CHAPTER 7

STOAT (*Mustela erminea* L.)

History of the status and distribution of the stoat in Yorkshire

Stoat remains, initially figured as 'weasel' in Buckland (1823) and subsequently re-determined as stoat (Rutter 1956), have been identified from Pleistocene deposits in Kirkdale Cave, North Yorkshire, but unfortunately the unstratified nature of its context precludes its identification as part of a post-glacial or recent fauna. As with the weasel, the literature from Quaternary, archaeological, topographical, local history and folklore studies provides little information on the origins and history of the weasel in mainland Britain and no post-glacial evidence of stoat has been identified from Yorkshire cave sites (Chamberlain 2002, Jenkinson 1984, Yalden 1999).

Although skeletal remains were identified in seven sedimentary strata within Pin Hole Cave, Creswell on the Derbyshire/Nottinghamshire border near the border with South Yorkshire, these occurred in a cold-phase glacial context characterised by the presence of mammoth (*Mammuthus primigenius*) woolly rhinoceros (*Coelodonta antiquitatis*), reindeer (*Rangifer tarandus*) and Norway lemming (*Lemmus lemmus*) and arctic lemming (*Dicrostonyx torquatus*) (Jenkinson 1984).

King and Moors (1979) suggest that since the greatest extent of glaciation during the Pleistocene did not extend south of a line from Essex to the Seven estuary and the last (Devensian) glaciation did not extend over parts of southern Yorkshire and the English Midlands, stoat and weasel could have existed in tundra habitats in southern Britain during late glacial and post-glacial times, presumably feeding on mountain hare and a rodent fauna dominated by lemming. However, there is some fossil evidence from the British Isles, particularly from cave deposits in Ireland dated 10,680 b.p., 9,980 b.p. and 7,650 b.p. (Yalden 1999). The most recent of these finds post-dates the severing of the English/continental land-bridge and potentially provides evidence that a continuous presence could have been possible through to historic times. However, even in the Irish records, there is a gap of over 7000 years to historic times before the next dated Irish skeletal remains dated as 305 years b.p. The absence of material evidence in bone assemblages from cave or archaeological sites from the Pleistocene through to medieval strata suggests the stoat may have been scarce or absent from the Yorkshire, or even the British, fauna until relatively recent times, certainly after the land-bridge with the continent had submerged beneath the rising North Sea some 9,500 years b.p. This may

even suggest that it could have been introduced as late as historic times.

Etymological and literary sources

Despite the absence of material evidence through to historic times, a knowledge of stoat under its various vernacular names is shown by usage in written form in England at least from the 10th century, and as having sufficient impact on the rural economy to be regarded as 'vermin' from the 16th century.

Archbishop Ælfric's Vocabulary of the 10th century includes '*hearma*' (Ermine) (Wright 1884), a term considered to derive from the old high German '*harmin*' referring to ermine, the term currently used for the white form of the winter pelage of the stoat (Oxford English Dictionary 1989). According to sources in the OED, the use of the term stoat dates back to the Porkington Manuscript of 1460 (MS. 10. Lf. 189) where the 'stote' it listed amongst 'bestes of ye stinking fure'. The St Alban's Book of 1486 (f. iv b.) lists the 's[t]ot', Huloet (1552) refers to the 'stoate' as 'a beast or vermyne whyche kylleth rabetts', and Topsell (1607) includes it with 'noysome beasts' in his anecdote 'It is said that if the head of a wolf be hanged up in a dove-cote, neither … stoate or other noysome beast dare enter therin'.

From at least the 15th through to the 19th century, various forms of the term 'lobster' were used as a vernacular term for *M. erminea*. Its earliest traced usage quoted by the OED is in Gairdner's edition of the Paston Letters (III, 365) of 1490 which refers to the practice of rabbit warreners in the parish of Oxenhed, Norfolk, hanging up such 'mysdoers and forfaytours as Lobsters…'. Huloet (1552) refers to 'lopster vermin' and the OED quotes to an untraceable source cited as Elton (1864) which notes that 'it is said that farmers in England complain of the lobsters sucking the eggs and killing the chickens'.

The term is composed of two etymological elements, the first being 'lob' sometimes expressed as club, clob, lob or lop. This refers to the flag or pendent-like black tip to the relatively long tail which persists through summer or winter (ermine) pelages. This conspicuous feature, by acting as a false or dummy target, has been shown to reduce fatalities resulting from attacks by avian predators (McDonald & Harris 1998). The final 'ster' or 'start' element refers to tail in the sense of the passerine bird redstart (*Phoenicurus phoenicurus* L.). It is tempting to suggest that the term 'stoat', which seems not to have any Germanic or Old English origins, could be derived from 'start'.

Specific reference to this usage in the Yorkshire region is made by Cocks (1878) who relates that in the district of Cleveland, more specifically an area 12 miles west of Whitby, 10 miles east of Stokesley and 9 miles south-east of Guisborough, the name 'clubster' for stoat was in use. In the Wester Ainsty (between Leeds and York) it is called 'clubstart' (Waite 1891) and in the Hornsea Mere area of Holderness they were locally known as 'clubbies' or 'clubstarts' (Bolam 1913). The term is compressed in usage to clobster or lobster and the form 'clubtail' has been used in the adjacent county of Lincolnshire (Blathwayt 1912).

By 1566, 'stote' was regarded as being sufficiently detrimental to agriculture as to be included amongst 'ravening Byrdes and Vermyn' for which the Elizabethan 'Acte for the Preservacion of Grayne' allowed parish officials to pay head money for their destruction. The only specific references to stoats in churchwardens' accounts are from the parish of Brompton by Sawdon where 2d. was paid for one in 1748 and in 1749 2d. bounties were paid for three clobsters, these constituting the earliest traceable Yorkshire stoat records.

The extreme scarcity of stoats in vermin bounty payments in Yorkshire parish accounts raises the possibilities that either (a) it was uncommon up to the mid-19th century, its status being suppressed by competitive species present prior to the 19th century, (b) it was common but not perceived to be a pest in many parishes and therefore few or no bounties were paid, or (c) stoats, along with weasels and polecats, were collectively referred to under the term 'foulmart'. Since stoats and weasels were being killed in large numbers by gamekeepers on game estates from at least the 19th century, proposition (b) would not seem to be the case. It is therefore puzzling as to why relatively few bounties were paid for them from parish funds. If proposition (c) is indeed the case, the analysis of bounty payments for foulmarts and polecats as providing evidence of the distribution and fluctuating status of *M. putorius* is seriously flawed.

Gamekeepers records of the 1930s

Amid the numerous opinionated, but generally unsupportable, statements concerning the status and distribution of stoats in the literature assembled into Appendix 3 are several key statistical records derived from evidence of gamekeepers' vermin management from the late 19th century to the 1960s. These are derived from the relative numbers of weasels and stoats on gamekeeper's gibbets, as at Irton in 1890 and 1905

(Gyngell 1905), Kirk Smeaton in 1901 (Sheppard 1901), Suffield in 1904 (Sheppard 1904), Egton Bridge and Driffield in 1931-1932 (Flintoff 1933), Kirby Moorside in 1914-1933 and Marske in 1933-1934 (Flintoff 1935) and Sandbeck Park in 1965 (Clegg 1967) and the numbers of weasels and stoats trapped on an 800 ha estate in North Yorkshire in 1943-1946 and 1969 (Hewson 1972). These are included in Appendix 7.3 and the ratios of stoat to weasel amalgamated in Figure 8.8 of Chapter 8.

In 1931-32 and 1933-34, when Yorkshire naturalists enjoyed a closer and more productive relationship with the landed and game-keeping fraternity, John Flintoff (1873-1941) of 'Water Ark', Goathland undertook a questionnaire survey of gamekeepers and estate managers requesting them to report the numbers, sexes and pelage forms of stoats trapped on shooting estates. Replies were readily provided from 51 estates in Yorkshire, seven from Westmoreland and Northumberland, and one each from Nottinghamshire and Lincolnshire. Flintoff's pioneering survey provides an unprecedented legacy of raw statistical data, anecdotes and preliminary interpretation (Flintoff 1933, 1935, 1936). Howes (2002a) re-worked Flintoff's data in relation to altitude and the natural geographical regions of Yorkshire as set out by English Nature (Selman *et al*. 1999) in order to reveal evidence of how the 'ermine' (winter whitening) mechanism operates in stoat populations in Yorkshire's topographically and climatically varied countryside. The present study re-examines the data in order to determine distribution during the 1930s and variations in persecution rates and thus regional population densities at the time.

Data from Flintoff (1933, 1935) have been compiled into Appendix 7.1 which gives the name and national grid reference of the shooting estate, the estate codes as referred to by Flintoff, the area of each estate expressed as km^2, the numbers of stoats killed for the 12-month period 1 September to 31 August, the number of stoats killed per km^2 for each year in each estate, and finally the year for which the records relate.

Although numerous historical reports of stoats are available from county and local natural history sources, few of the provenances are sufficiently defined to enable detailed mapping. Figure 7.1 shows the geographical locations of all Flintoff's shooting estates from which stoats were reported where the provenance was provided or was traceable. In the absence of localised records from other sources, Flintoff's data forms the basis of the earliest distribution map for stoats in Yorkshire.

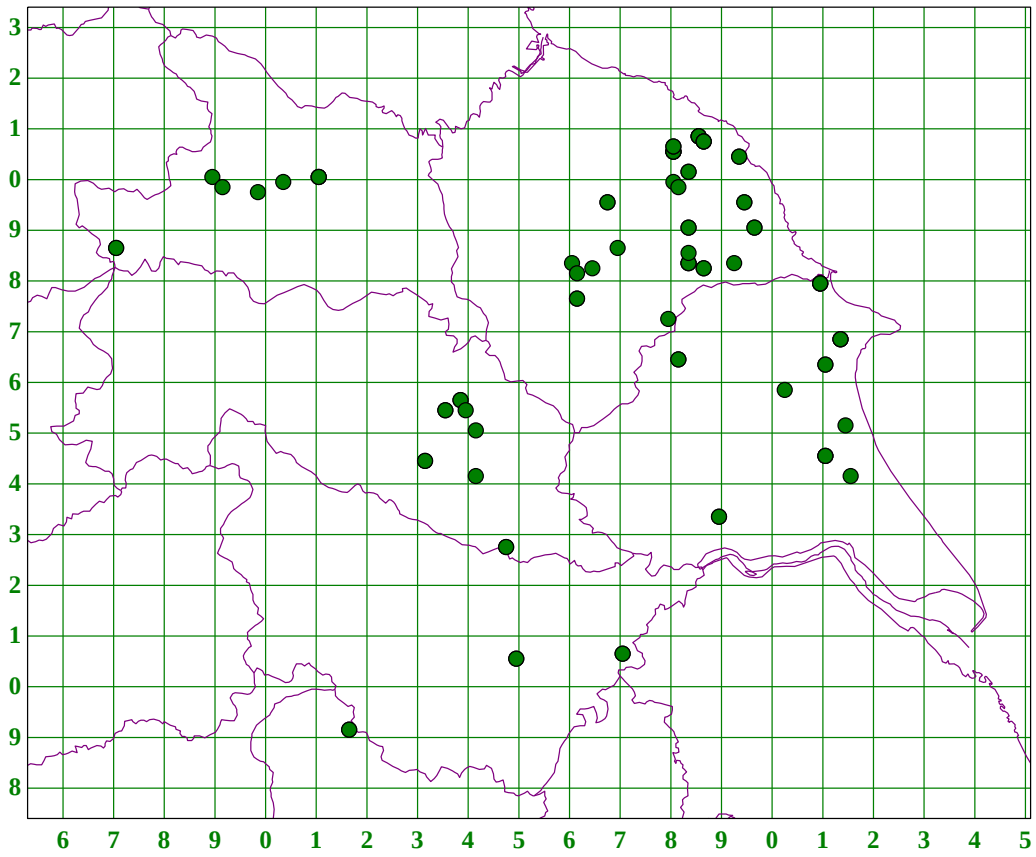

Figure 7.1. Locations of shooting estates where stoats were killed 1931-1934 (based on data in Flintoff 1933, 1935).

Population density

Appendix 7.1 shows that Flintoff was in receipt of cull data largely for the seasons 1931-1932 and 1933-1934, but some correspondents provided additional data for the seasons 1930-1931 and 1932-1933. Table 7.1 gives the rates of cull ranging from 2.62 to 6.36 per km^2 for these four consecutive seasons and shows a mean cull rate for the period 1930-1934 to be 2.96 stoats per km^2.

By sorting the data in Appendix 7.1 into broad geographical regions, Figure 7.2 shows apparent regional differences in cull rates which may reflect the actual population density of stoats. Since so few data were available for the southern Pennine Peak district, these have been merged with records from the Yorkshire Dales to form a western uplands group.

Table 7.1

Season	Area sampled (km^2)	Stoats killed	Stoats per km^2
1930-31	52.61	328	**6.23**
1931-32	963.68	2525	**2.62**
1932-33	36.43	232	**6.36**
1933-34	858.6	2578	**3.00**
Total	1911.32	5663	**2.96**

At 4.92 kills per km^2, the Wolds and Holderness provide evidence for the highest regional density. This trend is also reflected in Table 8.1 of the Chapter 8, which shows that of the YNU field excursions to each of the five Yorkshire vice-counties, those to VC61 (which largely equates with the Wolds and Holderness), produced the highest percentage of stoat records.

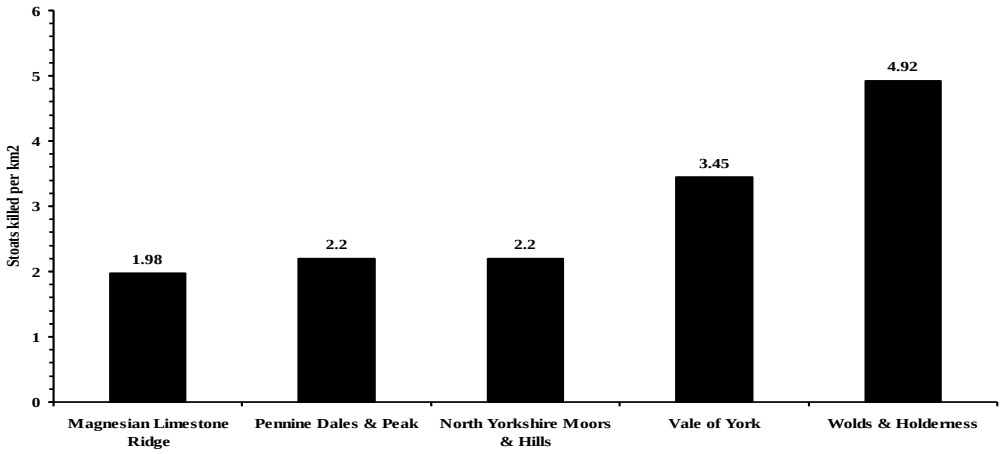

Figure 7.2. Cull rates (stoats killed per km^2) in five geographical regions of Yorkshire 1930-34 (based on data in Flintoff 1933, 1935).

Estate sizes varied considerably, the smallest keepered by T. Watt at Aislaby being 2.83 km^2 and the largest by far that of the 242.91 km^2 estate at Duncombe Park, keepered by Adam Gordon. Although the numbers of stoat killed generally increased with the size of the estate, Figure 7.3 shows that the cull rate per km^2 actually declined. Extreme cases are the rates of 9.54 stoats killed per km^2 at Aislaby in comparison with 0.74 per km^2 on the immense estate at Duncombe Park. Although this may be a reflection of the relative inefficiency of vermin management on the larger estates, probably resulting from a reduced staff of keepers following the First World War, it may account for some of the regional variation in stoat cull levels as revealed in Figure 7.2.

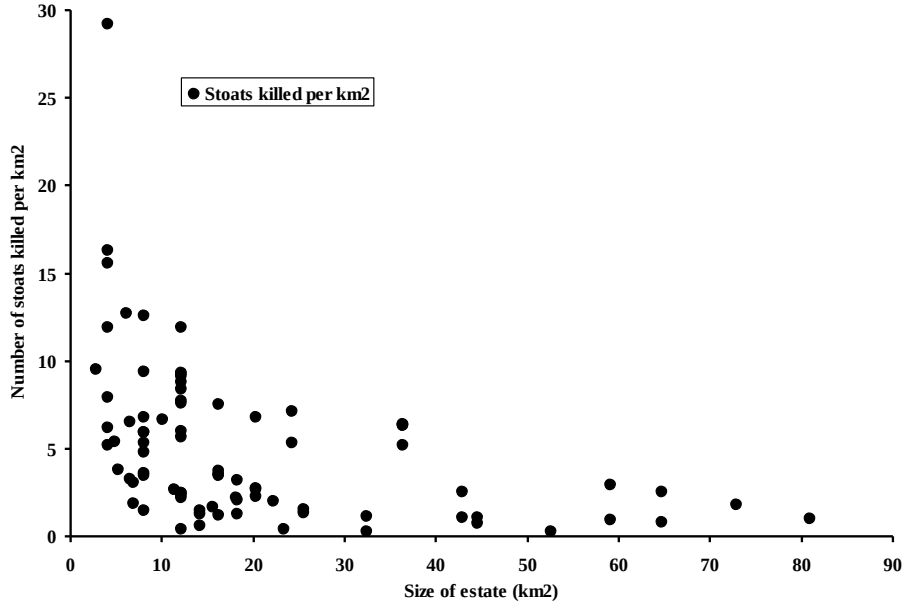

Figure 7.3. Relationship between size of shooting estate and stoat cull levels.

Analysis of ermine pelage in Yorkshire stoats

Of the stoats killed on Yorkshire estates, Howes (2002a) shows that males accounted for 62% and females for 38%. This pronounced bias, typical in trapping figures for mustelids, is shown by King (1975) to be associated with differential trapability attributable to the heavier males being more likely to activate the traps, females being more 'trap-shy', and more particularly to the relatively large home ranges of the males which increases their likelihood of encountering traps.

Winter whitening (piebald or full ermine) is shown to occur in only 4.6% of the annual cull of males compared with 9.8% in females. Provided both sexes are caught at a constant rate throughout all seasons, this would demonstrate the greater disposition of females to exhibit white or piebald pelage. Flintoff (1933) noted that of the total sample, only females were observed to exhibit full ermine pelage. Since genes which control the 'ermine' mechanism are thought to be linked with the female sex chromosome, females have a greater predisposition for winter whitening (King 1989, McDonald & Harris 1998).

Not all stoat populations have the gene which gives rise to the winter whitening process. King (1989) and McDonald and Harris (1998) show that the whitening gene tends to be absent in stoat populations in the south-east of Britain, but is present in the north-west. With Watsonian Yorkshire being on the boundary of these two zones, it

makes the varied topography of the county an ideal laboratory to monitor the winter whitening phenomenon.

Analysis of data for each ‘natural area’ of Yorkshire and counties to the north and south it, shows regional differences in the proportion of the populations showing winter whitening (see Appendix 7.2). Counties to the north of Yorkshire (Westmoreland and Northumberland) show that 15.3% of stoats exhibit whitening. In Yorkshire, the upland grouse moor areas support most ermine, being 9.4% in the Pennine and Dales region and 7.6% in the North York Moors. In the elevated Yorkshire Wolds it was 5.0%, but in the county’s lowland regions and counties to the south of it, whitening was scarcer, being 3.4% in the Vale of York and 3.5% in Nottinghamshire and Lincolnshire. Shortening day length in autumn triggers the stoat’s winter moult: if external temperatures drop below a critical threshold, pituitary hormones, which normally stimulate chromatophore development in the hair follicles, are suppressed. The newly formed outer 'guard' hairs therefore develop without pigment into the white, snow-camouflaged 'ermine' pelage. Spells of warmer weather encountered during the moult process can restore pigmentation, resulting in piebald stoats (King 1989, McDonald & Harris 1998). An examination of 73 YNU records shows that in Yorkshire, ermine and piebald stoats are recorded between November and April, with most seen in February (Figure 7.4). The rate at which winter whitening appears in stoat populations evidently varies from year to year, as demonstrated by field observations in the Southern Pennines

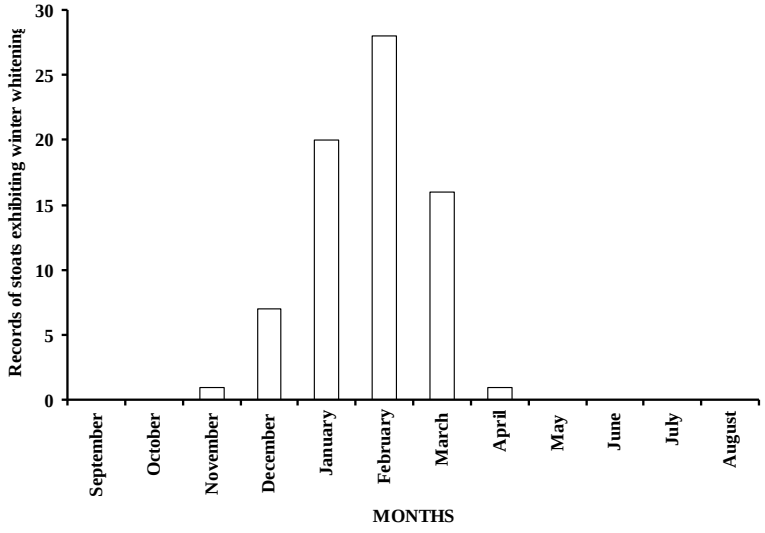

Figure 7.4. Seasonality of records of stoats exhibiting winter whitening (data from 73 observations in YNU mammal records).

and Dark Peak by the Sorby Natural History Society (Clinging 1984). Since the number of stoats exhibiting ermine is likely to vary according to prevailing temperature, this makes them potential indicators of climatic oscillation. The relative abundance of 19th century specimens of ermine-coated stoats in museum collections suggests that more may have been available to taxidermists of the past than is the case today, possibly indicating colder winters a century ago. On the other hand, unusual pelage forms, as with albinos, may have rendered white specimens more collectable and commercially rewarding to the trapper and taxidermist.

Estimations made by Flintoff's correspondents of the altitudinal ranges at which stoats were being killed on the shooting estates made possible an analysis of this factor as an influence in winter whitening. For stoats trapped at altitudes of up to 500 ft and from 500 to 1000 ft, the proportion of stoats exhibiting whitening was 5.6% and 5.9% respectively, whereas on shoots above 1000 ft, it was 13.8%, an increase possibly due to colder climatic conditions suppressing brown pigmentation of the fur during the autumn moult.

Discussion

Origins of the Yorkshire population

Absence of conclusive evidence of stoat in the post-glacial subfossil record for the Yorkshire region and its absence from elsewhere in Britain prior to the submergence of the land-bridge with Europe some 9,500 years b.p. suggests that it may have been accidentally introduced into the British fauna, possibly in historic times. Place name evidence based on either 'ermine', 'stoat' or 'lobstart' forms have not been encountered. Although the term ermine appears to have an origin in Old High German, and may have been imported with Germanic languages, its use is likely to have been associated with high status furs possibly of imported origin. The earliest written example of its use in English texts dates from the 10th century. Variations of the forms 'lobstart' and 'stoat' have been traced back the latter half of the 15th century, these allusions generally referring to its predatory nature. By 1566, its status as a pest is confirmed in the Act of Parliament which enabled parish officials to pay head money for their destruction. Its inclusion in the Act may, however, be based on a generalised prejudice against any predatory mammal and may not be confirmation of its widespread distribution or abundance. The earliest Yorkshire example has been traced back only to 1749.

Evidence of status changes

Whereas vermin bounty data from churchwardens' accounts enabled comparisons to be made with the status and distribution of weasel and potentially competitive species like fox and polecat, insufficient data on stoats from this source have prevented this exercise. Perhaps significantly, extensive searches by Oldham (1931) and Elliott (1936) of churchwardens' accounts in Hertfordshire and Bedfordshire respectively found relatively very few bounty payments for stoats, even into the first half of the 19th century.

This study has had to rely firstly on anecdotal information gleaned from topographical and natural history literature (see Appendix 7.3), which has had to be amalgamated with the equivalent data for the weasel to convert into an abundance index. This is incorporated into Figure 8.7 in Chapter 8, which shows the perceived changes in status of stoat and weasel per decade from the 1880s to the 1960s.

In addition, occasional statistical evidence, typically from gamekeeping sources and observational counts at bird observatories, tabulated in Appendix 7.3, provide the basis of Figure 8.8 in Chapter 8. which shows variations in ratios of weasels to stoats from the 1890s to the 1960s. Both anecdotal and statistical sources suggest an excess of weasels over stoats prior to the First World War, with an increase in both stoats and weasels observed following the war, although statistical evidence suggests that stoats were generally more numerous than weasels up to the late 1940s.

Data reworked from Flintoff (1933, 1935) provided an opportunity to examine cull rates in over 50 shooting estates in the county (see Appendix 7.1). Figure 7.1 shows the distribution of the estates and Figure 7.2 shows broad regional variations in mean cull rates, indicating that the highest mean cull rate (probably a reflection of relative population levels) was in east Yorkshire. Cull rates varied markedly from as low as 0.26 stoats per km^2 on a 55.63 km^2 estate at Fylingdales, north-east Yorkshire to 29.2 stoats per km^2 on a 4.04 km^2 estate at Leven Hall, east Yorkshire.

The high abundance and frequency of stoats relative to weasels was probably the case up to the eradication of rabbit stocks by myxomatosis which reached Yorkshire in 1954 and had decimated rabbit populations even in the most remote northern Dales by 1955. During the 1960s, stoats were scarcer than weasels and locally absent. King (1989) and McDonald and Harris (1998) show how stoat populations fluctuate according to the availability of rabbit prey. A dependency on rabbits was illustrated by an analysis of stoat and weasel prey in Yorkshire (Howes 1977). This study, based on

field observations had a bias towards the observable, namely larger prey items. Although a very wide range of prey types was catalogued, it is likely that rabbits may have been overestimated. Alcock and Warsop (1982) followed this study by one based on the examination of stomach contents of 30 stoats collected in the Sheffield and South Yorkshire region: 50% contained evidence of Lagomorph prey with woodmouse (*Apodemus sylvatica*) and field vole (*Microtus agrestis*), each being present in 20% of stomachs. King (1989) and McDonald and Harris (1998) show that after myxomatosis, competing predators such as weasels and foxes switched their diets to small mammals, which were abundant at that time. Stoats, without access to rabbit populations, were unable to successfully switch to smaller prey. This may provide a reason for their absence from the Yorkshire historic record prior to feral rabbits becoming hugely abundant, as they evidently were during the 19th century.

National game bag results (Tapper 1992) show that although stoats rallied as rabbits recovered post-myxomatosis, reaching a peak in the mid-1970s, both stoat and weasel have been declining. That foxes may have exerted a controlling influence on both these small mustelid is suggested by Mulder (1990), who reported on foxes killing and possibly being responsible for exterminations of stoats in dune regions of the Netherlands.