

# **Brown hares at Courtyard Farm, Ringstead, Norfolk**

## **The history and status of the brown hare on a north Norfolk lowland organic mixed farm**

*by John R Williamson*

Brown hares, *Lepus europaeus*, are widespread throughout central and Western Europe, including most of Britain. However, the origins of the brown hare in the British countryside are somewhat obscure. Palaeontology suggests the brown hare was not in our native fauna at the end of the last Ice Age, at the time when there was still a land bridge to the Continent. At that time our hares were mountain hares, a species now confined largely to the Scottish highlands. Originating on the grassland steppe of central Asia, the brown hare spread westwards as early Neolithic man cleared the primeval deciduous forest. The appearance of the brown hare in Britain was not until Roman times, or perhaps even a little earlier, by which time agriculture was present on much of the British lowlands. The Romans may even have introduced brown hares for coursing, a popular practice in Roman Gaul at this time.

By the late 19<sup>th</sup> Century there were around four million brown hares in the UK but gamebag records and surveys indicate a decline of more than 80% over the past 100 years. In some parts of South-West Britain, the brown hare is now almost a rarity, and is even thought to be locally extinct in some areas.

Modern estimates (Harris, 1995) suggested a UK population of 817,500, of which England held 572,250, Scotland 187,250, Wales 58,500, with very few in Northern Ireland.

The reasons behind the decline recorded in the last 100 years are not fully understood, but it is clear that intensification of agriculture has been a major factor. Brown hares neither carry appreciable amounts of stored body fat, nor hibernate, thus there is a need for constant food supplies throughout the whole year. Only landscapes rich in biodiversity are able to provide this continual food source.

Agricultural landscapes of the past, including traditional hay meadows and crops grown in rotation, provided the necessary biodiversity to support brown hares, mirroring the ancestral herb and grasslands of the species. However, since the World War II hay meadows in the UK have been reduced by 95% as hay-making for livestock fodder has largely been replaced by silage production (which is more profitable and less dependent upon weather conditions). Grassland grown for the production of silage tends to be sown to a single non-native grass species, producing a monoculture landscape that is low in biodiversity. Brown hares prefer to eat a mixture of wild grasses and herbs, with grasses predominant in the winter and herbs preferred in the summer. Modern, large fields, containing single crops, mean brown hares need to travel further, and expend more energy, in their effort to find continuous varied grazing. These combined factors probably partly explain why brown hares are now particularly scarce in western areas of the UK, where dairy farming often predominates. Brown hares now appear to thrive better in the arable areas of the east, giving a marked east-west divide in their national population.

Additional agricultural changes that have not been helpful to brown hares include the change to autumn sown cereals. Autumn sowing that can produce heavier

yields than spring sown cereals as a result of the longer growing season before harvest, and greater responsiveness to repeated applications of manufactured fertilisers. More winter cereal and oilseed rape is planted now in the UK than ever before. These crops are of low or no benefit to brown hares when compared with root crops or more mixed rotations. This is supported by Game and Wildlife Conservation Trust (GWCT) data that shows a negative association between brown hares and winter cereals, and a positive association with root crop areas. Grassland in crop rotation also tends to be positively associated with brown hares, though other crop categories had no significant effect on numbers. Radio-tracking of brown hares by the GWCT has shown that there is always pasture or grassland in their range, even if it is merely a grass track. Whilst over 90% of their range may comprise arable crops, they will travel some distance to be able to graze on grass. Thus, autumn sowing of winter cereals and oilseed rape, without any effective root crop or grassland rotation does adversely affect the amount of grass and herbage available as food source within a mainly arable range. In a situation that starkly reflects the plight of many diminishing populations of UK farmland birds, in some areas the relative absence of spring sown cereal crops and the scattered distribution of grassland and pasture means that brown hares now suffer food shortages at the at the end of winter and in early spring, the height of their breeding season and the very time when their need is greatest.

Furthermore, in excess of 150,000 miles of hedgerow and associated ground vegetation have been destroyed in the UK during the past 50 years, thus depriving hares of this vital source of food and shelter.

Brown hares are also at risk from farm machinery, particularly the large spraying units, and the associated use of pesticides intrinsically linked with intensive farming methods. Also, many leverets succumb to grass mowing operations in silage fields whilst laying-up in wait for their mothers to return at dusk to provide their single daily feed.

Despite its decline, the brown hare is the only British game species that has no shooting close season in England and Wales, where it can be shot throughout the year on enclosed land, while on moorland or unenclosed non-arable land, it can be shot between 11<sup>th</sup> December and 31<sup>st</sup> March. In Scotland the brown hare shooting season extends from 1<sup>st</sup> October to 31<sup>st</sup> January, and in Northern Ireland from 12<sup>th</sup> August to 31<sup>st</sup> January.

Brown hare shoots in East Anglia during February are known to account for up to 40% of the entire national population, despite the fact that the breeding season is well under way by February. This leaves many orphaned leverets to die of starvation waiting for their lactating mothers to return. There is no doubting that brown hares have a remarkable ability to recover from such levels of decimation, but clearly the impact of these shoots can be huge.

Brown hares do have a nominal level of protection in the form of the Hares Preservation Act 1892, which prohibits the sale of brown hares or leverets between 1<sup>st</sup> March and 31<sup>st</sup> July. It is illegal for British killed brown hares to be on restaurant menus this period, though foreign imports are exempt.

Growing concern at the rate of decline of the brown hare led to its inclusion as priority species in the Government Biodiversity Action Plan (BAP) in the mid-1990s. One of its chief aims was to double the brown hare population by the year 2010. The Environmental Stewardship Scheme offers a variety of options within both the Entry Level Stewardship (ELS) and Higher Level Stewardship (HLS) schemes to help the brown hare but the most current research indicates that habitat management alone is

highly unlikely to achieve this target and that additional measures need to be implemented to reduce brown hare mortality.

Much of the historical knowledge on brown hare populations in the UK is derived from game records on shooting estates. Table 1 shows data compiled by the Game & Wildlife Conservation Trust under the National Gamebag Census during the period 1961-2009. Aebischer, *et al.*, (2011) noted that brown hare gamebags dropped during a 15-year period following the onset of the Second World War, then recovered temporarily until the mid-1960s. Thereafter bags declined steadily until the 1980s. More recently there has been a slight rise across the UK as a whole and Table 1 clearly shows how abundant and widespread the species was a century ago compared with now, with declines across all environmental zones of between 43% and 90%. The subsequent increase phase across all environmental zones except the Scottish Lowlands coincides with the introduction of set-aside and agri-environment schemes that have restored some habitat diversity to farmland.

**Table 1.** Brown hare population trends from Game & Wildlife Conservation Trust National Gamebag Census 1961-2009.

<i>Environmental zone</i>	<i>No. of sites</i>	<i>Year</i>		<i>% change over period (range)</i>		
		<i>Start</i>	<i>End</i>	<i>1961-2009</i>	<i>1984-2009</i>	<i>1995-2009</i>
United Kingdom	1195	1961	2009	-46 (-67 to -23)	59 (1 to 131)	38 (3 to 76)
Easterly lowlands (England & Wales)	626	1961	2009	-43 (-66 to -9)	64 (3 to 142)	35 (-3 to 81)
Westerly lowlands (England & Wales)	218	1961	2009	-59 (-81 to -28)	39 (-39 to 129)	52 (-33 to 157)
Uplands (England & Wales)	96	1961	2009	-55 (-87 to 48)	16 (-60 to 377)	69 (-38 to 491)
Lowlands (Scotland)	91	1961	2009	-90 (-95 to 74)	-49 (-75 to -2)	-39 (-62 to 15)
Intermediate uplands/Islands (Scotland)	37	1961	2009	-49 (-93 to 24)	32 (-50 to 136)	97 (-72 to 293)
True uplands (Scotland)	109	1961	2009	-62 (-88 to -73)	17 (-53 to 106)	53 (-38 to 20)

Data on brown hare abundance have also been collected since 1995 as part of the British Trust for Ornithology (BTO) organised Breeding Bird Survey (BBS). Whilst data from the BBS shows a relatively stable trend since the survey commenced in 1995, GWCT brown hare bag trends show an increase during the same period. However, confidence intervals from the BBS survey fall almost completely within the GWCT confidence intervals, suggesting that the two surveys may be measuring the same trend.

Situated in the north Norfolk countryside, Courtyard Farm lies a short distance from the coast atop land rising gently from the south. At just 800 acres the mixed organic lowland farm is relatively small by modern intensive farming standards. Around 740 acres is dedicated to arable farming including over 120 acres of permanent HLS grassland (grass and wildflower meadows for controlled grazing and hay-making); in addition c.30 acres is established mixed woodland; c.14 acres is part of Ringstead Common (mainly grass, bracken, thorn scrub and mature trees); and c.10 acres is relatively young plantation woodland (native species such as wild cherry, field maple, beech, ash, etc.).

The principles of organic farming rely on maintaining a good, healthy soil quality and on maintaining nitrogen levels in the soil by following rotations that restore nitrogen using two to three years of clover leys, followed by typically three to four years of cropping that depletes the nitrogen fixed by clover and other legumes. As much crop residue as possible is ploughed in to fields, and animal waste and manures are recycled, providing particularly additions of phosphate and potassium. No manufactured fertilisers or pesticides are used on the land and save for low levels of control of the local rabbit and woodpigeon populations there has been no shooting and no comprehensive predator control on the farm for over 25 years.

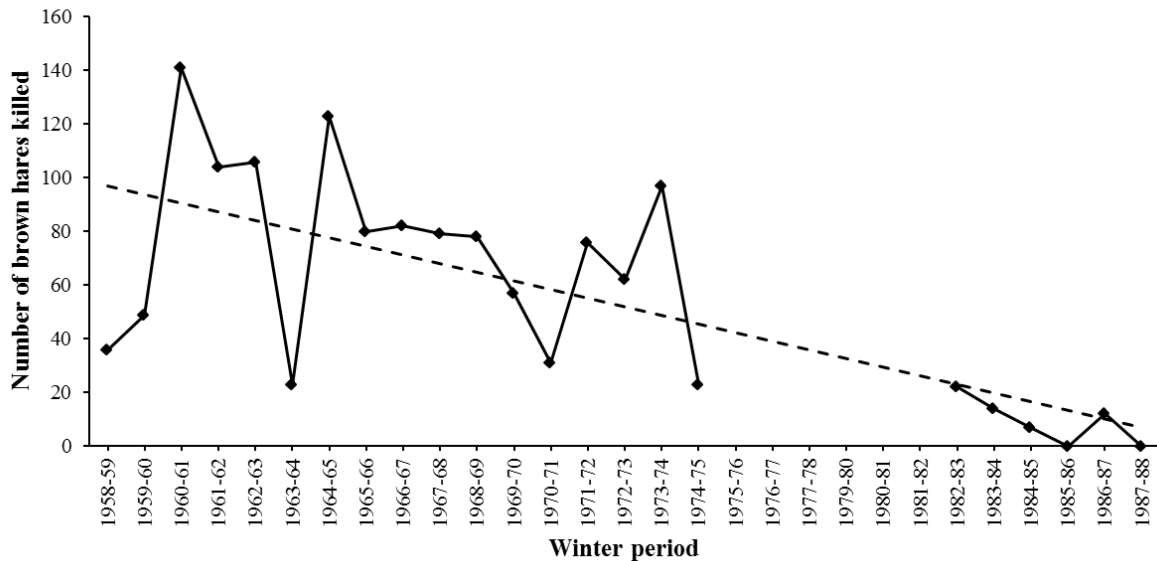
At Courtyard Farm, reflecting the picture for the most, if not all, of the UK, gamebag data forms much of the historical knowledge of the brown hare population. An annual brown hare shoot took place each winter, comprising around 25 guns and accounting for the majority of hares killed, with additional smaller numbers shot over the remainder of the winter period.

**Table 2.** *Winter brown hare gamebags from Courtyard Farm, Ringstead, Norfolk, 1958-59 to 1987-88.*

<i>Winter period</i>	<i>Total no. shot in period</i>	<i>Known bag sizes</i>	<i>Notes</i>	<i>Additional data</i>
1958-59	36			
1959-60	49			
1960-61	141			]
1961-62	104			]
1962-63	106			]
1963-64	24		Winter 1962-63 extremely cold	In the 1960s the annual brown hare shoot averaged around 25 guns and killed 50-60 brown hares
1964-65	123			]
1965-66	80			]
1966-67	82			]
1967-68	79			]
1968-69	78			]
1969-70	57			]
1970-71	31			
1971-72	76			
1972-73	62			
1973-74	97	78	Highest ever brown hare bag	
1974-75	23	22	Lowest ever brown hare bag	
No data				
1982-83	22			
1983-84	14			
1984-85	7			
1985-86	0			
1986-87	12			
1987-88	0		Shooting ceased 1987-88	

Table 2 shows the numbers of brown hares killed between the winters of 1958-59 and 1987-88, when shooting on the farm ceased, and despite some gaps in the data the linear trend in Figure 1 starkly reflects the obvious decline in brown hare numbers on the farm. The notable troughs in the graph depicted in Figure 1 coincide with the cold and snowy winter periods of 1958-59 and 1963-64 but it is less clear why troughs also appear for the winter periods 1970-71 and 1974-75 but most likely this is due to lower shooting efforts in those years.

**Figure 1.** *Brown hare shooting gamebags recorded at Courtyard Farm, Ringstead, Norfolk, from winter 1958-59 to winter 1987-88.*



Soon after all shooting ceased on Courtyard Farm, brown hare numbers had decreased so badly in the general area that annual brown hare shoots also ceased on abutting shooting estates, although in recent years hares shoots have restarted on neighbouring land. Not long after this, in 1992, spring brown hare counts commenced on the farm, more latterly as an annual event as part of the GWCT National Brown Hare Census. With the exception of a small number of years where data is unavailable the information derived from these counts during the period 1992-2014 is displayed in Table 3.

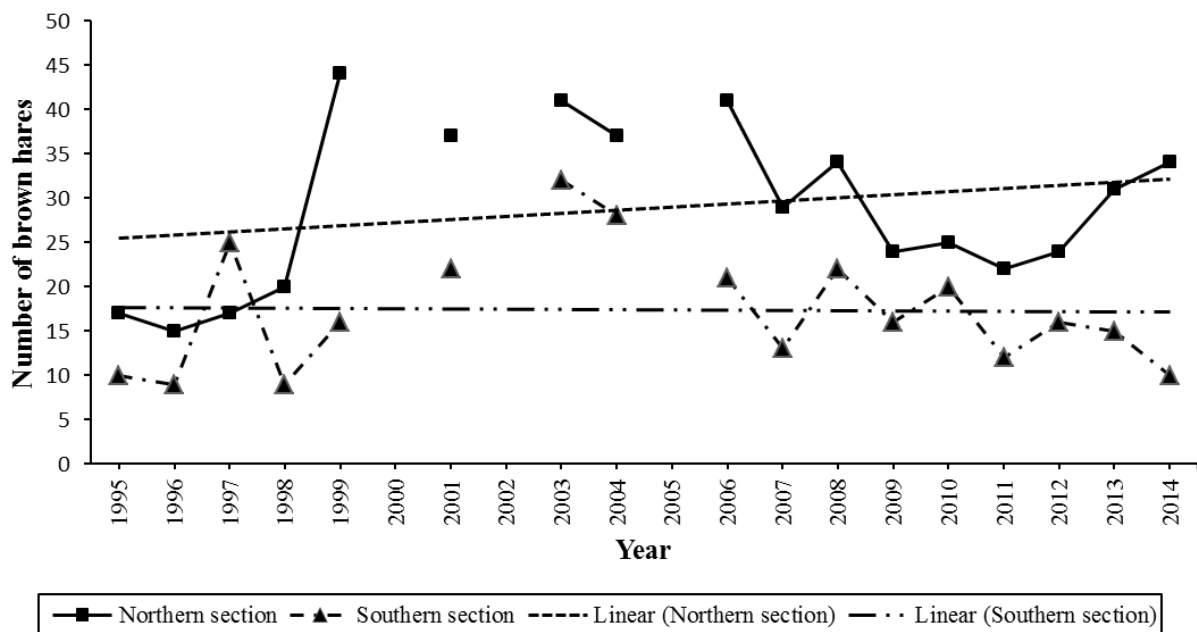
**Table 3.** *Game & Wildlife Conservation Trust annual spring brown hare counts at Courtyard Farm, Ringstead, Norfolk, 1992-2014.*

<i>Year</i>	<i>Number of brown hares per sector</i>						<i>Notes</i>
	<i>Northern</i>		<i>Southern</i>		<i>Total</i>		
	<i>No. (103 ac.)</i>	<i>No. per ac.</i>	<i>No. (75 ac.)</i>	<i>No. per ac.</i>	<i>No. (178 ac.)</i>	<i>No. per ac.</i>	
1992	12	0.12	7	0.09	19	0.11	Northern count estimated
1993	n/a		n/a		n/a		No data available
1994	n/a		n/a		n/a		No data available
1995	17	0.17	10	0.13	27	0.15	Northern area (2 fields out of 5) into Set Aside, then into Countryside Stewardship, crossed by permissive footpath
1996	15	0.15	9	0.12	24	0.13	
1997	17	0.17	25	0.33	42	0.24	Count for whole farm: 188 brown hares in 800 ac.
1998	20	0.19	9	0.12	29	0.16	
1999	44	0.43	16	0.21	60	0.34	
2000	n/a		n/a		n/a		No data available
2001	37	0.36	22	0.29	59	0.33	Southern area into conversion to organic farming, enclosed by permissive footpath
2002	n/a		n/a		n/a		No data available
2003	41	0.40	32	0.43	73	0.41	
2004	37	0.36	28	0.37	65	0.37	
2005	n/a		n/a		n/a		No data available
2006	41	0.40	21	0.28	62	0.35	
2007	29	0.28	13	0.17	42	0.24	
2008	34	0.33	22	0.29	56	0.31	
2009	24	0.23	16	0.21	40	0.22	
2010	25	0.24	20	0.27	45	0.25	
2011	22	0.21	12	0.16	34	0.19	
2012	24	0.23	16	0.21	40	0.22	
2013	31	0.30	15	0.20	46	0.26	
2014	34	0.33	10	0.13	44	0.25	

The principle of the GWCT National Brown Hare Census is that a pre-determined area of the farm that can be viewed from a parked vehicle should be surveyed for brown hares at either dawn or dusk, during a relatively warm period in spring (weather permitting this is usually early-mid April), on an annual basis. The purpose of the use of a vehicle is that brown hares are less likely to be disturbed by the presence of a vehicle, which should be in place at dawn, or well before dusk, than by a human. At Courtyard Farm two separate areas are surveyed annually. The northern section comprises 103 acres, of which c.57.3 acres are arable farmland and c.45.7 acres are permanent Stewardship Grassland (under the Higher Level Stewardship Scheme operating on the farm), and the southern section comprises 75 acres the entirety of which is arable farmland. In any year the arable farmland may consist of freshly ploughed and tilled land, spring sown peas, barley or wheat, Autumn-sown vetch, or first- or second-year stubbles of either of barley or wheat, undersown with rye grass, red or white clover or other nitrogen rich options. The link between all of these crops, barring the barley and wheat stubbles, is that they all offer little or no cover to brown hares at the time of the annual census. This effect may to a certain extent be reflected in census counts, particularly on the southern section where there is no adjacent permanent Stewardship Grassland to offer cover to brown hares when laid-up in their daytime forms.

Figure 2 shows the data available from each of the two sections surveyed at Courtyard Farm and despite some gaps in the data a number of events can be recognised. In 1995 part of the northern section now under annual survey was put into Set Aside, and then into Countryside Stewardship grassland and the HLS agri-environment scheme. The immediate effect of this can be seen in the dramatic increase in brown hares recorded during the period 1995-99.

**Figure 2.** Brown hare numbers at Courtyard Farm, Ringstead, Norfolk, 1995 to 2014  
(derived from Game & Wildlife Conservation Trust National Spring Brown Hare Census results)





The entirely arable southern section was converted to organic in 2000 and Figure 2 shows this coincided with the peak numbers of brown hares recorded on this section of the farm, though numbers have since fallen away somewhat. Both the northern and southern section also indicate a low point in numbers recorded in the spring of 2011, following the cold, snowy winter of 2010-11.

The linear trend of numbers recorded on the northern section of the farm is one of gentle increase, with numbers on the HLS grassland areas persistently higher than on the arable area of this section. Numbers on the northern section are also persistently higher than the southern section, where there is no HLS permanent grassland, though as stated previously numbers recorded during the survey can be affected by the stage of crop rotation in any field in any spring. Where field contents have been recorded on surveys over the study period it is clear that standing stubble, particularly when undersown with clover and rye grass, will hold more brown hares than bare earth fields or those with very young spring sown crops.

The linear trend in brown hare numbers on the southern section of the farm, as shown in Figure 2, is one of marginal decrease over the study period, which when considered with the gentle increase in the northern section suggests that numbers at Courtyard Farm have as a whole remained relatively constant throughout the study period. It is also clear that the preferred grassland habitat of the brown hare will hold larger numbers than arable land, be it organically or traditionally farmed, and that their distribution on arable land is governed to a certain extent by crop rotation. It certainly appears that the mix of permanent and temporary grass, stubbles, some winter cover crops and Vetch at Courtyard Farm is favoured by the local brown hare population.

The results from Courtyard Farm concur with those from the data collated from the BTO Breeding Bird Survey and, as with that survey, may be slightly at odds with the data collected from the GWCT National Gamebag Census which suggests an increase in brown hare numbers in recent years, although this may reflect greater shooting pressure in that period, as is the case on land next to Courtyard Farm. Either way it is clear from comparing modern data with historical data that there is no room for complacency when it comes down to brown hare conservation in the UK; it is a species in long-term major decline. The data from Courtyard Farm suggests that organic farming can at least halt that decline, and possibly start to reverse it.

## Acknowledgements

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