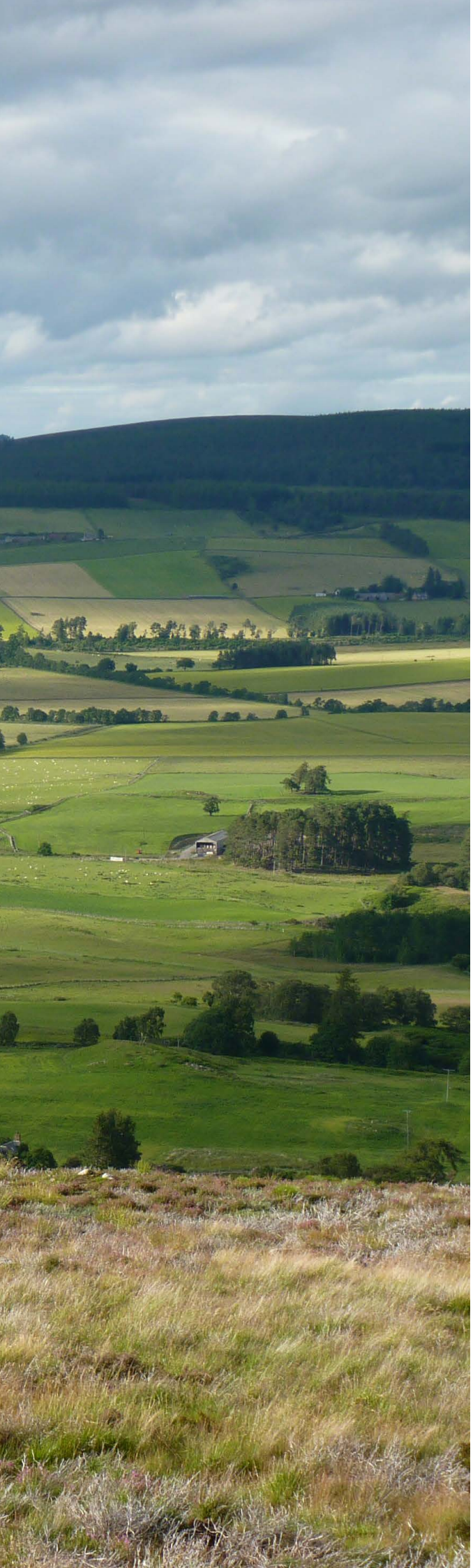
# Auchnerran Report 2019

The Game & Wildlife Scottish Demonstration Farm


Game & Wildlife CONSERVATION TRUST Scotland

www.gwct.org.uk



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## Acknowledgements

We are extremely lucky at Auchnerran to have enjoyed the support of a number of people and organisations. Just a few are listed here.

*Andrew Salvesen, the Allerton Project Steering Committee, The MacRobert Trust, EU LIFE+ programme, SongBird Survival, Working for Waders, Rory Cooper, John Riley and Alison Espie.*

# Foreword

## David Noble
Scottish Chairman

The success of the Allerton Project at the Trust's largely arable demonstration farm at Loddington in Leicestershire has shown the value of research and demonstration for game and wildlife conservation when delivered from a working farm. So, it has long been an ambition of the Trust to acquire a hill edge farm in Scotland. The operation of such a predominantly grass and hill farm would expand the Trust's ability to research and to demonstrate farming and conservation in a Scottish context. Its purpose would be to explore and to demonstrate how a livestock farm could be run profitably while showing how a carefully managed shoot could also improve the conservation of the wildlife already present and expand the diversity of that wildlife.

At the Game & Wildlife Scottish Demonstration Farm at Auchnerran, the Trust has found just such a farm and profound thanks are due to the wonderfully generous support of our landlord in helping to create the right conditions and infrastructure to make a start possible. It is now, after the first five years under the Trust's tenancy, that it can make its first report.

*David Noble, Scottish Chairman.*

From the start, Auchnerran has operated as a working farm, striving to make a profit and operating under the same financial conditions as any other upland farm in Scotland.

The farm has already shown its value as a way of demonstrating the challenges of hill edge farming in the context of wildlife conservation, particularly for waders as they suffer serious general declines. It has also shown how a small wild bird shoot can have its place in such a farm and can deliver benefits for biodiversity. Early work concentrated on benchmarking **'what we have'** and more recently on beginning to measure the effects of differing farm and shoot activities.

I commend and thank the hard work and generosity of so many people: our landlord, the Trust's directors, staff, annual students, Trust members and the many generous donors who have together succeeded in bringing this project to the starting blocks and in delivering the first five years of farming, study and demonstration. While early results are welcome, this is long-term work and we will need their continuing support if we are to succeed in the longer term. We have a great opportunity to learn so much at Auchnerran over the years to come but we must be patient.

David Noble

# Introduction

**Dave Parish,** Head of Scottish Lowland Research

Welcome to the first annual report for the Game & Wildlife Scottish Demonstration Farm, Auchnerran. This is a special edition not only because it is our inaugural issue but because it also summarises much of our work over the last five years, since the GWCT took on the tenancy in November 2014, with **'boots on the ground'** in 2015. Here you will find summaries covering the farm, shoot, our demonstration events and our research programme.

In 2014, the farm was purchased by the Trust's then Scottish Chairman, Andrew Salvesen, who was keen

> "Auchnerran is a real farm, not a nature reserve. It is important to note that the farm is a stand-alone operation"

to provide GWCT Scotland with a farm for research, conservation and demonstration. Thanks to Mr Salvesen's generosity, GWCT was offered the tenancy on the farm at a peppercorn rent. At this time, the farm was in a relatively poor state, with dilapidated fencing, very low soil pH with consequent poor grass quality, overgrazing and a sheep flock with numerous health and behavioural problems. More on this later. The farm was also keepered as it falls within the managed zone bordering the neighbouring grouse moor.

From the outset it has been a priority for the Auchnerran team to run the farm as a viable enterprise so that other farmers visiting or reading our reports would be reassured that they could implement any environmental measures we may develop on their farms too, without fear of compromising their bottom line. Auchnerran is a real farm, not a nature reserve. It is important to note that the farm is a stand-alone operation: it receives no additional financial support from the GWCT and in all ways is run just as any other farm in Scotland. Our research and monitoring work, and demonstration events, are funded separately from charitable donations and EU funds. Alongside a profitable farm we also aim to produce game and other wildlife so that we can run a small, wild game shoot (i.e. no releasing of captive-reared gamebirds) and look after the local wildlife.

The farm provides us with many opportunities to inform land managers and policy makers in Scotland. The Allerton Project at Loddington has had tremendous success in this regard and we hope to emulate that at Auchnerran. In particular, we hope to improve options in Scottish agri-environment schemes for grass-dominated farms, which are under-represented in the current scheme. Of course, any influence we may hope to have in future will stem from our science and to that end we are continually revising our research programme at the farm to provide the facts needed to do so. The following pages will provide more detailed, up to date information on what we do. We hope you enjoy it and if you have any questions or comments, or would like to visit the farm to see it for yourself, please do get in touch.

# The Farm

**Allan Wright,** Farm Manager
**Dave Parish,** Head of Scottish Lowland Research

Auchnerran is a grass-dominated hill-edge farm in eastern Aberdeenshire (FIGURE 1). The climate is reasonably harsh despite the farm sitting at about 180-280 m above sea level. Winters so far have been cold with periods of snow and a frequent cold wind coming off the Cairngorm mountains, which we adjoin. The soils are naturally acidic and dominated by sandy glacial deposits which means water drains quickly, even after heavy rain. This can also mean the ground can dry out in the summer if there is infrequent rain, as was the case in 2018 for example. The weather and soil can make farming here challenging.

The main body of the farm extends to 417 ha, around 70% of which is grass with the remainder comprising woods, fodder crops and game cover. The principal commodity on the farm is the sheep flock. This we inherited from the previous owner when it comprised many old, unproductive ewes in poor health, the result of little investment in the farm for some years previously. Now, thanks to the farm manager's efforts, all the ewes are no older than four years and the flock is far more productive, as illustrated by the lambing percentage in TABLE 1.

Lambing takes place out in the fields at Auchnerran in May, but shortly afterwards in early June, most of the flock are taken onto the adjoining hill to graze, which stretches to around 5,000 ha. They remain here until late autumn when the weather starts to worsen. The sheep benefit from this access to fresh summer grazing, but they also play an important role in maintaining the moorland habitat and controlling tick burdens on red grouse chicks, as the Auchnerran flock is managed as a **'tick mop'**. The sheep are dosed every 6-8 weeks with a pour-on acaricide which kills any tick that attach to them. When there are enough sheep on the hill to attract and kill sufficient tick in this way, research has shown that tick burdens on grouse chicks remain low, which in turn reduces the transmission rate of the Louping Ill virus that ticks carry and which can be fatal to grouse chicks and sheep. In this instance that means around 1,500 ewes plus their followers are required on the moor – not an insignificant number. Table 1 clearly shows that we are not at that number and indeed flock size has been declining since we took over as

we have weeded out the old and barren ewes. We have now turned the corner and predict we will hit the target flock size in 2021 if not sooner.

Whilst the flock are grazing on the hill, some of the land on the farm is dedicated to growing silage and brassicas (neeps and kale) to supplement grazing through the winter. Silage production reflects the weather conditions on the farm during the growing season as well as the underlying fertility of the soil. The latter was relatively poor when we took over, with very low soil pHs reflecting a lack of recent liming. We have slowly been liming soils where needed and reseeding some fields, which has resulted in higher yields of silage (TABLE 1) with a higher dry-matter and protein content, making it nutritionally superior for the sheep.

The flock return from the hill around early November, which has proven to be a particularly challenging period of the year. The large number of sheep and the lack of space and quality forage available for them, resulted in some health issues in the first few winters. This is now largely resolved with the improvements to grass quality and winter forage described above, but we cannot be complacent as the flock size will increase sharply over the next year or two. Most of the sheep stay on the farm in winter, but in another effort to reduce grazing pressure at Auchnerran, some spend part of their time on around 50 ha of land shared with the neighbour that we only use in winter, whilst others are away-wintered. The latter is where the sheep are taken to a completely different farm for the winter period. This was done for the first time in 2018/19 – actually to land owned by President Trump – and has been repeated this winter with just shy of 600 ewe-lambs making the journey across Aberdeenshire.

This year was Auchnerran's first in the Agri-environment and Climate Scheme (AECS), which offers payments in return for implementing environmental measures. This has allowed us to make significant progress with our replacement fencing so that we can better control the movement of sheep and grazing pressure in various areas. This in turn has made available a further 70 ha or so of grazing and puts the farm in very good shape going forward. One of the key AECS prescriptions chosen is **'wader grazed grassland'** (reduced stocking density to protect nests and chicks) which applies to 55 ha of pasture, reflecting the importance of Auchnerran for breeding waders. Other prescriptions we have put in place on the farm include **'wild bird seed for farmland birds'** (providing winter seed-food and shelter), 'forage brassica crops for farmland birds' (similar, but providing invertebrate food and shelter), **'water margins in grassland fields'** (protecting waterways from run-off) and some new-planted hedges. The latter consist of a mix of species, including goat willow, hawthorn and dog rose, to provide a wealth of resources for wildlife through the year.

FIGURE 1

Map of north-east Scotland showing the approximate location of Auchnerran.

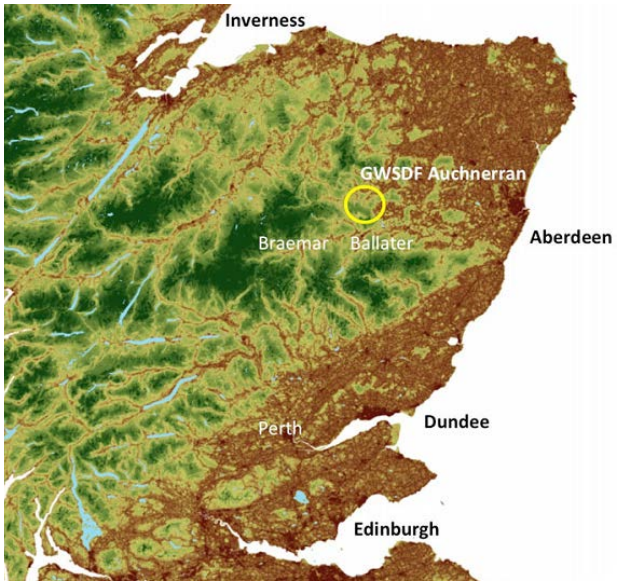



TABLE 1

Flock size and productivity (percent lambs reaching weaning age) at Auchnerran, along with annual silage production.

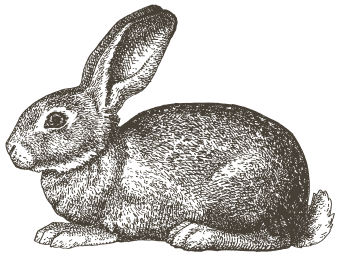
**Projected ewe numbers for 2020/21.*

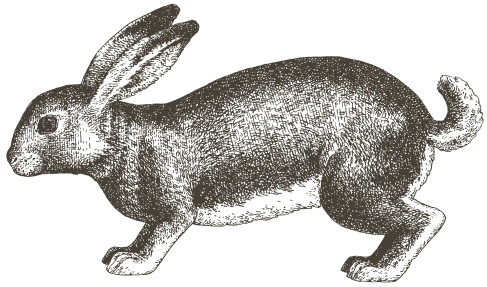
| | EWES | % LAMBS WEANED |
|---|---|---|
| 2015 | 1,440 | 60 |
| 2016 | 1,205 | 97 |
| 2017 | 1,126 | 120 |
| 2018 | 1,000 | 126 |
| 2019 | 986 | 124 |
| 2020 | 1,260* | - |
| 2021 | 1,500* | - |
| | SILAGE BALES | PER HECTARE |
| 2015 | 730 | 17 |
| 2016 | 717 | 20 |
| 2017 | 1,100 | 25 |
| 2018 | 460 | 12 |
| 2019 | 986 | 23 |

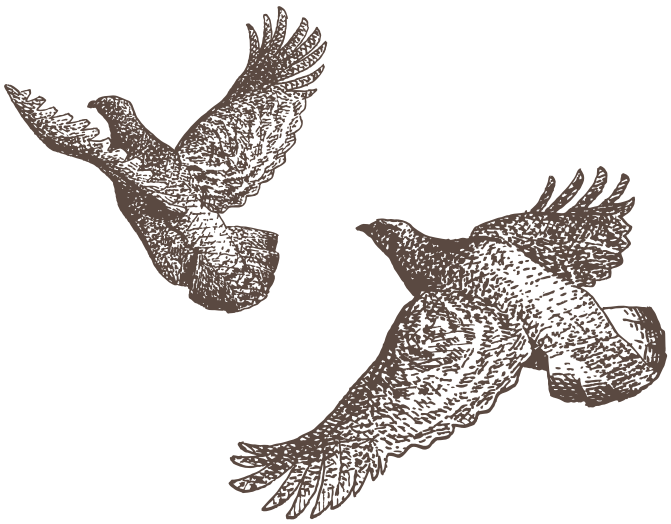
# The shoot

**Merlin Becker,** Trainee Advisor
**Dave Parish,** Head of Scottish Lowland Research

An important component of the ethos at Auchnerran has always been to show how a small, wild shoot can fit alongside an economical hill-edge farm, and how it contributes to the conservation of biodiversity. In 2014, we inherited a large population of pheasants from the previous commercial shoot, which have formed the kernel of a modest wild population now. Another species present, in great abundance, is the rabbit which is a serious pest on the farm and makes up a significant part of the bag at Auchnerran. We currently host a dozen or so rabbit days per year, including ferreting, in addition to several mixed-species days. Other species on the quarry list include woodpigeon and woodcock, though few of the latter are shot due to the challenging shooting conditions over truly wild Scottish terrain. Importantly, we have a monitoring programme in place for woodcock to ensure we are unlikely to shoot too many of the resident birds that breed on the farm, following GWCT published guidelines.







A vital part of any shoot is appropriate habitat management. We are lucky at Auchnerran that we have extensive patches of scrub and unimproved pasture which provide some food and cover for game and other wildlife. Auchnerran also has game crops providing food and cover during the winter. Establishing them, however, proved to be a challenge initially because of the huge number of rabbits grazing them and the nutrient-poor, highly acidic soils we inherited. After a lot of hard work by the team through 2017 and 2018 erecting rabbit fencing and applying lime and organic matter, we now have six game crop plots covering 5.6 ha. Our early attempts to establish game cover focused on the hardy **'Highland mix'** produced by Kings Crops, who have provided much needed expert advice and support throughout (see box below). This is a mix of cereals and linseed which performed well given the circumstances and provided valuable feed and cover to both our resident pheasants and many songbirds over winter. Now the protection afforded by the rabbit fencing, plus the improvements made to soil quality, have meant the crops have flourished and this year we tried the Kings Alba mix which includes triticale, barley, fodder radish, Kings kale rape, brown mustard, utopia and phacelia. The much-needed brassicas in this mix have established well and should reap rewards as hardy winter cover and food into 2020 for the first time.

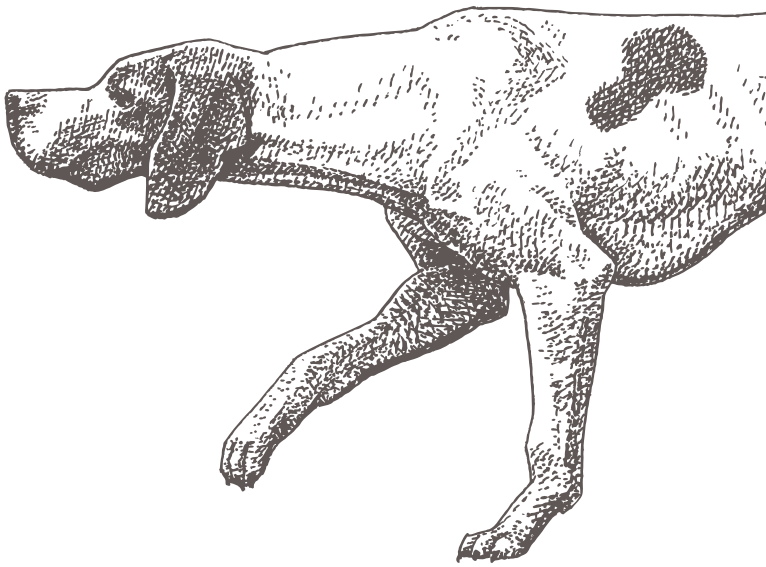
**Alan Johnson**
Scotland Technical Advisor, Kings Crops

"Between the high rabbit population and the results from the soil samples following my first visit to Auchnerran, I knew it was going to be a challenge to establish wild bird seed mixtures in such conditions. I give huge credit to the team at Auchnerran who took the advice given and put it straight into action; rabbit fencing the plots and annually applying lime and muck to stabilise the soil conditions.

In terms of crop to suit the situation, our Highland Mix was my first choice due to its high percentage of cereals which are more tolerant to a lower pH than brassicas. Also, because the plots had been cropped in the same area over many years, there was a good chance that there was going to be a high weed burden. Our Highland Mix has been designed so that a post emergence herbicide can be applied to control broad leaf weeds and, after finding that fat hen was quite problematic in the plots, it proved to be the right option."

Also key to the success of our wild shoot is predation management. We are lucky that Auchnerran falls under the care of the Dinnet moor gamekeepers who manage the adjacent grouse moor. One of the team is responsible for predation management on the farm which falls within a managed buffer zone around the moor itself. This has been the case for many years and is no doubt one of the contributing factors to the abundance and diversity of wildlife we enjoy on the farm. To quantify the effort involved in this and record the impact on the common, generalist predators targeted, we monitor the relevant species and work with the gamekeepers' to record their activities.

The feedback from guns who have shot on the farm has been hugely positive, with everyone enjoying the fantastic atmosphere and sport that Auchnerran has to offer. The 2019/20 season hosted 10 fast-paced rabbit days and three mixed species days, with our infamous **'five B'** hot-pot rabbit stew and local refreshments, to ensure all our guests are kept warm and watered.



# Demonstration events

**Merlin Becker,** Trainee Advisor, Scotland
**Ross MacLeod,** Head of Policy Scotland
**Dave Parish,** Head of Scottish Lowland Research

Auchnerran is ultimately a demonstration farm, where we hope to show other land managers and users' ways of incorporating game and wildlife management into grassland farming. Demonstration is crucial in our efforts to improve knowledge transfer to different groups and in trying to persuade policy makers and influencers of the need to alter agri-environment policy and the like. There really is no better way to get a point across than to show an audience something in action on the ground.

Since 2015 we have hosted a variety of people and organisations at Auchnerran, including farmers and landowners, NGOs and policy influencers, statutory bodies and MPs/MSPs, and research organisations. In 2019, we hosted a total of 172 individuals from 52 different organisations. This list included representatives from Scottish Government, Scottish Natural Heritage and the James Hutton Institute.

The highlight for the year was the visit from Lewis MacDonald; MSP and the Scottish Government's Curlew Species Champion. The curlew is a priority species for conservation nationally because of well-publicised declines and we are conducting research into their breeding productivity and movements at Auchnerran (and elsewhere in the Trust) and hope to contribute to the recovery of this species in the future. The farm also hosted several visits for long-standing members and supporters of the GWCT. The financial progress of the farm, our work on natural capital, farmer clusters and pragmatic adaptive management licenses across Scotland were discussed in detail.

*From left: Dave Parish GWCT Head of Scottish Lowland Research, Merlin Becker GWCT Trainee Advisor Scotland, Ross MacLeod GWCT Head of Policy Scotland, Lewis MacDonald MSP and Scottish Government's species champion for the curlew, Chris Hockley CEO of the MacRobert Trust, David Noble Chairman GWCT Scotland. © Merlin Becker*

*Opposite: Adult curlew on moorland in Yorkshire during the breeding season.*

# Research and monitoring

**Dave Parish,** Head of Scottish Lowland Research
**Marlies Nicolai,** Research Assistant

An important part of the research programme at Auchnerran is our annual monitoring. This focuses on key groups which help illustrate the state of biodiversity on the farm. In addition to this we also have projects which explore some issues in more detail.

## Annual monitoring

A very important part of our initial work programme at Auchnerran was the baseline monitoring in 2015 and 2016. This showed the diversity, and for some groups the abundance, of wildlife on the farm before any major management changes. The team monitored a wide array of wildlife including a number of invertebrate groups, game, breeding and wintering birds, various mammals and some reptiles. This was a mammoth effort and quickly highlighted the wealth of biodiversity present – no doubt arising from the years of low-intensity farming and predation control on the farm. This also suggested where future monitoring should be focused and the following section of this report concentrates on some of these key groups. This ongoing monitoring is important in advising farm management, as it allows us to identify and respond to any effects, both positive and negative, that practices may have on biodiversity.

### *Breeding birds*

Every spring and summer we count all birds using our fields and adjoining habitats. Trends in the **'Scottish Terrestrial Breeding Birds (Farmland) Index'**, which comprises 27 farmland bird species, are used by the Scottish Government as one of its broad measures of the health of the countryside so we summarise our data for the same species. The 2019 counts suggest quite a significant fall in abundance, with a 63% drop overall between 2018 and 2019, and 15 of the 27 species showing a decline. As a check on the reliability of this result, we can look at our thrush survey data, collected via a different methodology in a different habitat (woodland and scrub instead of farm fields). This is summarised in FIGURE 2.

The thrush data show a similar pattern to that from the Index data, with each species down on 2018 to some degree. Another group we monitor in more detail than most is the suite of breeding waders that Auchnerran supports. Counts of these species are illustrated in FIGURE 3. This suggests that these may be declining too with the exception of woodcock which seem to be reasonably stable (and which are again assessed via a different method to the majority of species).

So, these various survey results suggest some of the bird populations at Auchnerran are starting to show signs of decline. Despite the generality of this pattern, it may still just be a **'blip'** and might reflect local conditions in 2018/19. The result may be due to poor weather: 2018 was very dry and 2019 had some prolonged cold, wet periods (which may have impacted bird activity levels and therefore numbers seen). Of course, it might also be a response to the changes we have begun making on the farm, which would not be surprising as we know that farmland birds declined nationally when agricultural practices changed and we are making the same sort of changes. There is further evidence that this might be the case from our more detailed wader studies. We will watch carefully next year to see what happens.

*Song thrush. © Ian Preston*

FIGURE 2

Thrush abundance (maximum count across repeat surveys through the early spring) at Auchnerran from 2017 to 2019, from scrub/woodland counts.

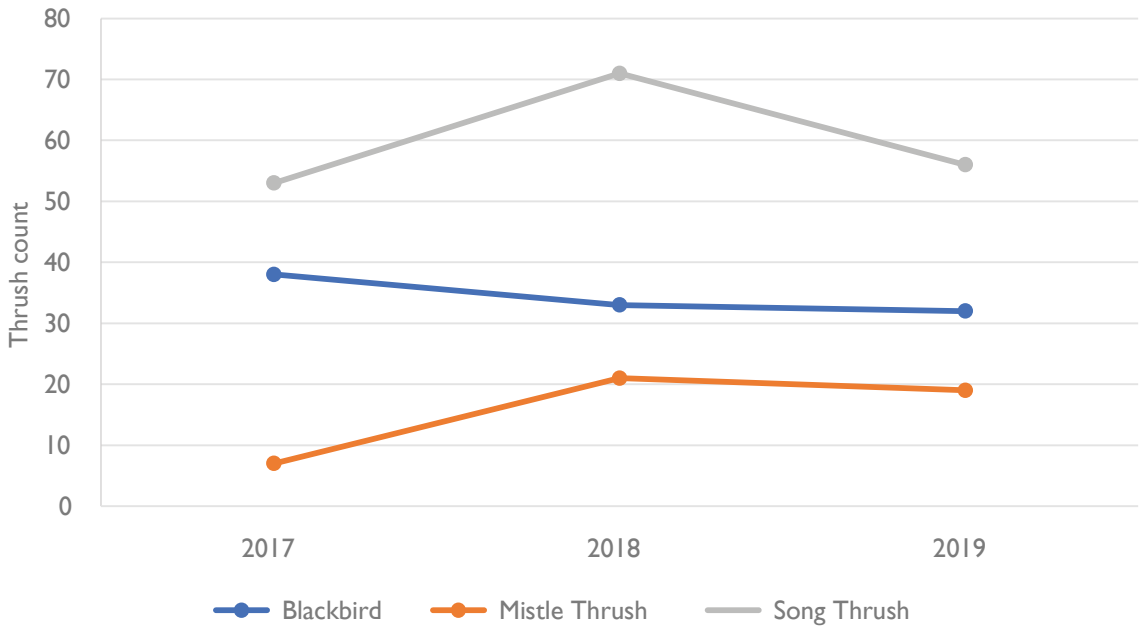
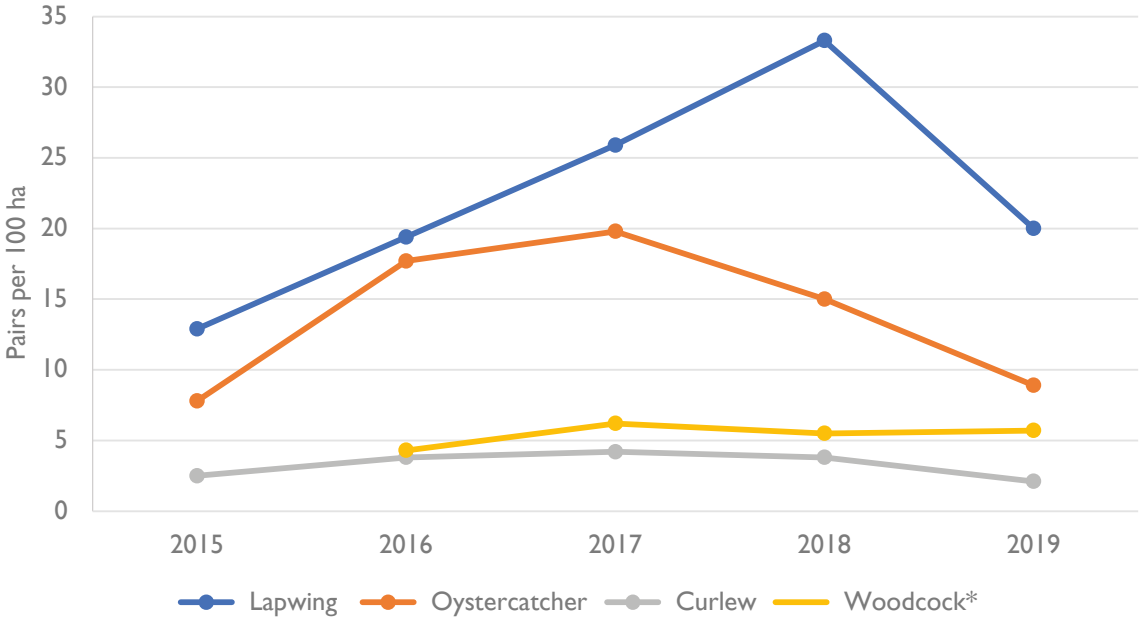



FIGURE 3

Trends in breeding wader abundance at Auchnerran from 2015 to 2019.
*Woodcock abundance assessed via roding-male surveys.
Other waders from modified breeding bird surveys.



*Male pheasant. © Mark Medcalf*

## *Game*

In contrast to some of our birds, brown hare numbers were up nearly 50% in 2019 relative to 2018. This is from the breeding bird surveys when we count hares as well. This is supported by our game surveys, which employ a different method and suggest that spring hare densities almost doubled between 2018 and 2019.

The autumn pheasant counts in FIGURE 4 highlight the change from high densities of leftover released birds in 2015, to our modest wild population today (a pattern mirrored in spring). The current birds are far harder to spot than their released relatives, as they stick to cover and are rarely seen in our grass fields. To address this, the team conduct **'flush counts'** in autumn where dogs and handlers walk through the game cover to flush otherwise hidden game. This revealed significant numbers of birds with the game cover holding up to about 60% of pheasants counted on the farm in autumn.

## *Rabbits*

Another species that was abundant when we took on the farm, and which makes a significant contribution to our fledgling farm shoot, is the rabbit. A firm of pest controllers consulted in our first year estimated the population at about 20,000 and our own survey in 2018 which mapped all rabbit warrens greater than 5 m by 5 m (FIGURE 5), revealed that warrens covered 11% of the survey area! This was cause for concern as they were eating, and perhaps spoiling, a large volume of grass that was then unavailable to the sheep. An attempt to reduce numbers began in 2018 when the farm team began shooting at night, with the addition of drop-boxes incorporated into some fencelines in 2018/19. Our rabbit monitoring in early spring and autumn, via spotlight counts at night, suggests this may have helped reduce numbers (FIGURE 6 overleaf).

Time will tell if this is a true drop in the population. If so, it will be interesting to see how some of the predatory species on the farm, such as buzzards and pine marten, respond and whether we record higher predation rates on other groups as a result.

FIGURE 4

Autumn pheasant densities at Auchnerran, 2015 to 2019. **'Field'** counts were conducted from a vehicle; **'game cover'** counts involved walking game crops with dogs to flush birds. The density of birds in the game cover is far greater than in the fields, as the game crops occupy a relatively tiny space compared to pastures but support similar numbers of pheasants.

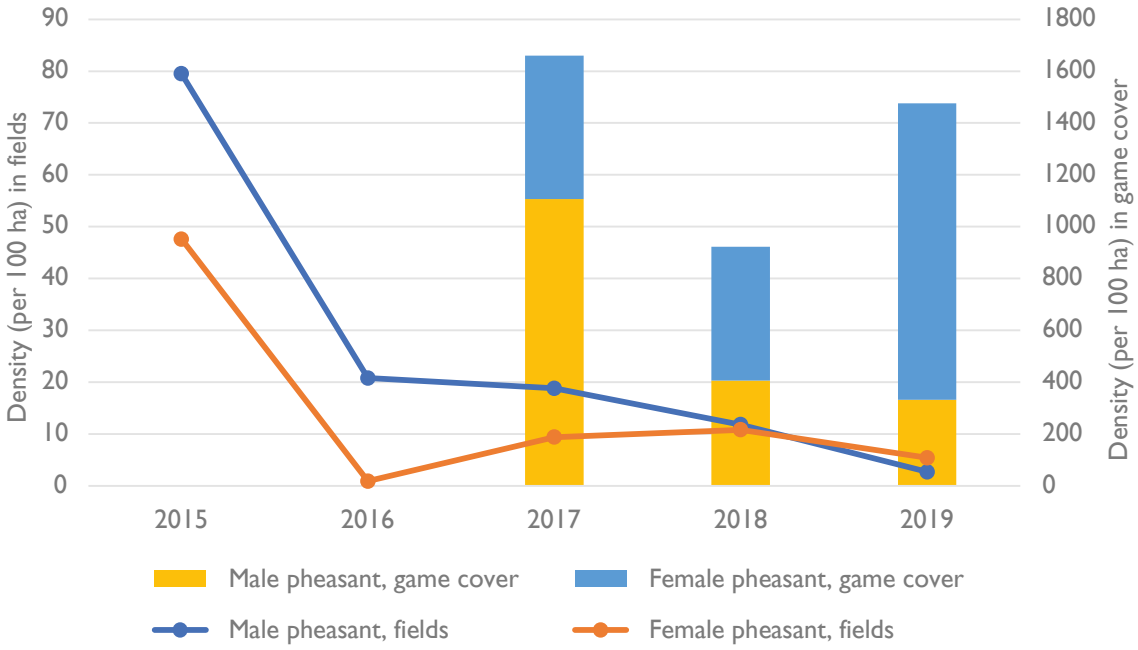



FIGURE 5

Map of rabbit warrens larger than 25 $m^2$ at Auchnerran in 2018.

*Rabbit snacking on our kale and neep field! © Marlies Nicolai*

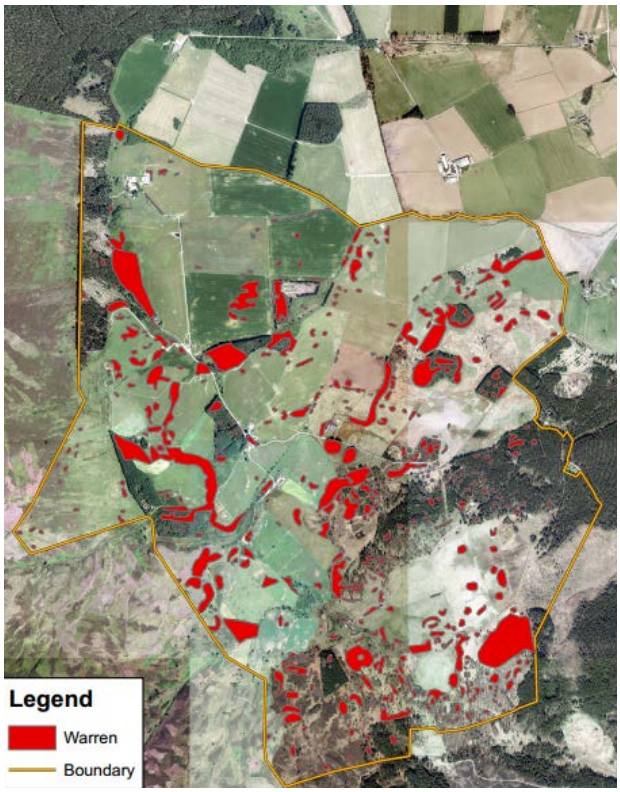
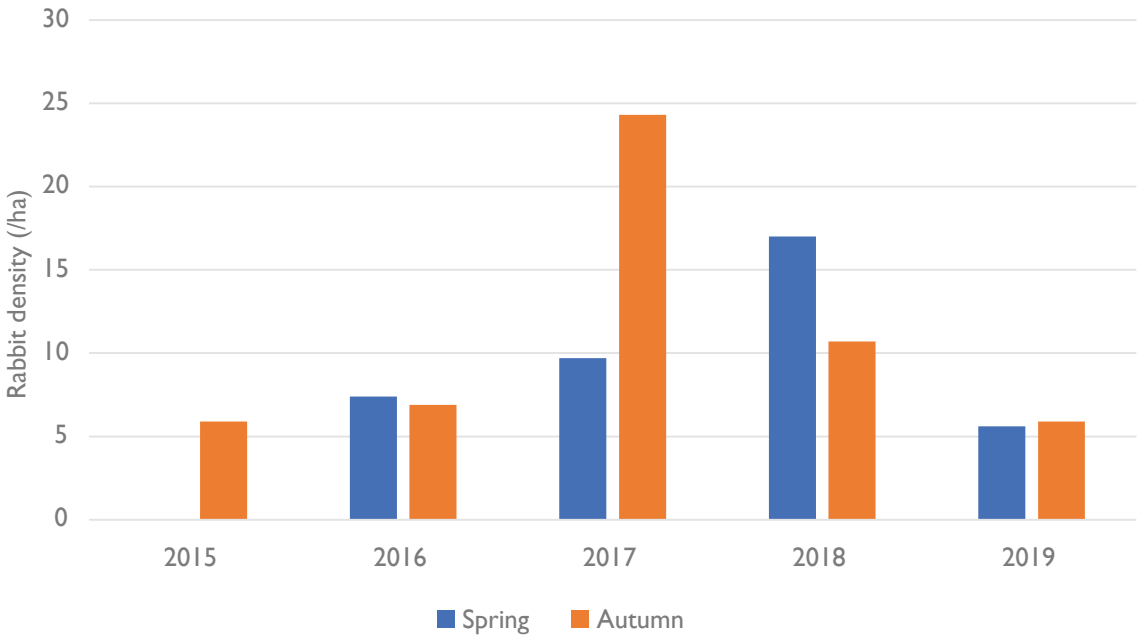


FIGURE 6

Rabbit density (per hectare) at Auchnerran, 2015 to 2019.




## *Tick*

As detailed in the **'Farm'** section of this report, the sheep flock at Auchnerran has an important tick-mop role on the moor during the summer. Whenever the sheep are gathered in for a treatment or shearing, etc., the research and monitoring team try to count tick on a sample of treated and untreated sheep to check that the acaricide is working correctly. In 2017 and 2018, 20 sheep were left untreated as controls which give a better idea of tick abundance in the environment. This increased to 40 sheep in 2019 because of the relatively low chance of encountering untreated sheep during processing. Still untreated sheep form a small portion of the sample counted.

Tick numbers on the sheep are low, with one section of the moor – West End – generally supporting the greatest number of tick, especially in 2018 (FIGURE 7).

As encounter rates with untreated sheep are low, **'background'** tick levels are also assessed by counting them on mountain hares – another common host (FIGURE 8). Ten hares were shot from each of nine sites across the moor, around 1.5% of the population (estimated from night time lamping counts).

*Sheep tick. © Richard Bartz*

The counts corroborate those from the sheep in that overall tick counts were low. The one exception is site four where tick burdens were relatively high in 2018: this corresponds to West End in the sheep data, also confirming the spatial distribution of tick on the moor.

FIGURE 7

Average (+ standard error) number of tick per sheep from three regions of the summer moorland grazing. Treated sheep only.

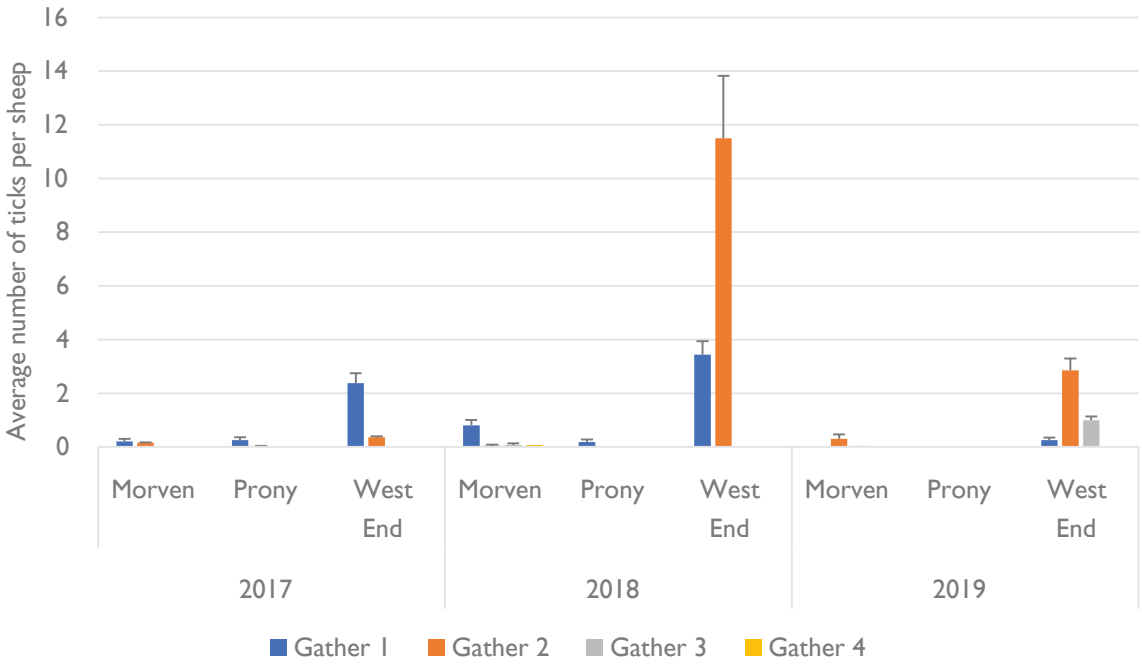
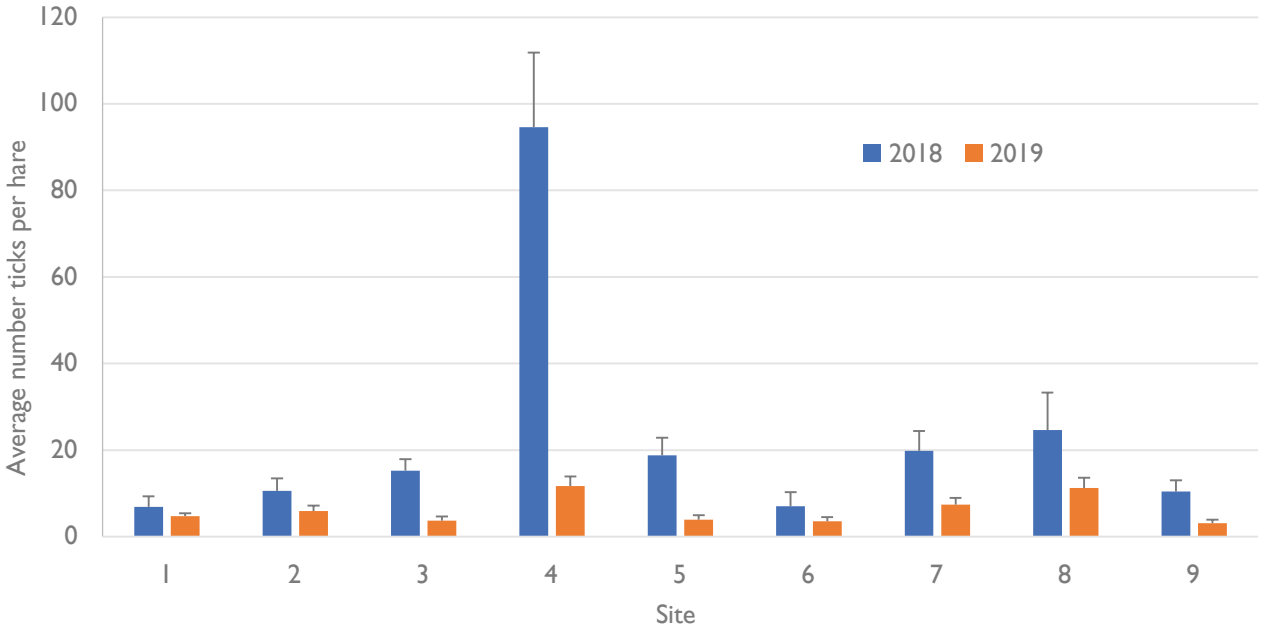



FIGURE 8

Average (+ standard error) number of ticks per hare, taken from nine sites across the moor.



## Wader studies

Waders breed in large numbers at Auchnerran. Most members of this group are declining in number and/or breeding range in Scotland, the UK and across much of Europe. Lapwing, oystercatcher, curlew and woodcock all follow this pattern but are present at Auchnerran in sufficient numbers to study. We currently focus on the first three species, with greater emphasis on woodcock in the future, subject to funding.

The focus of our wader studies has been on breeding productivity and what affects this for lapwing, oystercatcher and curlew, and how these three species move around the landscape throughout the year. Breeding productivity is a good way of assessing the **'health'** of a population. We know from research that each species needs to produce a certain number of young each year to maintain a stable population, so by measuring this we can suggest how numbers returning to breed might change in future: a significant fall in productivity may herald a future decline in the number of breeding adults. Understanding the birds' movements is also important because this helps us identify the key resources they are using (such as nest sites and foraging habitats) and where they are in the wider landscape, thereby allowing us to suggest how such resources should be managed to help the birds.

Wader numbers at Auchnerran have fallen in the last year or two as discussed above (FIGURE 3, page 15). It is too soon to be able to tell if this is permanent or temporary, let alone determine a cause. Despite this decline, the density of lapwing is still sufficient to class Auchnerran as a **'key site'** for this species as defined in a previous RSPB study. Interestingly, although the number of adults in spring has declined, the number of first-clutches produced has remained stable, suggesting that we may have lost non-breeding birds whilst our breeding stock remains unaltered.

Our monitoring has highlighted how some of the waders have responded to changes in field management. Each year we map the locations of nests and this shows that for fields that have been reseeded, or where grazing pressure may have increased, the number of breeding lapwing in particular has decreased. This is something we are exploring in more detail at present.


*Incubating lapwing, captured on a trail camera. © GWCT*

*Opposite: Pre-breeding flock of lapwing and starling. © Marlies Nicolai*

Productivity for lapwing, oystercatcher and curlew is relatively high at Auchnerran (TABLE 2 below), although it may have declined for oystercatcher and curlew in 2019. This may be related to the weather which was cool and wet at crucial times when young chicks were on the ground in 2019, although this didn't affect lapwing.

It is likely that waders do well at Auchnerran because of good habitat and low numbers of some of the predators on site. The latter is reflected in the causes of clutch failure in lapwing, with relatively low predation rates recorded to date (FIGURE 9: see also our Thrush Studies on page 26). It is not uncommon for studies to report predation rates well above 60% elsewhere. Our monitoring has yielded little data so far on the species of egg predators. This is hampered by access restrictions to fields during lambing (end of April and through May). We hope to address this from 2020.

*Newly hatched lapwing chick. © Marlies Nicolai*

*Clutch of lapwing eggs. © Marlies Nicolai*

Our studies of wader movements began in 2018. We take two main approaches: with help from Dr Andrew Hoodless, the GWCT's head of wetlands research, we have begun colour-ringing lapwing at Auchnerran as well as fitting some lapwing, and some curlew, with GPS tags. The colour rings are cheap and mean that over time we can mark a large proportion of our population of lapwing, which can then be identified if seen again wherever they go. We've already had a record back from Ireland of a bird ringed as a chick in 2019 (FIGURE 10). This will be particularly useful during our surveys outside the breeding season where we try to follow nomadic flocks of lapwing, often 300 strong, on surrounding farmland. We suspect many of them are **'our'** birds but so far have not been able to confirm this.

TABLE 2

Breeding productivity (number of fledglings per pair or per nest) at Auchnerran, 2017 to 2019.

| | YOUNG PER PAIR | | | YOUNG PER NEST | | |
|---|---|---|---|---|---|---|
| | **2017** | **2018** | **2019** | **2017** | **2018** | **2019** |
| LAPWING | 1.3 | 0.9 | 1.5 | 0.9 | 0.9 | 1.0 |
| CURLEW | 0.9 | 0.9 | 0.8 | 1.4 | 1.0 | 0.5 |
| OYSTERCATCHER | 0.3 | 0.4 | 0.3 | 1.0 | 0.9 | 0.4 |

FIGURE 9

Cause of failure for lapwing first clutches at Auchnerran, 2018 and 2019. (Percent plus standard error).

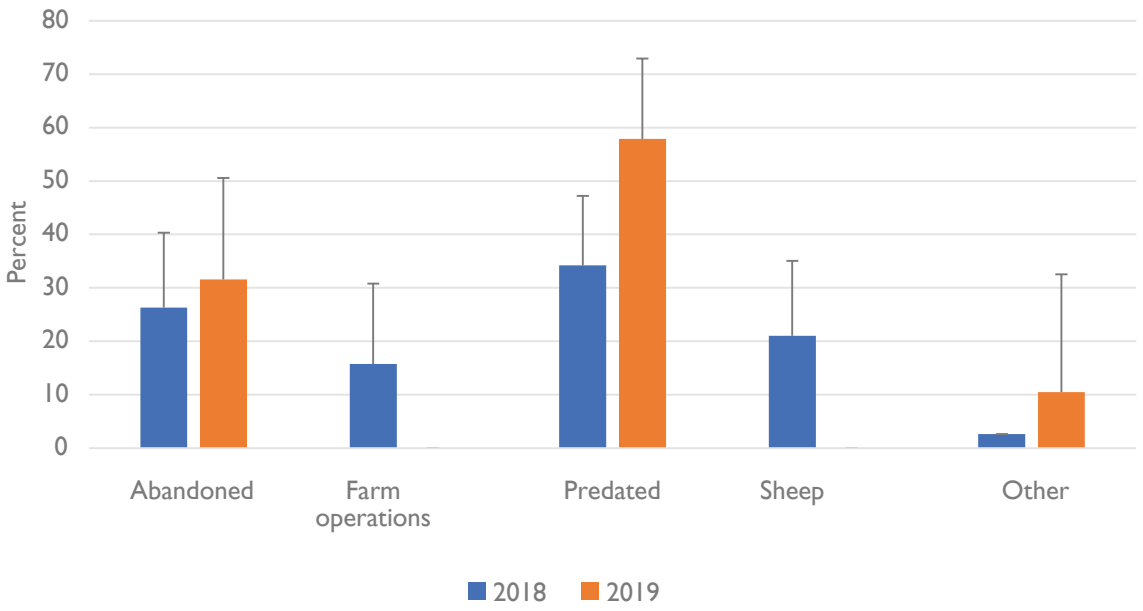



FIGURE 10

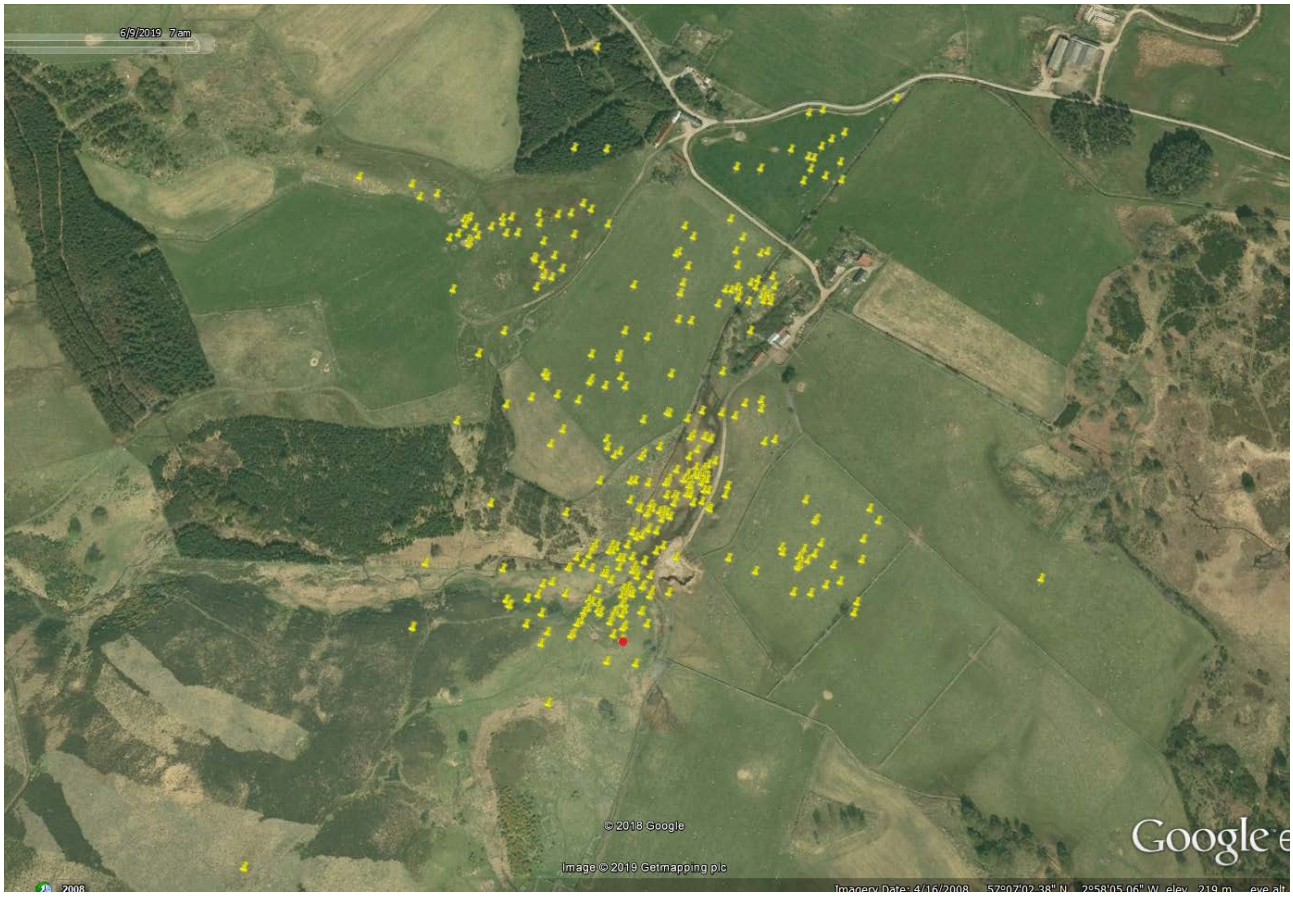
A lapwing ringed at Auchnerran as a chick in June 2019 and then seen by a member of the public in Ireland in mid-November later that year.

Our first GPS tagged bird was a male curlew in 2018, caught at the nest in the summer. The tag showed that he spent most of the breeding season on the farm or just over the boundary to our neighbour and then flew to Ireland. 2019 saw a male and a female tagged (from different nests), but unfortunately the female's tag failed. The 2019 male also stayed close to the nest for much of the summer (FIGURE 11 below). Other studies often find birds travelling greater distances to find suitable foraging locations etc., so the fact this bird moved very little suggests he found all he needed close to the nest.

Fourteen lapwing were also caught and tagged in 2019, although the different type of tag means we cannot access their tracking data until they return when we will download it via a local receiver unit. Watch this space! We hope to expand our tagging studies in 2020, if we can raise sufficient funds, to tag more curlew and lapwing, but also to include the much-ignored oystercatcher, which to date has received relatively little attention from conservationists despite significant recent declines in number. We would also like to include some other local sites in our programme too so we can compare different land management regimes.

FIGURE 11

Summer movements of the tagged male curlew at Auchnerran in 2019. The red pin shows the nest location.




*Opposite: Curlew chick. © Marilles Nicolai*

## Thrush studies

Thrushes (blackbird, song thrush and mistle thrush) are relatively abundant at Auchnerran. For example, song thrushes were at least three times as common during the spring at Auchnerran compared to an area of farmland nearby in 2015/16. So, in 2017 we began monitoring breeding thrushes in more detail to see if we could find out why, with additional support from SongBird Survival in 2018/19.

In 2017, with the help of Joe Bishop, a MSc student from Imperial College London, we found that thrushes were not only more abundant at Auchnerran than nearby, but also more productive with 63% of all nests hatching at Auchnerran versus just 25%, a statistically significant difference ($X^2_1=13.8$, $P<0.01$). In 2018 and 2019, when we were assisted by Minna Ots (Southampton University) and Katherine Thorne (Plymouth University) respectively, hatching success was still higher at Auchnerran (60% and 61% respectively) but not significantly so as it had increased at the reference site (48% and 47%).

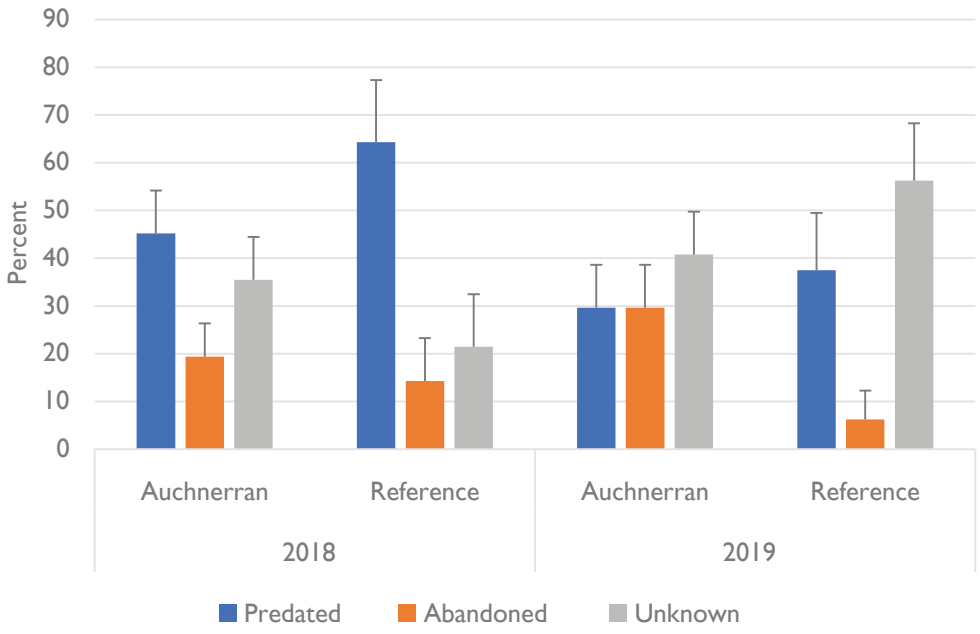
Our nest observations showed that predation rates were relatively low at Auchnerran compared to the reference site, though not significantly so (FIGURE 12) and that predation rates were marginally lower in 2019 compared to 2018.

We also surveyed the fields at the two sites to find out which ones the thrushes were using and searched for sparrowhawk plucking posts in and around the woodland at Auchnerran to try to gauge whether this species was preying on our resident thrushes. We are still exploring the data on field use but despite seeing sparrowhawk at Auchnerran, we were unable to find any prey remains. We believe they are occasional visitors to the farm and not significant predators of thrushes at this site.

*Song thrush chicks and one egg. © Minna Ots*

FIGURE 12

Causes of nest failure at Auchnerran and the reference site.



## LIFE Laser Fence

This project began in 2016 and is a collaboration of European partners, led by Liverpool John Moores University. The aim was to develop a laser deterrent system based on products available for scaring birds. The project is now coming to a close in 2020.

At Auchnerran we have been testing the new systems on rabbits and rats. Using the handheld device, we are able to project the laser spot on the ground close to the target animals to investigate their behavioural response. We have also used the programmable, stationary units which move the laser spot around the substrate in a repeating pattern, to see if they can reduce the number of target animals using a defined area.

Although there are no published data on bird responses to the existing laser systems, they are commercially available with an apparently high degree of satisfaction from those investing in them. Unfortunately, the response of mammals to the lasers does not appear to be as significant. We have tried different patterns of laser presentation (e.g. flashing the laser on-and-off or moving the spot from side-to-side) and different colours but have not recorded a response rate of greater than around 40%.

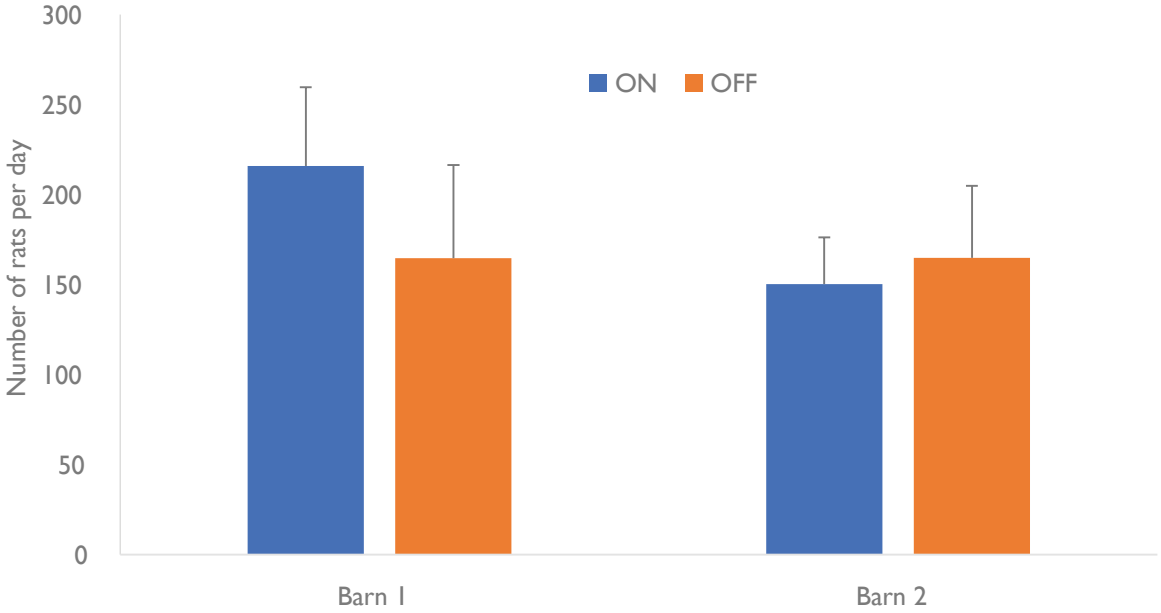
To date, the stationary devices haven't reduced the number of rats or rabbits in an area (e.g. FIGURE 13), although these trials have been logistically difficult to execute resulting in 'noisy' data, so these results should be treated with caution.

In the final few months of the study we will be continuing with trials to keep exploring options for increasing the effectiveness of the lasers and the animals' response rates, and deploy them in novel situations.

*Discussing Laser Fence applications. © Dick Playfair*

FIGURE 13

Average (+ standard error) number of rats visiting small bait sites each day in barns at Auchnerran when stationary lasers were either on or off.



# Financial report

## Game & Wildlife Scottish Demonstration Farm Statement of financial activities (including the income and expenditure account) year ended 31 December 2019

| | 2019 | | | |
|---|---|---|---|---|
| | Unrestricted | Restricted | Total | 2018 |
| | £ | £ | £ | £ |
| **INCOME & EXPENDITURE INCOME FROM** | | | | |
| **Donations & legacies** | | | | |
| Donations | 20,211 | - | 20,211 | 12,924 |
| Grants | 1,000 | - | 1,000 | 127,581 |
| **Charitable activities** | | | | |
| Farm income | 314,000 | - | 314,000 | 195,659 |
| Sundry income | 2,500 | - | 2,500 | - |
| **Total income** | 337,711 | | 337,711 | 336,164 |
| **EXPENDITURE ON** | | | | |
| **Charitable activities** | | | | |
| Farming | 178,483 | - | 178,483 | 202,982 |
| Research project | 44,475 | 35,000 | 79,475 | 87,072 |
| **Total expenditure** | 222,958 | 35,000 | 257,958 | 290,054 |
| **Net income/(expenditure)** | 114,753 | (35,000) | 79,753 | 46,1110 |
| **TOTAL FUNDS AS AT 31 DECEMBER 2018** | (£120,833) | £35,000 | (£85,833) | (£131,943) |
| **TOTAL FUNDS AS AT 31 DECEMBER 2019** | (£6,080) | £0 | (£6,080) | (£85,833) |

## Game & Wildlife Scottish Demonstration Farm
## Balance sheet as at 31 December 2019

| | | 2019 | | 2018 |
|---|---|---|---|---|
| | £ | £ | £ | £ |
| **FIXED ASSETS** | | | | |
| Tangible assets | | 133,551 | | 94,188 |
| | | 133,551 | | 94,188 |
| **CURRENT ASSETS** | | | | |
| Stock | 213,321 | | 189,250 | |
| Debtors | 173,497 | | 100,021 | |
| Cash at bank and in hand | 29,827 | | 49,087 | |
| | 416,645 | | 338,358 | |
| **CREDITORS: amounts falling due within one year** | 37,601 | | 22,815 | |
| NET CURRENT ASSETS | | 379,044 | | 315,543 |
| TOTAL ASSETS LESS CURRENT LIABILITIES | | 512,595 | | 409,731 |
| **CREDITORS: amounts falling due after more than one year** | | 518,675 | | 485,564 |
| | | (£6,080) | | (£85,833) |
| Representing: | | (6,080) | | (120,833) |
| **Income & expenditure account** | | - | | 35,000 |
| **Restricted funds** | | | | |
| **TOTAL FUNDS** | | (£6,080) | | (£85,833) |

# Meet the team

Below is the team at Auchnerran, not forgetting the students and volunteers from universities across the UK and Europe who make an invaluable contribution to our work each year. If you have any queries, would like to volunteer at the farm, make a donation or would like to visit the farm, please get in touch:

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