CHAPTER 3

RED FOX (*Vulpes vulpes* L.)

Introduction

The red fox (*Vulpes vulpes* L.) is a member of the family Canidae, a group of ten genera and 35 species including wolves, jackals and the domestic dog, as well as 12 species of fox in the genus *Vulpes* (Macdonald 2001). In addition to the red fox, the arctic fox (*Alopex lagopus*) was present in late glacial times (see Appendix 3.1) but only the wolf (*Canis lupus*) and domestic dog (*Canis familiaris*) have been present in Britain's post-glacial fauna. The wolf became extinct in England perhaps in the late 13th century (Yalden 1999), and the domestic dog generally failed or has not been allowed by human influence to form self-sustaining feral populations.

Sub-fossil fox remains have been identified in cave sediments and prehistoric archaeological excavations from 13 sites across Yorkshire representing a range of geological and cultural periods. However, the practice of dating such evidence in terms of faunal context, or indeed by the carbon dating of associated organic materials, is complicated by the fox's ability to burrow through datable sedimentary horizons.

The widespread occurrence and evidently fluctuating abundance and expanding distribution of the fox throughout Yorkshire has been investigated by the use of: a) place-name evidence; b) claims of permission to hunt it as an animal of the 'chase' in medieval times; c) its designation as 'vermin', for which bounty payments were recorded in churchwardens' accounts from the late 16th to the early 19th century; and d) records from fox hunts of the 18th, 19th and 20th centuries.

Cave and other sub-fossil faunas

If one assumes that foxes have died contemporaneously with other fauna within a dated horizon, then it would appear that foxes became a component of the Yorkshire fauna during arctic conditions of late glacial times (see Appendix 3.1). Remains of fox have been identified amongst late glacial faunas (including arctic fox and reindeer) at Elbolton Cave (SE/007614) (Jones 1888, 1889, 1890, Davis 1892, Tiddeman 1894a, Gilks 1973) and Victoria Cave (SD/838650) (Dawkins 1872, Tiddeman 1875, Gascoyne *et al*. 1981, Hedges 1992). Fox evidence occurred amongst postglacial faunas (including lynx and aurochs) at Moughton Fell Fissure (SD/795725) (Handby 1899, Jackson 1931),

Steetley Cave (SK/552790) (Jenkinson 1983) and Teesdale Fissure (Jenkinson 1983). By early post-glacial times, dated to 9,488 years b.p., fox remains were identified at the Mesolithic hunters' encampment at Star Carr on the north shore of Lake Pickering (Fraser & King 1954). At Calf Hole Cave on Malham Moor (SD/964646) (Tiddeman 1894b) fox occurred in deposits which could range from post conquest times back to the Mesolithic. At Cave Ha near Giggleswick (SD/789662) (Hughes *et al*. 1874, Tobin 1955, Pentecost *et al*. 1990) fox occurred in Bronze age deposits dated at 3,915 years b.p. with badger, deer sp. and various domestic taxa. Bones found as grave goods in an oak-trunk coffin in the Bronze Age barrow at Gristhorpe, North Yorkshire, were examined by Dr William Buckland and referred to as weasel (Williamson 1872, Rutter 1956). Subsequent examination by Dr. N. D. Melton and J. Bond of Bradford University has shown these bones to be of fox and pine marten (N. D. Melton *pers. comm*.). At Dawkabottom Cave (SD/951689), fox occurred with a range of domestic species together with badger, roe and red deer, and wild boar, though the presence of wolf suggests a date prior to the end of the 13th century (Denny 1859, Farrer & Denny 1865, Poulton 1881). At Lesser Kelcow Cave, Giggleswick (SD/809646) (Simpson 1950), fox occurred with badger and a range of domestic animals, the presence of rabbit suggesting a post-conquest date. Finally, at Lady Algetha's Cave in Wensleydale (SE/090911) (Horne 1885) fox occurred with a current fauna of domestic species together with badger, water vole and rabbit, though red deer may place the deposit prior to the 19th century.

Place-name evidence

In England, the red fox has been referred to by three vernacular names. The most frequent is the name *fox* which has Old English origins and is akin to the Old High German *fuhs*. The name *tod* or *todd* has Middle English origins with a primarily northern British usage. Finally, Renard or Reynard, a quasi-proper name given to the fox, has Old French and Middle English origins. Since each term has a considerable antiquity, each has been investigated with a view to locating place-names which are ascribable to fox (*Vulpes vulpes*) and which, in the absence of other contemporary evidence, may be used as an indication of the early distribution of the fox in Yorkshire.

By examining the 15 Ordnance Survey 1:50,000 scale 'Landranger' series maps which cover the Yorkshire area and the ten volumes of the English Place Name Society

dealing with the three Yorkshire Ridings (Smith 1937, 1961-1963, 1969), examples of place-names containing the elements fox, tod(d) and renard have been located. In each case their etymological association with the fox has been confirmed or otherwise by reference to Smith above, the results being tabulated in Appendix 3.2, from which a map has been created (see Figure 3.1) to show its distribution from the 11th to 19th centuries.

The term 'renard' has a long useage in literature, famously in Aesop's Fables, written in France at various times *c.* 1175-1250. A Flemish version of these anthropomorphic stories (now lost) was translated into English and printed by William Caxton in 1481 (Drabble 1985). In the 19th century the term, as applied to foxes which demonstrated 'cunning' in the context of a chase, has been frequently used in hunting literature. However, despite its familiarity, the term probably entered the vernacular language too late, at least in the north, to feature as a place-name element since the only examples located within the Yorkshire region appear not to have been derived from this etymological root.

'Tod' or 'todd' provided 19 examples, four of which were deemed to refer to red fox (*Vulpes vulpes*); the Old Norse personal name 'Toddi' (e.g. Tod Howe, Todmorden and Todthorpe) or the 19th century surname Todd (e.g. Todd Hill at Kirkby Overblow) can be referred to some other cases. Interestingly, its use as a place-name element becomes more frequent to the north of Yorkshire in Cumbria, Northumbria and the Scottish border counties.

Fifty examples of place-names using the element 'fox' were encountered, 26 of which were deemed to refer to red fox (*Vulpes vulpes*), one was a personal name or surname, and the remaining 23 are of unknown derivation. Figure 3.1 shows that the place-names deemed to refer to fox are largely distributed in the west of the county, along the Pennines or Pennine foothills, mainly at altitudes above the 400ft contour. In the north-east of the region, two sites are located on the western escarpment of the Cleaveland uplands and in East Yorkshire, two sites, the village of Foxholes, located on the high Yorkshire Wolds and Swine in the Hull Valley. The locations of prehistoric sites has also been plotted in Figure 3.1. Though these show a close correlation with the distribution of fox placenames, this coincidence may be a function of the distribution of sites capable of producing the preservation of skeletal material.

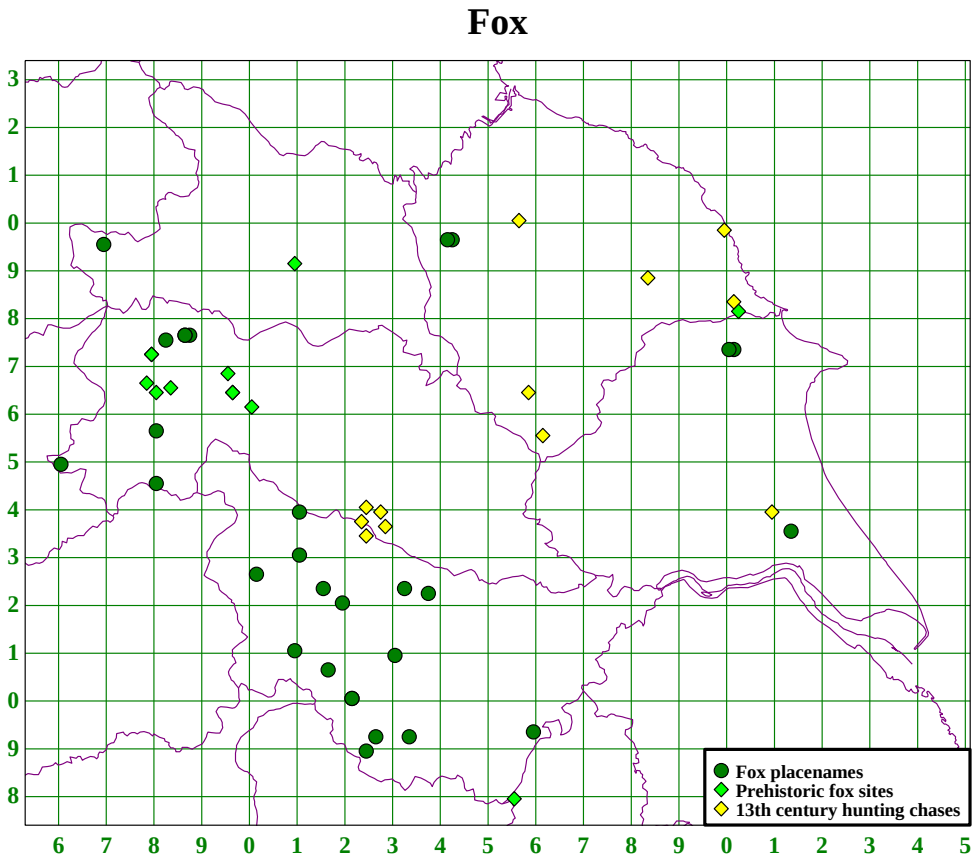


Figure 3.1. Locations of prehistoric fox sites, fox place-names of the 11th to 19th centuries and 13th century fox hunting chases.

The date at which a place or geographical feature is first named after the local occurrence of a fox, if indeed this was the reason for it being so named, potentially provides evidence as to when the species occurred in the district concerned. The earliest dates when these names appeared on manuscripts, maps, etc. have been obtained where available from the relevant English Place Name Society volumes and are included in Appendix 3.2. Earliest documentary dates range from the Domesday Book (1086) to

Table 3.1. Numbers of dated place name allusions for fox per century.

Century	Number
11th	2
12th	3
13th	2
14th	1
15th	1
16th	3
17th	4
18th	3
19th	7

1850, as detailed in Table 3.1. That the 19th century has the largest number of earliest datable documentary allusions, seven (27%) of the 26 available dates, may possibly indicate an increased number and distribution of foxes in Yorkshire. However, it is more likely to be a function of the greater availability of documentary sources in the form of detailed maps (tithe, estate and Ordnance Survey maps) at this time.

The fox as a beast of the chase

On the return of Edward 1st to England in 1274 from his crusade in the east, it was decided, in consultation with his council, to investigate improper alienations or encroachments on royal lands and privileges that had accrued during the previous reign. From 1274 to 1275, from 1279 to 1281 and again in 1293 to 1294 appointed Commissioners held 'sessions' in each administrative division (hundred) (or wapentake in Yorkshire) and jurors were called to give written verdicts on evidence of rights and privileges claimed by local landowners and clerics. Examples of claimed rights to hunt various specifically identified quarry animals provide circumstantial evidence of these species occurring in delineated parts of Yorkshire during the 13th century (English 1996).

Philip le Lardener was relieved of the liberty to hunt hare and fox in the forest of Galtres. The abbot of St Mary's, York claimed to have the chase through the whole of the forest of the king [in the region of] York for fox, cat, hare and badger. The abbot of Kirkstall 'claimed warren' to hunt stag, hind, buck, doe, goat, hare, fox or any other beast in Headingley, West Headingley, Cookridge, Adel, Horseforth and Bramley (English 1996). In a Patent Roll dated 9 September 1279 it is recorded that 'In 1234 Adam de Everingham had licence for life to hunt the fox in the king's chases and warrens of Holderness' (Reynard 1920). In 1252/53 Roger Hardy was granted licence to hunt fox in the forest of Pickering and in 1338 Henry Percy claimed the right to hunt fox in the manor of Seamer (Rimington 1956).

Thus in the 13th and 14th centuries, foxes were evidently present and hunted in the Forests of Galtres and Pickering, around York and in Holderness, and in the parishes of Adel, Bramley, Cookridge, Headingley, West Headingley, Horseforth and Seamer (see Figure 3.1). Although these references give no indication of frequency or population density, they suggest a wider distribution than do the perhaps earlier place-names. This might suggest an easterly spread from the Pennine foothills to the north and

west of Leeds, the Vales of York and Pickering, the uplands of the North York Moors and the coastal lowlands of Holderness.

Vermin bounty payments in churchwardens' accounts

Investigations into long-term distribution and status changes of Britain's vertebrate fauna is severely hampered by the paucity of accessible data sources earlier than the 19th and 20th centuries. However, a particularly fruitful, but seldom used, source of documentary evidence is the series of 'vermin' bounty payments contained in the yearly accounts of churchwardens and other parish or township officials from the late 16th to the mid-19th century. Though difficult to locate, decipher and extract, their particular value lies in their meticulous, statistically based and long-term nature, and their geographical focus. To date, the accounts of 65 Yorkshire parishes have been located which include records of bounty payments for the heads of 'vermin'. Foxes, usually at a shilling per head, featured in the churchwardens' accounts of 44 (67%) parishes. From the 65 positive sets of accounts, payments for some 10,556 carnivores have been recorded, of which 3,751 (35%) were for foxes.

Pre-19th century distribution and regional density

Tables 3.2a-e provide a gazetteer of parishes from which fox bounty payments have been located, shows the estimated altitude of the parish (as represented by the altitude of the parish church), earliest fox bounty record, number of fox bounties, total carnivore bounties and % carnivore bounties made up by foxes. In an attempt to investigate former variation in the relative abundance of foxes across the varied topography of Yorkshire, parishes have been aggregated according to the following broad regions: North-east Yorkshire, the Yorkshire Dales, Pennine South and West Yorkshire (to the west of the Magnesian limestone ridge), Lowland Southern Vale of York and the Humberhead Levels, below 100 ft (mainly to the east of the Magnesian Limestone ridge), and East Yorkshire (see Tables 3.2a-e). Table 3.2f provides the aggregate and mean figures for altitude, earliest record of fox, number of fox bounties, total carnivore bounties and fox as a % of total carnivore bounties within these regions.

Relationship with topography

Using a relatively limited series of parish records, Howes (1984) found evidence to

suggest that foxes were presented for bounty payments more frequently in upland parishes, suggesting that prior to the 19th century, foxes may have been more abundant or a greater nuisance in upland regions. Subsequent research presented here in Tables 3.2a-f has provided evidence of considerable variations in the % frequency of foxes in parishes of various altitudes, suggesting that the relationship with altitude is less convincing.

Table 3.2a-f. Regional Gazetteer of parish bounty payments.

TABLE 3.2a North-east Yorkshire Uplands						
PARISH	**Nat. Grid Ref.**	**Altitude (ft)**	**Earliest record**	**Fox bounties**	**Total bounties**	**% Fox**
Brompton-by-Sawdon	SE/9482	120	1788	2	156	1.3
Great Ayton	NZ/5610	219	1748	36	268	13.4
Helmsley	SE/6183	200	1673	605	606	99.8
Hilton	NZ/4611	148	1780	5	23	21.7
Scarborough	TA/0388	164		0	38	0.0
Stainton-in-Cleveland	NZ/4814	61	1771	5	316	1.6
Terrington	SE/6770	285		0	49	0.0
		171	**1752**	**653**	**1456**	**44.8**

TABLE 3.2b Yorkshire Dales						
Bedale	SE/2688	150	1673	15	119	12.6
Hudswell	NZ/1400	658	1698	5	7	71.4
Kirkby Malzeard	SE/2375	453	1576	3	5	60.0
Masham	SE/2280	260	1591	1047	1864	56.2
Rylestone	SD/9758	300	1747	15	15	100.0
Skipton	SD/9951	323	1729	1043	1070	97.5
		357	**1653**	**2128**	**3080**	**69.1**

TABLE 3.3c Pennine South & West Yorkshire (W. of Mag. Limestone ridge)						
Barnburgh	SE/4803	137	1719	10	123	8.1
Bradfield	SK/2692	1000	1741	6	6	100.0
Bradford	SE/1633	278	1668	22	34	64.7
East Ardsley	SE/3025	214		0	2	0.0
Ecclesfield	SK/3593	300	1714	12	72	16.7
Harthill	SK/4980	116	1759	5	58	8.6
Hickleton	SE/4805	328		0	5	0.0
Hooton Pagnell	SE/4808	246		0	1	0.0
Kildwick	SE/0145	180	1669	558	832	67.1
Luddenden	SE/0424	474		0	4	0.0
Northowram	SE/1127	770	1677	1	2	50.0
Peniston	SE/2403	537	1699	7	53	13.2
Tankersley	SK/3499	492	1795	28	42	66.6
Thorp Salvin	SK/5281	169	1700	99	267	37.1
Thurstonland	SE/1610	828	1774	8	293	3.7
Todwick	SK/4984	274	1741	2	16	12.5
Wadworth	SK/5696	145	1706	22	181	12.1

TABLE 3.3c (continued)						
Wakefield	SE/3320	126	1682	1	24	4.1
Whiston	SK/4590	137	1683	33	408	8.1
Worsbrough	SE/3503	178	1706	36	329	10.9
Yeadon	SE/2040	411	1723	1	3	33.3
		349	**1715**	**851**	**2755**	**30.8**

TABLE 3.2d Lowland Southern Vale of York (below 100ft mainly to E. of Magnesian. Limestone ridge)						
Adwick-le-Street	SE/5408	24	1817	1	35	2.8
Arksey-with-Bentley	SE/5707	22	1726	19	1147	1.6
Bawtry	SK/6593	27	1726	1	76	1.3
Bolton-on-Dearne	SE/4502	52	1789	2	3	66.6
Bolton Percy	SE/5341	21	1802	17	26	65.4
Doncaster	SE/5703	27		0	3	0.0
Fishlake	SE/6513	13		0	14	0.0
Rawcliffe	SE6823	15	1721	6	189	3.2
Snaith	SE/6422	30		0	4	0.0
Wath-on-Dearne	SE/4400	54	1724	8	18	44.4
		28	**1757**	**54**	**1515**	**3.6**

TABLE 3.2e East Yorkshire						
Beverley	TA/0439	54	1644	3	7	42.8
Cottingham	TA/0432	15	1661	37	1314	2.8
Elloughton & Brough	SE/9428	54		0	65	0.0
Langtoft-with-Cottam	TA/0166	235	1769	7	11	63.6
North Ferriby	SE/9825	50	1746	14	112	12.5
Patrington	TA/3122	28		0	156	0.0
Routh	TA/0942	15	1741	2	3	66.6
South Cave	SE/9231	144	1704	2	54	3.7
Tunstall	TA/3031	36		0	13	0.0
Wold Newton	TA/0473	150		0	15	0.0
		78	**1710**	**65**	**1750**	**3.7**

TABLE 3.2f All regions					
Region	**Mean Altitude (ft)**	**Earliest record**	**Fox bounties**	**Total bounties**	**% Fox**
Yorkshire Dales	357	1653	2128	3080	**69.1**
North-east Yorkshire	171	1752	653	1456	**44.8**
Pennine South & West Yorkshire	349	1715	851	2755	**30.8**
East Yorkshire	78	1710	65	1750	**3.7**
Lowland Southern Vale of York	28	1757	54	1515	**3.6**
Total	**216**	**1718**	**3751**	**10556**	**35.5**

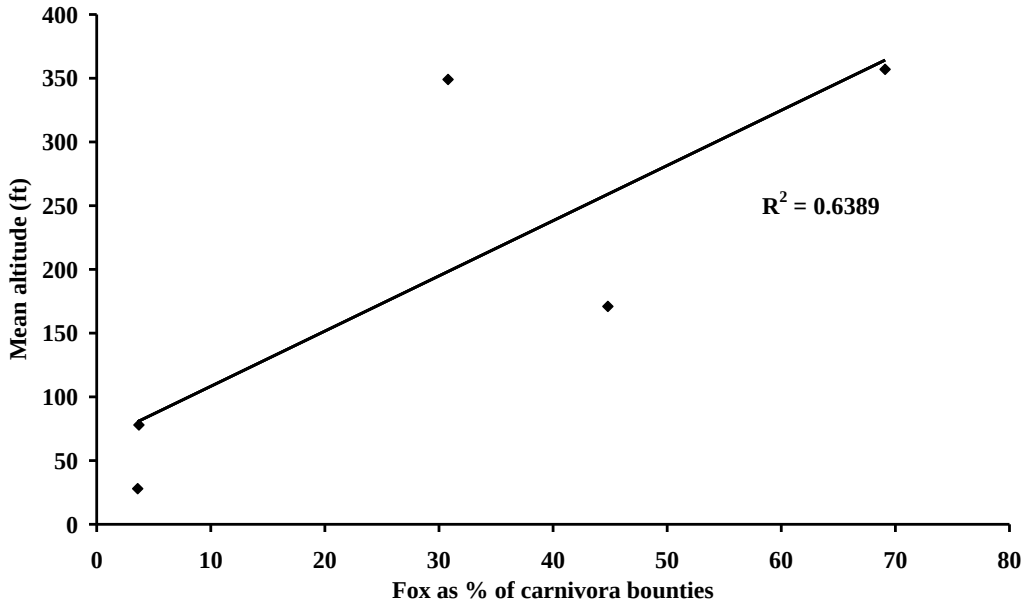


Figure 3.3. Relationship between mean altitude and % frequency of fox bounties in five geographical regions of Yorkshire.

However, in grouping parishes into the above-mentioned topographical regions (see Table 3.2f), Figure 3.3 illustrates a relationship between mean altitude and the relative frequency of fox bounties, showing that fox populations as expressed as a proportion of carnivore bounties, tend to be higher in upland areas, a feature reflected in the upland bias as suggested by fox place-name distribution (see Figure 3.1). Figure 3.2, compiled from Table 3.2a-f, plots a largely 17th to early 19th century geographical distribution of foxes across Yorkshire.

Status and distributional changes through time

As suggested in Figure 3.1, successive generations of allusions to fox in the form of prehistoric evidence, fox placename evidence and the locations of medieval hunting chases and as will be shown later (Figure 3.6), there seems to have been a distributional expansion from west to east and from upland to lowland regions of Yorkshire in the 18th and 19th centuries. To derive statistical data to examine this possibility, church wardens' accounts data have been arranged chronologically according to the first dates when fox bounties appeared in parish accounts, sub-dividing them into the six 50-year periods from 1550 to 1800. This enabled the mean first dates and mean parish altitude (as determined by the altitudes of the parish churches) to be calculated for each 50-year period. Figure 3.4 plots the result of this exercise, showing that in the 1550s the mean

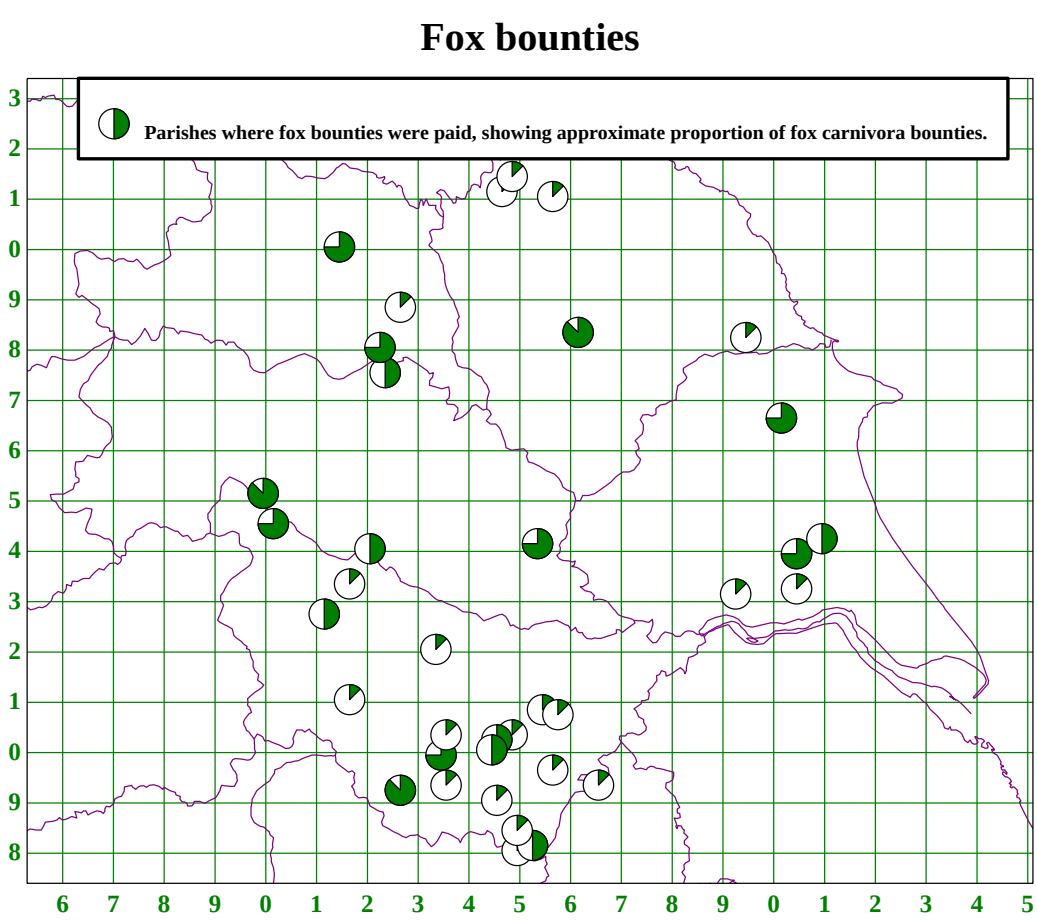


Figure 3.2. Locations of parishes for which fox bounties were recorded late 16th to early 19th century. Symbols (dark segments) indicate the approx. % of carnivore bounties represented by foxes.

altitude of parishes recording their first fox vermin bounty was 356ft. Mean altitudes progressively fell to 22ft by 1809. This suggests that foxes may have been either moving into, or becoming progressively more predominant in, lowland regions during the three centuries monitored by churchwardens' accounts.

The reasons for this apparent distribution and status change are unclear, but two related factors are worthy of consideration. Firstly, thousands of linear miles of potential fox denning sites and cover in the form of hedgerows and ditches were created across the Yorkshire landscape as a requirement of over 813 Parliamentary enclosure awards. Although there had been private enclosure agreements from Tudor times, the earliest Parliamentary enclosure award recorded in Yorkshire was in 1637 and the last in 1904, the majority taking place between 1750 and 1850 (see Figure 3.5). Table 3.3, calculated

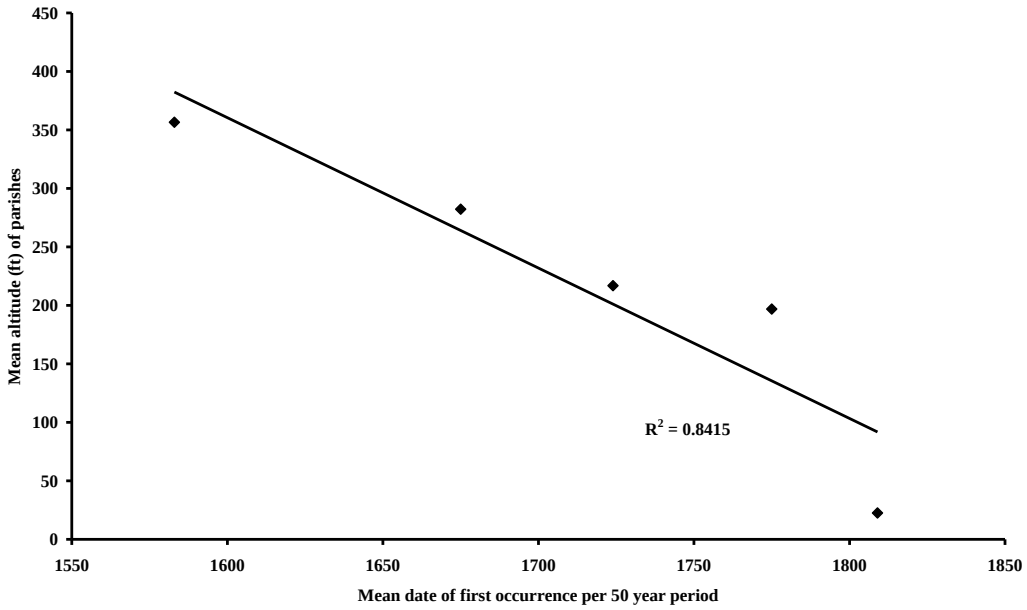


Figure 3.4. Relationship between earliest dates of fox bounty payments and mean altitude of parish.

from raw data in English (1985), shows the minimum acreages and proportions of the three ridings affected by the enclosure movement which collectively enclosed well in excess of one million thirteen thousand acres or 26% of Yorkshire's land surface. This excludes the acreages (not traced by English 1985) from some 97 awards which, if each was equal to the average enclosure size, could add a further 137,000 acres to the total. Figure 3.5, calculated from data extrapolated from English (1985), shows the period and rate at which common land was enclosed in Yorkshire.

Table 3.3. Proportion of Yorkshire affected by Parliamentary Enclosures

Riding	**Acreage**	**Min. estimated Acreage enclosed**	**% of Riding**
North Riding	1,361,795	253,989	18.7%
East Riding	750,384	339,308	45.2%
West Riding	1,785,760	420,548	23.6%
Total	**3,897,939**	**1, 013,845**	**26.0%**

Secondly, the management of landscapes and fox populations in the interests of the sport of fox hunting with hounds and on horseback, is indicated by the abundance and distribution of fox coverts (see Figure 3.6).

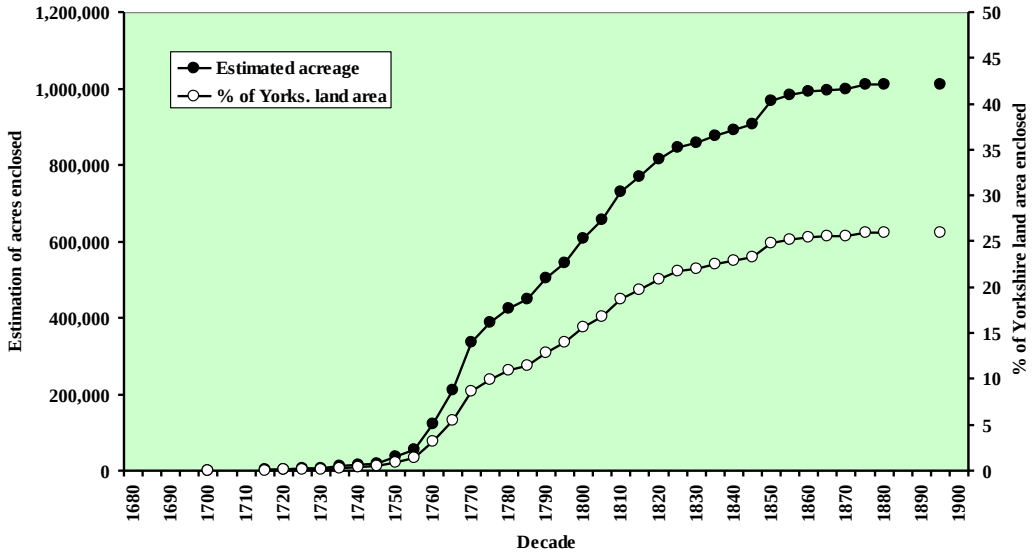


Figure 3.5. Accumulated acreages of enclosed common land and proportion of Yorkshire enclosed by Parliamentary enclosure awards since 1705.

Figure 3.6 shows the distribution of Fox Coverts shown on Ordnance Survey maps and of Whins, Gorses, Sticks, Thorns and Brockets in which fox hunts 'found' foxes. These coverts and fox refuges were created in the 18th-19th centuries on enclosed land and landed estates on behalf of the Fox Hunts. These are almost exclusively in relatively low lying and flat landscapes and are distributed from the Tees estuary vale, the northern Vale of Mowbray, the central and southern Vale of York, Vale of Pickering, eastward across the newly ploughed areas of the Yorkshire Wolds and down onto the Holderness plain. This contrasts with the predominantly upland and western Pennine distribution of fox evidence indicated in Figure 3.1. This form of fox husbandry may be partly responsible for the west to east temporal shift indicated by bounty payment trends in Figure 3.4.

Relationship between fox and other carnivores in relation to bounty payments

According to evidence in churchwardens' accounts from the 16th to the 19th centuries, the fox has remained a significant component of the carnivora fauna for which parish vermin bounties were paid (see Table 3.4). The fox's increase from 29% of carnivore bounties for the period 1750-1799, to 45% for the period 1800-1825 may simply have

been a statistical response to declines in other carnivores. However, by comparing the parish by parish statistics for fox with those of other carnivores, there would appear to be a negative relationship with species of *Martes* and *Mustela*, particularly pine marten, polecat and weasel. This suggests that the fox, through intraguild competition, could have contributed to local or general declines in these species (see Chapters on Pine Marten, Polecat and Weasel). Of fox hunting undertaken by organised packs of hounds in Yorkshire, Bonnett (1912) affirmed that 'Yorkshire is perhaps the best hunted county in England…Moors and hills...are as regularly hunted as the low country, and hounds are followed there with as much keenness and by as good sportsmen as any who throng the Kirk Gate on the first Monday in November'.

Table 3.4. Foxes as a proportion of Churchwardens' 'vermin' bounty payments per 50 year periods 1550 to 1800 in Yorkshire parishes.

Time period	Total Carnivore Prey items	% Fox	% *Mustela* spp.	% Others
1550 - 99	8	87	6	7
1600 - 49	21	66	25	9
1650 - 99	1765	31	49	20
1700 - 49	2663	33	58	9
1750 - 99	2253	29	70	1
1800 - 49	824	45	46	9

Fox hunting records

Yorkshire hunts are jealous of their antiquity and their rights, and several claim origin in royal charter. The Staintondale uphold such a claim, where there is a tradition that in the 13th century George Villiers, the second Duke of Buckingham, hunted both fox and red deer here by royal warrant. Tradition tells of the Buckingham Stone near 'Chop Yat' on the North York Moors marking where the duke's horse collapsed at the end of a severe three hours' chase, commemorating a run with a fox (Bonnett 1912). It is also claimed that foxes have been hunted on the Sinnington Hunt territory since the 13th century, and that organised fox hunting has operated here since 1680 (Bonnett 1912).

Evidence of fox hunting during the 17th century is demonstrated by the existence of kennels maintained on an elaborate scale at Beverley from which it is suggested Sir Michael Wharton (died in 1665) hunted the foxes of the district (Reynard

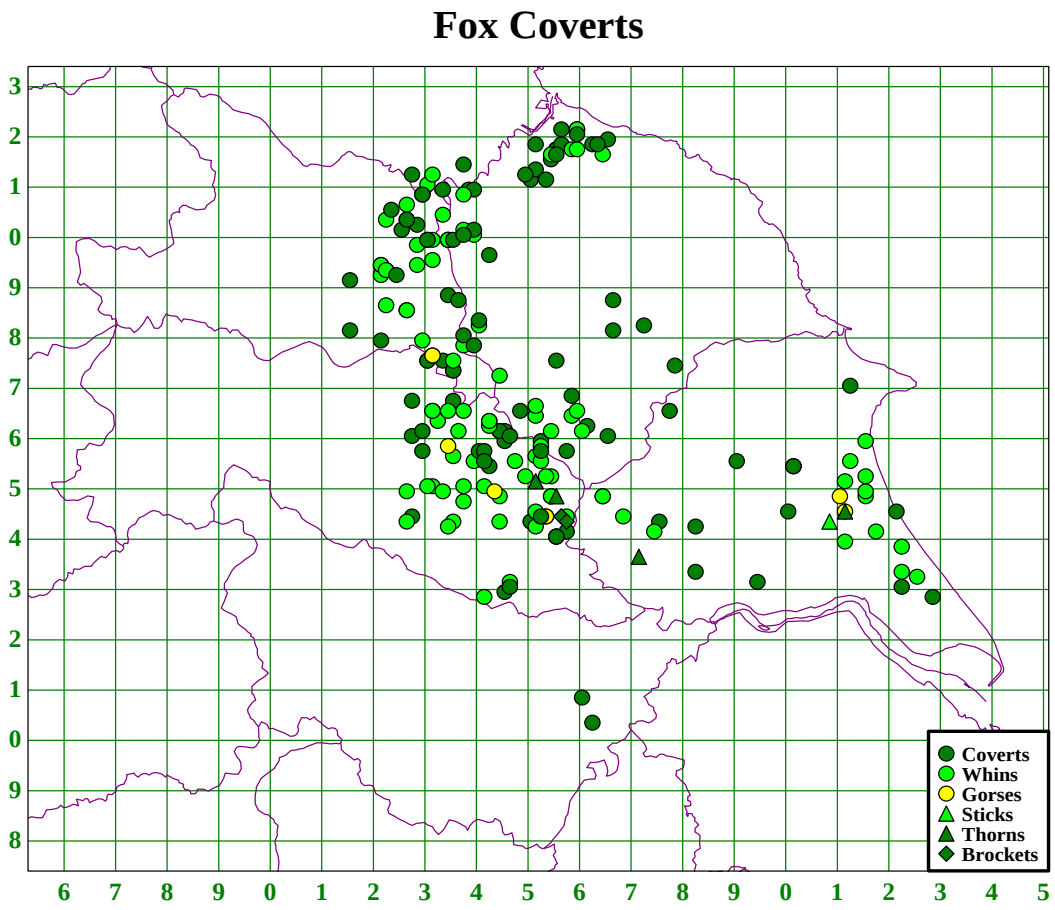


Figure 3.6. Distribution of 18th and 19th century Fox Coverts, Whins, Gorses, Sticks, Thorns and Brockets, based on Ordnance Survey and fox hunting literature.

1920). The 18th century saw a number of landowners funding packs of hounds and developing fox hunting territories; for instance, Squire William Draper of Beswick Hall, regarded as the 'paragon of the maintenance and management of stables, hounds and hunting procedure', began hunting with his own pack in the Holderness area in 1726 (Reynard 1920). Mr Stanhope of Cannon Hall, Barnsley had a pack of hounds up to the early 1770s (Henry 1938). The celebrated and very extensive Raby Hunt, the creation of the 2nd Earl of Darlington around 1774, incorporated territory later worked by the South Durham, Badsworth, Bedale, Hurworth, York and Ainsty and Zetland hunts (Henry 1938).

Through the history of fox hunting in the Yorkshire region, allusions to 30 packs of foxhounds have been traced, each operating within its own defined territory. Examples of maps showing the evolving territories of named packs of foxhounds throughout England are in *Baily's Hunting Directory* (1967, 1980), Carr (1976) and

Watson (1982). Figure 3.7, based on recorded 'find' sites in published hunt histories (Dixon 1899, Pease 1887, Raynard 1908, 1920, Simpson 1927), reveals the territories

Table 3.5. Chronological summary of Yorkshire Fox Hunts.

Hunt	Date of origin
Staintondale	13th century [1874 as currently constituted]
Bilsdale	13th century
Barlow*	17th century
Goathland	1650 [pre. 1860 as currently constituted]
Sinnington	1695
Raby*	1744 [divided up during first half of the 19th century]
Cleveland	18th century
Badsworth	1720
Holderness	1726 [1824 as currently constituted]
Bramham Moor	1740s to 1750s
Middleton	1764 [1832 as currently constituted]
West of Yore	1775 [1832 as currently constituted]
Hurworth	1803
Grove*	1807
Derwent	1808
Bedale	1816 (Formerly part of the Raby territory)
York & Ainsty (north)	1816
Rufford*	1834
Farndale	1835
Zetland	1866
Glaisedale	1877
York & Ainsty (south)	1929
Saltersgate Farmers	1939
Lunedale*	1948
Pennine*	1964
Grove and Rufford*	amalgamated 1952

(* operate only partly in Yorkshire)

of eight of the most long-running of these hunts, and Table 3.5 and Appendix 3.3 summarise their known or claimed dates of commencement, showing that most commenced in their present form from the mid-18th to the 19th century.

From the 18th to the early 20th century there have been a number of private and therefore relatively short-lived packs, which usually only survived according to their owners' physical abilities or private fortunes. Such packs included Mr Stanhope's hounds at Cannon Hall, Barnsley in the early 1770s; Mr Sherbrooke's hounds, which

later became the Derwent; Mr. Saville's hounds, based at Sandbeck Park in the 1830s, which later became the Rufford; Earle Fitzwilliam's hounds, based at Wentworth Woodhouse Park, operated from 1860 to at least 1912 on the Yorkshire/Derbyshire borders between the Badsworth and the Barlow hunt territories; Mr Simon Conyers Scrope's hounds operated from 1906 to at least 1912, along the western perimeter of the Bedale hunt from whom the land was loaned (Bonnett1912).

Management of hunting territory

It was to the prowess of the hunt master and the reputation of the hunt to provide exhilarating riding country and the prospect of finding good numbers of healthy foxes capable of producing good 'runs'. The extensive hunting literature provides lengthy, though often fragmented, transcriptions from hunt diaries of former masters, describing celebrated runs. Not only do these provide the basis of biological records and hunting statistics, they also form the bedrock of the folklore, epic poems and songs so important to hunt camaraderie and traditions.

Since most support for hunts in their formative days came from the landed families, it was possible not only for parcels of land but large tracts of agricultural acreage, indeed entire landscapes, to be designed for fox rearing purposes. The development of the hunting landscape proceeded apace at the time of the Parliamentary Enclosures (largely from the 1750s to the 1850s). Large tracts of open commons were subdivided into awarded land parcels and thousands of miles of hedgerows and networks of ditches were created as new enclosure boundaries. The distribution of these new landscape features is illustrated in Figure 3.6. Inevitably, new fox earth sites were created and the development of new sporting woodlands became a management craft in its own right. The design, planting and cycles of management of coverts, whins, gorses, sticks, thorns and brockets became highly sophisticated and was guided by its own manuals and literature (see Wroughton n.d., Beaufort 1986, Patten 1971).

A possible example of how the availability of designated fox coverts could affect the success of a hunt is in the statistics of the Raby Hunt where 40 to 50 foxes were killed each season between 1787 and 1792, with an average of 84 hunting days per season. This represents an estimated kill-rate of 47.6 to 59.5 per 100 days hunting. After the Duke of Darlington ceased hunting in 1835, his coverts were either burnt or grubbed

up. Thus, in 1838, the records show that 19 foxes were killed in 56 days hunting, representing a kill-rate of 33.9 per 100 days hunting.

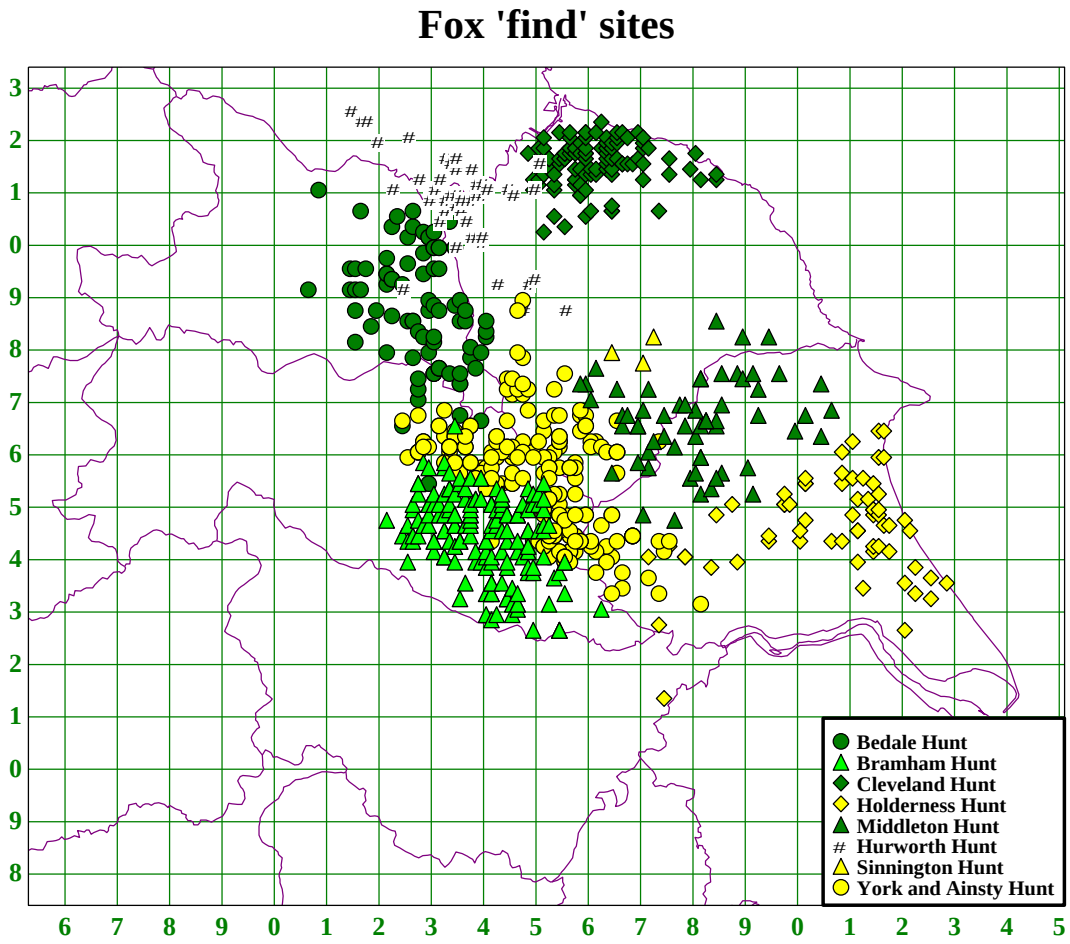


Figure 3.7. Locations of 'find' sites recorded for eight Yorkshire packs of foxhounds during the 19th century.

Distribution patterns and population trends

An attempt has been made to assemble data in the form of hunt statistics by collating where possible the annual (October to March, April or May) numbers of days hunted and the number of kills. In order to compare the kill-rates between years and with different hunts, they are calculated and expressed as the number of kills per 100 days hunting (for statistics on numbers of days hunted, foxes killed & kills per 100 days in the Badsworth, Bedale. Bramham, Brocklesby, Cleveland, Holderness, Middleton, Sinnington, Rabey, York & Ainsty and Braes of Derwent Hunts, see Appendix 3.4).

On the basis that the distances between foxes encountered within a hunt territory may provide a reflection of relative population density, this study has extracted the locations of 'meet', 'find' and 'kill' sites from hunt diary transcriptions. Where a 'meet'

is followed by a ‘find’, a linear search distance can be calculated; similarly, if a ‘kill’ is followed by a subsequent ‘find’, a search distance can be calculated.

Since the place names used in the hunt diaries are often historic, obscure and based on local knowledge and tradition, it has been necessary to search for site locations on contemporary (19th century 1st edition) six inch to the mile Ordnance Survey maps, then to extrapolate a 1km square grid reference from modern 1:2500 scale maps of the OS Landranger series.

Since find sites, for which map references have been located, constitute a mapable biological record, these have provided for the first time the basis for a graphic representation of fox distribution in 19th century Yorkshire (see Figure 3.7). They also clearly indicate the discrete territories of the six hunts examined in detail to date. (Fox hunting find sites, extracted from the 19th and early 20th century hunting literature and which form the basis of Figure 3.7, are presented in Appendix 3.5a-g).

In cases where direct line search distances have been estimated, a mean distance per hunting season is calculated and plotted with a view to assisting in providing an index of population density.

The ‘Great Mange’ epizootic of the 19th century

At least five outbreaks of mange have been reported in Britain in the 20th century, Somerset 1906; south coast of England, 1914; south-west England, 1918; west Midlands and Wales, 1931; and Sussex/Surrey border and London continuously since the 1940s (Vesey-Fitzgerald 1965, Teagle 1976, Burrows 1968, Lloyd 1980, Soulsbury *et al.* 2007).

This present study has discovered that in the Yorkshire region during the late 19th and the first decade of the 20th century, hunt masters and committees were embarrassed by the scarcity and poor quality of foxes within their territories. Though initially taken as a reflection on hunt management, experience in the field demonstrated that the fox population was suffering from what developed into a major epizootic of mange. Although occasional anecdotal experiences were described, the phenomenon was generally discussed in terms of, that ‘rule of thumb’ of the condition of a hunt, the numbers of ‘blank’ days when no foxes were encountered. Curiously, analyses of hunting statistics in terms of effort (days hunting) verses results (kills) seem not to have been undertaken at the time; poor seasons tended to be judged in terms of the number of

days lost and good years by the large total numbers of foxes either killed or run to ground.

Mange in foxes can be caused by two species of parasitic skin mite, *Sarcoptes sacabiei* and *Notoedres notoedres*. Both burrow into the superficial layers of skin and a scab of dried tissue-fluid exudate is formed, beneath which mites multiply rapidly. Hair is lost in patches and the skin assumes a dark, encrusted appearance with the presence of sloughed but unshed epithelial cells. At this stage the characteristic sweet 'mangy' odour, which may be due to secondary bacterial infection, is evident. Though *S. sacabiei* is most frequently cited in the literature as being the common causative agent, Lloyd (1980) cites a case of several foxes having been severely affected by *N. notoedres*.

Foxes in Britain have long demonstrated a susceptibility to mange outbreaks, indeed the earliest references to fox diseases in modern literature all refer to what is assumed to be mange (Beckford 1810). This has been familiar to huntsmen since the middle of the 18th century, when fox hunting became popular and though large-scale outbreaks seem to have been rare, the disease occasionally caused concern in fox hunting circles since fox populations are sometimes severely reduced and the sporting potential of a hunting country impaired.

A major epizootic at the turn of the 19th century was alluded to by Sir Alfred Pease, master of the Cleveland Hounds (Blakeborough & Pease 1914) 'there have always been *mangy* foxes - certainly for 200 years. That badgers have had mange occasionally since the great mange scourge among the foxes in our time is no wonder, but long ago badgers, thought to be immune or un-susceptible to mange, were introduced into fox hunting territories to clean mangy earths'. Gerald Lascelles (1915) also mentions the great epizootic of mange, which he claims began in 1895 and raged over 'almost all of England'.

The following accounts, gathered from anecdotal evidence from 12 Yorkshire hunts, are supplemented by analyses of hunt kill statistics and find distances as mentioned above. Furthermore, in order to examine the timing and performance of the outbreak in Yorkshire and adjacent areas, the histories of a further 20 hunts across England have been examined for comparative evidence.

BADSWORTH: Little evidence has been obtained for this hunt but a decline in kills from 83.6 in 1859/60 to 49.4 in 1864 (Dixon 1899, Simpson 1927) coincides with

a steep county-wide decline for the first half of the 1860s which could have been mange related.

BEDALE: Isolated cases of mange were encountered during the season of 1825/26 at Kilpin and on 22 February 1854 at Hollin Head Wood. Towards the end of the 1895/96 season foxes became very scarce with 'a good many disappointing days' and during the 1903/04 season the mange was described as 'epidemic' with foxes difficult to find in some areas (Reynard 1908).

BRAMHAM: Diary entries note an isolated though severe case of mange in a fox found and killed at Cocked Hat Whin on 26 February 1860. Described as 'skin and bones' it had no hair and 'the hounds refused to eat him' (Simpson 1927). An epizootic of mange broke out in 1894/95. 1895/96 was an 'unfortunate season', with foxes scarce and difficult to find. On 3 January 1896, Wilstrop Wood and all the coverts in the neighbourhood of the meet were blank'. Simpson (1927) noted that although 'blank' days were normally experienced only once in every five seasons, when mange was bad, two or three blank days were recorded per season, with seven recorded during the 1897 and 1898 seasons when foxes were severely reduced. The outbreak began to abate generally in 1898/99, but broke out again in the west of the Bramham country Simpson (1927).

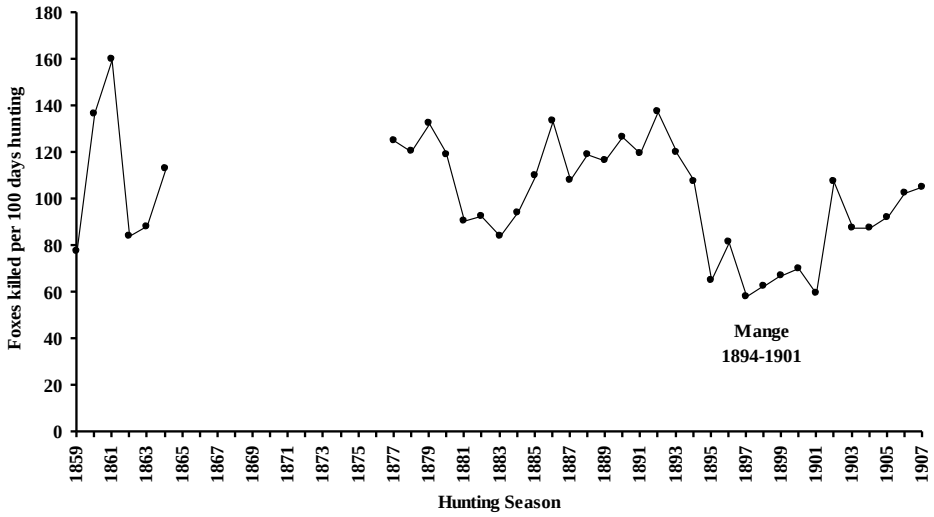


Figure 3.8. Numbers of foxes killed per 100 days hunting by the Bramham Hunt 1859 to 1864 and 1877 to 1907.

Figure 3.8 shows that hunting success rates had been steadily rising from 83.8 kills/100 days in 1883, reaching a post-1860 peak of 137.4 in 1892. The mange epizootic was first noticed in the Bramham territory in 1894. This was followed by a rapid decline in kills, noticed by huntsmen in 1895, and falling to a nadir of 57.8 by 1897, the lowest kill rate since 1859. Although huntsmen reported better hunting by 1899 when foxes were reported to be healthier and were 'turning up better' (Simpson 1927), in fact the statistics show that a significant rise only took place in 1902 when the kill rate rose to 107.3 kills/100days.

The mean distances between 'finds' shows a less convincing pattern, although in the peak fox year of 1891 the mean distance was as low as 0.5 km (Figure 3.9). This extended to 2.2 km in 1892 as foxes became statistically scarcer, 4.5 km when the lack of foxes first became noticeable to the huntsmen, and 4.5 km in 1895 when the population was nearing its nadir.

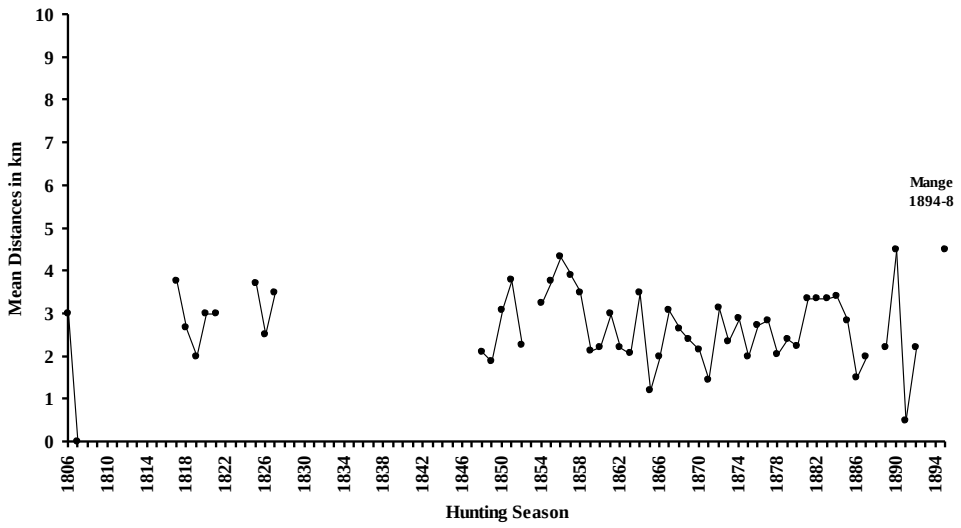


Figure 3.9. Mean distances between finds recorded by the Bramham Moor Hunt 1806/07 to 1895/96.

CLEVELAND: Countering allegations that foxes had acquired mange from badgers (*Meles meles*), Sir Alfred Pease felt that the reverse was the case, noting that 'there were plenty of mangy foxes' and 'that badgers have had mange occasionally since the great mange scourge among foxes in our time (referring to the 1890s) is no wonder, but long ago badgers, thought to be immune or un-susceptible to mange, were introduced into fox hunting territories to 'clean mangy earths' (Blakeborough & Pease

1914). Although the series of annual kills per 100 days hunting calculated for the Cleveland Hunt for the period 1838-1870 (based on data in Pease 1887) (see Figure 3.10) does not coincide with any documented outbreaks of mange, the rise in success rate from 22 kills/100days in 1864 to 75 in 1868 is indicative of a rise in population density prior to a mange-induced crash as demonstrated in Bramham Hunt in the 1890s.

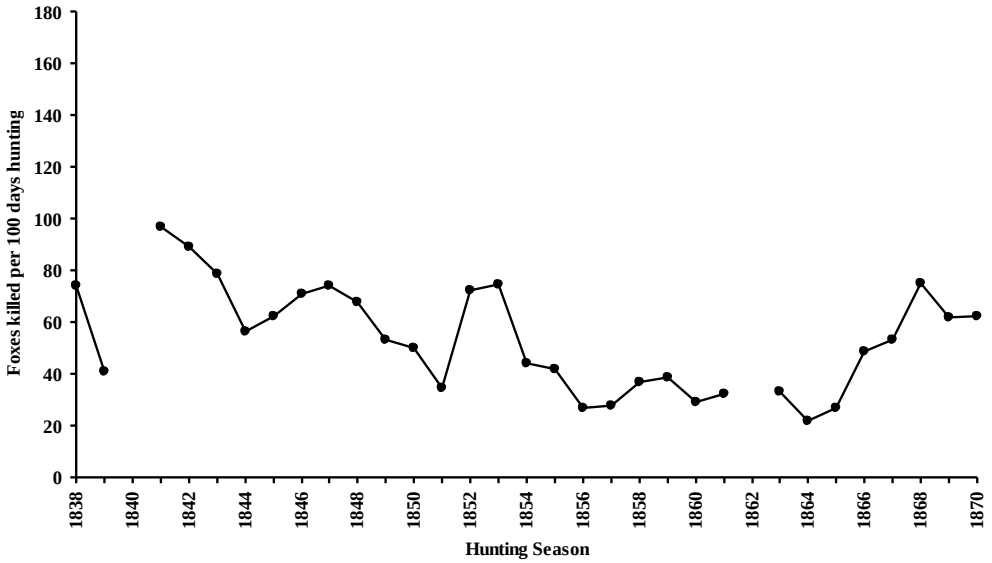


Figure 3.10. Numbers of foxes killed per 100 days hunting by the Cleveland Hunt 1838/38 to 1870/71.

DERWENT: Referring to the country hunted by Mr Sherbrooke's hounds kennelled at Snainton, Bonnett (1912) noted that foxes were 'generally not as good as they used to be a generation or two ago thanks to mange and extreme game preservation ... though good ones are still to be found'.

HOLDERNESS: The only record of mange was of one fox out of 91 killed during the 1847/48 season; although the fox was killed, the 'hounds would not or were not allowed to break it up' (Reynard 1920). The series of annual kills per 100 days hunting calculated for the Holderness Hunt for the period 1844/45 to 1885/86 (based on data in Reynard 1920) was inconclusive in indicating effects of mange since full hunting statistics were unavailable after 1885, though the rise from 69 kills/100 days in 1868 to 104 kills/100 days in 1885 reflected a pattern of increment common to most Yorkshire hunts prior to mange outbreaks Figure 3.11.

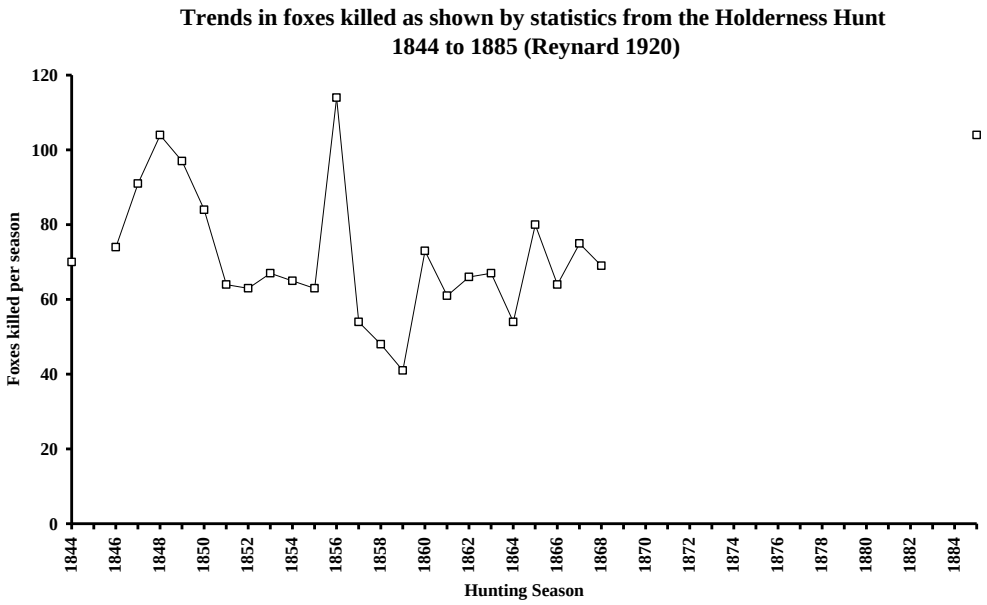


Figure 3.11. Numbers of foxes killed per 100 days hunting by the Holderness Hunt 1844/45 to 1885/86.

MIDDLETON: Mange was noted in the 1893/94 season, and the perceived scarcity of foxes during the 1900 to 1902 seasons was attributed to mange (Simpson 1927). Figure 3.12 shows a prolonged increase in kills/100 days hunting from 55.4 in 1853 to a post-1850s peak of 163.3 in 1892. This was the highest kill/100 days rate for

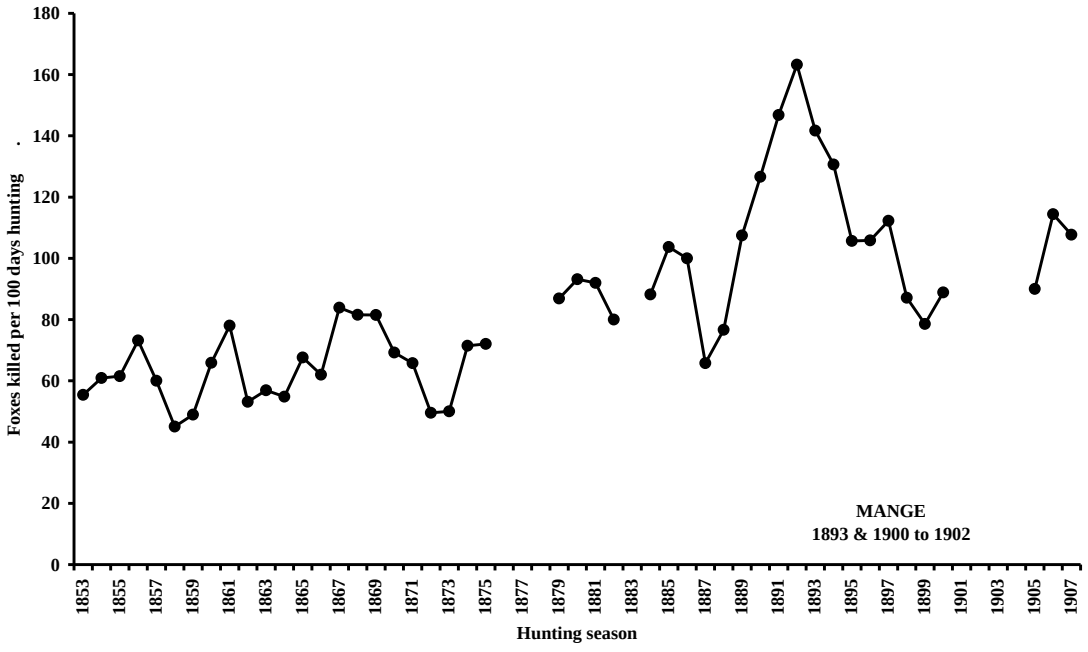


Figure 3.12. Numbers of foxes killed per 100 days hunting by the Middleton Hunt 1853/54 to 1907/08.

39 years and was followed by a rapid collapse in success kills/100 days rate to a nadir of 78.5 in 1899. A scarcity of foxes was noticed by the hunt in the seasons from 1900 to 1902 although rates rose to 114.4 kills/100 days by 1906.

YORK AND AINSTY: Mange was noted on 1 March 1873 at Simpson's Wood, and on 19 February 1874 and 25 March 1875 at Thorpe Green. Kill rates which had been at 83.6 per 100 days hunting in 1872 dropped to 66.6 in 1874 and mean distances between finds increased from 2.6 km in 1872 to 3.5 km in 1873. This suggests that mange coincided with a slump in kill rates which due to an increase in distances between finds suggests the decline was due to a scarcity of foxes. This outbreak of mange had evidently died out by 1886 when Mr Lycett Green (the new Hunt Master) paid tribute to the 'good and stout' quality of the foxes (Simpson 1927). Under Lycett Green, the annual kill rates progressively rose from a nadir of 58 in 1888 to a peak of 93 in 1891 when the mean distances between finds was 2.8 km. However, on 27 January 1892, a mangy fox was encountered but left in Overton Wood (Dixon 1899) and by early January 1894, Lycett Green found it necessary to write the following letter to the hunt committee on the increasing scarcity of foxes: 'For the first time during the eight years I have had the hounds, I am sorry to report a scarcity of foxes in the country. We have had mange now for three years and no doubt this must partly account for the dearth of foxes. Various means have been tried to stamp it out, without avail...The only plan left I can now think of is for all land-owners, covert-owners and others to co-operate and permanently stop all their earths before the breeding season. In cases where mangy foxes have been known to use earths, to destroy and disinfect the soil with lime. By this, I hope the healthy foxes will make new earths and the mangy ones will be easily killed' (Dixon 1899). Mange clearly took a severe toll, figures calculated from the hunt records bearing out Lycett Green's field experiences, the annual kill rate having fallen to 60 by 1895 and the mean distances between finds having risen to 4 km.

On 11 December 1894 a fox with a touch of mange was found at Pickering Wood and on 26 March 1895 a fox with mange was found at Deighton. Notwithstanding all the efforts to stamp it out, mange was still very much in evidence and by December 1895 the scarcity of foxed caused the hounds to make very long draws before 'finding'. By 1899, though mange was still present, the hunt had produced some very good runs (Dixon 1899).

COMMENTS BY NATURALISTS: The Yorkshire Naturalists' Union Vertebrates Section report for 1901 noted, if prematurely, that 'the gradual disappearance of mange amongst foxes must be a matter of congratulation. There is however, still a considerable amount of the disease prevalent in some districts. It has been a favourable breeding season for these animals and the enormous numbers of rabbits have caused parents foxes to have very little anxiety in providing food for their young' (YNU 1901). The slow disappearance of mange was again reported in 1906 (YNU 1906) and 1908, though even then 'foxes in some districts were still affected' (YNU 1908).

Referring to the 1912/13 season in the York area, Procter (1913) noted that foxes have been plentiful, though it is sometimes thought that mange follows any abundance of foxes. Records seem to give colour to this idea since the disease has usually appeared after sequences of good or improving hunting seasons. Of artificial fox earths, Procter suggested these are a frequent cause and venue of overcrowding.

Hunts outside Yorkshire

LAKELAND FELLS (CUMBRIA): Clapham (1920) gives no evidence of mange.

NORTH DURHAM HUNT: Referring generally to the major national epizootic, though specifying no dates, Blakeborough and Pease (1914) note that 'in this country, mange appeared...amongst the foxes'.

BRAES OF DERWENT (DURHAM): Later than in Yorkshire hunt territories, mange was first noticed in the 1902/03 season and up to the 1909/10 season 'the country was seriously afflicted with that bad epidemic of mange among foxes'. Foxes were 'hard to find' and when found were 'as often as not mangy'. Their debilitated condition was apparent during the period of the outbreak since 'long points [runs] were uncommon'. Not until the 1909/10 season could the records claim a succession of 'historic' days hunting, and evidence of mange was not reported after 1914 (Cowen 1955). Figure 3.13 shows a rise to a peak of 46.9 kills per 100 days hunting in 1902, followed by a rapid decline reaching a nadir of 18.3 in 1905, rising to a post-1890 peak of 70.5 in 1911; foxes with mange were encountered throughout this period.

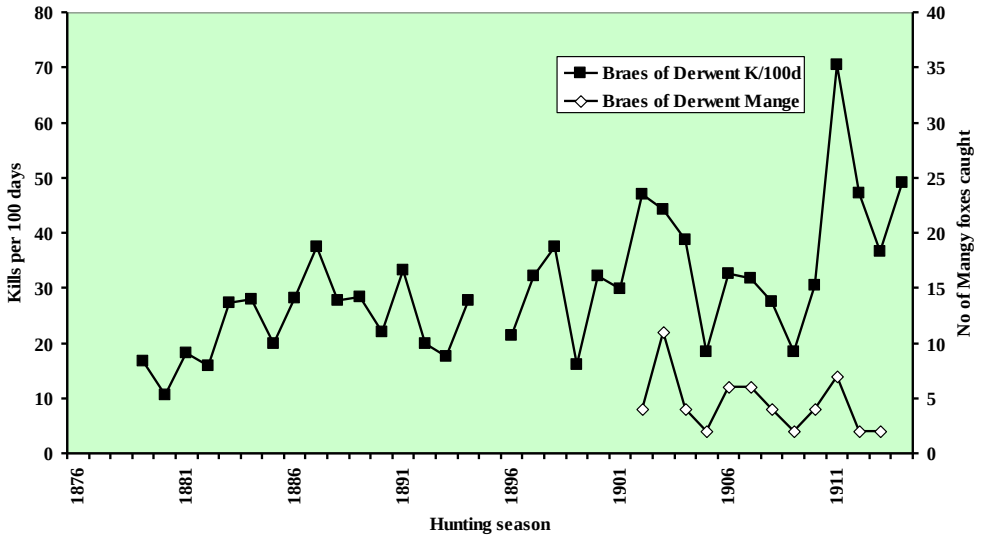


Figure 3.13. Numbers of foxes killed per 100 days hunting by the Braes of Derwent Hunt, Co. Durham 1890/91 to 1914/15.

BROCKLESBY (NORTH LINCOLNSHIRE): Although there is no specific mention of mange (Collins 1902), after a build up in the number of foxes killed per 100 days hunting from 65.6 in 1864 to 134.5 in 1894, the kill rate fell sharply to 76.0 in 1896 and 68.8 in 1898 (Figure 3.14). The nature of the progressive rise in kill rates, suggests an increasing and consequently denser fox population, possibly creating conditions suitable for the transmission of mange. The timing and rapidity of the subsequent decline is similar to the performance of adjacent Yorkshire hunts where fox populations had been reduced by mange.

BELVOIR (SOUTH LINCOLNSHIRE): Dale (1899) gives no evidence of mange.

MEYNELL (DERBYSHIRE): Isolated occurrences of mange were noted during the hunting seasons of 1887/88, 1891/92 and 1894/95. Curiously, 1895/96 was regarded as one of the best in the history of the Meynell, but three years later, 1898/99 was described as one of the worst seasons on record with 'bad foxes' and mange reported. The scourge then spread all over, not only the Meynell country, but all England (Randall 1901).

MELTON MOWBRAY (LEICESTERSHIRE): Paget (1931) gives no evidence of mange.

THE QUORN (LEICESTERSHIRE): Ellis (1951) gives no evidence of mange.

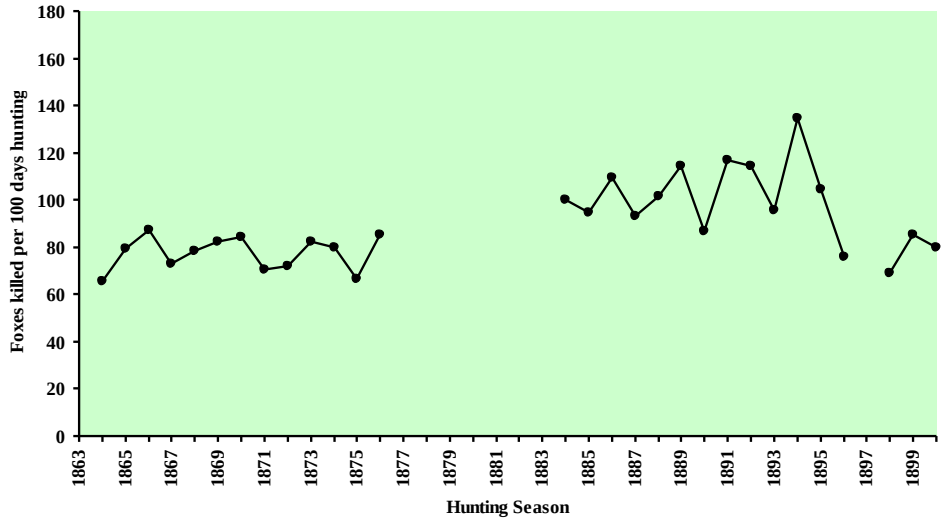


Figure 3.14 Numbers of foxes killed per 100 days hunting by the Brocklesby Hunt, North Lincolnshire 1864/65 to 1900/01.

WYNNSTAY AND SHROPSHIRE (SHROPSHIRE): Since Puleston's (1893) review of hunting only covers events up to the end of the 1884/85 hunting season, no evidence of mange was indicated. Outbreaks in nearby hunting territories in Warwickshire and Derbyshire did not manifest themselves until approximately a decade later.

WARWICKSHIRE: 'A great many foxes in the centre of the country had died of mange during the past two seasons (1893/94) and it is spreading into other parts of it to such an extent that the country is likely to be short of foxes eventually if it continues' (Mordant & Verney 1896).

ALBRIGHTON (WORCESTERSHIRE): Auden (1905) gives no evidence of mange.

OLD BERKSHIRE HUNT: Although reported to have been 'prevalent' for some years, mange evidently reached a climax here in the 1893/94 season when 'the Old Berks country was terribly affected' (Simonds & Cowdry 1905). Foxes were scarce and long draws (searches) were frequent. 'Hounds were out altogether seventy-five days and killed twenty-one and a half brace (43) of foxes of which seven and a half brace (15) (34%) were affected with mange'. These figures give a kill rate of 57.3 per 100 days hunting, which is similar to the post-mange levels monitored in those Yorkshire hunts for which statistics are available.

PUCKERIDGE (HERTFORDSHIRE): Although an isolated occurrence was noted on 27 March 1840, it was not until the 1900/01 season that mange seriously depleted the fox population. Hunt diaries of the time note that 'of the last ten hunting days of the season, four were blank, and four others produced only one a single fox each of which one was mangy...Taking the 1900/01 season as a whole, a quarter of the hunting days were blank or produced only one fox.' Cockayne, the huntsman noting in his account of the final day 'This ended the worst season I ever saw'. It was not until about 1915 that mange disappeared and not until after the 1914-1918 War that the hunt could report it had 'as many foxes as they wanted' (Berry 1950).

THE ESSEX FOXHOUNDS: Although mange was not specifically mentioned in the hunting literature, it may have been associated with the perceived scarcity of foxes in Essex in 1906. Bruce (1926) ascribed this scarcity to the alleged practice of 'exporting' fox cubs to London, noting 'It was well known that from certain portions of the county, cubs were sent to London by means of the nightly hay cart'. Steps were at once taken by the new Master of Hounds not only to prevent this 'export' but to renew the supply, though 'it was not for a season that restocking began to take effect'. This, notwithstanding, it is likely that the shortage of foxes noticed in 1906 was linked with the serious decline in fox numbers associated with the mange epizootic in the adjacent Puckridge Hunt and the nearby Old Berkshire Hunt.

OLD SURREY: Although originally a four days a week hunt for many years up to 1896, it thrived as a 'three days a week country'. However, the advance of railways, roads and general urbanisation severely reduced the availability of huntable land. In 1892 comments were made that where foxes were once found 'is now covered with villas and cut up by new roads' and in 1896 owing to 'inroads of the builder and other encroachments' the dog pack was sold and the hunting reduced to two days a week (Taylor & Harper 1906). Taylor and Harper (1906) noted that 'foxes in some parts of the district were very scarce'; although this was ascribed to increasing urbanisation, it could also have been evidence of the effects of mange which was present in nearby Puckeridge (1900/01), Old Berkshire (1893/94), Hampshire (1895-1898) and the Home counties in 1896 and 1897 (M'Fadyean 1898). Lloyd (1980) cites a case in 1969 of mange in several foxes in suburban Cheam, Surrey being severely affected by the skin mite *Notoedres notoedres*.

NEW FOREST (HAMPSHIRE): Gerald Lascelles (1915) noted that in 1789 the Lord Warden of the New Forest reported a 'great scarcity of foxes'. He also refers to a great epizootic of mange which began in 1895 and 'raged' for three years. It affected his hunting territory in the New Forest where, 'even badgers were woefully affected'. The hunting of foxes continued until the supply of foxes began to fail though within ten years of the outbreak foxes were plentiful again.

DORSET: Although published at a time when mange was evident in the neighbouring New Forest area, Symonds (1899) makes no mention of mange affecting foxes in the various hunting territories within Dorset. However, since the hunting diaries available to him covered the period from 1837 to 1857, these predated the period of the national epizootic.

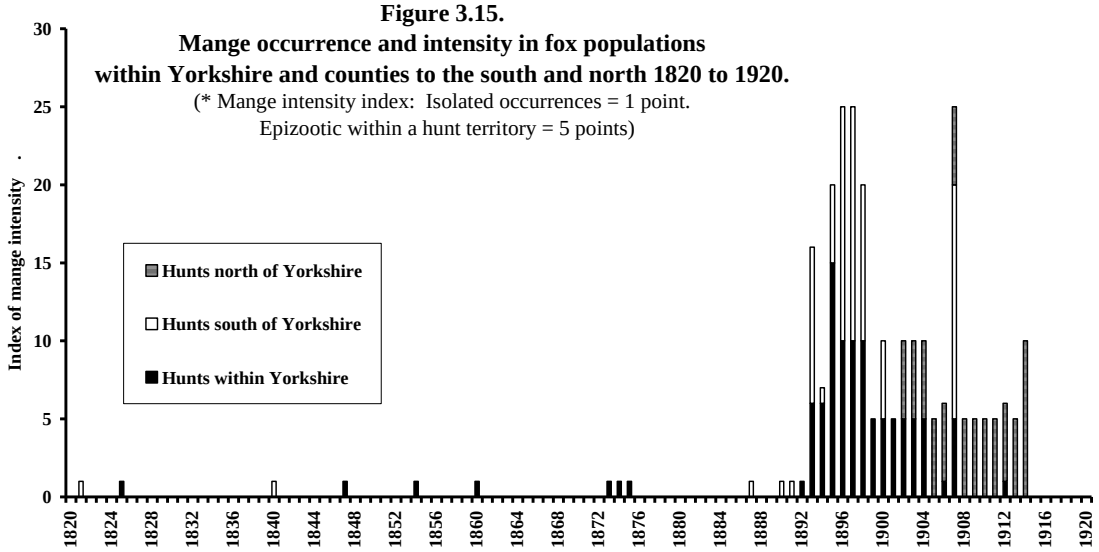
WEST SOMERSET: 'Of late years, foxes ... have been more than decimated by the most virulent form of mange and despite the optimistic report to the contrary, are still far from having a clean bill of health' (Heinemann 1907). Blakeborough and Pease (1914) confirm this, claiming that in a district of north Devon and extending to Bridgewater, 'badgers are plentiful and foxes mangy'.

EXMOOR, EAST DULVERTON AND WEST DULVERTON HUNTS (DEVONSHIRE): 'Of late years, foxes in these three hunts have been more than decimated by the most virulent form of mange and despite the optimistic report to the contrary, are still far from having a clean bill of health' (Heinemann 1907). Blakeborough and Pease (1914) also note that 'in a district extending from Barnstaple to Bridgewater, from Porlock to Dulverton, badgers are plentiful and foxes mangy'.

SOUTH DEVON HUNT: After the notably successful season or 1889/90 when 'more foxes were found ... than had been ever been found before', the 1890/91 session was a bad one. Speculations as to the cause included the hot and dry weather which had led to a 'very bad scenting season' and the rising practice of letting coverts for shooting which prevented access for hunting until after Christmas. These lean years led to the resignation of one long-term Master in 1890/91 and presumably because of a continuation of poor results, of his successor in 1892/93 (Tozer 1916). Since mange was present in English fox populations during this period, with pre-1907 outbreaks in the north Devon and west Somerset (Heinemann 1907, Blakeborough & Pease 1914), the decline could be circumstantial evidence of a further outbreak in south Devon. Figure

3.15 shows the periodicity of the mange epizootic in Yorkshire and in counties to the south and north, indicating that mange was widespread in

Figure 3.15.
Mange occurrence and intensity in fox populations within Yorkshire and counties to the south and north 1820 to 1920.
(* Mange intensity index: Isolated occurrences = 1 point. Epizootic within a hunt territory = 5 points)



hunted populations throughout the 19th century but becoming particularly virulent and widespread during its final decade and persisting through the first decade of the 20th century.

Causes of mange outbreaks

Speculation as to the cause of the epizootic ranged from the occurrence of prolonged hot and dry or cold and dry conditions (Tozer 1916). The possibility of weather conditions affecting population levels is frequently referred to in the hunting literature. The Bedale Hunt reported that hard frosts during the winter of 1892-93 caused hunting to be abandoned for four weeks and that the particularly hard winter of 1894-95 caused hunting to be abandoned for ten weeks. Hunts reported mange occurring as an added problem after periods of dry weather, when scent trails were difficult for the hounds to follow. It is possible that dry conditions could have raised the survival rates of cohorts of fox cubs by reducing the problems of exposure and hypothermia exacerbated by soaking fur or being flooded out of low-lying earths.

In order to identify any meteorological conditions which regularly coincided with incidences of mange, the detailed season by season historical weather analysis provided

by Bedford (2005) was compared with the 80 seasons (winters, springs, summers and autumns) of the 20 years (between 1825 and 1912) when mange was noted in Yorkshire.

Figure 3.16 shows that in 43 (54%) seasons when mange was present the weather conditions were deemed to be 'average', 15 (19%) were warmer than average and 22 (27%) were colder than average. Records show that extreme weather only very marginally coincided with incidences of mange. The very hot summer of 1893 produced a 73 day drought, 1899 was another notably hot summer. 1894 produced an extremely cold winter with record low temperatures. 1902 and 1907 had particularly cold summers.

Procter (1913) speculated that an artificially high fox population, fostered by over efficient fox-rearing husbandry through the provision of artificial earths,

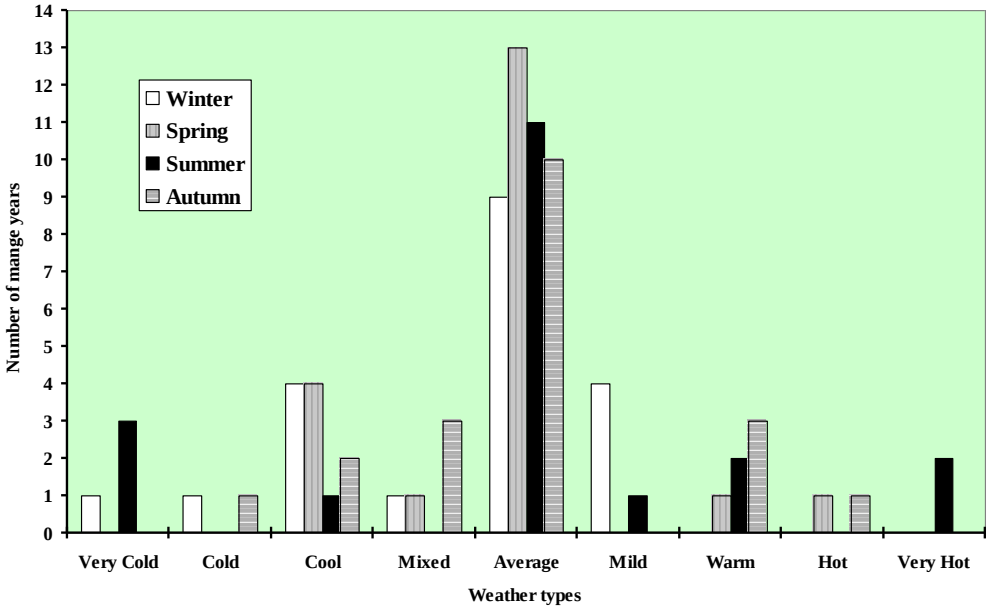


Figure 3.16.—Relationship of incidences of mange in Yorkshire with prevailing weather conditions.

encouraged close proximity of individuals facilitating the spread of the mite-borne disease. Certainly, anecdotes and analyses of hunting statistics provide evidence that throughout Yorkshire, and evidently across England, populations as expressed in terms of kills per 100 hunting days were increasing progressively through the 1880s and 1890s, with some of the highest figures recorded in living memory or in documented histories of the respective hunts.

In 1889/90, the South Devon hunt recorded its best ever season, followed in 1890/91 by one of its worst (Tozer 1916), and although mange was not specifically identified as a cause, the disease was at large in other Devonshire and west country hunt territories (Heinemann 1907, Blakeborough & Pease 1914). In 1895/96, the Meynell hunt in Derbyshire, celebrated one the best seasons in its history, but within three years (1898/99) was experiencing one of the worst on record with 'bad foxes' and mange reported (Randall 1901).

Looking at the Yorkshire situation in isolation, it would seem that outbreaks in the 1893/94 season in the adjoining territories of the Braham, York and Ainsty and Middleton hunts progressively spread to adjacent hunts, progressed over the next five years to the Cleveland and Braes of Derwent to the north, and a further five years to manifest itself in the South Durham territory. An examination of the national picture (see Figure 3.17) suggests that a progressive spread from a single epicentre as in the case of the highly contagious Myxomatosis in rabbits, does not seem to have taken place here. Instead, there are evidently up to 6 isolated but synchronous outbreaks from sites as far afield as South Devon, Berkshire, Warwickshire and the above- mentioned hunts in Yorkshire. Probably mange became evident in fox populations whenever conditions were appropriate. Since fox populations seem to have been rising to unprecedented levels during the early 1890s, excessive occupancy of fox earths may have provided the conditions appropriate for mange to develop.

By examining hunt performance (foxes killed/per 100 days), not only were numbers seen to be increasing for a series of years prior to mange being noticed, but in some cases kill rates reached record levels in the annals of the hunts concerned. Figure 3.18 shows a remarkable synchronicity between the hunting success rates for the three nearby hunts of Bramham, Middleton and Brocklesby, each rising to record levels before quickly collapsing to relatively low levels, in the case of the Bramham to a record low level in terms of foxes killed/per 100 hunting days. That a synchronous collapse in fox populations can be caused by the effects of an epizootic is understandable; however, the synchronous performance of population levels during the mid- to late-1880s suggests that fox populations were responding to influences independent of hunt management Figure 3.19 reveals that mange occurs coincidentally with cyclic peaks of fox abundance. In the case of the 1892 record peak which seems to have been echoed

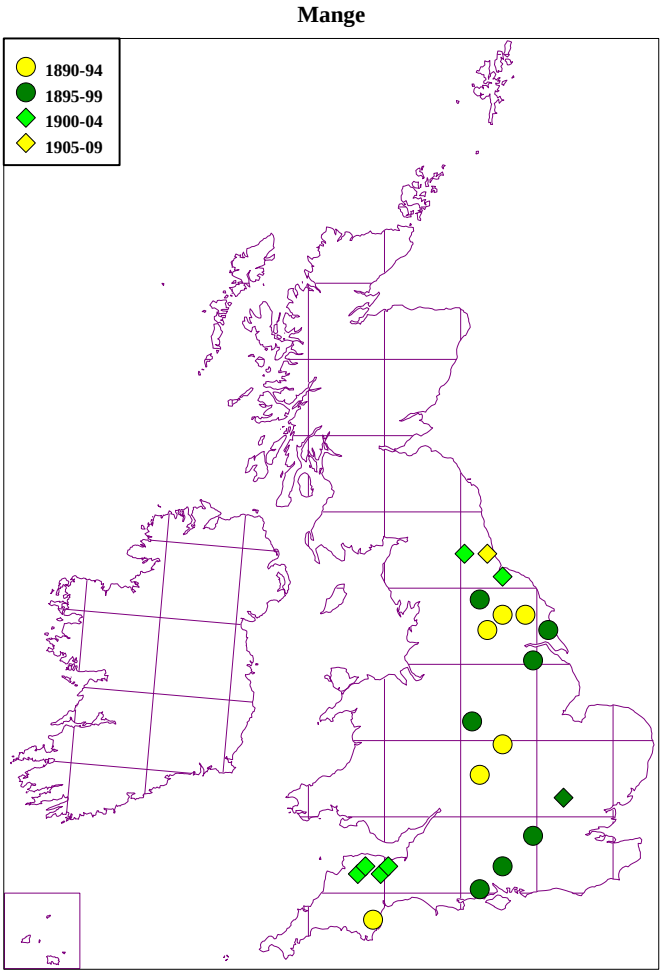
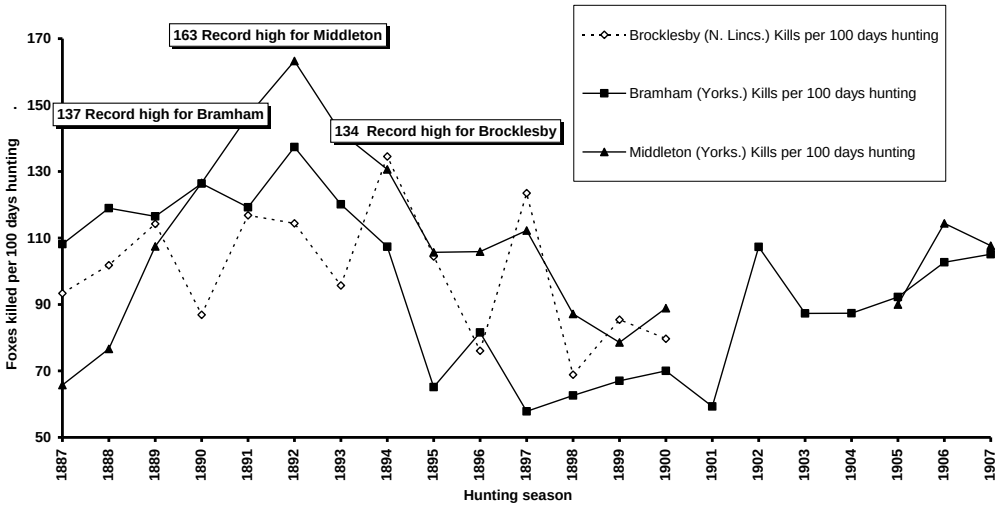


Figure 3.17. The timing and distribution of Yorkshire occurrences of mange in the context of recorded and deduced national distribution.

Figure 3.18. Trends in fox kill rates prior to, during and after the national mange epizootic in three local hunts.



nationally, a particularly severe outbreak occurred which persisted for 12 years, embracing the successive two peaks of 1902 and 1906.

Food and breeding site availability

The late 19th century saw an increase in game-rearing, largely for pheasants, but also partridge and grouse shoots, with an associated growth in the intensity and sophistication of game-keeping. Since an important function of game-keepers was to suppress the numbers of predatory bird and mammal species, one could expect a responsive increase in the population density of prey species such as rodents and lagomorphs. Since fox populations were jealously guarded by hunts, even to the extent of holding 'courts' to expose and admonish those responsible for fox snaring. Foxes were generally excluded from the depredations of the game-keepers and would therefore have had access to otherwise poorly predated rodent and lagomorph populations. One could also surmise that with the maturation of the thousands of miles of hedgerows and field drains created, in response to the many 18th and 19th century enclosure awards across Yorkshire affecting in excess of one million acres (about 26% of the Yorkshire landscape) and producing [more than 61,000 miles] of boundary hedge wall and drain, a substantial number of additional fox earth sites which would have become available at this time.

Rise of fox populations in urban areas

Howes (1982, 1984, 1985a) showed that foxes had been noticed visiting or occupying urbanised areas of some 20 towns and cities across Yorkshire from Sheffield in the south, north to the towns of the West Yorkshire conurbation and east to Hull and Scarborough. Although one case (Rotherham) dates back to the 19th century and three relate to the 1930s and 1940s (Wakefield, York and Scarborough), the majority of occurrences date from the 1960s.

In analysing the results of 152 responses to questionnaires on the status of urban foxes sent in 1997 to 139 Local Council Environment Departments, local mammal groups and the RSPCA in England and Wales, Wilkinson and Smith (2001) showed that 11 responses were received from Watsonian Yorkshire, Bradford, Darlington, Halifax, Harrogate, Huddersfield and Middlesbrough, being additions to the 1985 inventory.

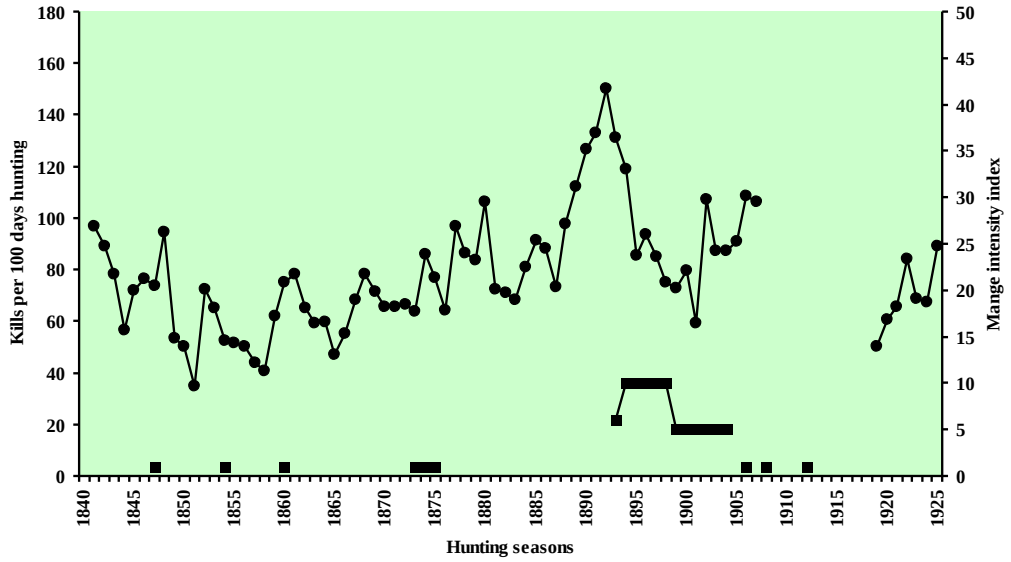


Figure 3.19 Relationship between fox density (●), as indicated by mean kills per 100 day hunting calculated from all available Yorkshire data (1840 to 1925), and the reported incidence of mange (■).

Perceptions of the respondents indicated that foxes were increasing in Bradford, Huddersfield, Leeds, Sheffield and York. There was no change reported from Darlington, Halifax, Rotherham or Wakefield and reports were decreasing from Harrogate and Middlesbrough.

Although numerous casual records are now available from 26 towns and cities within Watsonian Yorkshire, to date specific studies of urban fox populations have only been undertaken in Sheffield and Doncaster. The activities, habitat utilisation and distribution of foxes in urban and suburban Sheffield, canvassed by extensive press and radio publicity, have been monitored and mapped by Whiteley (1984, 1988) and Clinging and Whiteley (1984). Presence has been established in almost all urbanised 1 km squares within the city. By contrast, a garden wildlife questionnaire survey undertaken by Doncaster Museum in 1997 produced evidence of foxes visiting only 22 gardens in 13 1 x 1 km squares within the Doncaster Metropolitan Borough.

Summary and discussion

There is good evidence to show that mange had a considerable adverse effect on fox population sizes, especially when foxes become numerous. Ratcliffe (1956) indicated

that in Australia from 1940 to 1950 the fox population had reduced by 80% due to sarcoptic mange and Lindhart (1960), working in New York State, provided a case where mange also brought about an 80% reduction in fox density. During the Australian epizootic, Rolls (1969) recorded that there was little breeding during the period when the disease was prevalent. This coincides with the experiences in the York and Ainsty hunt during the mange epizootic in 1894, the hunt master reporting 'I did not find the litters of cubs I expected during cub hunting nor have they turned up since' (Dixon 1899).

Recent work on urban fox populations in Bristol showed that between the introduction of sarcoptic mange in May 1994 and spring 1996 an estimated 90% of the fox population had died (Baker *et al*. 2001). Baker *et al.* (2001) also showed that fox numbers remained relatively constant during the 1960s and 1970s, at 4.1 social groups per 1 km^2, the average group size being 3.4 adults, giving an adult fox density of 13.9 per 1 km^2. Generally there was only one breeding female per social group, producing an average litter of 3.8 emergent cubs. This produced a cub density was 15.6/km^2. Thus the spring density (adults and cubs combined) in the late 1970s was 29.5 foxes/km^2, but by 1990 the number of social groups and average group size had both declined, the spring density in 1990 reducing by 30% to 20.7/km^2.

By 1993, evidently in response to householders putting food out for local foxes, adult fox density increased to 25.8/km^2 and cub productivity increased with 1.6 litters per group and emergent litter size up to 4.3 cubs giving a total spring density of 64.3 foxes/km^2. During 1994-1995, mange caused a dramatic decline in fox numbers. Surviving individuals responded rapidly to the loss of neighbouring social groups by expanding their territories to occupy the vacant areas. Curiously, from 1995 to 2000, fox numbers changed very little due to mechanisms of social behaviour and the persistence of mange. Territories remained large throughout the second half of the 1990s and in combination with small group sizes, population density was correspondingly low, at less than two adults per 1 km^2.

Although each remaining social group was producing cubs that could either have settled within the natal territory, formed new groups or enlarged the natal territory, the cubs generally dispersed away from the territory despite the abundant availability of food. This was a behaviour which did not generally happen during the pre-mange period, its effect being to suppress the rate at which the population density increased.

Since the density reducing behaviour described by Baker *et al*. (2001) would seem to limit the build up and spread of mange within a wild population, the prospect of the late 19th to early 20th century mange epizootic throughout rural England could have been an inadvertent artificial phenomenon. With hunt servants traditionally charged with the duty of maximising numbers and distribution of foxes within their hunt territory, it is possible that the progressive increase of foxes in hunting country, as identified by the present study, may have been artificially induced to the extent that populations, through close proximity, consecutive use of denning sites and possibly starvation through over exploited prey resources, became particularly vulnerable to mange.