3 Hybridisation between polecats and ferrets

The presence of both polecats and polecat-ferrets throughout a considerable part of the polecat's range in Britain presents a challenging issue for conservationists. The significance and conservation implications of hybridisation between polecats and ferrets have been discussed previously (Davison *et al.*, 1998; Kitchener *et al.*, 1999). With the polecat population expanding across Britain, there may be cause for concern that much of the population comprises hybrids or even feral ferrets, which may arguably have a lower conservation value than true polecats.

Recently, Costa *et al.* (2013) developed genetic methods to investigate the extent of hybridisation in the polecat population. A relatively high proportion of animals sampled (31%) were hybrids, with hybrids most frequently found outside of Wales and genetically pure polecats most frequently found in Wales. Notably, Costa *et al.* (2013) concluded that the phenotype (what the animal looks like) is often not a close match with the genotype (the animal's DNA), casting doubt over the phenotypic classification used in polecat recording during this and previous distribution surveys. This creates even greater challenges for wildlife recorders attempting to distinguish and classify polecats and polecat-ferrets.



Photograph: One of three polecats in greenhouse in recorder's garden in Staffordshire, July 2015 © Nick Hulme



Photograph: Polecat-ferret in Devon, June 2015 © Audrey Wolstenholme

Nevertheless, the polecat phenotype carries competitive advantages over hybrids or ferrets, with higher fitness and survival in animals conforming to the true polecat phenotype (Kitchener *et al.*, 1999). During the 2004-2006 survey, polecat-ferrets were significantly under-represented among road casualties during the autumn juvenile dispersal period, compared with polecats, suggesting that there may be differences in reproductive fitness and/or survival between polecats and polecat-ferrets (Birks, 2008). Consequently, their superior competitive ability means that polecats are likely to swamp most of the ferret genetic influences, so past hybridisation may not have a long-term impact on phenotype, behaviour and ecology of the population (Kitchener & Birks, 2014). In light of this, Kitchener & Birks (2014) have argued for pragmatism when classifying polecats and polecat-ferrets. Since it is not feasible or desirable to genetically test every polecat, a robust phenotype-based approach to identifying polecats is recommended (Kitchener & Birks, 2014), as applied during the current survey.

During all three polecat distribution surveys (the current survey; Birks, 2008; Birks & Kitchener, 1999), a consistent theme has emerged whereby the proportion of animals phenotypically conforming to true polecats is highest in the polecat's core range whereas the proportion of animals phenotypically conforming to polecat-ferrets is highest towards the edge of the polecat's core range and in reintroduced populations. Encouragingly, during the current survey, counties matching the criteria of 'Polecat Purity Zones' 1 and 2 were found over a wider area of Wales and central and southern England than during the 2004-2006 survey, demonstrating that the geographical area dominated by true polecats, rather than polecat-ferrets, is increasing (see section 3.5). The reintroduced polecat population in Cumbria, which comprised a relatively high proportion of polecat-ferrets during the 2004-2006 survey, is now dominated by true polecats, with only three verifiable records of polecat-ferrets (10% of verifiable records) received

during the current survey. This evidence supports the argument that polecats will out-compete polecat-ferrets or feral ferrets in the long-term, thus resulting in a population in which true polecats are dominant. If this process continues, there is arguably little cause for concern over the impact of hybridisation on the polecat population on a national scale in the long-term.

4.4 The status of the polecat elsewhere in Europe

Comparisons can be drawn between the status of the polecat in Britain and that in the rest of the species' ranges in continental Europe. In contrast to the recovery of the polecat in Britain, in parts of continental Europe the polecat population is declining (Fernandes *et al.*, 2008). Population declines have been reported in Germany (Will Duckworth, *pers. comm.*), Spain (Virgós, 2003; Emilio Virgós, *pers. comm.*), Portugal (Santos Reis & Mathias, 1996; Emilio Virgós, *pers. comm.*), Austria (Andreas Kranz, *pers. comm.*), Belarus (Vadim Sidorovic, *pers. comm.*), Croatia, (Konjević, 2005), Luxembourg (Baghli & Verhagen, 2003), Belgium (Libois, 1996), Poland (Pertoldi *et al.*, 2006) and Italy (Vigna Taglianti, 1998, cited in Birks & Kitchener, 1999). The reasons for this decline are not well understood but habitat fragmentation and degradation and the drainage of wetlands have been suggested as the principal causes (Blanco & Gonzalez, 1992, cited by Pertoldi *et al.*, 2006). In light of reported declines throughout much of its range, the recovery of the polecat in Britain could be regarded as significant for the overall status of the global population.

4.5 Recommendations for future work

4.5.1 Monitoring polecats

In the absence of a suitable tried-and-tested field survey method for surveying polecats, a citizen science survey based on the collection of records from the general public and naturalists is still the most appropriate approach for a wide-scale national survey. The development of camera traps, now commonly used in wildlife recording, has been a welcome addition to recording polecats, a technique not widely available during previous polecat surveys.

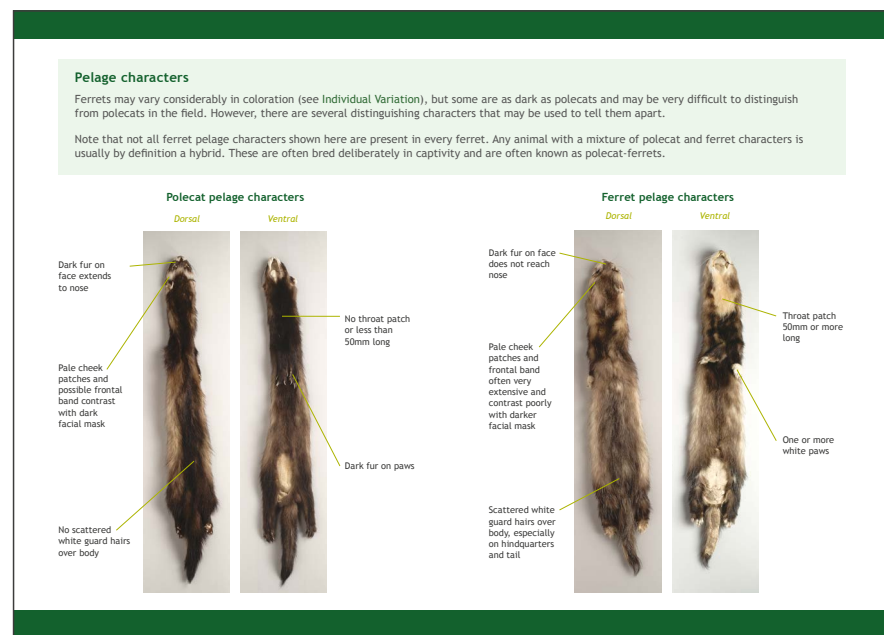
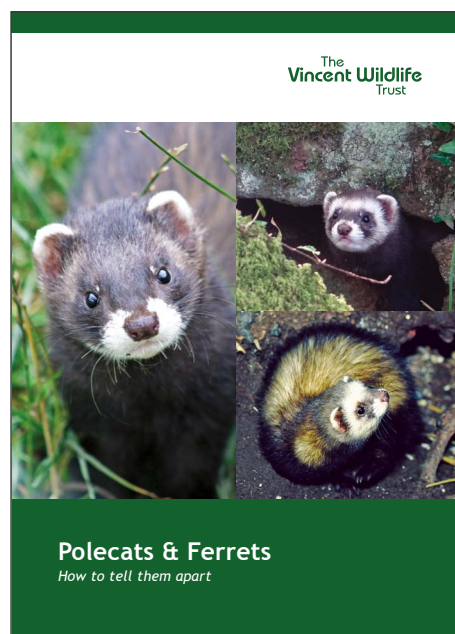
In line with recommendations from previous polecat surveys, distribution surveys should be carried out at ten-year intervals in Britain in order to monitor ongoing changes in polecat distribution (Birks & Kitchener, 1999; Birks, 2008).

4.5.2 Investigating threats to polecats

There are several factors which may influence the ongoing recovery and range expansion of the polecat population, as discussed in section 4.3.2. There is a case for quantifying these hazards and their potential impact on the population in order to inform appropriate management strategies. A PhD project is currently underway to improve understanding of the ecological characteristics that expose polecats to anthropogenic hazards, such as rodenticides and subsequent secondary poisoning.

4.5.3 Raising awareness and promoting understanding

As the polecat expands its range across Britain and becomes re-established in areas from which it has been absent for a significant period of time and in areas with a higher human population density, there is a need to raise awareness and promote tolerance of this little-known and often poorly-understood species. This is particularly pertinent in cases where polecats forage and/or den in gardens or outbuildings and may come into frequent contact with humans, occasionally even entering homes. Furthermore, polecats may come into conflict with humans when they have the opportunity to predate poultry or game. Distribution of general information leaflets and availability of information online can be helpful and promoting sustainable predator-proof husbandry methods for penned poultry and game should be encouraged.



Photographs: VWT leaflet 'Polecats & Ferrets: How to tell them apart' illustrating the difference polecat and polecat-ferret pelage characteristics.

4.5.4 Improving confidence in polecat records

The difficulty in separating true polecats from polecat-ferrets presents challenges for recording polecats and can hamper recording efforts. Classifying animals as polecat or polecat-ferret is particularly important in areas in which polecats are newly re-establishing, where there is a need to gather accurate information on the status of the population. A leaflet illustrating the pelage characteristics of polecats and polecat-ferrets is available on the VWT's website to help recorders and Biological Record Centres to classify records. Linked to this, recorders should be encouraged to provide photos of the animal (including the body and the face) where possible, in order to help with phenotypic classification. Future molecular analysis of polecat specimens as per Costa *et al.* (2013) may be appropriate.

5. Conclusion

The polecat population in Britain is continuing to recover and re-colonise parts of its former range following a severe historical decline during the 19th century. Since the previous two distribution surveys, the polecat's range has expanded considerably into parts of southern and eastern England and the polecat is now more widespread than at any time in over 100 years. Whilst it seems likely that the population will continue to expand, the potential impact of anthropogenic threats on the continuing recovery is unknown and warrants further investigation.



Photograph: Polecat © Anne Newton

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Appendices

Appendix 1. A summary of the number of records received and the polecat re-colonisation date for each vice county. Records believed to be of domestic ferrets have been excluded. *The percentage is of verifiable records.

Vice county	True polecats	Polecat-ferrets	Unverifiable	% True polecats*	Re-colonisation date
West Cornwall	0	2	9	0	Late 2000s-early 2010s
East Cornwall	5	6	40	45	Still absent?
South Devon	15	30	81	33	Late 2000s-early 2010s
North Devon	6	6	25	50	Late 2000s-early 2010s
South Somerset	9	16	52	36	Early 2000s
North Somerset	7	4	24	64	Late 2000s-early 2010s
North Wiltshire	6	0	3	100	Mid-1990s
South Wiltshire	13	1	9	93	Mid-1990s
Dorset	13	3	38	81	Mid-1990s
South Hampshire	2	1	9	67	Early 1990s
North Hampshire	3	3	8	50	Early 1990s
West Sussex	7	5	10	58	Early 2000s
East Sussex	0	1	5	0	Late 2000s-early 2010s?
East Kent	5	8	11	38	Late 2000s-early 2010s
West Kent	0	0	1	0	Still absent
Surrey	0	2	6	0	Early 2000s
South Essex	0	4	3	0	Early 2000s
North Essex	9	11	32	45	Late 2000s-early 2010s?
Hertfordshire	5	1	18	83	1980s
Middlesex	0	0	3	0	Still absent?
Berkshire	20	2	21	91	Mid-1990s
Oxfordshire	15	2	13	88	Mid-1990s
Buckinghamshire	6	1	16	86	Late 1980s
East Suffolk	1	2	7	33	Late 2000s-early 2010s
West Suffolk	14	9	12	61	Early 2000s
East Norfolk	0	6	10	0	Late 2000s-early 2010s
West Norfolk	5	8	11	38	Late 2000s-early 2010s

Vice county	True polecats	Polecat-ferrets	Unverifiable	% True polecats*	Re-colonisation date
Cambridgeshire	10	4	21	71	Late 2000s-early 2010s
Bedfordshire	4	0	11	100	Early 1990s
Huntingdonshire	5	0	2	100	Early 2000s
Northamptonshire	4	1	14	80	1980s
East Gloucestershire	12	0	7	100	1950-1964
West Gloucestershire	3	0	10	100	1950-1964
Monmouthshire	9	0	11	100	1940s
Herefordshire	39	1	38	98	Never extinct
Worcestershire	13	0	3	100	1960s
Warwickshire	11	1	9	92	1970s
Staffordshire	12	2	14	86	Late 1970s
Shropshire	18	1	32	95	Never extinct
Glamorgan	7	0	13	100	1950s
Breconshire	11	0	10	100	Never extinct
Radnorshire	8	0	3	100	Never extinct
Carmarthenshire	19	0	31	100	Never extinct
Pembrokeshire	7	0	8	100	Never extinct
Cardiganshire	22	0	28	100	Never extinct
Montgomeryshire	8	0	13	100	Never extinct
Merioneth	9	1	13	90	Never extinct
Caernarvonshire	11	0	11	100	Never extinct
Denbighshire	22	0	35	100	Never extinct
Flintshire	3	1	8	75	1940-1962
Anglesey	3	0	8	100	Mid-1990s
South Lincolnshire	4	4	8	50	Late 2000s-early 2010s
North Lincolnshire	8	0	10	100	Early 2000s
Leicestershire & Rutland	4	3	3	57	Mid-1990s
Nottinghamshire	10	1	7	91	Early 2000s

Vice county	True polecats	Polecat-ferrets	Unverifiable	% True polecats*	Re-colonisation date
Derbyshire	4	0	10	100	Early 1990s
Cheshire	31	3	38	91	Early 1970s
South Lancashire	1	1	10	50	Late 2000s-early 2010s
West Lancashire	2	1	4	67	Mid 1990s
South-east Yorkshire	0	1	2	0	Still absent?
North-east Yorkshire	0	0	6	0	Still absent
South-west Yorkshire	2	1	12	67	Late 2000s-early 2010s
Mid-west Yorkshire	4	4	7	50	Late 2000s-early 2010s
North-west Yorkshire	1	2	10	33	Late 2000s-early 2010s
Durham	0	0	2	0	Still absent
South Northumberland	1	9	9	10	Late 2000s-early 2010s
Westmorland	11	0	12	100	Late 1970s
Cumberland	17	3	11	85	Late 1980s
Dumfriesshire	1	1	2	50	Early 2010s
Roxburghshire	0	0	1	0	Still absent
Midlothian	0	0	1	0	Still absent
Mid Perthshire	0	1	4	0	Early 1990s
East Perthshire	1	1	2	50	Early 1990s
Angus	5	3	4	63	Early 1990s
Kincardineshire	0	0	1	0	Still absent
South Aberdeenshire	0	0	1	0	Still absent
Moray	0	0	1	0	Still absent
East Inverness-shire	0	0	1	0	Still absent
Kintyre	0	0	1	0	Still absent
Mid Ebudes	0	1	0	0	Still absent
North Ebudes	0	0	1	0	Still absent
East Sutherland	0	0	1	0	Still absent
Caithness	0	1	1	0	1990s?

Photograph: Polecat © Anne-Marie Kalus



The Vincent Wildlife Trust

The Vincent Wildlife Trust has been involved in wildlife research and conservation since 1975. It has focused particularly on the needs of British mammals including the otter, pine marten, polecat, stoat, weasel, water vole, dormouse and the bats. Currently the VWT's work is centred on the pine marten, polecat, and the rarer bats.

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