CHAPTER 10

AMERICAN MINK (*Mustela vison* Schreber)

Introduction

The American Mink (*Mustela vison* Schreber), a native of North America, is a versatile riparian predator feeding on a wide range of waterside and aquatic vertebrate and crustacean prey. The ranges of 15 subspecies extend from the arctic tundra of Canada and Alaska south to the everglade swamps of Florida and the desert habitats of California and New Mexico. Due to a history of export to fur farms in the old world since the 1920s, escapees from captivity have formed feral populations in a number of western European countries including Britain, Denmark, Iceland, Ireland, Italy, Finland, France, Germany, Netherlands, Norway, Sweden, Portugal and Spain, and isolated cases of free-range animals have also been reported from Belgium (Birks 1986, Centre for Conservation Science website http://www.ccs.st-and.ac.uk/mink.php).

The smaller European Mink (*Mustela lutreola*), which belongs to a separate sub-genus (*Lutreola*), was once common throughout the deciduous forest zones of mainland Europe, and indeed sub-fossil evidence from Earlham quarry, Boxgrove, West Sussex (Roberts 1986) shows that it occurred in Britain during a minor interglacial between the Cromerian interglacial and the onset of the Anglian glaciation. In recent times, due to a long history of intense hunting and trapping throughout its European range, its distribution and status has become very much reduced.

As a direct policy to re-establish a commercially viable source of 'free range' mink fur, American mink were liberated into countries of the former Soviet Union from the 1930s to 1980. This action has enabled American Mink to colonise much of the old range of the European mink and to spread into Belarus, the Czech Republic, Estonia, Latvia, Lithuania, Kazakhstan and Poland, with recent reports from Hungary, Slovenia and Serbia (Birks 1986, Linn & Birks 1989, Centre for Conservation Science website http://www.ccs.st-and.ac.uk/mink.php).

American mink were first imported into Britain from Canada and Alaska in 1929 to be farmed for fur. Yalden (1999) ascribes the origins of this commercial episode to surviving military officers returning from the First World War investing their pensions in

the new industry of fur farming, the close association between British and Canadian forces for training and joint combat purposes no doubt providing the necessary contacts and inspiration for subsequent peacetime commercial venture.

Soon after their introduction to fur farms in Britain, escapees began to be reported from places as far apart as Lancashire, Warwickshire and Berwickshire (Lever 1977). Until 1945 the industry was a small one (Thompson 1964), but business expanded considerably after the Second World War with large numbers of American mink (as many as 700 in a single shipment) imported from America and Scandinavia (Lever 1977). By 1962 the number of mink keepers had risen to a peak of c.700 (Swan 1981), with a number established in Yorkshire (D. Malam *pers. comm*.).

Shortly after the Second World War there were unconfirmed reports of escaped mink breeding in the wild, notably from Singleton in the Fylde region of Lancashire, where a number of large fur farms were located, one of which evidently specialized in selling pairs of mink to prospective breeders (Lever 1977). The first proof of the existence of a feral population came in 1956 from the River Teign in South Devon where a female and her young were noticed, and a self-sustaining population became established (Linn & Stevenson 1980). In April 1958, a pregnant female containing six foetuses was trapped on the River Deben, East Suffolk (Lever 1977). By 1961 feral populations had been reported from Avon, the Carmarthenshire/Cardiganshire border, Pembrokeshire, Devon, Dorset, Gloucestershire, Hampshire, Suffolk, Wiltshire, Lancashire and Yorkshire (Lever 1977).

In Yorkshire, free range mink reported and trapped from 1952 to 1964 were attributed to escapees which had not at that time given rise to feral populations (Clark 1970); however, feral populations quickly established thereafter (Clark 1966, 1970), with Govett (1966) reporting that ‘The most dramatic change in animal life in the county recently is the eruption of the American mink in the last few years and especially this year (1966)’. Preliminary maps of the distribution of free-range (not necessarily self-sustaining feral) mink in Yorkshire are provided in Howes (1983) and Delany (1985).

On 1 January 2003, the Fur Farming (Prohibition) Act 2000 (Commencement) Order 2001 came into effect, after which it was illegal in England and Wales to keep animals solely or primarily for slaughter for the value of their fur. After 1 January 2002, fur

farmers who incurred financial losses as a result of the ban were able to submit claims for compensation under conditions set out in the Fur Farming (Compensation Scheme) (England) Order 2001. These orders were made under the Fur Farming (Prohibition) Act 2000, which received Royal Assent on 23 November 2000. Although these statutory instruments draw to a close further prospects of mink escaping or being liberated into the wild, the progress of feral populations is still highly dynamic, with repercussions for predator - prey relationships and competition with other riparian predators deserving of continual monitoring.

Historical review of American mink in Yorkshire river catchments

The aims of this study were to assemble information on the origins, chronology and extent of spread of feral mink through the riparian and aquatic habitats within the river catchments of Yorkshire and to examine trends in their colonization, population composition, seasonal behaviour and subsequent decline.

Records appearing in local natural history society reports and forwarded to the Yorkshire Naturalists' Union mammal recorders from the 1950s onward have been collated. To these have been added trapping records from the 1960s and 1970s obtained from the Leeds, Hull and Newcastle offices of the former Ministry of Agriculture Fisheries and Food (MAFF) and the Agricultural Development Advisory Service (ADAS). Latterly, batches of records were obtained from planning-related consultancy surveys, County Wildlife Trust/Environment Agency river catchment surveys and particularly from the standardised national otter surveys of 1977-79 (Lenton *et al.* 1980), 1984-86 (Strachan *et al.*, 1990), 1991-94 (Strachan & Jefferies 1996) and 2000-02 (Crawford 2003), the National Water vole Survey 1989-1990 (Strachan & Jefferies 1993), and the Water vole and Mink Survey of Britain 1996-98 (Jefferies 2003). Information on the locations of licensed mink farms within the Yorkshire Ridings was obtained from MAFF and ADAS.

Mink farms

In 1962, the provisions of the Destructive Imported Animals Act 1932 were expanded to include mink via by the Mink (Keeping) Order of 1962 which required mink farms to be

licensed and any escapes to be reported. Through the process of MAFF inspecting premises and issuing licenses, the whereabouts of local mink farms were systematically traced. From archived files it has been possible to construct Table 10.1, which lists 79 licensed mink farms active at various times in Yorkshire. Figure 10.1 shows the locations of these commercial fur farms, their significance to this study being their potential as sources of escaped or released stock to form the basis of feral populations.

Table 10.1. Evidence of mink farms in Yorkshire (MAFF and ADAS sources).

East Yorkshire	**Grid Ref.**	**Date(s)**
Riccall	SE/6137	1963
Raywell, Cottingham	SE/9930	1963
North Frodingham, Driffield	TA/0953	1960; 1963
Dunnington	SE/6752	1963
Kirkella, Hull	TA/0129	1960
Melbourne	SE/7444	1960
Millington	SE/8351	1963
Swanland, North Ferriby	SE/9927	1960
Weeton	TA/3520	1965
North Yorkshire	**Grid Ref.**	**Date(s)**
Askham Bryan	SE/5548	1965
Cotherstone, Barnard Castle	NZ/0119	1960s
Bentham	SD/6669	1965; 1968
Eskdaleside, Sleights	NZ/8608	1973 (11males and 53 females; license not renewed in 1974)
Farnham	SE/3460	1965
Green Hammerton	SE/4556	1965
Alma Fur Farm, Pickhill, Thirsk	SE/3483	1973 (60 males and 240 females; license not renewed in 1974)
Bondgate, Helmsley	SE/6183	(4 males and 15 females; sold out in 1970)
Pottergate, Helmsley	SE/6183	1960
Wood Cottage, Brompton-by-Sawdon	SE/9482	(50 breeding mink; went out of business in 1968)
Brompton-on-Swale	SE/2199	1960
Knaresborough	SE/3457	1968
Gilling West, Richmond	NZ/1805	1960
Cappleside, Settle	SD/8059	1960
Stainforth, Settle	SD/8167	1965; 1968
Cowling, Skipton	SD/9642	1965; 1968
Hazlewood, Tadcaster	SE/6439	1968
Hilton Mink Farm, Hilton, Yarm	NZ/4611	1960 (c. 250 males and 960 females in 1969)
Yarm	NZ/4212	1960
Acomb, York	SE/5650	1960
Thoresby Road, Acomb, York	SE/5650	1960
Brafferton, Helperby, York	SE/4370	1960
Copmanthorpe, York	SE/5646	1960
Dunnington, Nr. York	SE/6649	1960

West Yorkshire	Grid Ref.	Date(s)
Allerton, Bradford	SE/1234	1965; 1968
Bolton, Bradford	SE/1535	1960; 1965
Cullingworth, Bradford	SE/0636	1965; 1968
Lower Grange, Bradford	SE/1133	1960; 1965
Thornton, Bradford	SE/1032	1960; 1965
Tyresall, Bradford	SE/2032	1960; 1965
Wyke, Bradford	SE/1526	1965; 1968
Thornhill Edge, Dewsbury	SE/2417	1968
Elland	SE/1221	1960; 1965
Luddenden Foot, Halifax	SE/0424	1960; 1965
Mount Tabor, Halifax	SE/0527	1960; 1965
Ripponden, Halifax	SE/0319	1960; 1965
Southowram, Halifax	SE/1123	1960; 1965; 1968
Wadsworth Lane, Hebden Bridge	SD/9827	1960; 1968
Mytholm, Hebden Bridge	SD/9827	1952
Hebden Royd	SE/0263	1965
Bradley, Huddersfield	SE/1620	1968
Kirkheaton, Huddersfield	SE/1818	1960
Grange Moor, Huddersfield	SE/2216	1965; 1968
Outlane, Huddersfield	SE/0817	1965; 1968
Salendine Nook, Huddersfield	SE/1017	1965; 1968
Swalesmoor Road, Huddersfield	SE/0-1-	1965; 1968
Tongsbridge, Huddersfield	SE/1509	1965; 1968
Copperas Mount, Keighley	SE/1020	1965; 1968
Ingrow, Nr. Keighley	SE/0539	1960; 1965
Lees, Keighley	SE/0437	1960; 1965
Oakworth, Keighley	SE/0338	1965; 1968
Silsden, Keighley	SE/0445	1965; 1960
Harrogate Road, Huby, Leeds	SE/2747	1960
Horsforth, Leeds	SE/2337	1965
Mirfield	SE/2019	1965
East Hardwick, Pontefract	SE/4618	1965
North Fetherstone, Pontefract	SE/4021	1960; 1965
South Elmsall, Pontefract	SE/4811	1960
Crigglestone, Wakefield	SE/3115	1965; 1968
Stanley, Wakefield	SE/3522	1965; 1968
Sherburn-in-Elmet	SE/4933	1960
Todmorden	SD/9324	1965

South Yorkshire	Grid Ref.	Date(s)
Armthorpe, Doncaster	SE/6304	1968
Cadeby, Doncaster	SE/5100	1968
Fishlake, Doncaster	SE/6513	1965; 1968
Finningley, Doncaster	SK/6899	1965
Old Edlington, Doncaster	SK/5397	1960
Mexborough, Doncaster	SK/4799	1965
Swinton, Rotherham	SK/4599	1965
Stannington, Sheffield	SK/2988	1965; 1968
Thorpe Salvin, Rotherham	SK/5281	1965

Escaped and feral mink

A further condition of the 1962 legislation was to require landowners to report the presence of escaped or feral mink. Land-owners and estate workers were generally oblivious of the presence of mink, even in riparian situations, but following awareness training sessions provided by ADAS staff (D. Malam *pers. comm*.) and experimental trapping sessions associated with the newly launched MAFF bounty scheme, mink were regularly encountered and reported.

Mink Farms in the Yorkshire region

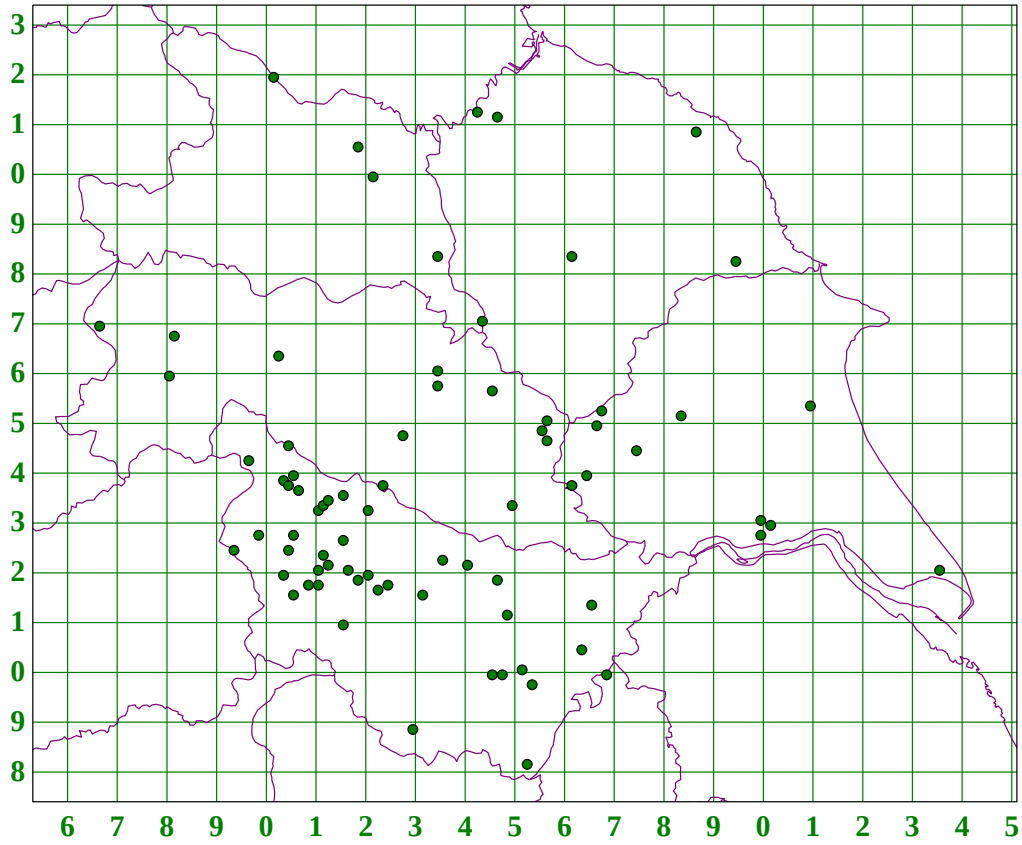


Figure 10.1. Distribution of commercial mink farms listed in Table 10.1.

MAFF's own trapping-based eradication scheme was instigated in 1965, but abandoned in 1970 when it was accepted that mink were too well established and widely distributed for eradication by this means. From 1970, riparian landowners and occupiers have been encouraged to undertake trapping where necessary to protect vulnerable stock (poultry, ornamental wildfowl and fish) (Swan 1981).

Piecemeal sightings and other encounters with mink by naturalists, anglers and other members of the public reported to local Natural History Societies have been compiled (Appendix 10.1); in all, more than 890 records and reports of escaped or feral populations of mink have been gathered from 29 watercourses since 1962 (see Figure 10.2); however recent survey data are only available for the south of the county.

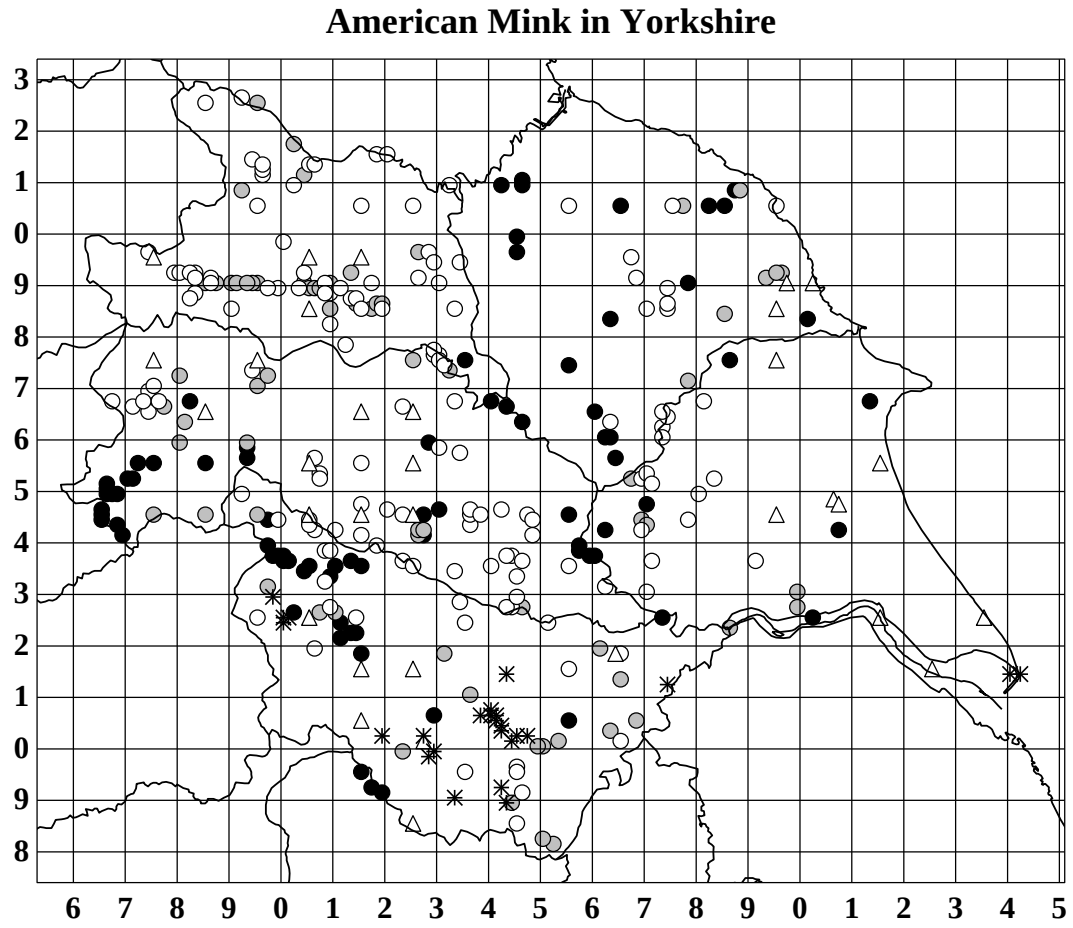


Figure 10.2. Distribution of free-range and feral mink in Yorkshire from the 1960s to the 2000s with records indicated in decades (based on data in Appendix 10.1).

Key: 1960s - ●. 1970s - Grey circle. 1980s - ○. 1990s - Δ. 2000s - *.

Early Yorkshire records

Since some of the early records were not immediately followed by subsequent encounters, they may represent isolated escaped animals which did not, at least initially, form the basis of feral populations, as, for example, one killed in August 1963 on Oakdale Reservoir,

Thimbleby within the Codbeck and Swale catchment where regular records of mink were not apparent until 1977. In 1966, mink were present on the Gypsy Race at Boynton in East Yorkshire, a record which may have resulted from escapes from the North Frodingham mink farm, but seems not to have resulted in a sustainable population. A road casualty at Armthorpe in 1974 is likely to have been an isolated escapee from the Armthorpe mink farm, and escapees from the Finningley mink farm, which had its license revoked during the 1970s due to poor stock security, seem not to have immediately established feral populations in the River Torne catchment. Permanent populations on the River Torne and local wetlands were not apparent until the 1980s, although sightings and signs are relatively scarce even today. Although mink were found in the Torne just east of the Yorkshire border (SE/72) during the National Water Vole Survey of 1989-1990 (Strachan & Jefferies 1993), no signs were located in the Yorkshire stretch in SE/71. A water vole survey of the Potteric Carr wetlands within the upper Torne catchment found no current evidence of mink (Thorpe 2001). Surveys of riparian mammals of the Hatfield Chase and the River Torne to the Trent only revealed very sporadic evidence of mink and this, mainly downstream to the east and beyond the Yorkshire boundary (Palmer 2001).

Trapping numbers

Unfortunately, the records of 204 mink trapped on the Hodder, Ure, Nidd and Wharfe in 1965 and c. 150 trapped annually until 1968, presumably on these rivers (Clark 1970) appear not to have been archived; consequently, figures cannot be separated to determine performances on individual rivers. Subsequent to Clark's (1970) work, trapping was undertaken, but records were not systematically maintained or at least retained. According to the limited records which do survive (held or published by MAFF), trapping seems to have taken place in three phases (see Figure 10.3): firstly in 1962 and 1963 on the upper Aire in response to escapes from west Yorkshire fur farms, secondly from 1965 to 1970 on Hodder, Ure, Nidd, Wharfe and Ouse during the abortive MAFF mink eradication scheme, and finally from 1977 to 1982 by private landowners on the Lune, Ribble, Wharfe, Ure and Swale, but mainly on the Ure. In all, 390 records were compiled by this study, the numbers for specific river catchments being provided in Table 10.2.

Table 10.2. Trapping totals per river catchment 1962 to 1983.

River catchment	Number trapped
Ribble	6
Ouse	9
Swale	17
Aire	21
Lune	24
Tees	29
Wharfe	47
Hodder	56
Ure	181
Total	**390**

On the Upper Aire in 1962, three were trapped at Allerton in June and ten in the Stanbury area in November, but in 1963 and 1965 only four per year were reportedly trapped (MAFF). On the Hodder, local land managers were not aware of mink in the area in 1964, though trapping in 1965 caught 56 specimens (Clark 1970).

It was known that mink had moved into the easterly flowing river catchments of Pennine Yorkshire at this time, and trapping on the Ure, Nidd and Wharfe produced 204 mink in 1965 and c. 150 annually up to 1970 (Clark 1970). Trapping trials in 1965, using 60 traps on a 2-mile stretch of the Wharfe, produced 11 mink (4 adults and 7 juveniles), and using seven groups of four traps along a 17-mile stretch of this river in a period of just over two years ending in October 1968, produced 28 mink (Clark 1970). Available trapping records for the Ure are as follows: 1967 (1), 1977 (3), 1978 (14), 1979 (20), 1980 (34), 1981 (19), 1982 (47) and 1983 (25 from ten traps set along 0.25 miles), and for the Tees as follows: 1968 (1), 1969 (1); 1979 (5); 1980 (4); 1981 (11) and 1982 (7).

Early evidence of feral breeding

Claims of feral breeding on Yorkshire waters were initially based on evidence that repetitive trapping seemed not to remove riparian populations. Actual evidence of free-range breeding, in the form of trapped juveniles or lactating females, was seldom reported, those reports which survive dating from well after the species was known to be well established within the relevant river catchment.

Without supporting evidence, the Aire in West Yorkshire was stated to have a feral population by 1964 (Clark 1970). In 1968, breeding was claimed on the Foss, near York

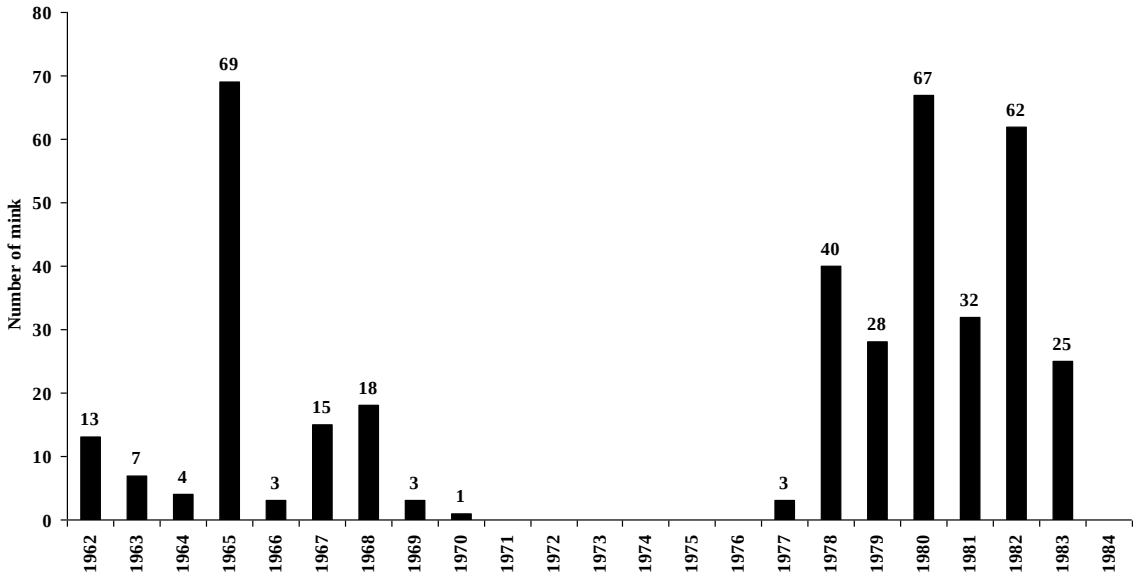


Figure 10.3. Trapping records of mink on Yorkshire rivers (from Clark 1970 and MAFF)

(York Naturalists' Society *in litt*.) and on the Calder (Simms 1970). In 1978, a lactating female was trapped at Ellerton on the Swale, and immature females were shot at Worton on the Ure and on a tributary of the Derwent at Thornton Dale. In 1979, a juvenile male was trapped on the Scur Beck, a tributary of the Tees. Even so, these animals could have been recent escapees.

Seasonal activity patterns as indicated by trapping data

Work on territorial spacing behaviour by Chanin (1981), Dunstone and Birks (1983) and Birks (1986, 1989) shows that single mink occupy discrete areas of the riverside, marsh, reedbed or lake shore. These areas tend not to overlap, but where overlap does occur, this only involves mink of opposite sexes.

If the local and ephemeral effect of escapees and/or liberations from fur farms are ignored, the numbers of feral mink in an area are influenced by the spacing effect of territoriality. Density or territory size varies primarily according to the availability of prey. On the banks of the River Teign in South Devon this ranged from 1 mink per 3.8 - 4.8 km

of bank (Chanin 1981), increasing to 1 mink per 1.9 - 2.4 km of bank after rabbits had become a food source (Birks 1989). By contrast, on the rocky coast of south-west Scotland, where mink prey were especially abundant, density of resident mink was 1 mink per 0.53 km of coastline. This compaction was achieved by small territory size and greater territory overlap by opposite sexes (Dunstone & Birks 1983). Radio tracking studies on the Teign (Birks 1983) showed differences in territory sizes between the sexes, female territories covering 1.46 - 2.87 km of river (mean 2.16 km), whilst male territories covered 1.9 - 2.9 km (mean 2.53 km).

Figure 10.4 is an analysis of the monthly numbers of mink trapped on Yorkshire river systems between 1962 and 1982: all records, irrespective of sex or age, show a bimodal, spring and autumn pattern of activity, the autumn peak being the greater. This is broadly similar to the aggregate monthly trapping figures from 1965 to 1968 for Lancashire and West Yorkshire rivers as shown by Clark (1970). The spring peak occurs from March to April and coincides with 'rutting' when males evidently relinquish their territories to search for females who are receptive for about three weeks during February and March (Birks 1986).

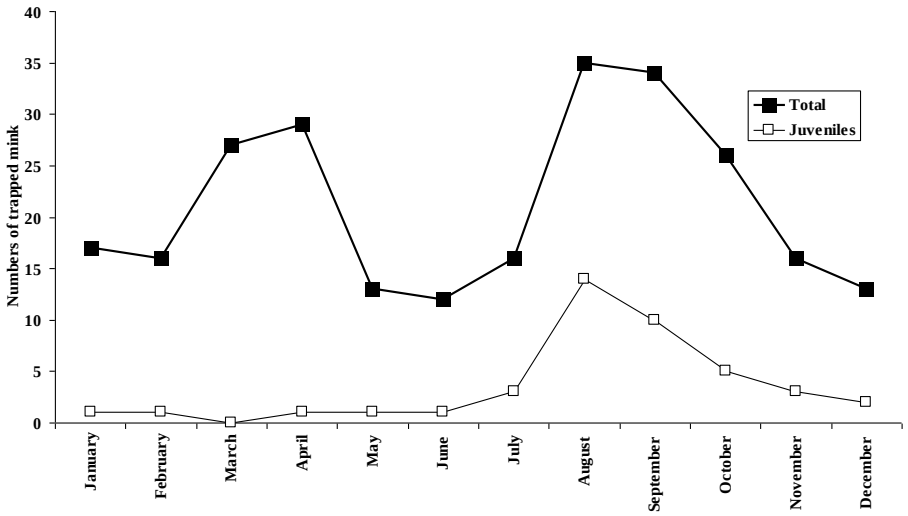


Figure 10.4. Seasonal activity patterns by monthly trapping results.

Given the linear distribution of female waterside territories, the male's evident strategy of travelling extensively along riparian habitats is likely to be successful in terms of maximizing the numbers of encounters with females and therefore of mating opportunities. Birks' (1989) data showed the spring peak to consist largely of transient males. Unless the MAFF data available to this study are incorrect, this is at variance with the available Yorkshire trapping records.

In Figure 10.5, the records of male and female mink are separated, showing a marked peak of female rather than male activity (13 females to 4 males), more specifically in March. Misidentification of sex or erroneous logging of data by MAFF are possible explanations for this discrepancy. A further explanation may be the ratio of female to male animals in fur farms. Table 10.1, providing the numbers and sexes of animals held in four Yorkshire fur farms, shows the ratio of females (1268) to males (325) to be about 4 : 1. If during the period of trapping (1978 to 1982, data coming from the Tees, Swale and Ure) animals were escaping or being liberated from failing mink farms (D.Malam *pers. comm*.), the ratio of females to males would have resulted in skewed statistics. However, since Figure 10.5 shows that females only outnumbered males during March and June, with sexes being equal or males predominating in other months, this is unlikely to explain the March discrepancy. The extension of this spring peak of activity to include April probably represents the re-formation of male territories after the period of mating expeditions.

Litters of young, usually numbering from four to six, are born in late April or early May; they become effectively independent of their mothers by early August, at the age of about three months, and depart from the natal territories as a consequence of increased intolerance by their mothers (Birks 1986, 1989). Dispersal distances for young females are often within 5 km of their natal territory, although males commonly move in excess of 10 km (Birks 1986, 1989). The second, late summer/autumn activity peak from August to October (see Figure 10.4) coincides with the period of juvenile dispersal and territory establishment (Birks 1986, 1989). In separating out the data for mink identified as juveniles, Figure 10.4 shows that records of trapped juveniles peak in August and

September. Figure 10.5 shows that mobility at this time (quest for the establishment of territories - Birks 1986, 1989) also involves adults of both sexes.

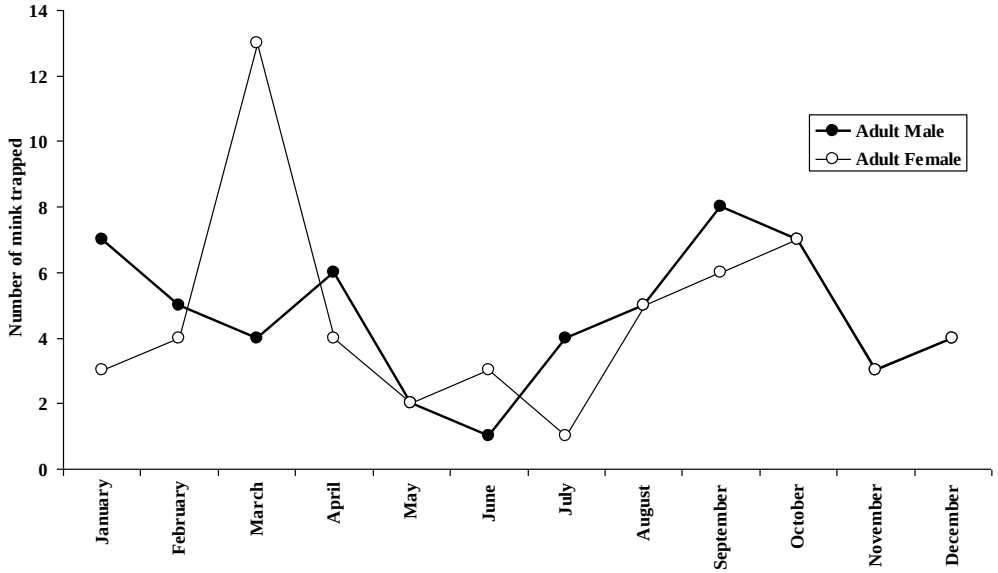


Figure 10.5. Seasonal activity patterns of males and females as shown by monthly trapping results.

In principle, this bimodal activity graph is similar to that of the larger mustelid, the badger, as demonstrated by road casualties. In this case, the spring peak relates to sexual activity in the sense of males travelling in search of mating opportunities, and the late summer peak is related to dispersal of the young and territorial activity.

Rate of occupation

Despite the very wide distribution of mink farms throughout Yorkshire (Figure 10.1), the establishment of feral populations continued to be concentrated in the west-flowing Lune, Hodder and Ribble and the Pennine headwaters of the Aire, Swale, Ure and Wharfe. An impression of the pattern and rate at which mink colonised river catchments throughout Yorkshire can be determined from Table 10.3, which also shows the number of 10 x 10 km squares in which mink have been recorded within the catchment and the minimum number of years taken to occupy those units. From these figures, an index of 'rate of occupation'

has been constructed by dividing the number of 10 x 10 km squares occupied by the minimum number of years records show that it took for those squares to be colonised. This is probably an underestimation, since the earliest records may refer to recent escapees from captivity rather than established feral populations, and the sporadic nature of field surveys provides the opportunity for colonisation to have taken place ahead of field observations. Figure 10.6 illustrates the rate of increase in the occupation of new watercourses and 10 x 10 km squares.

Table 10.3. First year of occupation, the number of 10 x 10 km squares occupied, and rate of occupation for Yorkshire watercourses to 1990.

River Catchment or Watercourse	Earliest record	Squares occupied	Rate of occupation (squares per year)
Calder	1952	7 in 32 years	(0.22)
Aire	1962	15 in 29 years	(0.52)
Swale	1963	14 in 28 years	(0.50)
Colne	1965	1 in 1 year	(1.00)
Esk	1965	4 in 24 years	(0.16)
Hodder	1965	3 in 1 year	(3.00)
Lune	1965	3 in 15 years	(0.20)
Nidd	1965	5 in 12 years	(0.41)
Ribble	1965	9 in 12 years	(0.75)
Ure	1965	18 in 20 years	(0.90)
Wharfe	1965	15 in 19 years	(0.78)
Race	1966	1 in 1 year	(1.00)
Don	1966	10 in 25 years	(0.40)
Foss	1966	3 in 3 years	(1.00)
Ouse	1966	8 in 11 years	(0.72)
Hull	1966	3 in 13 years	(0.23)
Rye	1967	4 in 18 years	(0.22)
Derwent	1968	16 in 22 years	(0.72)
Tees	1968	14 in 22 years	(0.63)
Dearne	1969	5 in 21 years	(0.23)
Torne	1974	3 in 16 years	(0.18)
Humber	1975	2 in 7 years	(0.28)
Chesterfield Canal	1977	1 in 2 years	(0.50)
Rother	1977	2 in 6 years	(0.33)
Pocklington Canal	1981	1 in 1 year	(1.00)
Codbeck	1984	4 in 7 years	(0.57)
Leeds/Liverpool Canal	1985	1 in 1 year	(1.00)
Foulness	1990	3 in 2 years	(1.50)
Went	1990	2 in 2 years	(1.00)

Figure 10.6, derived from data in Appendix 10.1, illustrates the numbers of main water courses and the number of 10 x 10 km squares occupied in 5-year periods from 1960

to 2004. This shows a rapid rise in occupied river systems and 10 x 10 km squares from 1960-64 to 1965-69. At this time it is likely that records were elevated by a) specimens escaped or liberated from failed mink farms and b) access to MAFF trapping records. The reduction during the 1970-74 period may be due to a cessation of MAFF funded trapping activity and that the mink recorded were representative of self sustaining feral populations.

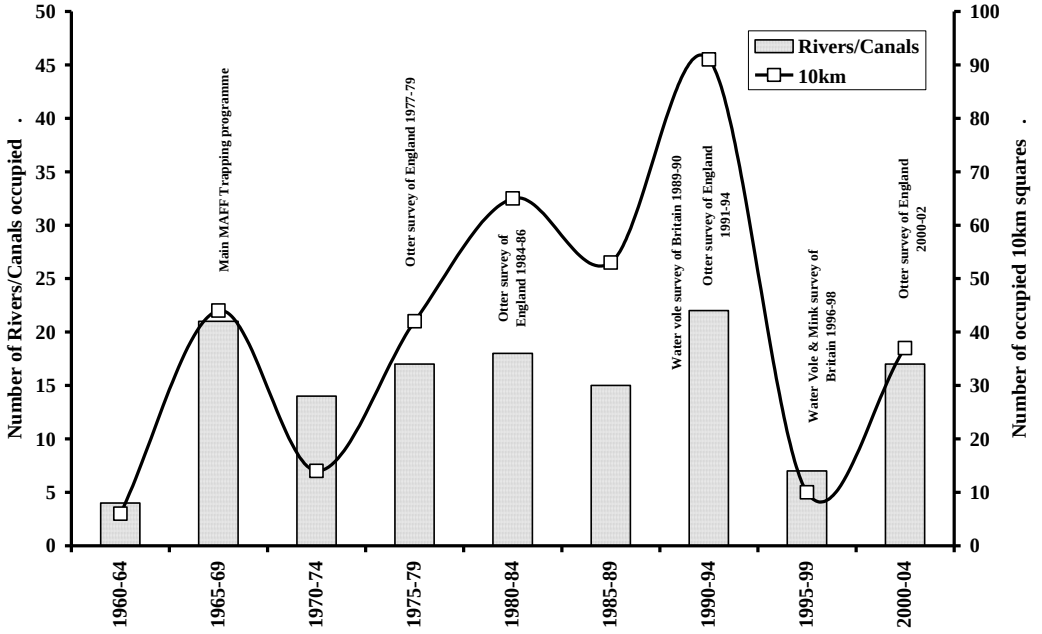


Figure 10.6. Changing distribution of feral mink in Yorkshire as indicated by the number of occupied river catchments and 10 x 10 km squares recorded in five year periods 1960 to 2004.

The rate of occupancy of 10 x 10 km squares increased substantially from 14 in the 1970-74 period to a zenith of 91 occupied squares during the 1990-94 period. Work on the water vole and mink survey of Britain 1996-98 (Jefferies 2003) revealed a major crash in occupied 10 x 10 km squares and river catchments to an apparent nadir of seven river catchments and ten 10 x 10 km squares. Although representing a real trend, these figures, based on 'snapshot' data gathered on single visits to designated survey sites evidently underestimated the actual presence of populations as indicated by the results of casual reporting and local surveys (see Appendix 10.1). The National Otter Survey of 2000-02

(Crawford 2003) and various local subsidiary surveys undertaken by consultancies or the Wildlife Trust produced mink records from 37 10 x 10 km squares within 17 river catchments. Although higher than Crawford's (2003) figure, it still represents a 33.7% decline from the 1990-94 zenith.

From December 1989 to November 1990 (Strachan & Jefferies 1993) and from November 1996 to June 1998 (Jefferies 2003), while monitoring water vole status on 71 sample riparian recording plots on Yorkshire river systems, provided subjective assessments of the level of mink activity. This was scored on a status scale from 0 (no signs) to 5 (abundant signs). The results are included in Appendix 10.1 and are summarised in Table 10.4 and Figure 10.7.

Table 10.4 shows that the assessment of mink activity levels scored 117 status points in 1989-90 but only 11 in 1996-98 and that negative records increased from 15 to 64 in the same period (see Table 10.4 and Figure 10.7).

Table 10.4. Changes in mink status code scores 1989-90 and 1996-98 (derived from Strachan & Jefferies 1993 and Jefferies 2003).

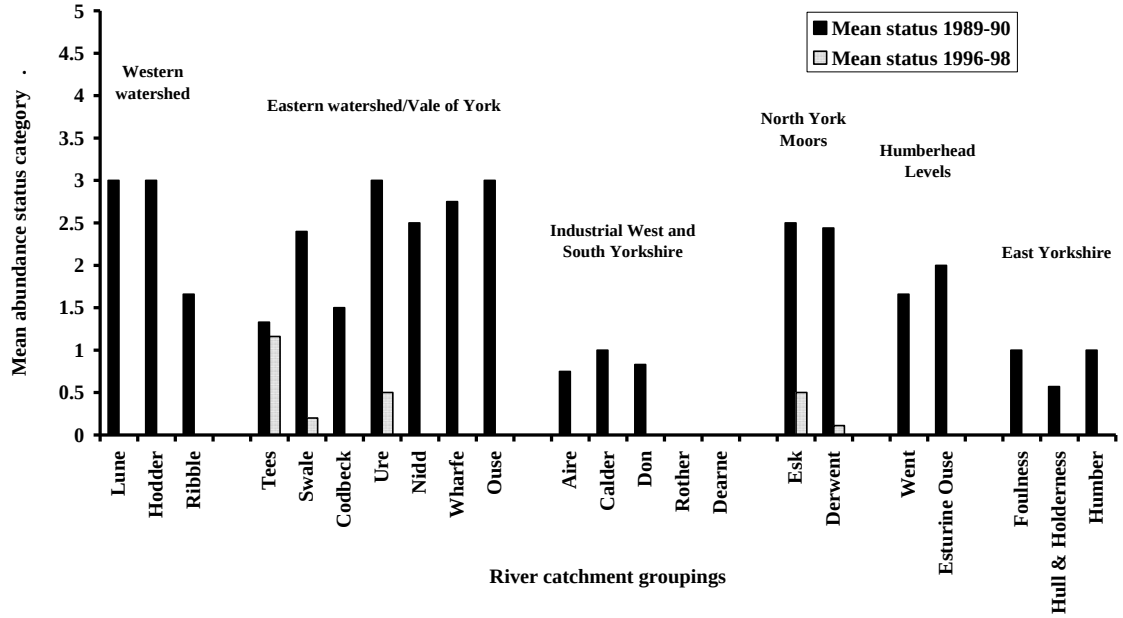
Status code	1989-90	1996-98	Change
0	15	64	+49
1	18	6	-12
2	18	0	-18
3	17	0	-17
4	3	0	-3
5	0	1	+1
Status points	**117**	**11**	**-106 (90.5%)**

As a means of illustrating mink activity levels, rather than purely presence of absence, on specific rivers and within regional catchments, the mean of the status scores have been calculated for each river. Figure 10.7 compares status performance in river systems of the western watershed (Lune, Hodder & Ribble), the eastern watershed and Vale of York (Tees, Swale, Codbeck, Ure, Nidd, Wharfe & Ouse), the industrial West and South Yorkshire (Aire, Don, Rother & Dearne), North York Moors (Esk & Derwent),

Humberhead Levels (Went & Torne) and East Yorkshire (Foulness, Hull, Holderness drains and Humber).

Figure 10.7 demonstrates that in the monitoring period 1998-90 the highest levels of population density (as indicated by the abundance of scats and footprints) were present in the rivers of the western watershed, the Yorkshire Dales feeding into the central Vale of York, the North York Moors and the Humberhead Levels. The lowest scores of population density were shown to be in the rivers of the Industrial West and South Yorkshire and East Yorkshire.

Figure 10.7. Mean status code scores for Yorkshire river systems 1989-90 and 1996-98 (calculated from Strachan & Jefferies 1993 and Jefferies 2003).



The same exercise repeated at the same sites during the survey period 1996-98 reveals evidence of recordable activity on only the most northerly rivers (Tees, Swale, Ure, Esk and Derwent) and these at a lower level than monitored seven years earlier, indicating a catastrophic population crash within Watsonian Yorkshire during this period.

In monitoring status changes, as demonstrated by presence or absence data in the national mink surveys of 1989-90 and 1996-98, Jefferies (2003) calculated an 87.72% loss of occupied sites in the Yorkshire river catchment region within this 7-year period. Since rivers of adjacent catchment regions come within Watsonian Yorkshire, Table 10.4 includes

the status change data for the adjoining North-west, Northumbrian and Severn-Trent regions.

Table 10.4. Changes in survey site occupancy between the 1989-90 and 1996-98 National Mink Surveys (Jefferies 2003).

	1989-90 National Mink survey			1996-98 National Mink survey			Percentage loss between first & second survey		
Region	**Sites**	**Positive**	**%**	**Sites**	**Positive**	**%**	**Positive 1st/2nd**	**No. lost**	**% loss**
Yorkshire	112	57	50.89	112	7	6.25	57/7	50	87.72
North-West	137	58	42.34	137	2	1.46	58/2	56	96.55
Northumbrian	80	39	48.75	80	21	26.25	39/21	18	46.15
Severn-Trent	192	69	35.94	192	28	14.58	69/28	41	59.42
Totals	**521**	**220**	**42.22**	**521**	**58**	**11.13**	**220/58**	**156**	**70.90**

Jefferies (2003) shows that 'crashes' had occurred in mink distribution throughout mainland Britain and examined its variable severity, timing and potential causes. Factors examined were under-recording, pollution, disease epizootics, habitat change, depletion and disappearance of important food items, and interaction with otters. He concluded that in the light of the timing and extent of recolonisaton of river systems by otters, intra-guild competition between increasing populations of otters and the smaller mink was the primary cause.