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Original article

The extent and impact of shooting on black grouse *Tetrao tetrix* in northern England

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In northern England, 95% of black grouse *Tetrao tetrix* leks occur on the fringes of managed grouse moors. Recognising the threatened conservation status of black grouse in northern England, most grouse moors have refrained from deliberate shooting for more than a decade. Despite this, black grouse are unintentionally shot in mistake for red grouse *Lagopus lagopus scoticus*. We assessed the circumstances and frequency of shooting in northern England and its potential impact on population recovery from three independent sources, annual shooting returns as part of the Game and Wildlife Conservation Trust's (GWCT) National Gamebag Census (NGC), incidents of shooting reported independently to the North Pennines Black Grouse Recovery Project (NPBGRP) and losses of radio-tagged black grouse to shooting. Moors contributing to the NGC between 1998 and 2008 reported 110 black grouse shot from 13 of 23 moors, averaging 1.2% of the estimated post-breeding population. From 2001 to 2008, 152 black grouse from 28 moors were reported shot independently to the NPBGRP, equivalent to an annual 1.0% of the post-breeding population. The majority appeared unintentional (78%), with females (68%) more frequently shot. Out of 244 radio-tagged black grouse on 15 estates, four adult females were shot (1.6%). The voluntary restraint from harvesting black grouse in northern England appears effective, with incidents of shooting infrequent. Continued effort to minimise shooting incidents, particularly on the fringe of the range to encourage settlement of dispersing females, may contribute to increasing numbers and range.

Key words: black grouse, grouse moors, National Gamebag Census, red grouse, shooting, Tetrao tetrix

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Shooting bag records from grouse moors in Scotland and northern England show a 90% decline in the numbers of black grouse *Tetrao tetrix* shot between 1900 and 1989 (Baines & Hudson 1995). The decline commenced in the late 19th century, but has increased during recent decades, from an estimated 25,000 displaying males in 1990 (Baines & Hudson 1995), to 6,500 in 1996 (Hancock et al. 1999) and 5,100 in 2005 (Sim et al. 2008). Black grouse in the UK are now recognised as a Red-List species of High Conservation Concern (Gregory et al. 2002) and are a 'Priority Species' of the UK Government's Biodiversity Action Plan (Anon 1995). In 1999, the UK government set targets to stem their decline and to increase both numbers and range, nominating the Game and Wildlife Conservation Trust (GWCT) and the Royal Society for the Protection of Birds as the joint lead partners responsible for delivering the Species Action Plan. In the UK, almost all the land is privately owned, and the right to hunt game is vested with the landowner (which

contrasts to the USA and much of Europe, where wildlife is public property and harvests are regulated by government); therefore, the approach taken was to encourage landowners and managers to conserve black grouse on their land (Warren & Baines 2004). In addition to promoting a suite of conservation measures, sustainable harvesting guidelines were produced recommending that black grouse were only considered for harvesting when a number of parameters relating to male density and breeding productivity were exceeded. These guidelines also recommended that males are targeted (males have historically been primarily selected) as they are considered less likely to effect population growth rates.

In northern England, the remaining population of ca 1,000 males is chiefly restricted to the fringes of managed grouse moors in the Pennine hills (Warren & Baines 2008), and has since 1998 been actively targeted for recovery through the North Pennines Black Grouse Recovery Project (NPBGRP) (Warren & Baines 2004). In the area, gamekeepers are employed to manage heather *Calluna vulgaris* and to control predators to maximise the numbers of red grouse *Lagopus lagopus scoticus* for sport shooting (Hudson & Newborn 1995). Following the instigation of conservation measures specific to black grouse on the fringes of these moors (Calladine et al. 2002, Warren & Baines 2004), numbers are now stable, but the range has severely contracted. In 2006, black grouse occupied only 43 10-km grid squares (Warren & Baines 2008). Recognising their threatened status, most grouse moor managers have been refraining from shooting them for more than a decade and even impose fines if a black grouse is shot in mistake for a red grouse. As black grouse tend to be a long-lived species, and in the North Pennines adult annual survival rates are high (0.70) (Baines et al. 2007), their population numbers are more sensitive to variations in juvenile and adult survival than to changes in fecundity (Caizergues & Ellison 1997). Thus, any additional mortality due to shooting may negatively impact population growth, particularly on the fringes of their range where numbers are already low. This in turn may limit range expansion, a key objective of the English black grouse Species Action Plan. In this paper we investigate the circumstances and frequency of black grouse shooting in northern England and assess its potential impacts on population recovery.

Material and methods

Shooting data and population estimates

The GWCT's National Gamebag Census (NGC) collects shooting bag returns annually from > 600 estates in the UK (Tapper 1992). Data for black grouse shot were available from 23 moorland estates within the black grouse range in northern England between 1998 and 2008. Separate, independent reports of shooting reported to the NPBGRP were also collected from 28 moorland estates between 2001 and 2008, of which 13 also contributed to the NGC. We considered data from both sources independently. These 38 estates hosted 60% of the English black grouse population in 2006 (Warren & Baines 2008) and covered an area of 1,500 km^2. All estates managed heather moorland for red grouse shooting (Hudson & Newborn 1995). Ten estates also released pheasants *Phasianus colchicus* on the moor margins for sport shooting, of which three released both pheasants and red-legged partridges *Alectoris rufa*. Data reported independently to the NPBGRP included the sex of shot birds (known for 141 of the 152 birds shot) and whether the shooting was unintentional or deliberate, whereas the NGC data were undifferentiated totals. Estimates of black grouse post-breeding population size for the moors reporting to the NGC and those to the NPBGRP were made using the equation ($N_{autumn} = ((N_{males} \times 2) \times 0.85) + (N_{females} \times BP)$), where N_{males} = the numbers of lekking males on the moor, $N_{females}$ = number of breeding females, and BP = annual breeding productivity. Lek data were available for all moors from national surveys in 1998, 2002 and 2006, which surveyed all known leks and other suitable habitats and was considered full coverage (Warren & Baines 2008). Annual lek survey data were available for 15 of the 23 moors contributing to the NGC and 18 of the 28 moors reporting to the NPBGRP. For the moors with only partial survey data available, the annual totals of lekking males were calibrated from the previous survey year using mean estimates of annual population change. All lek surveys were undertaken in April and early May to coincide with peak lek attendance (Baines 1996), and we assumed 100% attendance at leks. Our model assumed a 1:1 sex ratio and incorporated summer adult survival (during the period April-August) of 0.85 calculated from a sample of 144 radio-tagged

black grouse in the region from 1998 to 2004 (Baines et al. 2007). We obtained the annual breeding productivity (BP) data (chicks/female) from annual counts at an average of 19 sites (range: 8-26), in late July or August from 1998 to 2008 using pointer dogs to locate females and their broods. Annual estimates of breeding productivity were on average 1.3 chicks/hen (range: 0.3-2.1) from a mean of 93 females per annum (range: 44-124).

Radio-tagged black grouse

We obtained data on shooting mortality from a sample of 244 radio-tagged black grouse distributed across 15 estates in northern England between 1998 and 2009 (Warren & Baines 2002, Baines et al. 2007, Baines & Richardson 2007). Juveniles were caught in August (63 males, 85 females and nine unsexed) when still in family groups and were aged 8-10 weeks old. We dragged a net over a pointing dog that indicated the brood position. This sample was supplemented with a further 87 black grouse (10 males and 77 females) caught at night time roosts in winter using a high powered lamp and a small hand-held net. All black grouse were fitted with 17g necklace radio-transmitters (Biotrack Ltd, Dorset, UK) and tracked fortnightly. Black grouse that were shot were either reported directly to us by the estates, or if they had been wounded and not recovered by shooters, were located by us with the cause of death identified during a *post mortem* necropsy.

Statistical analysis

To establish whether the numbers of black grouse shot varied in relation to black grouse abundance and good red grouse years (when more shooting occurs and hence the likelihood of shooting black grouse in error increases), shooting data from the NGC and those reported to the NPBGRP were tested independently using Generalised Linear Models (GLM) with a Poisson error distribution and a logarithm link function in Genstat 11 (VSN International Ltd). Numbers of black grouse shot were the dependent variable, with year as a factor, and the log-transformed post-breeding number of black grouse and annual bag of red grouse (only available for the NGC data set) as covariates. Differences in the numbers of black grouse shot from estates contributing to both the NGC and the NPBGRP were tested through a paired t-test. Between-sex differences in black grouse shot were tested using χ^2-contingency table analysis.

Results

National gamebag census

Between 1998 and 2008, 110 black grouse were shot on 13 of the 23 sample moors. The annual total shot varied between years ($\chi^2_1 = 4.01$, $P < 0.001$) from only two black grouse (0.3% of the post-breeding population) in 1998 to 25 (3.3%) in 2007 (Fig. 1). On average, this formed 1.2% ($\pm$ 0.3 SE) of the post-breeding population. More black grouse were shot when post-breeding numbers were higher ($\chi^2_1 = 45.80$, $P < 0.001$, slope $= 0.46 \pm 0.08$ SE) and when more red grouse were shot ($\chi^2_1 = 7.37$, $P = 0.007$, slope $= 0.11 \pm 0.05$ SE).

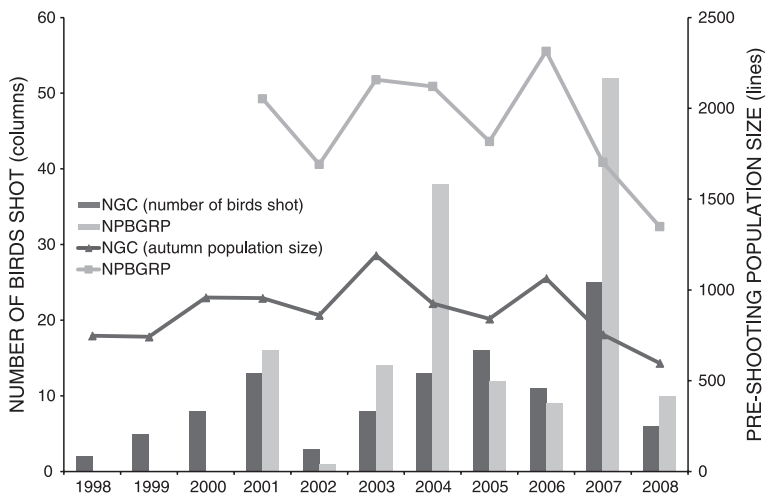

Figure 1. Numbers of black grouse shot per annum in northern England and matching post-breeding numbers of black grouse present before shooting from each source for 23 upland shoots reporting bags to the National Gamebag Census (NGC) during 1998-2008, and for 28 upland shoots that reported shot birds to the North Pennines Black Grouse Recovery Project (NPBGRP) during 2001-2008.

Independent reports

Of the 152 black grouse recorded shot from 28 shooting estates, 93% were shot on red grouse shoots, 6% on either released pheasant or red-legged partridge shoots and 1% on other shoots. Of these, 78% were shot through mistaken identity ($N = 118$) and 22% deliberately ($N = 34$). Of those shot by mistake, 68% were females and 32% males in direct contrast to intentional shooting, where 80% were males ($\chi^2_1 = 24.03$, $P < 0.001$).

The annual total shot varied between years ($\chi^2_1 = 14.31$, $P < 0.001$) from one (0.1% of the post-breeding population) in 2002 to 52 (3.1%) in 2007 (see Fig. 1). On average, this formed 1.0% (± 0.3 SE) of the post-breeding population. Numbers shot in a year were not related to the post-breeding population size in that year ($\chi^2_1 = 0.46$, $P = 0.50$, slope = 0.04 ± 0.05 SE). There was no difference in the reporting rate to the NPBGRP and to the NGC ($t_{27} = -1.1$, $P = 0.28$).

Telemetry data

Whether or not a radio-tagged black grouse had died from shooting was known for 244 black grouse; of these only four, all adult females had been shot (1.6%).

Discussion

Black grouse were an infrequent addition to shooting bags, representing 1.0% (NPBGRP data) to 1.2% (NGC data) of the post-breeding population. The proportion of the post-breeding population shot varied annually from 0.1 to 3.1%, and compared favourably with the data from the radio-tagged black grouse, where 1.6% of deaths were attributable to shooting. More black grouse were shot in good red grouse years when shooting effort was greater. Although this may suggest that good red grouse years are also good black grouse years, good red grouse years in northern England are linked to parasitic worm *Trichostrongylus tenuis* driven cycles (Potts et al. 1984, Hudson et al. 2002), and are not correlated with good black grouse years, which are related to June weather conditions (Baines et al. 2007). Females were more likely to be shot than males, probably owing to their similarity to red grouse. This contrasted with the incidents of deliberate shooting, where males were targeted. Findings from all three independent sources were consistent, with incidents of shooting infrequent suggesting that voluntary restraint from harvesting black grouse in northern England was effective.

Many grouse moor managers attempted to prevent black grouse from being shot by briefing sportsmen on their identity and whereabouts, and by imposing financial penalties for black grouse that are killed. Results from the NGC suggested that numbers shot increased in line with pre-breeding numbers, but the larger data set from the independent reports to the NPBGRP showed no such trend. The independent reports were from moors which supported an overall twofold higher autumn population than those reporting to the NGC, and therefore incidents of shooting appear independent of density. The latter finding and the bias towards females being shot may have implications for range expansion, with the possibility of juvenile females being unintentionally shot when dispersing into areas of low population density on the edge of the range (Caizergues & Ellison 2002, Warren & Baines 2002). Therefore, it is important that moors on the fringes of the range continue to implement measures to prevent black grouse shooting through adequately briefing hunters and their loaders on their possible presence, through implementing adequate fining systems and warning systems to prevent unintentional shooting.

In conclusion, black grouse shooting in northern England is infrequent and is often through mistaken identity for red grouse. Populations in northern England are maintained by high adult survival rates (Baines et al. 2007), and continued voluntary restraint from shooting them is important to maintain population recovery. The findings of our study have repercussions for other grouse species of conservation concern, as it demonstrates the effectiveness of a voluntary moratorium on shooting whilst numbers recover. Pressure to remove black grouse from the quarry list is likely to be counter-productive as it would remove the incentive for landowners to invest in appropriate land management. Hunters also demonstrated that for a sexually dimorphic lekking species such as black grouse, males can be primarily selected for, and this means that harvests can be taken without removing females.

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References

Anonymous 1995: Biodiversity: The UK Steering Group Report. - Volume 2 Action Plans. Her Majesty's Stationery Office, London, 324 pp.

Baines, D. 1996: Seasonal variation in lek attendance and lekking behaviour by male Black Grouse *Tetrao tetrix*. - Ibis 138: 177-180.

Baines, D. & Hudson, P. 1995: The decline of black grouse in Scotland and northern England. - Bird Study 42: 122-131.

Baines, D. & Richardson, M. 2007: An experimental assessment of the potential effects of human disturbance on black grouse in the North Pennines, England. - Ibis 149(s1): 56-64.

Baines, D., Warren, P. & Richardson, M. 2007: Variations in the vital rates of black grouse *Tetrao tetrix* in the UK. - Wildlife Biology 13(Suppl. 1): 109-116.

Caizergues, A. & Ellison, L.N. 1997: Survival of black grouse *Tetrao tetrix* in the French Alps. - Wildlife Biology 3(3): 177-186.

Calladine, J., Baines, D. & Warren, P. 2002: Effects of reduced grazing on population density and breeding success of black grouse *Tetrao te*trix in northern England. - Journal of Applied Ecology 39: 772-780.

Gregory, R.D., Wilkinson, N.I., Noble, D.G., Robinson, J.A., Brown, A.F., Hughes, J., Procter, D.A., Gibbons, D.W. & Galbraith, C.A. 2002: The population status of birds in the United Kingdom, Channel Islands and Isle of Man: an analysis of conservation concern 2002-2007. - British Birds 95: 410-450.

Hancock, M., Baines, D., Gibbons, D., Etheridge, B. & Shepherd, M. 1999: Status of male black grouse *Tetrao tetrix* in Britain in 1995-96. - Bird Study 46: 1-15.

Hudson, P.J., Dobson, A.P. & Newborn, D. 2002: Parasitic worms and population cycles of red grouse. - In: Population cycles: The Case for Trophic Interactions. Oxford University Press, Oxford, UK, pp. 109-130.

Hudson, P.J. & Newborn, D. 1995: Red grouse and Moorland Management. - Game Conservancy Trust, Fordingbridge, UK, 169 pp.

Potts, G.R., Tapper, S.C. & Hudson, P.J. 1984: Population fluctuations in red grouse: analysis of bag records and simulation model. - Journal of Animal Ecology 53: 21-36.

Sim, I.M.W., Eaton, M.A., Setchfield, R.P., Warren, P.K. & Lindley, P. 2008: Abundance of male black grouse *Tetrao tetrix* in Britain in 2005, and changes since 1995-96. - Bird Study 55: 303-313.

Tapper, S.C. 1992: Game Heritage. - The Game Conservancy Trust, Fordingbridge, Hampshire, UK, 140 pp.

Warren, P. & Baines, D. 2002: Dispersal, survival and causes of mortality in black grouse *Tetrao tetrix* in northern England. - Wildlife Biology 8(2): 129-135.

Warren, P. & Baines, D. 2004: Black grouse in northern England: stemming the decline. - British Birds 97(4): 183-189.

Warren, P. & Baines, D. 2008: Current status and recent trends in numbers and distribution of black grouse *Tetrao tetrix* in northern England. - Bird Study 55: 94-99.