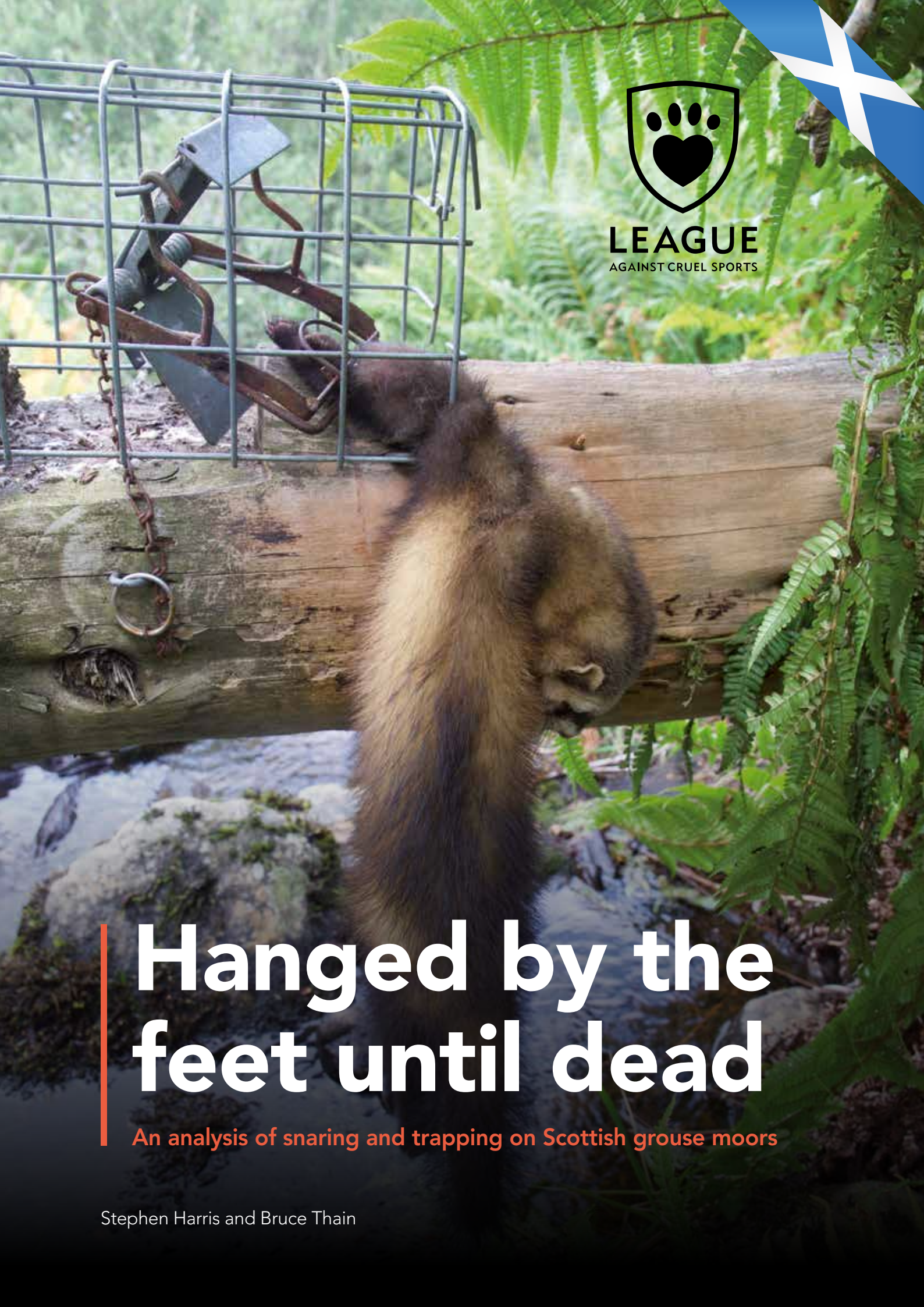


LEAGUE
AGAINST CRUEL SPORTS

Hanged by the feet until dead

An analysis of snaring and trapping on Scottish grouse moors

Stephen Harris and Bruce Thain

The survey was conceived by the Director of the League Against Cruel Sports Scotland as a part of its contribution to Revive - the coalition for grouse moor reform. No member of the League Against Cruel Sports or Revive had any input to the analyses or conclusions presented in this report.

All the photographs in this report were taken by Bruce Thain on the seven estates included in the survey.

The websites quoted in this report were accessed between March and July 2020 and the links were active at the time of going to press.

Hanged by the feet until dead

An analysis of snaring and trapping on Scottish grouse moors

by Professor Stephen Harris BSc PhD DSc
and Bruce Thain

A report commissioned by the
Director of the League Against Cruel Sports Scotland
August 2020

Executive Summary

i. Seven grouse-shooting estates were surveyed on 128 days between 7 June 2018 and 5 September 2019. Survey days were spread across the year and provided a snap-shot of their annual management practices. The seven estates covered an area of 404.19 km^2 (40,419 ha). All parts of each estate were surveyed once: on average 3.2 km^2 was surveyed on each day. The estates were chosen for ease of access. Based on intensity of habitat management (not covered in this report) and predator control, we assessed that one of the estates was very intensively managed, for one the level of management was intensive, three were progressively less intensively managed, and the other two were practically unmanaged. The seven estates surveyed provided a cross-section of the varying levels of management intensity on Scottish grouse moors.

ii. All the data were collected by one person who behaved in accordance with the Land Reform (Scotland) Act 2003. He recorded the following: multicatch corvid traps, Larsen traps, Larsen mate traps, Larsen pod traps, pigeon lofts, partridge release pens, pheasant release pens, bird scarers, shooting sites and associated features, carcasses of ravens and birds of prey, live sightings of birds of prey, spring traps set on rails (rail traps), spring traps set in tunnels (tunnel traps), mammal cage traps, snares, stink pits (fox middens) and sheep carcasses. He also recorded a variety of habitat management and other landscape features. In this report we only discuss the use of snares and mammal traps. Nothing was disturbed during the survey but, whenever possible, each item was photographed *in situ* and its position recorded using a geographic information system (GIS). Based on 20 years of experience working on Scottish grouse moors, the surveyor estimated the total proportion of each feature he believed that he had found.

iii. There is a lack of clarity as to how much land in Scotland is used for grouse shooting. In view of the great variation in the estimates published in the last few years, we have assumed that, at the time of this survey, the area of land managed for grouse shooting was between 0.8 and 1.5 million hectares i.e. between 10% and 19% of the total land area in Scotland. We used these figures to calculate lower and upper estimates of the impacts of snaring and trapping practices on Scottish grouse moors.

iv. Of the 108 snares found on the seven estates, 41 (38%) were set; all appeared to be fox snares. Of the 72 that could be examined, 12 (17%) were not tagged. Snares were mostly set around stink pits, near partridge and pheasant release pens, and along artificially-created fox runs. Allowing for snares that could have been missed, we estimated that 144 snares were deployed on the seven estates, of which 55 were set. This is equivalent to 20,100 snare days/year (a snare day is one snare set for one day) on the surveyed estates. Depending on the area of grouse moors in Scotland, we estimated that there were between 295,000 and 745,000 snare days/year on Scottish grouse moors.

v. There has been a dramatic increase in the use of rail traps over the last decade. These are spring traps set on a post or rail across a stream or ditch; the trap is typically set in a wire cage. Of the 1051 rail traps found, 727 (69%) were set. Allowing for traps missed in the survey, we estimated that there were 1106 rail traps on the seven estates, of which 765 were set. These formed a high-density network across the more actively managed estates, and we estimated that there were 280,000 rail trap days/year on the surveyed estates. Depending on the area of grouse moors in Scotland, we estimated that there were between 5,250,000 and 10,360,000 rail trap days/year on Scottish grouse moors.

vi. Of the 712 rail traps examined in detail, none met the best practice guidelines produced by professional organisations that advise the shooting industry: for 619 (87%) the mesh on the tunnel was too large, for 511 (72%) the tunnel was too short, and for 709 (virtually 100%) the excluder was too large. Rail traps are not selective: of the 61 carcasses left in rail traps that could be identified to species, 37 (61%) were target species and 24 (39%) were non-target species. Rail traps pose a particular threat to small birds because a wide range of species use the rails to cross streams and ditches: including a further ten carcasses that could not be identified to species, 12/71 (17%) captures were birds. The impact of mortalities in rail traps on local bird populations is unclear.

vii. Tunnel traps were less common than rail traps: of the 369 that were found, 187 (51%) were set. Allowing for those that could have been missed, we estimated that there were 568 tunnel traps on the seven estates that were surveyed, of which 288 were set. This is equivalent to 105,100 tunnel trap days/year on those estates. We estimated that there were between 1,350,000 and 3,900,000 tunnel trap days/year on Scottish grouse moors. Of the 216 tunnel traps where it was possible to see into the tunnel, 70 (32%) appeared to have no excluder, for 113 (52%) the excluder appeared to be too large, for 15 (7%) it was not clear whether the excluder was of the recommended size, and only 18 (8%) had an excluder that appeared to conform to the best practice guidelines produced by professional organisations advising the shooting industry. Tunnel traps appear to pose less of a threat to birds: all of the 12 carcasses found in tunnel traps were mammals.

viii. Based on published capture rates, we estimated that between 8000 and 21,000 foxes, and an equal number of non-target species, were snared on Scottish grouse moors each year. We estimated that 81,500 animals (of which 49,700 would have been target species, 31,800 non-target species) would be caught in 5,250,000 in rail trap days/year on Scottish grouse moors (our lower estimate of trapping effort) and 160,800 animals (of which 98,100 would have been target species, 62,700 non-target species) in 10,360,000 rail trap days/year (our upper estimate of trapping effort). For tunnel traps, 1,350,000 tunnel trap days/year (our lower estimate of trapping effort) would catch 21,000 animals and 3,900,000 tunnel trap days/year (our upper estimate of trapping effort) would catch 60,500 animals each year. While we have limited data on the species caught in tunnel traps, around half of these captures were likely to be non-target species.

ix. While these calculations are of necessity approximate because there are limited data on capture rates on Scottish grouse moors, the data from this survey suggest that between 120,000 and 260,000 animals were snared or trapped each year, nearly half of which were likely to be non-target species. To put this into perspective, this is equivalent to around 15 animals snared and trapped per km^2 of Scottish grouse moor each year, half of which will be foxes, rats, stoats and weasels, and the other half will be birds, rabbits and other non-target species. It was not possible to estimate the number of animals caught in live-capture traps and shot each year.

Contents

Background

Grouse shooting is widespread in upland areas of Britain. Estates managed solely for red grouse are found mainly in southern Scotland, England and Wales, whereas estates managed for both red grouse and red deer are mainly in north-eastern Scotland; there are significant habitat differences between English grouse moors, Scottish grouse moors and Scottish moors managed for both red grouse and red deer (*https://www.gwct.org.uk/research/species/birds/red-grouse/grouse-moor-survey/*).

Grouse shooting can take several forms, although the relative importance of each is unclear, and the different forms of grouse shooting can be undertaken on a single estate. A 2009 questionnaire survey of 92 Scottish estates found that 41% of shooting days were for driven grouse, 34% for walked-up shooting, 12% for shooting over pointers, and 13% for other types of shooting (Fraser of Allander Institute, 2010).

There has been extensive debate in recent years on how some upland areas are managed to promote high densities of grouse for shooting (e.g. Thompson *et al.,* 2016; Sotherton *et al.,* 2017). Of particular concern has been widespread predator control; while much of the focus hitherto has been on the illegal persecution of birds of prey (e.g. Etheridge *et al.,* 1997; Melling *et al.,* 2018; *https://community.rspb.org.uk/ourwork/b/investigations/posts/the-illegal-killing-of-birds-of-prey-in-scotland-2015-17*), there has also been concern about the killing of non-predators such as mountain hares (e.g. Harrison *et al.,* 2010; Wright *et al.,* 2014; Watson & Wilson, 2018). However, there has been little discussion about snaring and trapping mammalian predators.

The most striking effects of grouse moor management are the marked contrasts between the negative impacts on several species of predatory birds and the beneficial effects of the widespread destruction of predators on red grouse and some waders (Grant *et al.,* 2012). There is a widespread perception that predator control is important for conservation and to maintain an ecological balance, an impression that is promulgated by organisations such as the British Association for Shooting and Conservation (BASC), the Game & Wildlife Conservation Trust GWCT), the National Gamekeepers Organisation (NGO) and the Scottish Gamekeepers Association (SGA). The GWCT (2017), for instance, claims that 'The justification for predator control as part of game management is that it leads to good conservation of wildlife and habitats in the countryside'. However, intensive management to benefit red grouse (particularly rotational burning and predator control) may be beneficial for some waders but less so for many passerines: upland species such as meadow pipits, skylarks and whinchats, for instance, are more strongly associated with landholdings not managed for red grouse (Newey *et al.,* 2016).

A recent review for the Scottish government stated that effective predator control is an integral part of the management of Scottish grouse moors which can also benefit some other species, especially waders such as curlews, golden plovers and lapwings, mountain hares, black grouse, and ground-nesting birds of prey such as hen harriers and merlins (Werritty, 2019). However, the same review concluded that 'one of the most striking findings' was 'The paucity of robust, scientific evidence on the environmental impacts of management activities such as predator control and raptor persecution' on the ecology of Scottish uplands (Werritty, 2019).

This report provides the first quantified analysis of snaring and trapping activities on Scottish grouse moors.

The extent of grouse moors in Scotland

In undertaking this analysis, we faced the same fundamental problem as previous reviews i.e. the lack of a clear definition of what constitutes a 'grouse moor' and the absence of official information on the number of estates on which grouse shooting takes place (Werritty, 2019). We needed a reasonably accurate figure of the total area of grouse moors in Scotland so that we could estimate the overall impact of predator control on Scottish grouse moors. The problem was compounded because some moorland was only used for walked-up shooting, whereas some published estimates only included areas used for driven grouse shooting. Furthermore, while they are not used directly for grouse shooting, some forests and other areas had predator control programmes that contributed to the management of the adjacent grouse moors, and some areas of moorland were managed for concurrent uses and may have been described as a deer forest, hill stock farm or conservation area, but also had some grouse shooting (Werritty, 2019; *https://www.giftofgrouse.com/2019/04/18/the-area-of-grouse-moor-in-scotland/*). The lack of quantified information on grouse shooting enterprises in Scotland hinders an accurate assessment of their environmental footprint (Werritty, 2019).

The area of land used for grouse shooting in Scotland has declined substantially, as has the number of grouse killed,

particularly since the mid-1970s (Tapper, 1999). According to the Scottish Moorland Group, part of the landowners' association Scottish Land and Estates, the University of Strathclyde estimated that there were 485 active grouse moors in Scotland in 1991 covering 1.86 million hectares. In 2009 the estimate was 304 actively managed grouse moors and, in 2013, an estimated 1 million hectares were used for grouse shooting in Scotland (*http://www.scottishmoorlandgroup.co.uk/grouse-shooting*).

In 2018, there were an estimated 120 grouse shooting estates in Scotland but there was great diversity in both the size and level of investment in individual enterprises (*https://www.giftofgrouse.com/2019/04/18/the-area-of-grouse-moor-in-scotland/*). A geographic information system (GIS) analysis based on the presence of shooting butts suggested that Scottish grouse moors covered an area of just over 1 million hectares (about 13% of Scotland), but this analysis excluded smaller holdings and walked-up grouse shooting (Matthews *et al.*, 2018). However, it has been suggested that declines in grouse shooting in the five years up to 2019 meant that only around 10% of Scotland's land area was being used for some form of grouse shooting at the time of this survey (*https://www.giftofgrouse.com/2019/04/18/the-area-of-grouse-moor-in-scotland/*).

Recent estimates of the land area used for grouse shooting in Scotland are summarised in **Table 1**. The percentages presented here differ from some of those quoted in earlier reports: our percentages are based on a total land area in Scotland of 7.8 million hectares (*https://www2.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/agritopics/LandUseAll*). In view of the great variation in these estimates, we have assumed that, at the time of this survey, the area of land managed for grouse shooting in Scotland was somewhere between 0.8 and 1.5 million hectares i.e. between 10% and 19% of the total land area.

TABLE 1. Summary of some recent estimates of the area of Scotland managed for grouse shooting

Organisation	Year	Area of grouse moors in Scotland	Reference
Land Reform Review Group	2014	Over 1.5 million hectares of moorland (circa 19% of Scotland) managed for grouse shooting	Elliot *et al.* (2014)
League Against Cruel Sports	2015	Over 1 million hectares of land devoted to grouse moors (13% of Scotland)	Wightman & Tingay (2015)
The Revive Coalition	2018	Scottish grouse moors covered somewhere between 1 and 1.5 million hectares, amounting to 13-19% of Scotland	Tingay & Wightman (2018)
James Hutton Institute	2018	Larger holdings covered just over 1 million hectares (about 13% of Scotland); this did not include smaller holdings and areas used for walked-up grouse shooting	Matthews *et al.* (2018)
The Revive Coalition	2019	Around 19% of Scotland's land area used for both walked-up and driven grouse shooting; driven grouse shooting took place, or had recently taken place, on land holdings covering around 13% of Scotland's land area	Armstrong (2019)
Grouse Moor Management Review Group	2019	The Scottish Moorland Group estimated that less than 7% of Scotland's land area had some component of grouse moor management	Werritty (2019)
The Gift of Grouse	2019	No more than 10% of Scotland (circa 0.8 million hectares) used for both driven and walked-up shooting	https://www.giftofgrouse.com/2019/04/18/the-area-of-grouse-moor-in-scotland/

Legislation and best practice guidance on snaring and trapping in Scotland

For millennia traps have been the preferred method of catching wild mammals (Lloyd, 1963), and for many decades have been the commonest method used for controlling the numbers of wild mammals in Great Britain (Scott Henderson, 1951), probably because of their ease of use and low installation and maintenance costs. A summary of the main legislation regulating snaring and trapping in Scotland, and the relevant codes of practice and other guidelines on best practices issued by professional organisations that advise the Scottish shooting industry, are given in the Appendix. Some issues relevant to snaring and trapping practices on Scottish grouse moors are discussed in the main report.

Data collection

SURVEY AREAS

The Land Reform (Scotland) Act 2003 gives everyone statutory rights of access over land and inland water throughout Scotland in order to cross land or for the purposes of recreation, relevant educational activity or carrying out a commercial activity. The rights are subject to specific exclusions set out in the Act, and governed by the Scottish Outdoor Access Code (*https://www.outdooraccess-scotland.scot/scottish-outdoor-access-code*). The data presented in this report were collected by one person (Bruce Thain, hereafter BT), who behaved responsibly and in accordance with the Act.

Seven grouse-shooting estates, covering an area of 404.19 km^2 (40,419 ha), were chosen on the basis of ease of access. Multiple visits were made to each estate on irregular dates between 7 June 2018 and 5 September 2019 to capture an overview of their predator-control and other activities across the year. These estates were:-

i. **Easter Clunes & Drumbain Estate, Inverness** - 2233 acres (9.04 km^2), surveyed over six days

ii. **Glenmazeran Estate, Inverness** - 8117 acres (32.85 km^2), surveyed over 11 days

iii. **Invermark Estate, Angus** - 43,787 acres (177.20 km^2), surveyed over 25 days

iv. **Kildrummy Estate, Aberdeenshire** - 6521 acres (26.39 km^2), surveyed over eight days

v. **Millden Estate, Angus** - 19,358 acres (78.34 km^2), surveyed over 46 days

vi. **Skibo Estate, Sutherland** - 5762 acres (23.32 km^2), surveyed over six days; only the high ground of Skibo Estate was surveyed

vii. **Tillypronie Estate, Aberdeenshire** - 14,097 acres (57.05 km^2), surveyed over 26 days

Thus there was a total of 128 days survey effort across all seasons, with an average search effort of 3.2 km^2 per day.

The estate boundaries were obtained from Who Owns Scotland (*www.whoownsscotland.org.uk*) and, for some estates, from the Deer Management Units shown on Scottish Natural Heritage's (SNH) website (*https://www.nature.scot*). In the field BT recorded the GPS positions of fences and other boundary markers: the estate areas presented here are based on his field data because these were the areas he surveyed.

While the estates were not pre-selected on the basis of their management techniques, the survey showed that one (Millden) was very intensively managed, for one (Tillypronie) the level of management was intensive, three (Easter Clunes & Drumbain, Invermark and Glenmazeran, in order) were progressively less intensively managed, and the other two (Kildrummy and Skibo) were practically unmanaged. This assessment was based on the intensity of habitat management (which is not covered in this report) and predator control activities, some of which are described.

So the analyses presented here are based on a cross-section of the varying levels of management intensity on Scottish grouse moors. While we cannot say how representative these data are of Scottish grouse moors as a whole, based on his 20 years of experience BT believes this is a typical cross-section, possibly a little below average in terms of the overall intensity of management.

SURVEY TECHNIQUES

The survey was carried out covertly so that the data were not biased by management changes implemented in response to the data collection. While gamekeepers saw BT walking along vehicle tracks on a number of occasions, this was typical of the behaviour of hillwalkers generally. He travelled along all vehicle tracks and scanned the area either side of the track, using binoculars where necessary. Streams were either walked or scanned from suitable vantage points so that he could be confident of finding

nearly all the spring traps set on rails positioned across streams. BT scanned all the other ground carefully with binoculars, usually from the other side of a glen: he stopped to scan as he walked up one side of a glen and then the other. Transects were walked through woods, scanning them with binoculars to ensure that all the ground was covered.

While the aim was to cover all of the moorland once, some ground was inevitably covered more than once when accessing and departing the area to be surveyed on a subsequent day. Any new items were recorded: where the status of an object already recorded had changed, the information collected on the first survey was used in the analyses. BT never interfered with estate infrastructure: where possible, a number of photographs were taken of each item found, along with the exact location, date, time and other details, although not every item could be examined in detail. The information recorded was subsequently uploaded by BT onto a GIS database: he used Garafa GIS Pro for data capture and QGIS for data collation.

INFORMATION RECORDED

BT recorded the following types of traps and associated features; his survey effort and the trapping intensity on each estate are summarised in **Table 2**. He also recorded features associated with shooting activities, the numbers of different species of birds he saw each day, and other structures of interest such as partridge and pheasant release pens: these data are not included in this report.

The ease of finding each type of trap was in part influenced by a number of factors. Based on his survey techniques and 20 years of experience working on shooting estates, BT estimated the proportions of the different types of traps and other features that he found. These were used to adjust our calculations of the number of each feature present on Scottish grouse moors.

FIGURE 1. Artificial fox runs created by spraying lines of herbicide through dense vegetation

FIGURE 2. Spring traps set in wire cages (rail traps) on posts laid across streams






i. **Snares for foxes:** 75% found. Confidence in this estimate is moderate – snares were not easy to see from a distance, but were often set in groups associated with easy-to-find features such as stink pits (see below), partridge and pheasant release pens, and fox runs. On one estate many artificial runs, sometimes hundreds of metres long, had been created by spraying lines of herbicide through dense vegetation **(Figure 1)**. Artificial runs were searched for snares because they provided foxes with easy-to-navigate routes.

ii. **Stink pits:** 80% found. Confidence in this estimate is moderate/high - these were areas where the bodies of various animals were dumped to attract foxes and other predators. A wide variety of animals, including farm stock, surplus game animals such as deer and pheasants, and wild animals such as foxes, corvids and salmon, have been used as bait in stink pits (Anon., 2019a). Typically stink pits are surrounded by brash walls with a limited number of entry points where snares can be set to target any animals attracted to the carcasses.

iii. **Sheep carcasses:** 30% found. Confidence in this estimate is moderate. Sheep carcasses were found in a variety of locations, ranging from open moor to inside shooting butts, and appeared to be the result of natural deaths.

iv. **Spring traps set on rails:** 95% found. Confidence in this estimate is high. Almost all the traps set on rails were along streams **(Figure 2)**, which were comprehensively surveyed. However, some were also set on rails on top of walls: while walls were scanned, some would have been missed. On one estate some traps were set on rails across drainage ditches, and some of these would also have been missed.

v. **Spring traps set in tunnels:** 65% found. Confidence in this estimate is moderate – these traps were mostly positioned near vehicle tracks, but could be located anywhere **(Figure 3)**. They were typically well hidden and so it is likely that a significant proportion were missed.

vi. **Mammal cage traps:** 50% found. Confidence in this estimate is moderate – two types of cage traps were located. BT found 16 cage traps that consisted of wire/weld mesh cages operated by a treadle. This style of trap was typically large and set in woodland. They could be well hidden and camouflaged, or in the open. While they were often associated with pheasant pens, they were also found in a wide variety of locations. Most appeared to be targeting foxes, and contained a single compartment baited with a carcass. However, one trap with an entrance measuring 30 cm x 30 cm was set in a stream **(Figure 4)**. BT also found 156 rabbit drop traps (each of which can catch several rabbits).

Results and discussion

SNARING FOXES

The use of snares

BT found 108 snares, of which 41 (38%) were in use. The others were *in situ* but had been closed. Sixty were tagged as fox snares, 12 were not tagged, and it was not possible to examine the other 36. Since none of the snares that could be examined were tagged as being set for hares or rabbits, we have assumed that all the snares were being used to catch foxes. Studies in lowland England showed that fox captures were highest in the first 10 days after snares were deployed (Defra, 2005), which explains why many of the snares that BT found were not in use. Snares are set around stink pits and/or along artificial trails prepared through thick vegetation, particularly in spring and summer (*https://www.gwct.org.uk/advisory/guides/fox-snaring-guidelines/*) and periodically when a fox(es) is/are believed to be in the area.

Stink pits

BT located 39 stink pits, which were generally distributed in a network across an estate **(Figure 5)**. He estimated that he found 80% of them, suggesting that there were 49 on the seven estates. At that density there would have been 1000 (assuming an area of 0.8 million ha) to 1800 (assuming an area of 1.5 million ha) stink pits on Scottish grouse moors. Dead corvids, deer and foxes were the most common bait recorded by BT, but sheep were used occasionally, even though this is an offence under the Animal By-Products (Enforcement) (Scotland) Regulations 2013 and the Animal By-Products (Miscellaneous Amendments) (Scotland) Regulations 2015. To prevent harm to people, animals and the environment, the Animal By-Products (Enforcement) (Scotland) Regulations 2013 require that the body or part of a body of a farmed animal that has not been slaughtered for human consumption must be held in such a manner as to ensure that any animal or bird will not have access to it (*https://www.gov.scot/publications/animal-by-products-disposal-guidance/*).

FIGURE 3. Typical locations for spring traps set in tunnels (tunnel traps): they were often set near features such as drainage pipes, roads and walls






FIGURE 4. Live-capture trap set in a stream

TABLE 2. Summary of the survey effort and number and density of spring traps recorded on each estate, ranked by management intensity[a]

Estate	Millden	Tillypronie	Easter Clunes & Drumbain	Invermark	Glenmazeran	Kildrummy	Skibo
Management intensity	1	2	3=	3=	5	6	7
Area	78.34 km^2	57.05 km^2	9.04 km^2	177.20 km^2	32.85 km^2	26.39 km^2	23.32 km^2
No. of survey days	46	26	6	25	11	8	6
Average area surveyed per day	1.70 km^2	2.19 km^2	1.51 km^2	7.09 km^2	2.99 km^2	3.30 km^2	3.89 km^2
No. of rail traps found	761	124	50	66	17	1	32
Density of rail traps	9.7/km^2	2.2/km^2	5.5/km^2	0.4/km^2	0.5/km^2	<0.1/km^2	1.4/km^2
No. of tunnel traps found	147	127	44	30	8	8	5
Density of tunnel traps	1.9/km^2	2.2/km^2	4.9/km^2	0.2/km^2	0.2/km^2	0.3/km^2	0.2/km^2
Total no. of spring traps found	908	251	94	96	25	9	37
Overall density of spring traps	11.6/km^2	4.4/km^2	10.4/km^2	0.5/km^2	0.8/km^2	0.3/km^2	1.6/km^2

[a] Rankings were based on a subjective assessment of the intensity of habitat management and predator control

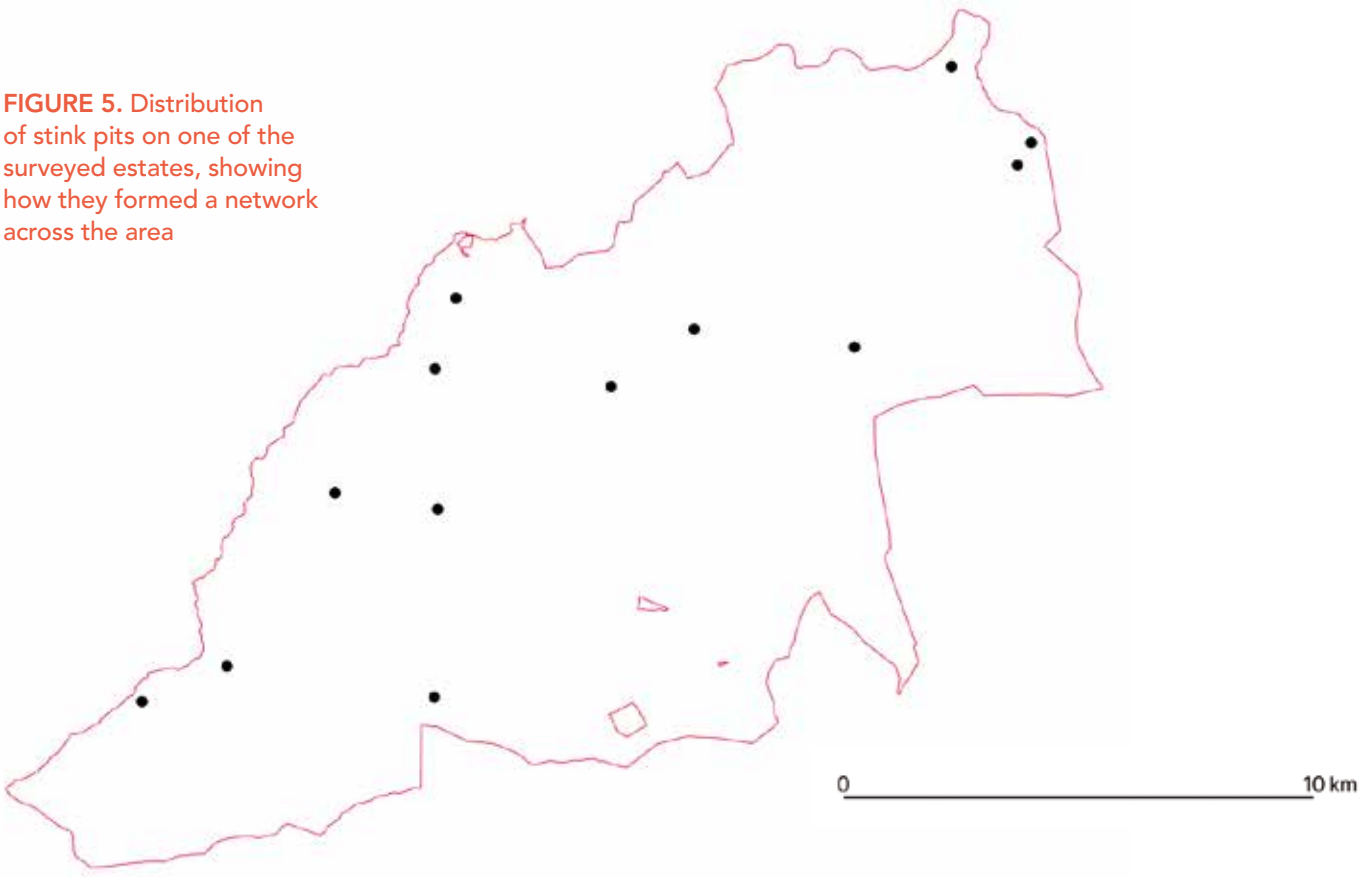


FIGURE 5. Distribution of stink pits on one of the surveyed estates, showing how they formed a network across the area

The carcasses of wild animals are generally exempt from the Regulations, although there is general guidance on the disposal of deer carcasses and offal not intended for human consumption (*https://www.highland.gov.uk/info/1211/animal_welfare_and_pest_control/65/animal_health_and_welfare/4*). The advice published by the NGO is that, while wild game species such as deer, grouse, partridges and pheasants are exempt if they were wild when killed and not intended for the human food chain, the eggs, chicks and gamebirds that died in captivity are covered by the Regulations (Knight, 2014). However, the carcass of a wild animal that has been shot, snared or trapped should be disposed of appropriately **(Figure 6)**. Wild animal carcasses are classed as waste and there is a legal duty of care to handle, store and dispose of them safely so that the operator does not 'cause pollution or attract vermin' (*https://www.netregs.org.uk/environmental-topics/waste/animal-by-products-and-food-waste/animal-carcass-disposal/*). However, if it is suspected that an animal was infected with a disease which can be spread to people or animals, they must be disposed of as a category 1 animal by-product i.e. it is classed as high risk (*https://www.gov.uk/guidance/fallen-stock#wild-animals*). There is a great deal of data on the risks of spreading diseases of economic significance to domestic and wild animals by disposing of carcasses inappropriately (Harris & Dorning, 2017). Advice published by the NGO suggests that it is probably better to use an artificial lure rather than a stink pit when trying to catch predators (Knight, 2014).

FIGURE 6. A stink pit showing the brush walls with entry points where snares are set and the pile of carcasses in the middle

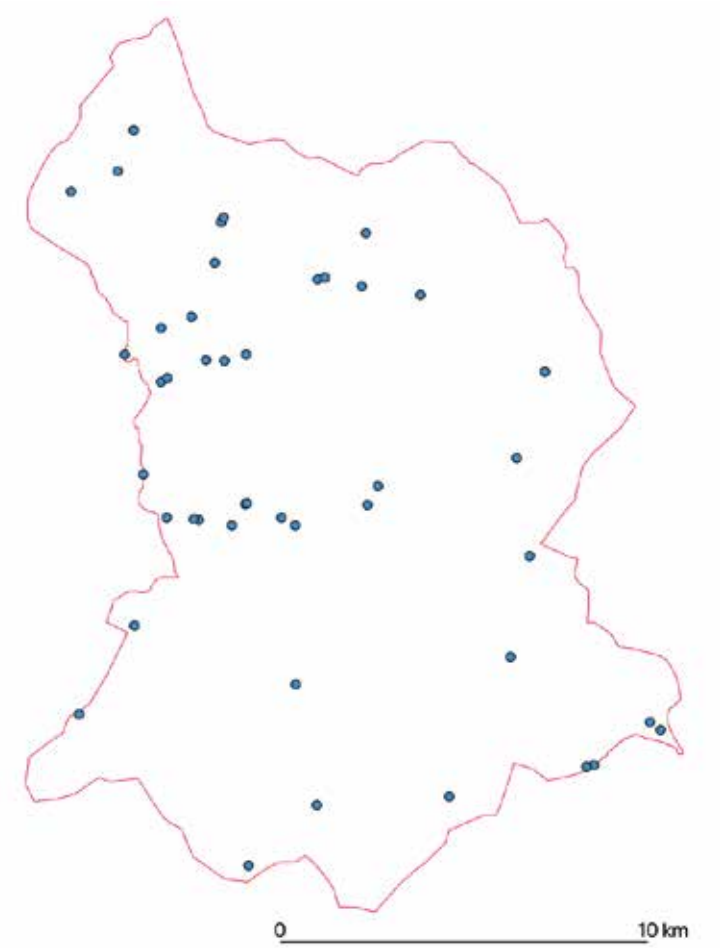


FIGURE 7. Distribution of sheep carcasses on one of the surveyed estates

Sheep carcasses

BT recorded 123 sheep carcasses: the number found on each estate, ordered by increasing intensity of management for grouse shooting, was: Skibo - none, Kildrummy - none, Glenmazeran - 2, Easter Clunes & Drumbain - 5, Invermark - 25, Tillypronie - 47 and Milden – 44. Thus the number of sheep carcasses he found reflected the intensity with which each estate was managed for grouse shooting; carcasses were typically randomly scattered across the estate **(Figure 7)**. While the cause of death of these sheep was not established, disease and/or or ill-health was likely to be a factor contributing to the death of many of them.

The density of carcasses recorded on the seven estates equates to between 2450 (assuming 0.8 million ha) and 4550 (assuming 1.5 million ha) sheep carcasses on Scottish grouse moors. Allowing for dead sheep that were missed (BT estimated that 30% were found), this equates to between 8100 and 15,200 sheep carcasses on Scottish grouse moors. This is a substantial biomass: assuming 60 kg average weight at the time of death, this was equivalent to between 486,000 kg (486 metric tonnes) and 913,000 kg (913 metric tonnes) of fallen stock at the point of death (the carcasses were in various stages of decomposition, and it was not possible to determine how long each animal had been dead).

There are strict rules on the disposal of fallen stock (i.e. any animal that has died of natural causes or disease, or that has been killed for reasons other than human consumption) to prevent harm to people, animals and the environment. Owners are required to contact an approved collector within 24 hours of the animal's death, and the carcass must be delivered to an approved sampling site within 72 hours. While burying fallen stock on the farm is generally illegal due to the risk of spreading disease through residues in the soil, ground water or air pollution, there is a derogation for burial in some parts of Scotland that have been designated 'remote areas' (*https://www.gov.scot/publications/animal-by-products-disposal-guidance/pages/fallen-stock-and-other-animal-carcases/*).

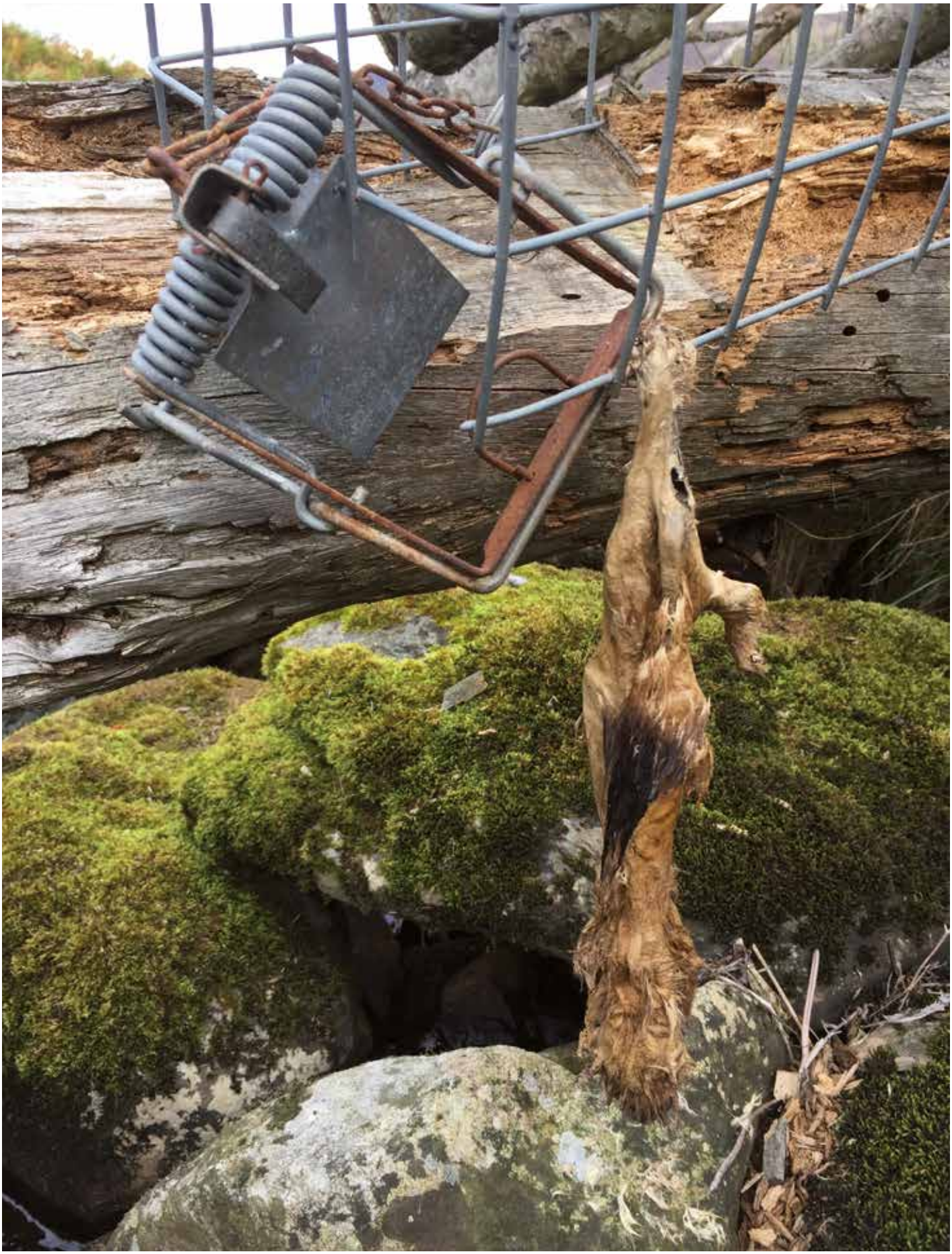
The numbers of sheep carcasses was surprising: whether this reflected lower livestock welfare standards on moors managed intensively for grouse shooting is unclear. Whatever the reason, there is a high incidence of parasites and disease in fallen stock and these carcasses pose a significant risk of spreading infection (Harris & Dorning, 2017). They also provide a substantial food source for predators and scavengers (e.g. Hewson, 1984).

ARE SPRING TRAPS HUMANE?

The Scott Henderson Committee was appointed in 1949 'to enquire into practices or activities which may involve cruelty to British wild mammals, whether at large or in captivity, including anything occurring in the pursuit or capture of such animals'. They reported in 1951, and their recommendations led to the introduction of the Pests Act 1954. This Act regulated the use of spring traps in England and Wales and amended the Agriculture (Scotland) Act 1948 to similar effect, so that only approved traps would be permitted.

In 1953, just prior to the onset of myxomatosis, 3.5 to 4 million gin (leg-hold) traps with 4-inch jaws were in regular use in Britain: they were mostly used to catch rabbits but were also used to catch animals considered to be harmful to sporting interests (Lloyd, 1963). The Humane Traps Advisory Committee was set up in 1954 and was asked to approve any traps that were considered to kill humanely but were as efficient as gin traps, which were made illegal in England and Wales on 31 July 1958. However, their use remained legal in Scotland to catch foxes and, under some circumstances, otters, until their use was finally abolished on 1 April 1973 with the implementation of the Agriculture (Spring Traps) (Scotland) Act 1969. Of the 270 traps submitted for approval to replace the gin trap, many 'were of weird and strange construction' (Lloyd, 1963).

FIGURE 8. Stoat caught by a hind leg in a rail trap: the time it took to die is unknown but was likely to have been considerable



Of the traps examined by the National Institute of Agricultural Engineering (Bateman, 1979), those which incorporated the frame and gin-type spring were studied most closely because the design was time-honoured and appealed the most to trappers (Lloyd, 1963). The Fenn, Fuller, Imbra, Juby, Lloyd and Sawyer were ultimately included in the Spring Traps Approval (Scotland) Order 1958. This Order has been revised on a number of occasions (*https://www.legislation.gov.uk/title/the%20spring%20traps%20approval*).

The six approved traps were largely based upon designs which included a pair of vertically striking arms arranged to apply a lethal blow to an animal's head or neck and to grip it (Bateman, 1971, 1979). However, the relative importance of impact momentum and clamping force of the approved traps was not evaluated: impact momentum is likely to cause physical damage to the nervous system, blood vessels and organs, whereas clamping force will prevent the animal's escape, potentially (but not necessarily) causing asphyxiation or occlusion of blood vessels (Baker *et al.,* 2012). The relative importance of these measures will vary with the species caught, the size of the individual, and where it is caught by the trap. For brushtail possums, for instance, a clamping force for a successful neck strike is considerably lower than that required for a head strike, which would permit significant advantages in trap design if the trap can be made to target the neck (Warburton & Hall, 1995). The animals we recorded in spring traps were caught by various parts of the body: 2/59 of the mammals found in spring traps (a polecat-ferret and a stoat) were caught by the feet or a leg and died hanging from the trap **(Figure 8)**.

Fenn traps were developed through a series of models. The Fenn Mk I, II and III traps were authorised by the original Spring Traps Approval (Scotland) Order 1958, although there were structural problems with the Fenn Mk I and Mk II traps that made them unpopular with gamekeepers (Bateman, 1971). The Fenn Mk III resolved concerns about robustness (Bateman, 1971) but not humaneness. The Fenn Mk IV was approved for use in Scotland in the Spring Traps Approval (Scotland) Amendment Order 1970 and rapidly became the most popular spring trap used to catch rats, stoats and weasels (Bateman, 1979). This remained the position for half-a-century, even though it is unclear whether the Fenn Mk IV trap was ever assessed as being humane. Bateman (1979) described the Fenn trap as 'probably the most popular of the British humane spring traps. …. in 90 per cent of captures they achieve a fast and painless kill. Where this is not so, it is usually because they have not been set sufficiently finely'. Since the Fenn Mk IV trap spectacularly failed to meet the humaneness standards specified by New Zealand's National Animal Welfare Advisory Committee and the Agreement on International Humane Trapping Standards (AIHTS) (see below), the basis for claiming that 90% of captures achieved a fast and painless kill is unclear.

The assertion that Fenn traps were humane remained unchallenged for nearly half a century, even though the inability of Fenn traps to kill animals quickly was widely recognised by practitioners. In the original tests of traps to replace gin traps, it was accepted that 'The capture and holding of animals by less vulnerable parts of the body than the chest, head, or neck, is often due to hind-leg strikes. As there seems to be no simple method of ensuring that the animal is always in the most favourable position to obtain a clean kill, this inherent fault in humane trap design is recognized and a small number of live captures is accepted' (Lloyd, 1963). More recently, the GWCT said that 'A generic limitation with Fenn traps and other 'body-grip' traps …. is that they kill by striking and crushing the body of the animal **(Figure 9)**. The most humane death would result from a strike to the head sufficient to fracture the skull, causing instant irreversible loss of consciousness. This rarely happens in body-grip traps, in which the best outcome is that the body is gripped in the chest or neck, with brain death following as a consequence' (*https://www.gwct.org.uk/game/research/predation-control/tunnel-traps/towards-better-tunnel-traps/*).

When Fenn traps were introduced, it was generally perceived that accessibility for inspection by a keeper had to be taken into account, since humanitarian considerations require that each trap should be inspected at least once every twenty-four hours (Bateman, 1979). The Protection of Animals (Scotland) Act 1912, Section 9 (Inspection of traps), stated that 'Any person who sets, or causes or procures, to be set, any spring trap for the purpose of catching any hare or rabbit, or which is placed as to be likely to catch any hare or rabbit, shall inspect or cause some competent person to inspect, the trap at reasonable intervals of time and at least once every day between sunrise and sunset'. This requirement was introduced when the gin trap was the only spring trap in widespread use; it was repealed by the Animal Health and Welfare (Scotland) Act 2006. The Spring Traps Approval (Scotland) Order 1958 and subsequent amendments only specified the types of spring traps that could be used, and for which species: there was no specific requirement to inspect spring traps once they had been set, let alone daily.

The Animal Health and Welfare (Scotland) Act 2006 includes any animal 'under the control of man on a permanent or temporary basis' (Section 17 (1) (b)) which is, of course, the position for any trapped animal. The Act makes it clear that a person is guilty of causing unnecessary suffering to an animal if he 'knew, or ought reasonably to

FIGURE 9. Rats caught in rail traps: they were held by various parts of the body. How long it takes a rat to die in a spring trap is unknown, especially when caught by the pelvis (bottom left)

have known, that the act would have caused the suffering or be likely to do so by both his/her deliberate acts and by omission (Section 19 (1) (a) and (b) and Section 19 (2) (a) and (b)). Furthermore, Section 19 (3) (b) (ii) says that a person commits an offence by failing 'to take such steps (whether by supervising the other person or otherwise) as are reasonable in the circumstances to prevent that happening'. Relevant considerations when determining whether suffering is unnecessary include 'whether the suffering could reasonably have been avoided or reduced' (Section 19 (4) (a)).

The British Pest Control Association, in their 2013 *Code of best practice – spring trapping*, says that spring traps 'should be checked at least once a day, or more often where legislation requires it' (*https://bpca.org.uk/pest-advice/documents-and-codes/codes-of-practice*). However, the general impression has emerged that, since spring

traps are perceived to be killing traps, there is no welfare requirement to inspect them either daily or even regularly. The situation was summed up by the GWCT as follows: 'If the trap uses a decoy bird, then responsibility for the bird's welfare is an obligation under the Animal Welfare Act. However, the Animal Welfare Act also applies to all captured animals, and here we get into uncharted territory. The prevailing view among veterinary experts seems to be that, if the trap is intended to hold alive, daily inspection is a reasonable minimum frequency. If the trap is intended to kill, there is much less agreement' and, if people fail to check their traps daily, they are 'entering uncharted waters legally' (*https://www.gwct.org.uk/trapper/instructions/adding-traps/*).

Changes to New Zealand's Animal Welfare Act 1999 allowed kill traps to be left set for extended periods between checks; however, the ethical basis for this change was questionable until it could be shown that Fenn traps killed stoats quickly and consistently. So the National Animal Welfare Advisory Committee (NAWAC) developed guidelines for testing traps that were in use in New Zealand; this required that captured animals were rendered irreversibly unconscious in less than three minutes on 70% of the time and in less than five minutes on 80% of the time. Traps performing to this level with 90% confidence were considered 'acceptable', although 'acceptable' should not be taken to imply 'humane'. New Fenn Mk IV and Mk VI traps, and used Fenn Mk VI traps, were tested in pens to see whether they met the standard of rendering all ten test animals irreversibly unconscious within three minutes, with the caveat that testing had to be stopped as soon as three animals failed the test (National Animal Welfare Advisory Committee, 2005). With the exception of one stoat captured in a new Fenn Mk VI trap, all stoats remained conscious until euthanized after five minutes. In view of the unacceptable performance of Fenn Mk IV and Mk VI traps, only three stoats were used in each test (Warburton *et al.,* 2008).

To put this into perspective, it should be remembered that male stoats in New Zealand are, on average, 12% smaller than British stoats i.e. 324 grams versus 367 grams, and female stoats 14% smaller i.e. 207 grams versus 242 grams, respectively (King, 2005; Harris & Yalden, 2008). Despite performing so badly against stoats that are significantly smaller than those found in Britain, the Fenn Mk IV and Mk VI traps and copycat designs continued to be the most widely used spring traps in Britain.

No attempt was made to check whether the spring traps used in Britain really were 'killing' traps until the European Community, the government of Canada, and the government of the Russian Federation came to an agreement on humane trapping standards (AIHTS) which, for killing traps, specified the time to unconsciousness and insensibility and the maintenance of this state until the animal was dead; the overarching aim of the Standards is to ensure a sufficient level of welfare of trapped animals, and to further improve this welfare standard (*http://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX-:21998A0214(02)&from=EN*). However, the AIHTS only applies to species commonly caught in the wild for their fur: of the listed species, only badger, beaver, marten, otter and stoat occur in the UK, and only stoats may be taken or killed without a special licence. So the AIHTS standards do not apply to any of the species routinely trapped in the UK other than stoats.

The AIHTS standard for stoats is for at least 80% of trapped animals to be rendered unconscious and insensible (measured as the loss of corneal and palpebral reflexes) within 45 seconds, and to remain in this state until death. The Fenn Mk IV and Mk VI traps, and copycat designs such as those by Springer and Solway, and the BMI Magnum traps all failed to render stoats unconscious and insensible reliably within 45 seconds, even though the principal criticism of the AIHTS standards is that the time to loss of consciousness is far too long (Harrop, 1998). More recently, the UK Wild Animal Welfare Committee (WAWC) repeated this criticism, saying that 'in order to be humane, any killing method must cause rapid, irreversible loss of consciousness in the target animal' and noted further, 'Not only do most of the currently approved stoat traps not meet the stoat-specific 45-second TIU criterion, but it is possible and likely that many of these traps that were approved for other species before 2011 do not meet the UK's existing 5-minute criterion either, and yet will remain approved for these other species. Since we believe the current TIU criteria have no logical scientific foundation, we would wish to see the development and approval of traps where TIU was effectively reduced to zero in order to protect animal welfare' (*http://www.wawcommittee.org/images/resources/AIHTS-consultation-response-from-WAWC-29.4.18.pdf*).

The deadline to become compliant with AIHTS was the end of July 2016; the UK argued that they needed extra time to facilitate the changes because there was no satisfactory substitute, even though it had long been known that Fenn traps were not humane. So, while the AIHTS came into effect on 28 March 2019 by way of the Humane Trapping Standards Regulations 2019, implementation for stoats was further delayed for another year to allow time for non-compliant stoat traps to be phased out (*https://www.gov.uk/government/news/humane-trapping-standards-march-2019-update*). From 1 April 2020, stoats may only be caught in those traps specified in the Spring Traps Approval (Scotland) Amendment Order 2018 and a new General Licence GL14. While the AIHTS standards did not apply during this study, they are relevant to the findings.

FIGURE 10. Spring traps set in different styles of tunnel, with and without excluders fitted




ARE SPRING TRAPS SELECTIVE?

Advice from professional bodies on tunnel design and the size of excluders

The Spring Traps Approval Orders required that spring traps are set in a natural or artificial tunnel to prevent the accidental or deliberate capture or maiming of birds or larger mammals (Short & Reynolds, 2001; *https://www.gwct.org.uk/game/research/predation-control/tunnel-traps/*). While the term 'tunnel' has not been defined in the Spring Traps Approval Orders, the basic concept of a 'tunnel' is that it is 'a subterranean passage' or 'the burrow of an animal' (*The Shorter Oxford English Dictionary*, 1973) i.e. a tunnel is underground and dark, and it is clear that the original presumption underpinning this requirement was that spring traps would be set in such a way that mimicked natural runs and tunnels that would attract rats, stoats and weasels (Bateman, 1979). Traditionally, materials such as bricks, rocks, stones, turf or wood were used to make the tunnels **(Figure 10)**, but when a lot of spring traps were being set it was more practical to use 6-inch (150 mm) diameter drainage pipes in 18-inch (450 mm) lengths (Bateman, 1979). For ease of use, spring traps are now often set in blind-ended custom-built wooded tunnels **(Figure 11)**.

FIGURE 11. Wooden tunnels used to set spring traps

Despite the basic presumption that spring traps should be set in a tunnel, the GWCT said that a range of materials can be used to make the tunnels and, in the case of spring traps set on rails over ditches and watercourses, weldmesh can be used to reduce flow resistance if traps are submerged during a flood. In this case, they recommend that 25 mm square weldmesh should be used for 'tunnel' construction to help minimise the risk of mountain hares, lambs or birds being caught by the leg from above (*https://www.gwct.org.uk/blogs/news/2020/february/all-change-to-upland-trapping-from-april-2020/*). However, there are few records of animals caught from above: a much greater risk is that a diversity of birds will hop or walk along the rail and into the trap **(Figure 12)** because of the open nature of mesh cages (*https://community.rspb.org.uk/ourwork/b/investigations/posts/rspb-concerns-over-rail-traps-and-ring-ouzels*). The RSPB have recorded blackbirds, dippers, mistle thrushes, red grouse, ring ouzels, skylarks, song thrushes, starlings and pied wagtails caught in spring traps set on rails which the shooting industry might consider to be 'properly' restricted (*https://community.rspb.org.uk/ourwork/b/investigations/posts/birds-and-other-wildlife-caught-in-spring-traps-on-grouse-moors*). The RSPB has also recorded many rail traps with poor or no access restriction in place and additional species caught in these have included merlins, red grouse and tawny owls (Guy Shorrock, *pers. comm.*).

The GWCT strongly discouraged the use of rail traps where ring ouzels and red squirrels are present (*https://www.gwct.org.uk/blogs/news/2020/april/all-change-to-upland-trapping-from-april-2020/*; article dated 27 February 2020), although, for some reason, they deleted the reference to ring ouzels in a revised version of the article issued on 20 April 2020. In this survey rail traps were regularly recorded in areas where ring ouzels were present **(Figure 13)**. According to the GWCT, red squirrels seem to be naturally drawn to rails, particularly those set across waterways. Under the Wildlife & Countryside Act 1981, as amended, it is illegal to set any trap likely to kill or cause bodily injury to any wild animal in Schedules 5 and 6 of the Act, which includes red squirrels. The GWCT cautions that the continued use of rail traps in or close to red squirrel woods could jeopardise future use of rail traps as part of a legitimate predator control programme (*https://www.gwct.org.uk/blogs/news/2020/february/all-change-to-lowland-trapping-from-april-2020/*). Red squirrels were not specifically included in this survey but were seen on three of the estates surveyed and there were signs of red squirrels on others.

FIGURE 12. A thrush killed in a rail trap

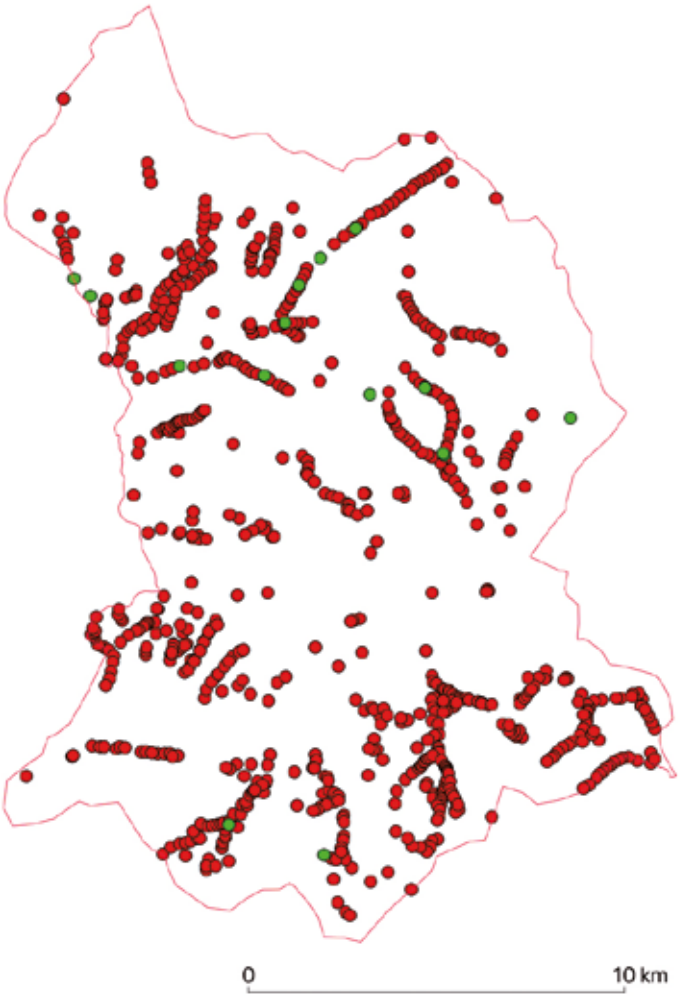


FIGURE 13. Distribution of rail traps (red circles) and ring ouzel sightings (green circles) on one of the surveyed estates

In response to inquiries from the RSPB, Defra stated on 18 January 2019 that 'A condition of spring trap approval is that trap users are obliged, 'so far as is practicable without unreasonably compromising its use for killing or taking target species, to use the trap in a manner that minimises the likelihood of its killing, taking or injuring non-target species' .... Since it is unlikely that the addition of excluders sufficient to minimise the capture of birds would 'unreasonably compromise' the ability to catch the target species, failure to fit effective excluders is likely to be a contravention of the condition that requires trappers to minimise the risk to non-target species (*https://community.rspb.org.uk/ourwork/b/investigations/posts/rspb-concerns-over-rail-traps-and-ring-ouzels*).

However, Defra did not recommend an appropriate size of excluders to keep birds out but still allow target species to be caught. While there are no specific data for tunnel traps, there are data on the ability of smaller species of birds to escape from corvid traps. The standard wire netting (40 × 25 mm) of the multi-catch and the weldmesh (75 × 25 mm) of the Larsen both allowed small birds to pass through when they moved slowly, but when birds were moving quickly, it occasionally became a barrier .... The 50 × 50 mm mesh of the Larsen-mates allowed small passerines through at speed, and even blackbirds and squirrels could pass through it barely obstructed (Campbell *et al.,* 2016).

The GWCT has issued a range of conflicting advice on both the need to use, and the size of, excluders to minimise the risk of catching non-target species. For instance, on one hand they said that the tunnel, whether run-through or blind-ended and baited, must have excluders at the entrance(s) to deter non-targets (*https://www.gwct.org.uk/blogs/news/2020/february/all-change-to-lowland-trapping-from-april-2020/*), whereas concurrent advice offered by the GWCT was that the use of physical excluders is discretionary because trap operators must weigh up the risk of catching a non-target species against the utility of the trap for its intended purpose (*https://www.gwct.org.uk/game/research/predation-control/tunnel-traps/*). This is all-too-reminiscent of the comments made 70 years earlier in the Scott Henderson report, which concluded that there is 'a reluctance to see any reason for ceasing to use a trap which is doing its job; the suffering inherent in its use may be recognised as unfortunate, but is considered to be unavoidable' (Scott Henderson, 1951). While this comment was made in relation to gin traps, which remained in use in Scotland for another 20 years, the impression that utility, not animal welfare or any negative conservation impacts of their use, still appears to be the prime concern when setting spring traps.

When discussing selectivity, the GCWT said that 'it is an offence to set a trap that is likely to injure or kill a polecat .... The offence is to set the trap, not to catch a polecat. Landowners and employers who cause or allow such an offence are also culpable' and so 'we recommend the use of excluders on trap tunnels to be sure of not committing this offence'. The GWCT also explains that the legal status of feral ferrets and polecat-ferret hybrids is uncertain and has not been clarified by case law, but that a trap capable of killing or injuring a ferret would clearly be capable of killing or injuring a polecat (*https://www.gwct.org.uk/blogs/news/2016/april/new-report-highlights-increase-in-polecat-range/*). The animal shown on the title page of this report is a polecat-ferret (identified by Elizabeth Croose of the Vincent Wildlife Trust); it was killed in Angus close to an area where wild polecats have been recorded (Croose, 2016). Whatever the legal status of hybrids, how this polecat-ferret died is a significant welfare issue.

Because of the potential risks of catching protected species in spring traps, the GWCT was awarded a contract from English Nature (a forerunner of Natural England) to develop physical baffles to exclude the entry of larger (protected) species while allowing the entry of smaller

FIGURE 14. Hedgehog caught in a rail trap; how long it took to die is unknown

ones. This work was undertaken in 1998 and 1999. The 'excluder' they developed for tunnel traps consisted of vertical wooden dowels set in a wooden frame measuring 20 × 19 cm (illustrated on page 54 in GWCT, 2019), although it could be made of other materials. The spacing of the dowels was carefully tested with captive animals to exclude hedgehogs, pine martens and polecats, the protected species of concern, while allowing free entry to stoats and weasels. The critical dimension identified in this research contract was that no gap should be more than 32.5 mm wide. Trials by gamekeepers showed that stoat and weasel captures were undiminished, but the excluder significantly reduced catches of grey squirrels and rats, which were larger (Short & Reynolds, 2001). In 2016 the GWCT reiterated that an excluder with a gap no greater than 32.5 mm wide should be used where there is a recognisable risk of catching a protected species and thereby committing an offence (*https://www.gwct.org.uk/blogs/news/2016/april/new-report-highlights-increase-in-polecat-range/*). Since one of the protected species included in the English Nature contract to the GWCT was hedgehogs, which are widespread in Scotland, it is hard to identify areas of the mainland where excluders with a maximum size of 32.5 mm wide should not be used **(Figure 14)**.

Despite the advice they published following the contract undertaken for English Nature, more recently the GWCT has suggested that where stoats and weasels are the main target, tunnel excluders should have apertures no larger than the 51 mm used in the DOC run-through trap baffle. The explanation given for this change is that it keeps things simple, is defensible, and is amply big enough for stoats and weasels to enter (*https://www.gwct.org.uk/blogs/news/2020/february/all-change-to-lowland-trapping-from-april-2020/*). They also recommend that, for trappers targeting grey squirrels (and rats) with DOC traps, a larger excluder aperture is better (*https://www.gwct.org.uk/blogs/news/2020/april/all-change-to-upland-trapping-from-april-2020/*). The DOC traps developed by New Zealand's Department of Conservation have larger entrances because, in New Zealand, feral ferrets and hedgehogs are also targeted because of their conservation impacts (King, 1984, 2005). Since the GWCT's research showed that an excluder with a gap greater than 32.5 mm wide offers little if any protection for protected species, it is unclear why larger excluder sizes are permitted for use in Scotland (*http://www.sasa.gov.uk/document-library/predator-traps-instructions-uk*).

The positioning of the trap in a tunnel is also important and will determine the minimum length of each tunnel. The GWCT recommends that traps need to be kept far enough back from the entrance to avoid the risk of a non-target capture by paw, claw or beak. This would require the trap to be positioned 150 mm from the entrance and so, with a double-ended tunnel, the total length should be no less than 460 mm (18 inches) long (*https://www.gwct.org.uk/blogs/news/2020/february/all-change-to-lowland-trapping-from-april-2020/*). This is still quite a bit less than the manufacturer's recommendation, which is that the internal dimensions of the tunnel should be 150 mm wide by 145 mm high by 550 mm long (*https://www.fenntraps.com/mk4-fenn-spring-trap.html*). There is no guidance on the minimum tunnel length to be used in Scotland (*http://www.sasa.gov.uk/document-library/predator-traps-instructions-uk*).

Species killed in spring traps

The remains of 71 dead animals were recorded in rail traps that had not been reset. Some of these were comparatively fresh, whereas others were decomposed or mummified, and so had been left in the traps for an extended period. There were 13 dead rats, 12 stoats, 10 rabbits, six decomposed mustelids, three decomposed birds, three decomposed mustelids/rats, three dippers, three weasels, two mistle thrushes, two red grouse, one blackbird/ring ouzel, one hedgehog, one polecat-ferret, one starling and 10 mammals that were so decomposed (only fur and/or bones left) that it was not possible to establish the species and whether or not they were target species **(Figure 15)**. It was difficult to identify some of the carcasses because nothing was touched in the field. BT also recorded the remains of 97 birds and mammals (bones, feathers and fur) in traps that had been reset and three carcasses (one rabbit, one stoat and one weasel) that had been left near traps that had been reset.

FIGURE 15. Dippers killed in rail traps

FIGURE 16. Dead stoats in rail traps in various stages of decomposition

Of the species recorded by BT, rats, stoats and weasels were the only species that could be caught legally in spring traps set on rails (rabbits could only be caught in particular types of spring traps set in rabbit tunnels). Of the captures that could be identified, 37/61 (61%) were target species and 24 (39%) were non-target species **(Figure 16)**. Of the 71 captures (including the 10 mammal carcasses that were not identified to species), 12 (17%) were birds. We excluded the 97 traps that had been reset but still had the remains of previous captures from this analysis since this would have biased our calculations: rabbit fur, for instance, was more obvious and easier to identify in the field than rat or mustelid fur, and bird feathers may not have persisted as long as fragments of fur caught in the trap mechanism, and were generally difficult to identify to a species, although this was not always the case e.g. the neck feathers of a pheasant adhering to a trap that had been reset.

It was harder to see into tunnel traps, but 12 carcasses were recorded in tunnel traps, all mammals: six rabbits, five bodies that were too decomposed to identify, and one that was either a stoat or weasel.

The code of good shooting practice, co-published by all the leading field sports organisations, says that displaying carcasses serves no useful purpose and will offend other countryside users, so they should not be left on public view (Anon., 2012a). While this advice was originally intended to apply to gibbets, carcasses left on view in rail traps are just as likely to cause offence. Furthermore, carcasses should be disposed of responsibly (BASC, 2013). Leaving carcasses to decompose in traps is contrary to the advice of the professional organisations that advise the shooting industry, as is leaving carcasses of previous captures nearby.

DOES THE USE OF RAIL AND TUNNEL TRAPS ON SCOTTISH GROUSE MOORS CONFORM TO BEST PRACTICE AND OTHER GUIDELINES?

Photographs, generally multiple photographs, were taken of spring traps set on rails and in tunnels on each estate, and later examined to determine whether they were set in accordance with the best practice guidelines. Photographs of 712 rail traps were of suitable quality: we included traps that were set or were clearly in use but not actually set on the day of the survey. SH examined these photographs to determine whether they met the following criteria specified by the GWCT. (i) Was 25 mm square weldmesh (or a similar small mesh) used for tunnel construction to minimise the risk of mountain hares, lambs or birds being caught by the leg from above? (*https://www.gwct.org.uk/blogs/news/2020/february/all-change-to-upland-trapping-from-april-2020/*). Some tunnels were made of small mesh but had a removable section above the actual trap that was made of larger mesh. Since the recommendation was to use small mesh to prevent larger species being caught by putting a leg or foot through the mesh, tunnels mostly made of smaller mesh but with larger mesh directly above the spring trap were deemed not to have met best practice guidelines. (ii) Since rail traps are invariably set in double-ended 'tunnels', was the tunnel at least 460 mm (18 inches) long so that the trap could be positioned 150 mm from the tunnel entrances to prevent non-target species being caught by inserting a paw, claw or beak? (*https://www.gwct.org.uk/blogs/news/2020/february/all-change-to-low-land-trapping-from-april-2020/*). Tunnel length was estimated by comparison with the size of the trap (a Fenn Mk IV trap is 125 mm wide, 135 mm high, 120 mm long when closed, 140 mm wide, 50 mm high, 120 mm long when set). To allow for any errors in calculation, any tunnel believed to be in excess of 410 mm (16 inches) long was deemed to be acceptable. (iii) Was the tunnel fitted with an excluder with a gap no greater than 32.5 mm wide to minimise the risk of catching protected species? (*https://www.gwct.org.uk/blogs/news/2016/april/new-report-highlights-increase-in-polecat-range/*).

Of the 712 rail traps where all three features of the tunnel construction were clearly visible, 619 (87%) were made of mesh larger than 25 mm square, 511 (72%) had a tunnel length of less than 410 mm (16 inches), and 709 (virtually 100%) had an excluder above the recommended size **(Figure 17)**. None of the 712 rail traps examined met all three of the best-practice guidelines recommended by the GWCT.

The survey also found that rail traps are not inspected regularly, their operating efficiency checked, and the traps either reset or disabled. BT gained the impression that traps close to areas with easy public access were checked more frequently, whereas those in the more remote parts of an estate were left unchecked for extended periods. In their code of practice on trapping pest mammals, BASC (2013) says that traps should be checked at least once a day; the number of mummified bodies that BT recorded in rail traps shows that many are not checked for extended periods, months in many cases.

Failing to check traps daily also has a significant impact on animal welfare: after some 60 years of use, Fenn and a number of other body-grip traps were shown not to kill stoats humanely, and their use to catch stoats was prohibited in Scotland from 1 April 2020 (Spring Traps Approval (Scotland) Amendment Order 2018). However, their use is still permitted for rats and weasels, even though there is no evidence that these species are killed humanely.

FIGURE 17. Rail traps set in wire cages that were well below the recommended minimum length

FIGURE 18. Spring traps that have not been maintained and the mechanism has become rusty




In Britain the weight range of female stoats is 180 to 303 grams, for male weasels 81 to 195 grams (Harris & Yalden, 2008); since their weights overlap, it is illogical to assume that weasels are killed humanely when Fenn traps failed to meet basic welfare standards even when tested on smaller stoats in New Zealand (Warburton *et al.*, 2008). The same welfare concerns apply to non-target captures, especially larger species of mammals such as hedgehogs, large rats and larger mustelids, and birds such as grouse, pheasants and small birds of prey. Failing to check spring traps at least daily will inevitably mean that many animals are left in the traps for some time (sometimes a considerable time) before they die of their injuries. Welfare concerns are also compounded by failing to check spring traps daily because their operating efficiency is reduced over time (Baker *et al.*, 2012). Left unchecked, traps become rusty **(Figure 18)** and/or, in the case of rail traps, the mechanism is impaired by the accumulation of vegetation and other debris washed down in floods **(Figure 19)**.

It was harder to inspect tunnel traps because the traps were often set in rock piles or tunnels constructed out of rocks and turves so that it was difficult to see the actual trap or whether an excluder had been fitted. Many of the spring traps were set in purpose-made wooden tunnels that were then covered in rocks or turves. While these wooden tunnels typically had a hole drilled in one end to act as an excluder, the panel with the excluder had been removed in some so that the wooden box was open-ended. On one estate, stones were used to restrict the size of the opening but these were subject to collapse.

FIGURE 19. Spring traps where vegetation washed down in floods, or the remains of previous captures, has impaired their operating efficiency






FIGURE 20. The top two photographs show spring traps set in rock piles without an excluder, the bottom left photo shows a tunnel trap with an excluder which would not prevent the entry of protected species, and the bottom right photo shows a tunnel trap with a wire mesh excluder that has not prevented a rabbit from being caught: traps set in this way pose a risk to a diversity of animals




For the 216 tunnel traps where it was possible to see into the tunnel, 70 (32%) appeared to have no excluder **(Figure 20)**; these were mostly when tunnels were made from natural rock piles. A further 113 (52%) had excluders that were larger than the 32.5 mm recommended by the GWCT (*https://www.gwct.org.uk/blogs/news/2016/april/new-report-highlights-increase-in-polecat-range/*), for 15 (7%) it was not clear whether the excluder was the recommended size, and for 18 (8%) the excluder was probably of the size recommended by the GWCT. It was rarely possible to see how far the trap was positioned behind the excluder, except when the tunnel was constructed from a length of plastic pipe. Where the trap could be seen, it was often just behind the excluder where non-target species could easily be caught by paw, claw or beak **(Figure 21)**, contrary to GWCT guidelines (*https://www.gwct.org.uk/blogs/news/2020/february/all-change-to-lowland-trapping-from-april-2020/*).

In their code of practice on trapping pest mammals, BASC (2013) says that every effort should be made to avoid the capture of non-target and protected species. However, the proportion of non-target captures (39%) in spring traps set on rails shows that they are non-selective, and the high number of non-target captures found in this survey and reported elsewhere belies any suggestion that rail and tunnel traps are being used in such a way as to minimise the risk of catching non-target species.

FIGURE 21. Tunnels where the spring trap was positioned just behind a wire excluder: the 'excluder' on the tunnel (top image) offered no protection for non-target species and the trap (bottom image) is positioned at the front of the tunnel to catch any animal reaching for the eggs

INTENSITY OF PREDATOR CONTROL ON SCOTTISH GROUSE MOORS

The intensity of predator control varied between estates: BT recorded a maximum density of 9.7 rail traps/km² and 4.9 tunnel traps/km² **(Table 2)**. Allowing for the proportion of traps that BT estimated that he missed (5% of rail traps, 35% of tunnel traps) suggests that the actual maximum density was 10.2 rail traps/km² and 7.5 tunnel traps/km². These traps were distributed in a network across each estate, presumably to ensure that no target species (rats, stoats and weasels) were missed **(Figure 22)**; this intensity of trapping was likely to have had a significant impact on the whole ecosystem.

Not all of the snares and traps located in the survey were set when found. For snares, it was easy to determine which were set, but for rail and tunnel traps it was sometimes impossible to see the actual spring trap. So to calculate trapping effort, the rail and tunnel traps for which it was not possible to establish whether the spring trap was set were allocated proportionally for each estate as either set or not set, depending on the numbers of traps on that estate where it was possible to see whether they were set.

Since the survey was carried out across the year to avoid seasonal biases, the number of traps found to be in use on a particular day provided a snap-shot of the intensity of trapping effort, and so the data were used to estimate the number of trapping days on Scottish grouse moors. For this we have provided two estimates for each of 0.8 million ha and 1.5 million ha, the lower and upper estimates of the area of Scotland managed for shooting grouse **(Table 1)**, one based on the actual number of snares and traps found in the survey, and one for the number estimated to be present, to take account of those that were missed. We then used these data to calculate the number of snare days and trap days/year (i.e. one snare/trap day is one snare/trap set for one day) on Scottish grouse moors **(Table 3)**. So, for instance, the minimum estimate for the number of rail trap days/year on Scottish grouse moors was 5,250,000 and the maximum was 10,360,000.

FIGURE 22. Distribution of rail traps (left) and tunnel traps (right) found on one of the estates surveyed, showing how they formed a high density network across the whole area

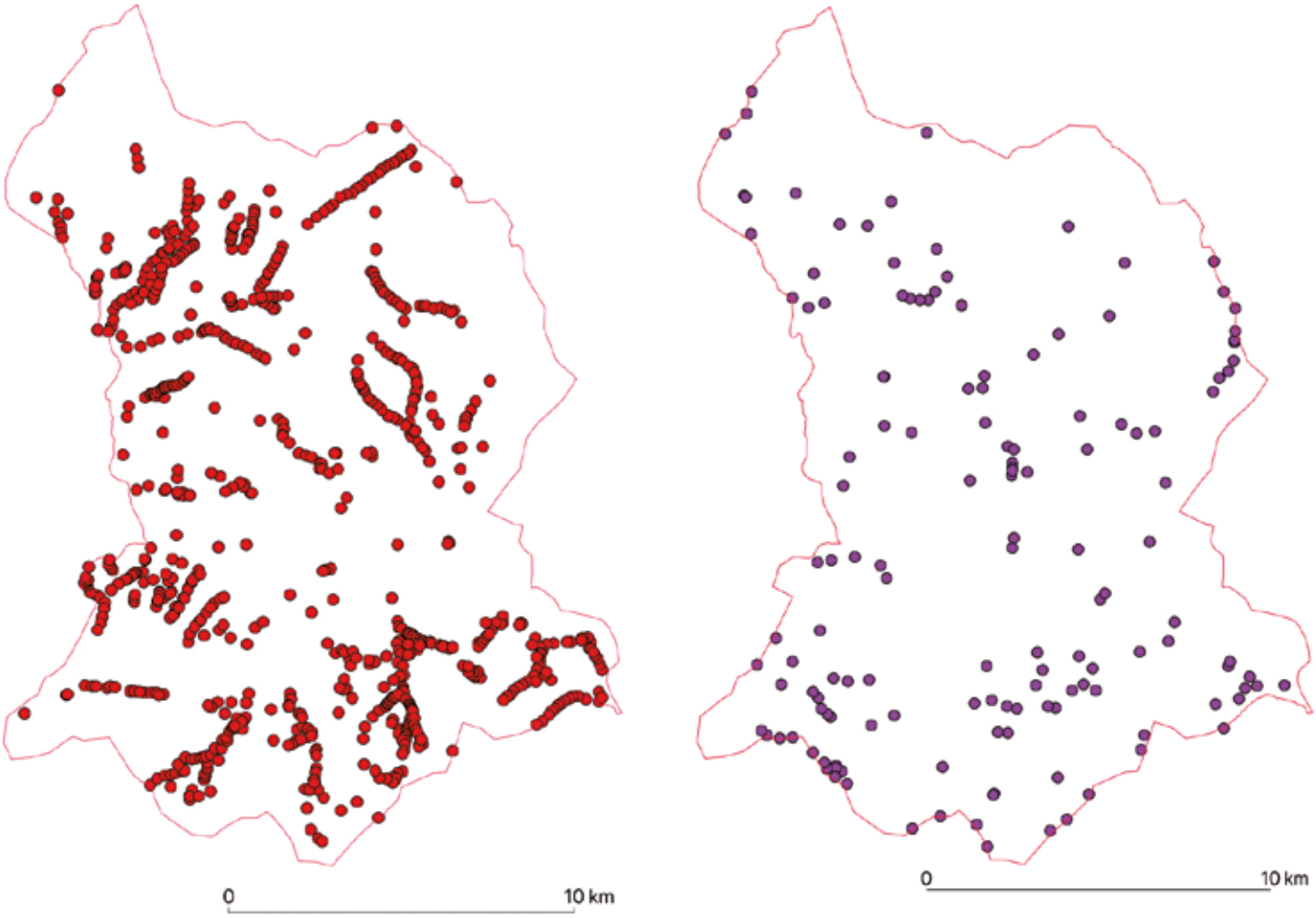


TABLE 3. Estimates of snaring and trapping intensity on Scottish grouse moors

	No. found[a]	Estimated % found	Estimated no.[b]	No. on 0.8 million ha[c]	Estimated no. on 0.8 million ha[d]	No. on 1.5 million ha[e]	Estimated no. on 1.5 million ha[f]
No. of snares	108	75%	144	2100	2900	4000	5300
No. of snares set[g]	41	75%	55	800	1100	1500	2000
No. of snare days/year[h]	15,000	75%	20,100	295,000	395,000	555,000	745,000
No. of stink pits	39	80%	49	800	1000	1400	1800
No. of rail traps	1051	95%	1106	21,000	22,000	39,000	41,000
No. of rail traps set[g]	727	95%	765	14,000	15,000	27,000	28,000
No. of rail trap/days year[h]	265,000	95%	280,000	5,250,000	5,525,000	9,850,000	10,360,000
No. of tunnel traps	369	65%	568	7300	11,200	13,700	21,100
No. of tunnel traps set[g]	187	65%	288	3700	5700	6900	10,700
No. of tunnel trap days/year[h]	68,300	65%	105,100	1,350,000	2,080,000	2,535,000	3,900,000
Total no. of spring traps	1420	-	1674	28,000	33,000	53,000	62,000
Total no. of spring traps set[g]	914	-	1053	18,000	21,000	34,000	39,000
Total no. of spring trap days/year[h]	335,000	-	385,000	6,600,000	7,600,000	12,400,000	14,300,000
No. of mammal cage traps	16	50%	32	320	630	590	1190
No. of mammal cage traps set[g]	2	50%	4	40	79	74	148
No. of mammal cage trap days/year[h]	730	50%	1460	14,450	28,900	27,100	54,200
No. of rabbit drop traps	156	50%	312	3100	6200	5800	11,600
No. of rabbit drop traps set[g]	10	50%	20	200	400	370	740
No. of rabbit drop trap days/year[h]	3650	50%	7300	72,250	144,500	135,500	271,000

[a] The number found on the seven estates surveyed i.e. an area of 40,419 ha

[b] Total number estimated to be present on the seven estates surveyed, corrected to allow for the proportion of each item that BT believed that he found

[c] The actual number found on the seven estates surveyed, extrapolated to 0.8 million ha of managed grouse moors in Scotland and rounded as appropriate

[d] The actual number estimated to be present on the seven estates surveyed, extrapolated to 0.8 million ha of managed grouse moors in Scotland and rounded as appropriate

[e] The actual number found on the seven estates surveyed, extrapolated to 1.5 million ha of managed grouse moors in Scotland and rounded as appropriate

[f] The actual number estimated to be present on the seven estates surveyed, extrapolated to 1.5 million ha of managed grouse moors in Scotland and rounded as appropriate

[g] The survey was spread across all seasons and so the proportion of snares or traps that were set on each survey day was taken to be representative of the annual pattern of use

[h] Estimate of the number of days per year that snares or each type of trap were set on the surveyed estates and extrapolated to 0.8 million ha or 1.5 million ha of managed grouse moors in Scotland, rounded as appropriate

NUMBER OF ANIMALS KILLED ON SCOTTISH GROUSE MOORS

Calculating the numbers of animals killed on Scottish moors managed for grouse shooting is problematic, not least because the continuous high levels of poisoning, shooting, snaring and trapping means that densities of resident predators are likely to be low (Whitfield *et al.,* 2003; Smart *et al.,* 2010; Porteus *et al.,* 2019; *https://www.gwct.org.uk/game/research/predation-control/fox-control-on-shooting-estates-how-good-is-it/*). In fact the number of estates with resident predators is declining: in 2011 89% of a sample of nearly a thousand gamekeepers in Britain reported the presence of stoats on their shoot, whereas this had declined to 84% in 2019; comparable figures for weasels were 83% and 74% (Anon., 2011, 2019b). The numbers and distribution of traps on the estates we surveyed suggest that there will be few resident small predators. It is hard to be sure what impact this has on capture rates, especially in areas where a number of contiguous estates are managed for grouse shooting. However, while many of the animals caught on heavily keepered estates are likely to be immigrants, very large numbers can be killed during periods of dispersal (Baker & Harris, 2005).

We estimated that the number of snare days/year on moors managed for grouse shooting in Scotland was between 295,000 and 745,000. There are no good data on snare capture rates on grouse moors. In lowland England, two wildlife biologists working for the Game Conservancy Trust (as it was then) caught 26 foxes in 940 snare days i.e. 36 snare days per fox (Defra, 2005). At that capture rate, between 8000 and 21,000 foxes would be caught each year in the 295,000 to 745,000 snare days/year on Scottish grouse moors.

In addition, even snares set by experienced operators catch roughly as many non-target species (badgers, deer, domestic animals, hares and, in Scotland, pine martens) as they do foxes (Defra, 2005; Anon., 2012b, Anon., 2016), so several thousand non-target species will also be caught each year on Scottish grouse moors. Even if some are released, many captured animals will be injured and unfit for release or will die in the snares (Defra, 2005; Anon., 2012b). Even animals released from snares may die later from pressure necrosis; this is not immediately apparent and so best practice is to observe every animal that has been caught in a snare (or other ligature) for at least seven days before release (Stocker, 2005).

To reduce the risk of injuries to non-target species, a Scottish Technical Assessment Group on Snaring proposed that the noose size should be increased by moving the position of the stop from the current 23 cm to 26 cm and that the number of swivels on a fox snare should be increased to two to reduce the risk of entanglement (SNH, 2017). Neither of these proposals had been implemented at the time of this survey.

BT found 71 dead animals in 1051 rail traps, many of which had been dead for some time i.e. at the time of the survey, 6.8% of the rail traps contained dead animals. This suggests that on any day the estimated 21,000 to 41,000 rail traps deployed on Scottish grouse moors would have displayed the remains of between 1400 and 2800 dead animals, of which 61% (roughly 850 to 1700) would have been target species and 39% (roughly 550 to 1100) would have been non-target species **(Figure 23)**.

FIGURE 23. Young rabbits caught in rail traps

FIGURE 24. Stoat recently caught in a rail trap enveloped with flood debris

There are limited data on spring trap capture rates, and the only data that are available are for traps set in tunnels, not on rails. In 1961, the Eley Game Advisory Station, a forerunner of the GWCT, reported that a test of the Fenn Mk III trap by one gamekeeper (25 traps set in tunnels for 100 days each) captured 130 animals (64 young rabbits, 27 rats, 25 weasels, 11 hedgehogs, two stoats and one grey squirrel) in 2500 trap nights i.e. 19.23 trap nights/capture (Bateman, 1971). A study of tunnel trap capture success on keepered estates in England recorded 621 captures in 43,998 trap nights between April and September (70.85 trap nights/capture) and 667 captures in 38,956 trap nights between October and March (58.40 trap nights/capture). Across the year, this was 1288 captures in 82,954 trap nights (64.41 trap nights/capture) (Short & Reynolds, 2001). Using the capture rate reported by Short & Reynolds (2001), our lower estimate of 5,250,000 rail trap days/year on Scottish grouse moors **(Table 3)** would catch 81,500 animals (49,700 target species, 31,800 non-target species), and 10,360,000 rail trap days/year (our upper estimate) would catch 160,800 animals (98,100 target species, 62,700 non-targeted species) **(Figure 24)**.

Applying the same capture rate to tunnel traps, 1,350,000 tunnel trap days/year (our lower estimate for Scottish grouse moors) would catch 21,000 animals and 3,900,000 tunnel trap days/year (our upper estimate) would catch 60,500 animals each year. While we have limited data on the species caught in tunnel traps, around half of the species of mammals that were caught were non-target species. For comparison, in 2012, 800 (predominantly lowland) estates from around the UK killed 61,000 target species (35,000 brown rats, 16,000 stoats and 10,000 weasels), the vast majority of which were trapped (*https://www.gwct.org.uk/policy/consultation-responses/implementation-of-aihts/evidence-gathering/*).

We could not estimate the numbers of animals caught in mammal cage traps (which we estimated were set on Scottish grouse moors for between 14,450 and 54,200 trap days/year) or rabbit drop traps (which we estimated were set on Scottish grouse moors for between 72,250 and 271,000 trap days/year).

Despite the limited data on capture rates in the Scottish uplands and on the long-term impact of high-intensity shooting, snaring and trapping on local populations of predators, our estimates of the total number of animals killed on Scottish grouse moors are realistic when compared to studies from elsewhere in Britain. Our calculations suggest that, at the time of the survey, 8000 to 21,000 foxes and an equal number of non-target species, were snared on Scottish grouse moors each year, 81,500 to 160,800 animals were killed in rail traps each year, of which 39% were non-target species, and 21,000 to 60,500 animals were killed in tunnel traps each year, i.e. between 120,000 and 260,000 animals were snared or trapped each year, nearly half of which would have been non-target species.

These estimates apply to an area of between 0.8 and 1.5 million hectares (10% to 19% of Scotland), so around 15 animals were snared and trapped per km^2 of Scottish grouse moor each year, nearly half of which would have been foxes, rats, stoats and weasels, and the other half would have been badgers, birds, rabbits and other non-target species. This estimate does not include the mammals that are shot or caught in live capture traps. These would have added significantly to the total.

Conclusions

i. We estimated that between 120,000 and 260,000 animals were snared or caught in spring traps each year on Scottish grouse moors, nearly half of which would have been non-target species i.e. around 15 animals/km2 were caught in snares and spring traps each year on Scottish grouse moors. This does not include animals caught in other types of trap or shot. The number of animals (both predators and other species) killed to support grouse shooting in Scotland is likely to have a significant environmental impact.

ii. There was a marked disconnect between the best practice guidelines produced by professional organisations that advise the shooting industry and current snaring and trapping practices we recorded on Scottish uplands managed for grouse shooting. For instance, 17% of fox snares found in this study were not tagged and 62% were *in situ* but not set. Of the traps we were able to examine, none of the rail traps, and at least 85% of the tunnel traps, did not conform to best practice guidelines disseminated by organisations advising the shooting industry.

iii. The first Spring Traps Approval Orders came into effect in 1958; during the subsequent six decades, millions of rats, stoats and weasels in Britain will have been caught in spring traps that have now been shown not to be humane for stoats. This is a significant welfare issue. The AIHTS welfare standards for stoats, or similar, should apply to all the species which it is legal to catch in spring traps in Scotland.

iv. There has been a marked increase in the use of rail traps over the last decade: we estimated that twice as many rail traps were deployed on Scottish grouse moors as tunnel traps. One of the arguments used in favour of rail traps is that, when set in a wire cage, they resist flooding. However, this allows debris washed downstream to foul the trap and affect its operating efficiency. Also, the mechanism becomes rusty if not checked regularly. Section 11B (3) (b) of the Wildlife and Natural Environment (Scotland) Act 2011 makes it clear that an operator commits an offence if s/he does not check a snare each day to ensure that it is free running. It is unclear why operators are not required to check spring traps each day to ensure that their operating efficiency has not been compromised, and that any animals that have been caught are dead. As for snares, it should also be a requirement for their bodies to be removed on inspection and disposed of appropriately.

v. Rail traps are not selective, and this is a consequence of how they are set, not the type of trap that is used i.e. the situation will remain the same with AIHTS-compliant traps. Utility/ease of use appears to override all other considerations. Even though rail traps have been in widespread use for a decade, with non-target captures frequent, the impacts of setting rail traps in wire cages has never been tested: experimental work to design suitable housing for rail traps to minimise the risk of catching small birds is long overdue.

vi. The advice issued by SASA (*http://www.sasa.gov.uk/document-library/predator-traps-instructions-uk*) is less comprehensive than the best practice guidelines issued by the GWCT and fails to address the key welfare issues identified in this report. For reasons that are unclear, there has been a diminution of the requirements specified by SASA in relation to the use of DOC traps. The advice issued in 2011 (*https://web.archive.org/web/20150924000354/http://www.sasa.gov.uk/wildlife-environment/wildlife-management*) contained detailed instructions on tunnel length, the minimum distance between the external excluder and the internal baffle, and the size of the mesh (20 mm) and holes in the external excluders (60 × 60 mm for DOC 150 and DOC 200 traps, 80 mm for DOC 250 traps). The current advice (*https://www.sasa.gov.uk/sites/default/files/UK%20Doc%20Trap%20instructions_1.pdf*) simply says that 'Tunnels must be 'suitable for the purpose' with respect to selectivity (exclusion of non-target species), convenience in operation and human safety. How this is done is left to [*sic*] discretion of the operator, allowing some flexibility over materials, dimensions, and tunnel size according to circumstances' … 'External excluders can be made of any suitable materials and may be of any configuration which practicably minimises the likelihood of it killing, taking or injuring non-target species, without unreasonably compromising the trap's use. …. If using weld mesh to make an external excluder, we suggest a 65 mm (2½ inch) wide x 80 mm (3⅛ inch) high aperture'. However, tunnel length and excluder size are critical features in reducing the number of non-target captures and the risk to protected species. All spring traps in Scotland should be set in a tunnel of a specified minimum length with an excluder no wider than 32.5 mm.

vii. Since this study was undertaken, a number of traps are no longer permitted to be used to catch stoats. The advice from professional organisations is that Fenn-type and BMI bodygrip traps can still be used for rats and weasels, but that trappers must reduce excluder apertures on any rails and tunnels that house these traps to minimise the risk of catching stoats. This is an unrealistic requirement given the overlap in size and weight between stoats and weasels and the

body size of rats. Under Section 11 of the Wildlife & Countryside Act 1981, as amended, 'a person shall be guilty of an offence if that person .... sets in position any trap or snare of such a nature and so placed as to be .... likely to cause bodily injury to any such wild animal'. Since stoats are widespread on Scottish grouse moors, it is inevitable that setting any trap that is not approved for use to catch stoats is both likely to catch a stoat and likely to cause bodily injury to the stoat. It is unclear why traps not approved for stoats can still be used for rats and weasels.

viii. The AIHTS requires that 'trappers are trained in the humane, safe and effective use of trapping methods, including new methods as these are developed' *(http://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:21998A0214(02)&from=EN)*. In Scotland, however, the AIHTS only applies to stoats. The same trapping and training standards should apply to all species caught, or likely to be caught, in spring traps.

ix. Stink pits ('fox middens') pollute the environment and have the potential to spread a variety of diseases to wild and domestic animals; stink pits were strongly implicated as a source of enzootic abortion of ewes in two previously accredited sheep flocks in Lanarkshire (Milne *et al*., 1997). The Scottish Parliament debated their use on 15 June 2017 (*http://www.parliament.scot/parliamentarybusiness/report.aspx?r=11007&i=100606#ScotParlOR*), but large numbers remain in use on Scottish grouse moors. Artificial lures can be used whenever it is necessary to snare foxes.

Summary

One of the outstanding features of this study is that many of the issues we have identified have been ongoing for some decades. The Scott Henderson committee concluded that 'the indiscriminate destruction of stoats and weasels, either deliberately or in traps set to catch rabbits, is to be deprecated. These animals should not be regarded as 'vermin" (Scott Henderson, 1951). Attitudes do not seem to have changed over the last 70 years.

This study has provided the first quantified assessment of the intensity of ground predator control. We found that failure to comply with codes of practice is widespread on Scottish grouse moors, and that the guidelines produced by professional organisations advising the shooting industry had little impact on trapping practices on Scottish grouse moors.

Although this study was undertaken before changes to the types of traps that can be used to catch stoats came into effect in Scotland on 1 April 2020, this does not affect our findings. The key issues we identified relate to how the traps are set and how often they are checked and maintained. Continuing to set any type of spring trap in wire mesh cages placed on rails will result in a substantial number of non-target captures, including large numbers of birds. The risk to non-target species is greatly increased by using an excluder with an aperture greater than 32.5 mm. Setting a trap too close to the excluder poses an additional risk to non-target species. Comprehensive regulations on how spring traps can be set in Scotland are long overdue.

While some traps have been tested to determine the time to unconsciousness and insensibility for stoats, it is not known if they meet the same standards for other target species. Also, allowing the continued use of traps to catch rats and weasels, but which are not approved for stoats, will ensure a continued high level of animal suffering.

In a defence of grouse shooting, the GWCT stated that red grouse shooting should be undertaken sustainably and in ways that improve biodiversity and ecosystem services (Sotherton *et al*., 2017). The ecological impact of killing large numbers of target and non-target species in Scottish upland ecosystems is unknown but is likely to be a major cost to conservation (Mustin *et al*., 2018). By any reasonable measure, the management of Scottish grouse moors cannot be considered environmentally sustainable.

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The authors

Professor Stephen Harris has had a lifetime's experience studying the ecology of carnivores in Britain (and elsewhere), and has published extensively on many aspects of predator management. He has also studied trapping practices in Britain and elsewhere, and has published numerous papers and reports on these issues. He analysed the data and took the lead in preparing the report.

Bruce Thain has worked on Scottish shooting estates for 20 years, and has extensive experience of game management practices. He collected all the data presented in this report and collaborated in the analyses and writing the report. Bruce Thain is a pseudonym that has been used to protect his identity.

References

Anon. (2011) *Gamekeepers and wildlife – the full survey report 2011. https://www.nationalgamekeepers.org.uk/media/178/gamekeepers-and-wildlife-full-report.pdf.*

Anon. (2012a) *The code of good shooting practice*. Rossett, Wrexham: British Association for Shooting & Conservation. *http://www.codeofgoodshootingpractice.org.uk/*.

Anon. (2012b) *Determining the extent of use and humaneness of snares in England and Wales*. Report to Defra on contract WM0315. *http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=14689*.

Anon. (2012c) *Snaring in Scotland – a practitioners guide*, fourth edition. *https://www2.gov.scot/Topics/Environment/Wildlife-Habitats/paw-scotland/Resources/Goodpracticeadvice/Snaringguide.*

Anon. (2016) Cruel and indiscriminate: why Scotland must become snare-free. Edinburgh: OneKind. *https://www.onekind.scot/resources/cruel-indiscriminate-why-scotland-must-become-snare-free/.*

Anon. (2019a) *Untold suffering – how thousands of animals are trapped, snared and killed to protect grouse shooting for sport*. Edinburgh: OneKind. *https://revive.scot/publication/untold-suffering-how-thousands-of-animals-are-trapped-snared-and-killed/.*

Anon. (2019b) *Gamekeepers: conservation and wildlife – a new survey. https://www.nationalgamekeepers.org.uk/articles/gamekeepers-and-wildlife-new-report.*

Armstrong H (2019) *A better way – how an alternative to grouse moors could help tackle climate change, increase biodiversity and benefit Scotland's people*. Edinburgh: The Revive Coalition. *https://revive.scot/publication/a-better-way-how-an-alternative-to-grouse-moors-could-help-tackle-climate-change-increase-biodiversity-and-benefit-scotlands-people/.*

Baker PJ & Harris S (2005) Does culling reduce fox *(Vulpes vulpes)* density in commercial forests in Wales, UK? *European Journal of Wildlife Research*, **52**, 99-108.

Baker SE, Ellwood SA, Tagarielli VL & Macdonald DW (2012) Mechanical performance of rat, mouse and mole spring traps, and possible implications for welfare performance. *PLoS One,* **7(6)**, e39334. *https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0039334.*

BASC (2013) *Trapping pest mammals – a code of practice*. Rossett, Wrexham: British Association for Shooting & Conservation.

Bateman JA (1971) *Animal traps and trapping*. Newton Abbot: David & Charles.

Bateman JA (1979) *Trapping: a practical guide*. Newton Abbot: David & Charles.

Campbell ST, Hartley FG & Fang Z (2016) *Assessing the nature and use of corvid cage traps in Scotland: Part 3 of 4 – trap operation and welfare*. Inverness: Scottish Natural Heritage Commissioned Report № 933.

Croose E (2016) *The distribution and status of the polecat* (Mustela putorius) *in Britain 2014-2015*. Ledbury, Herefordshire: Vincent Wildlife Trust.

Defra (2005) *Report of the independent working group on snares. http://archive.defra.gov.uk/wildlife-pets/wildlife/management/documents/snares-iwgs-report.pdf.*

Elliot A, Watt J, Cooke I & Tabor P (2014) *The land of Scotland and the common good – report of the Land Reform Review Group. https://www.gov.scot/publications/land-reform-review-group-final-report-land-scotland-common-good/.*

Etheridge B, Summers RW & Green RE (1997) The effects of illegal killing and destruction of nests by humans on the population dynamics of the hen harrier *Circus cyaneus* in Scotland. *Journal of Applied Ecology*, **34**, 1081-1105.

Fraser of Allander Institute (2010) *An economic study of grouse moors – an update*. Perth: Game & Wildlife Conservation Trust. *https://www.gwct.org.uk/media/350583/An-Economic-Study-of-Grouse-Moors.pdf*.

GWCT (2017) *The moorland balance – the science behind grouse shooting and moorland management*. Fordingbridge, Hampshire: Game & Wildlife Conservation Trust. *https://www.gwct.org.uk/news/news/2017/august/gwct-releases-a-new-and-comprehensive-guide-to-moorland-management-ahead-of-glorious-twelfth/*.

GWCT (2019) *The moorland balance – the science behind grouse shooting and moorland management*, second edition. Fordingbridge, Hampshire: Game & Wildlife Conservation Trust. *https://www.gwctshop.org.uk/products/the-moorland-balance-second-edition-ebook*.

Grant MC, Mallord J, Stephen L & Thompson PS (2012) *The costs and benefits of grouse moor management to biodiversity and aspects of the wider environment: a review*. Sandy, Bedfordshire: RSPB.

Harris S & Dorning J (2017) *Hunting with hounds and the spread of disease*. Godalming: League Against Cruel Sports.

Harris S & Yalden DW (2008) *Mammals of the British Isles: handbook, 4th edition*. Southampton: The Mammal Society.

Harrison A, Newey S, Gilbert L, Haydon DT & Thirgood S (2010) Culling wildlife hosts to control disease: mountain hares, red grouse and looping ill virus. *Journal of Applied Ecology*, **47**, 926-930.

Harrop SR (1998) The Agreements on International Humane Trapping Standards – background, critique and the texts. *Journal of International Wildlife Law and Policy*, **1**, 387-394. *https://doi.org/10.1080/13880299809353908*.

Hewson R (1984) Scavenging and predation upon sheep and lambs in west Scotland. *Journal of Applied Ecology*, **21**, 843-868.

King C (1984) *Immigrant killers: introduced predators and the conservation of birds in New Zealand*. Auckland, New Zealand: Oxford University Press.

King CM (2005) *The handbook of New Zealand mammals*, second edition. South Melbourne, Australia: Oxford University Press.

Knight M (2014) Bring out your dead. *Keeping the Balance*, **Spring 2014**, 46-47. *https://www.nationalgamekeepers.org.uk/media/91/Carcass%20Disposal.pdf*.

Lloyd HG (1963) Spring traps and their development. *Annals of Applied Biology*, **51**, 329-333.

Matthews K, Miller D, Mell V & Aalders I (2018) Socio-economic and biodiversity impacts of driven grouse moors in Scotland: Part 3. Use of GIS/remote sensing to identify areas of grouse moors, and to assess potential for alternative land uses. *https://sefari.scot/research/socioeconomic-and-biodiversity-impacts-of-driven-grouse-moors-in-scotland*.

Melling T, Thomas M, Price M & Roos S (2018) Raptor persecution in the Peak District National Park. *British Birds*, **111**, 275-290.

Milne EM, Windsor RS & Hosie BD (1997) Disease risk from 'fox middens'. *Veterinary Record*, **140**, 135-136.

Mustin K, Arroyo B, Beja P, Newey S, Irivine [*sic*] **RJ, Kestler J & Redpath SM** (2018) Consequences of game bird management for non-game species in Europe. *Journal of Applied Ecology*, **55**, 2285-2295.

National Animal Welfare Advisory Committee (2005) *NAWAC guideline 09: assessing the welfare performance of restraining and kill traps*. Wellington, New Zealand: Ministry of Agriculture and Forestry.

Newey S, Mustin K, Bryce R, Fielding D, Redpath S, Bunnefeld N, Daniel B & Irvine RJ (2016) Impact of management on avian communities in the Scottish highlands. *PLoS One*, **11(5)**, e0155473. *http://dx.doi.org/10.1371/journal.pone.0155473*.

Porteus TA, Reynolds JC & McAllister MK (2019) Population dynamics of foxes during restricted-area culling in Britain: advancing understanding through state-space modelling of culling records. *PLoS One*, **14(11)**, e0225201. *https://doi.org/10.1371/journal.pone.0225201.*

Scott Henderson J (1951) *Report of the committee on cruelty to wild animals*. London: HMSO.

Short MJ & Reynolds JC (2001) Physical exclusion of non-target species in tunnel-trapping of mammalian pests. *Biological Conservation*, **98**, 139-147. *https://doi.org/10.1016/S0006-3207(00)00148-8.*

Smart J, Amar A, Sim IMW, Etheridge B, Cameron D, Christie G & Wilson JD (2010) Illegal killing slows population recovery of a re-introduced raptor of high conservation concern – the red kite *Milvus milvus*. *Biological Conservation*, **143**, 1278-1286.

SNH (2017) *Review of snaring for Scottish government: prepared by SNH December 2016*. Edinburgh: the Scottish Government.

Sotherton N, Baines D & Aebischer NJ (2017) An alternative view of moorland management for red grouse *Lagopus lagopus scotica*. *Ibis*, **159**, 693-698. *https://doi.org/10.1111/ibi.12489.*

Stocker L (2005) *Practical wildlife care*, second edition. Oxford: Blackwell.

Tapper S (1999) *A question of balance*. Fordingbridge, Hampshire: the Game Conservancy Trust.

Thompson PS, Douglas DJT, Hoccom DG, Knott J, Roos S & Wilson JD (2016) Environmental impacts of high-output driven shooting of red grouse *Lagopus lagopus scotica*. *Ibis*, **158**, 446-452.

Tingay R & Wightman A (2018) *The case for reforming Scotland's driven grouse moors*. Edinburgh: The Revive Coalition. *https://revive.scot/publication/the-case-for-reforming-scotlands-driven-grouse-moors/.*

Warburton B & Hall JV (1995) Impact momentum and clamping force thresholds for developing standards for possum kill traps. *New Zealand Journal of Zoology*, **22**, 39-44.

Warburton B, Poutu N, Peters D & Waddington P (2008) Traps for killing stoats *(Mustela erminea)*: improving welfare performance. *Animal Welfare*, **17**, 111-116.

Watson A & Wilson JD (2018) Seven decades of mountain hare counts show severe declines where high-yield recreational game bird hunting is practised. *Journal of Applied Ecology*, **55**, 2663-2672.

Werritty A (2019) Grouse moor management review group: report to the Scottish Government. *https://www.gov.scot/publications/grouse-moor-management-group-report-scottish-government/.*

Whitfield DP, McLeod DRA, Watson J, Fielding AH & Haworth PF (2003) The association of grouse moor in Scotland with the illegal use of poisons to control predators. *Biological Conservation*, **114**, 157-163. *https://doi.org/10.1016/S0006-3207(03)00019-3.*

Wightman A & Tingay R (2015) The intensification of grouse moor management in Scotland. Glasgow: League Against Cruel Sports Scotland. *http://www.andywightman.com/docs/LACS_Grouse_Report_2015.pdf.*

Wright LJ, Newson SE & Noble DG (2014) The value of a random sampling design for annual monitoring of national populations of larger British terrestrial mammals. *European Journal of Wildlife Research*, **60**, 213-221.

Appendix

SNARING FOXES

The use of snares is legal in Scotland, although more strictly regulated than elsewhere in the UK. The main legislation is the Wildlife & Countryside Act 1981, as amended by the Nature Conservation (Scotland) Act 2004, the Wildlife and Natural Environment (Scotland) Act 2011 and the Humane Trapping Standards Regulations 2019 (although these last regulations post-date this survey).

Section 11 of the Wildlife & Countryside Act 1981 makes it an offence to:-

- Set in position or otherwise use any self-locking snare (or a snare of any other type specified in an order made by the Scottish Ministers)
- Set in position or otherwise use any other type of snare which is either of such a nature or so placed (or both) as to be calculated to cause unnecessary suffering to any animal coming into contact with it. Unstopped snares, drag snares and snares set where the captured animal is likely to become fully or partially suspended, or drown, are categorised in the Act as calculated to cause unnecessary suffering and are therefore illegal
- Use any trap or snare for the purpose of killing or taking or restraining any wild animal in Schedule 6 (including hedgehog, otter, pine marten, polecat, red squirrel and wild cat) or 6ZA (badger, beaver, otter, pine marten and stoat), or set in place any trap or snare of such a nature and so placed as to be likely to cause bodily injury to any of these wild animals

Additional measures in sections 11A to 11F of the Wildlife & Countryside Act 1981 provide that:-

- Anyone who sets a snare must complete a training course and obtain an identification number from the police, which must be shown on a tag fitted permanently to the snare. The tag must remain readable and must indicate whether the snare is intended to catch a brown hare, rabbit or fox
- Anyone who sets a snare must inspect it, or cause it to be inspected, at least once a day at intervals of no more than 24 hours
- The purposes of inspection are to see whether an animal is caught and to see whether the snare is free-running
- Any captured animal must be removed, whether alive or dead, and a snare that is no longer free-running must be removed or restored
- It is an offence to possess a snare or set a snare without authorisation from the owner or occupier of the land
- The identification number on the tag will be presumed to be that of the person who set the snare
- Records must be kept of the location of all snares set, both currently and over the previous two years with dates of setting and removal, and information about every animal captured; records must be produced within 21 days if requested by a constable
- The Scottish Government must produce a report on the operation of the snaring regime and lay it before the Scottish Parliament, every five years

Further details on identification tags and the information they must display is provided in the Snares (Identification Numbers and Tags) (Scotland) Order 2012, and on training requirements and providers in the Snares (Training) (Scotland) Order 2015, both made under the Act.

On a wider scale, under section 9 of the WCA it is an offence in Scotland to intentionally or recklessly kill, injure or take any wild animal in Schedule 5, including pine marten and red squirrel. Section 10A and Schedule 5A protect brown hares and mountain hares during their close seasons.

In terms of species protection, under the Conservation (Natural Habitats, &c.) Regulations 1994, as amended by the Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007, it is illegal to:-

- Deliberately or recklessly capture, injure or kill a wild animal of a European protected species, such as wild cat and otter (Regulation 39/Schedule 2)
- Use certain killing methods including 'traps which are non-selective according to their principle or their conditions of use' to take or kill protected animals including mountain hare, pine marten and polecat (Regulation 41/Schedule 3). SNH advised in 2017 that 'snaring a mountain hare does require a specific licence on the basis that it could be considered 'indiscriminate", "non-selective", or "capable of causing local disappearance or serious disturbance to a population" of mountain hares (Regulation 41 (2) (c) of the Habitats Regulations), and is therefore otherwise illegal unless licensed' (*https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2017/03/review-snaring-scottish-government-prepared-snh/documents/00515272-pdf/00515272-pdf/govscot%3Adocument/00515272.pdf*)
- Thus, during the period of the survey, the snaring of mountain hares was technically permissible, subject to a licensing requirement (Regulation 44), but SNH were no longer issuing licences on welfare grounds (*https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2017/03/review-snaring-scottish-government-prepared-snh/documents/00515272-pdf/00515272-pdf/govscot%3Adocument/00515272.pdf*)

Under the Snares (Training) (Scotland) Order 2015, which succeeds two previous Orders, the following bodies are approved to provide accredited snare training: Borders College, British Association for Shooting and Conservation Limited, Countryside Alliance, Game and Wildlife Conservation Trading Limited, The Board of Management of The North Highland College, Scottish Association for Country Sports, Scottish Gamekeepers Association Charitable Trust and Scotland's Rural College. The order includes a list of basic competences to be achieved through training, including having a reasonable expectation that the setting of the snare is an appropriate method of 'predator control' - an usual reference in light of the fact that snares are set for rabbits and hares as well as foxes. *Snaring in Scotland – a practitioners' guide*, fourth edition (Anon., 2012c), provides guidelines drawn up by GWCT, BASC and SGA and approved by other countryside organisations in Scotland. The guide summarises the legislation to 2012 and makes the following points:-

- Fox snares should not be set where there is evidence of regular use by non-target species
- Snares should be held over the selected run by loose attachment to one or more supports known as tealers which are placed firmly in the ground
- Snares not being checked daily should be uplifted to remove any risk of accidental capture or malicious use
- If a protected species is found dead or has to be humanely dispatched the local WCO should be informed

LETHAL TRAPS FOR MAMMALS

The Spring Traps Approval (Scotland) Order 2011 was in effect at the start of this survey and specified the types of spring traps that could be used in Scotland, the target species for each type of trap, and how each trap could be set. The key requirements for using spring traps, as far as this study is concerned, were:-

- The spring traps approved for use to catch rats, stoats and weasels (the species most likely to be targeted by gamekeepers on grouse moors) at the time of the survey typically 'must be set in a natural or artificial tunnel which is suitable for minimising the chances of capturing, killing or injuring non-target species whilst not compromising the killing or taking of target species'
- Some types of spring traps, such as those manufactured by the Department of Conservation, Wellington, New Zealand, can only be set in an artificial tunnel built to the Department of Conservation's design specifications as set out in their trap use instructions published on SASA's website on 7th November 2011
- The Spring Traps Approval (Scotland) Amendment Order 2018 removed the Fenn Mk I, Mk II and Mk III, Imbra, Juby, Lloyd and Sawyer traps from the approved list as from 3 January 2019
- The Spring Traps Approval (Scotland) Amendment Order 2018 updated the conditions for the use of some of the approved traps made by the Department of Conservation, Wellington, New Zealand as from 3 January 2019
- The Spring Traps Approval (Scotland) Amendment Order 2018 prohibited the use of a further eleven types of traps for catching stoats as from 1 April 2020

LIVE CAPTURE TRAPS FOR MAMMALS

A live capture (cage) trap is open at one or both ends and is triggered by a pressure treadle or by pulling on a bait attached to a hook or similar mechanism. These traps are single-capture, usually made from some sort of weld-mesh (although solid-sided traps can also be used), and are designed to catch and hold species such as foxes, grey squirrels, mink, rabbits and rats: they may be commercially made or made by the gamekeeper (*https://www2.gov.scot/Topics/Environment/Wildlife-Habitats/paw-scotland/types-of-crime/Trappingsnaring/Livecapturetraps*).

There are few specific regulations on the use of cage traps. The Wildlife & Countryside Act 1981, for instance, places no legal requirement on the frequency with which live capture traps should be inspected. However, the Animal Health and Welfare (Scotland) Act 2006 places a duty of care on anyone who sets a live capture trap; it is an offence if 'an act of his, or a failure of his to act, causes a protected animal to suffer unnecessarily'. The Chartered Institute of Environmental Health produced a Code of practice for the use of vertebrate traps (*https://www.pestmagazine.co.uk/media/231920/cieh-code-of-practice-for-use-of-vertebrate-traps-sep-2014.pdf*): this includes the following recommendations:-

- The Animal Health and Welfare (Scotland) Act 2006 requires that an operator must consider providing captured animals with food, water or shelter where the period of time they are in the trap exceeds that of any relevant licence conditions or guidelines
- It is the responsibility of the trap operator to ensure that all animal welfare legislation is adhered to when such animals are caught and held in live capture traps
- Cage traps should be inspected at periods which take account of the target species' patterns of activity, factors which may increase the stress of being captured, the reaction of the animal when caught, and the likelihood of inflicting injury on itself by trying to escape. For rural foxes, the recommendation (based on guidelines issued by the Universities Federation for Animal Welfare) is that traps are inspected daily, within a few hours following dawn

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