

upland

A win-win situation?



Hare today...



Hunting for sustainability





Science for sustainability – from Scotland to the Serengeti

Success in achieving the long term use of our biodiversity is closely linked to the extent to which conservation and management can integrate the cultural, social and economic aspirations of people, with the ecological functioning of our environment.

This is as true today in Scotland – where most land is managed for a mixture of farming, forestry and sporting purposes – as it is in much of the developing world, where subsistence farming and natural resource use is widespread, and particularly important for impoverished rural communities.

The sustainable use of biodiversity generates passionate views, both in the scientific and conservation community, and more widely in society. This is particularly the case in relation to the use of wildlife here in Scotland where our strong sporting heritage has led to large areas of the uplands being managed for grouse shooting and deer stalking, but a common public perception is that this is at odds with conservation, animal welfare and access to wilderness areas.

With such potential for controversy, it is essential that biodiversity use is underpinned by a strong science base to ensure that appropriate management decisions are taken. The science base must incorporate ecological relationships – such as the effects of parasites and predators on the population dynamics of harvested species, or the wider biodiversity impacts of grazing by wild herbivores.

Equally, such ecological relationships must be placed in their social and economic context, as ultimately it is people who rely on and make decisions about wildlife use and management. An understanding of the social and economic contexts in which decisions are made regarding biodiversity and its management, is as important as an understanding of the underlying ecology.

In the following pages we provide an introduction to some of the research undertaken at the Macaulay Institute which is related to the sustainable use of wildlife. Much of this work is based in Scotland and focuses on our most iconic species – red deer, red-grouse, mountain hares – and their management systems which arose in Victorian times and now need to fit the 21st century.

Increasingly, however, we are working in the international arena and our Scottish research is relevant to the global paradigm of sustainable use.

The work presented here demonstrates that sustainable use is contentious and requires both good science and wide public debate. In this regard we are delighted to have formed a collaboration with the Tooth & Claw initiative who are addressing many of these issues in an innovative and visually stimulating way in the context of society's relationship with predators. We are grateful to Tooth & Claw for providing access to their extensive library of stunning wildlife images with which we have illustrated this publication.

Much of this work has been funded by the Scottish Government with added value from other funds including RCUK's RELU programme and the EU.

We hope you enjoy reading upland, and please get in touch if you have any comments or questions.

**Best wishes,
Simon Thirgood & Stefano Fiorini**

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A win-win situation?

Experts suggest feasibility study into ceiling
on harrier numbers



Two scientists involved in the high-profile studies of hen harriers and red grouse at Langholm Moor have called for field trials of a “ceiling” on harrier numbers in an attempt to end the long running conflict between conservationists and grouse managers.

High densities of hen harriers are incompatible with driven grouse shooting and consequently, gamekeepers illegally kill these protected birds of prey. As a result, harriers are absent from large areas of apparently suitable moorland habitat.

In a paper published in the *Journal of Applied Ecology*, Dr Simon Thirgood and Professor Steve Redpath from the Aberdeen Centre for Environmental Sustainability (ACES) suggest that the most effective way of improving the conservation status of harriers on grouse moors might be to apply local “ceilings” to the number of breeding birds.



to harrier numbers on grouse moors could be agreed locally by interested parties, and that additional birds could then be safely moved to other areas.

“If successful, this could prove to be a way to both minimise the local impact of predation on grouse moors and increase the national population of harriers – providing a ‘win-win’ situation for harrier conservation

intervention to limit harrier densities, citing European legislation which prevents such action.”

“We feel that a fundamental change in attitude is required from all parties to resolve the conflict between harriers and grouse. If those involved genuinely wish to strive for a solution then compromises will be required and attitudes to predators, their control and their protection, will have to be modified to accommodate changed circumstances.”

Last September, a £3m follow up to the Langholm project was launched by a partnership of organisations including Scottish Natural Heritage, RSPB, GWCT, Natural England and Buccleuch Estates. The ten year project is focusing on the use of ‘diversionary feeding’ – providing alternative food for the harriers to reduce their predation on grouse chicks.

According to Professor Redpath, questions remain as to the effectiveness of this approach.

“Our earlier work demonstrated that feeding harriers can greatly reduce predation rates on grouse chicks. However, we still do not know how feeding will affect harrier numbers in the long term and indeed whether fed harriers and grouse shooting can coexist.

“Some of these issues will be addressed by ongoing work at Langholm. However, we suggest that the quickest way of finding an effective solution to this problem is to simultaneously make progress on different fronts – it is sensible to test a ‘harrier ceiling’ now, and not wait for ten years until the Langholm Moor Demonstration Project is complete.”

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Professor Redpath said: “All moors can cope with some harriers, but few gamekeepers allow any of these predators to breed because of the fear that numbers will subsequently flourish. A ceiling scheme is a way of encouraging grouse managers to put an end to illegal killing of harriers, safe in the knowledge that numbers will not reach densities where they can threaten the viability of their grouse moors.”

Dr Thirgood said they proposed a large-scale trial where a ceiling

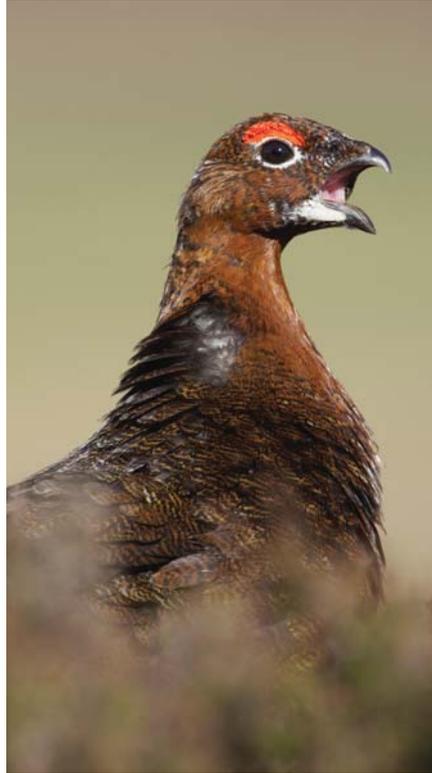
and grouse management.”

Progress in reconciling the two camps had reached a stand-still with both sides distrusting each other, and a ceiling system was worth a “serious look” as an acceptable compromise, he added.

“Hunters have been slow to recognise that illegal killing of raptors is unacceptable in 21st Century society where there is strong support for conservation. Conservationists, on the other hand, have been unwilling to compromise over any form of



Seeing red



Public statements made in the national hen harrier-grouse debate often ignore the local perspective, according to a Scottish survey.

According to the authors, the study shows that the organisations involved need to be aware of the various feelings and motivations of those working on the ground.

The majority of those with shooting interests thought local grouse management was impeded by legislation they felt favoured conservation interests.

Twenty-seven people involved in grouse management responded to the interview and questionnaire on the issue.

In the same Macaulay study, 17 conservationists questioned said they thought value differences between themselves and the hunting lobby was the greatest obstacle.

The groups disagree over the protection of hen harriers, which predate red grouse. Grouse are traditionally hunted for sport and many estates see this as central to their role in countryside management.

According to conservationists, hen harriers were almost driven to extinction through persecution in the last century.

Although they are now protected by law, some persecution still goes on, and published research has shown that hen harriers can sometimes have a big impact on grouse numbers.

“Understanding the complexity of these views could help in developing solutions”

According to lead author, Dr Keith Marshall, the national debate over hen harrier conservation and their impact on driven shooting interests has led to a perceived stalemate, with those on the ground frustrated by a lack of progress.

“It is clear from our study that many remarks made by organisations nationally are in fact antagonising individuals within the other camp.”

This polarisation of views was strongest in the north east of Scotland.

In the north – where grouse are less economically important – lack of trust was not perceived to be such an important barrier between the groups.

The debate originated and still persists in south west Scotland, where both hen harriers and livelihoods have suffered.

Dr Marshall said: “Our study reveals where individuals essentially coincide in their views, and where they disagree – either substantively, or in terms of the importance assigned to a particular issue.

“Both sides agree that an independent mediator could help them make progress in areas of agreement.

“The various views and perceptions held by those responsible for the day to day use, management, and protection of the resources in a conflict, are integral to the debate.

“These are important considerations in relation to conflict management, where revealing the complexity of the views could improve mutual understanding and thereby help in the development of potential solutions.”

The study was recently published in the journal *Biodiversity and Conservation*.

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The question is contentious, and one that has been argued about for many decades, but Professor Steve Albon asks...

Are there too many deer?

“As always the answer depends on your perspective.

The manager of a sporting estate will probably err on the side of relatively high numbers to produce enough mature stags to shoot as trophies. In contrast, a conservationist attempting to permit natural woodland generation will want much lower numbers.

Similarly, a member of the general public concerned about animal welfare may want lower numbers to minimise the risk of winter starvation. Or the welfare issues might be indirect because red deer support large tick populations which impact on the

health of both game species and humans.

In practice, the evidence is that lowering numbers will almost certainly benefit all four interests since growth, reproduction and survival all improve at lower densities, because there is more food. Reducing density has been shown to lead to higher recruitment rates, particularly of males, greater body growth, and ultimately, larger antlers.

Intuitively, more food at lower deer densities should also mean that preferred plants, typically, grasses and sedges, can be selected, while less nutritious woody plants, vulnerable



David Riley

because growth rates are typically slow, are avoided.

So, one might ask, why is there an ongoing debate about too many deer? The answer is complex.

First, despite increased culls, red deer numbers continue to rise, almost certainly associated with our changing climate leading to warmer springs with calves born earlier and heavier, and enhancing their viability to survive the winters, which have become milder, too.

Second, these growing populations are seen by some as a threat to our ‘iconic’ heather moors, which until recently were grazed, for at least part



of the year, by increasing numbers of sheep, too. Since, red deer and sheep select similar diets within this habitat there has been a polarised, and often heated, argument which has pitched either sheep or deer as the “villain of the piece” in terms of the loss of heather moor.

But until last year the problem was an absence of any wide scale empirical data of the grazing and trampling impact associated with either the presence of sheep versus deer on any open-hill vegetation community, or the variation in deer density seen across landscapes.

Now the Macaulay has shown that on Dry-shrub heath in 11 Deer Management Groups spread across Scotland, the presence of sheep compared to their apparent absence (not recorded present) had a significant grazing impact on heather, whereas this was only true for

the presence of deer in one area – Cairngorm-Speyside. Furthermore in five of these areas the impact of sheep was significantly greater than deer.

The results of this work have important implications for managers of upland estates in Scotland.

In particular, the trend of removing sheep from the open-hill following recent CAP reform is likely to lead to a reduction in grazing and trampling pressure, which should halt further degradation of heather moor. However, since red deer also prefer to forage in grass patches, they may fill the ‘vacuum’ left by the removal of sheep, hindering re-colonisation by heather.

Unfortunately, understanding of the extent to which red deer will change their behaviour when sheep are removed is largely anecdotal.

Addressing this knowledge gap is a priority, especially given that

the numbers of red deer are likely to continue to grow. Where sheep remain, and deer densities rise above 15 per km², increased culling may be the only way to constrain the rate of population growth and, in turn, reduce the utilisation of heather.

Finally, there is an opportunity to reconsider the issue of whether heavy herbivore impact, is an undesirable outcome, rather than a dynamic process. Light grazing will maintain heather-dominated habitats but grass-dominated ones require moderate or greater levels of grazing impact.

The debate is really about how the guild of herbivores in the uplands are managed to create or maintain landscapes with different ecological properties and visual characteristics.”

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What drives deer numbers?

A study looking for the factors controlling deer numbers in Scotland has found the number of calves per hind decrease in rainy winters.

According to Dr Pérez-Barbería, understanding what drives the population dynamics of deer is of paramount importance as they are the main ‘engineers’ of the wild Scottish landscape.

“There is a need for consistent and reliable information on population dynamics across Scotland to predict deer numbers under both climatic and rural policy changes. This is why we are setting up the basis of long-term deer population monitoring.”

Dr Pérez-Barbería is investigating what drives deer populations using three integrated approaches – historical records of deer surveys; long term monitoring of body condition in larders; and experimentally assessing the effect of weather on the grazing behaviour of – and interaction between – deer and sheep.

This information is combined with climate records and habitat to investigate the contribution of each to changes in deer populations.

“The historical records of the last forty years clearly

indicate that reproductive rates – that is the number of calves per hind – decrease in rainy winters,” said Dr Pérez-Barbería

These results are the first to come from the study which is investigating the factors behind changing deer numbers in Scotland.

Number of calves per hind is higher at the end of winter in populations in the west of Scotland when compared to those east of the Great Glen, and Dr Pérez-Barbería believes that the more sheltered habitats of the west might be the cause.

This is supported by results from his larder analysis that indicate that forest hinds are more fertile than those from the open hills.

In many places in Scotland, reproductive rates were found to decrease as deer numbers increased – indicating that many populations have exceeded their available habitat. Males are suffering more as their body weights decrease faster than females’ as the population increases.

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It's good to talk

New partnerships utilising the experiences of stalkers, gamekeepers and policy makers aim to develop sustainable deer management in Scotland.

Ways to integrate local knowledge into computer based systems – allowing the evaluation of local deer management at the landscape scale – are

currently being tested by Macaulay researchers.

Deer range across boundaries and agreeing how deer use the landscape

is central to sustainable management. Their approach will provide the basis for management decisions to be made across neighbouring estates.

Project co-ordinator Dr Stefano Fiorini hopes the system will eventually become an essential tool for deer managers across the country.

“Unrealistic predictions by scientists can lead to dissatisfaction and disengagement with both land managers and policy makers.”

To help resolve this, Dr Fiorini's team sought the views of a range of people working with deer, to find the discrepancies between the scientific predictions and actual deer movements.

According to Dr Fiorini, these discussions revealed that the inaccuracies are in part due to differences in the importance placed on habitat and shelter by scientists and deer managers.

“In addition, our ecological models need to take into account man-made impacts on habitat use such as the locations of fences and footpaths,” he added.

This current application of PGIS



(Participatory Geographic Information Systems) aims to improve understanding of the factors responsible for deer movements, and to predict future distributions resulting from changes in climate or land use policies.

The new model, modified by this stakeholder knowledge will be tested at a series of workshops planned for 2008.

This work is part of a wider project investigating how managing deer for hunting and sporting objectives can be reconciled with managing deer for natural heritage objectives.

Dr Fiorini said: "As wild deer are free-ranging they often cross ownership boundaries where these contrasting objectives exist. Investigating how to reconcile these objectives is a key feature of this project."

The RELU (Rural Economy and Land Use Programme) funded project aims to understand how well people involved in deer management work together, and how this can be improved.

The project will act as a case study that will inform the management of other rural resources.

Dr Fiorini said that the project differs from previous research by putting stakeholders at the centre of the work.

"From the outset the research has been influenced and modified by direct engagement with deer managers and practitioners, as well by engaging with representatives of relevant government agencies, NGOs and sector representatives."

As well as the Macaulay, the project involves researchers from Forest Research, the Universities of Aberdeen, Edinburgh, St. Andrews and York, and the Durrell Institute of Conservation and Ecology.

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RELU Fellowships

An opportunity for partnership building

Team members based at Macaulay and the University of Aberdeen have also facilitated access to the RELU Fellowship program allowing further opportunities for stakeholders' engagement with the project.

Mark Lazzeri from the Assynt Foundation took advantage of the opportunity provided by the Fellowship scheme and joined during November 2007.

Here he shares his thoughts of the pros and cons of the experience.

"My initial thoughts on this topic were that there are no cons to taking up a RELU fellowship; I certainly had an extremely useful and enjoyable week. The downside is probably a direct result of my character rather than any intrinsic flaw in the Fellowship process. The problem is that I am now more frustrated and have more work.

It is a number of years since I left the world of research and academia finally to become a practising land manager on an estate in NW Scotland. The time spent with the researchers helped to encourage me to tackle some of our practical problems in a more logical and perhaps scientific manner. It enabled me to establish contacts with a number of interesting and interested people whom I can contact for opinions and advice.

There are so many things that I now want to incorporate into our estate management policies. From the way discussion groups were organised, through the process of the "choices analysis" work to the opportunities for involving other land managers (in the widest sense) in recording



Mark Lazzeri

and research. My problem – and I suppose it is actually a happy one – is that I can see so many potential benefits, that I want to start implementing everything straight away.

I cannot believe that anyone, other than perhaps the most hardened cynic would fail to benefit and enjoy the experience of a RELU Fellowship. The researchers made me feel welcome and were very supportive making participation in discussions easy. I am sure that the contacts I made during the Fellowship visit will strengthen and that more formal links may be established in the future.

I am now an even stronger advocate of involving industry (particularly land management) with academic research and will actively promote this approach."

The Assynt Foundation owns about 44500 acres of what was traditional deer forest, 11000 acres of which fall within SSSI and/or SAC designations. The Foundation is developing a deer management programme, in conjunction with Deer Commission for Scotland and Scottish Natural Heritage. The aim is to reduce the resident deer population to allow regeneration of woodland and recovery of other degraded habitats.

Hare today... gone tomorrow?

Mountain hare populations are under threat from habitat loss, climate change, and local over-exploitation, and are thought to have sharply declined in numbers in Great Britain.

The Macaulay's mountain hare research aims to provide the evidence for sound, sustainable management of one of Scotland's most iconic species.



Status

The Scottish mountain hare is native to the highlands of Scotland. They are typically more numerous in central and eastern areas where they are strongly associated with heather moorland that is managed for red grouse, and they likely benefit from the habitat management and predator control aimed at improving grouse densities.

Mountain hares are listed under EC Habitats Directive (1992), as a species 'of community interest whose taking in the wild and exploitation may be subject to management measures' and member States are required to ensure the conservation status of mountain hares is maintained and that their populations are managed sustainably. Mountain hares have recently been designated a UK Biodiversity Action Plan Species.

Dispersal

Human pressure and climate change are generating an increasingly fragmented landscape in which natural populations are becoming more isolated and prone to greater risk of local extinction, over-exploitation, or frustrated dispersal.

In such fragmented landscapes the movements of animals are critical

in maintaining declining populations or recolonising previously occupied areas.

Dispersal is not well understood and our research aims to better understand how mountain hare populations are linked by the movement of individuals and to identify whether juveniles or adults, for example, are more likely to disperse than other individuals, and over what distances.

Management

Mountain hares are a traditional quarry species and are an important source of revenue for many sporting estates. They are also killed to control numbers on grouse moors, to protect forestry plantation, woodland regeneration, and crops.

Mountain hares are an important host for sheep ticks and can, in some circumstances, play a key role in the transmission of the louping-ill virus, and reliable anecdotal evidence suggests they are increasingly subject to management culls as part of tick and louping-ill control programmes.

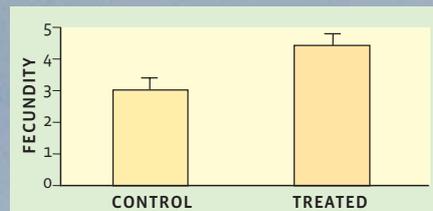
Our work understanding how mountain hare populations respond to different levels of harvest or culling is vital for the species sustainable management.

Understanding Cycles

Analysis of hunting records of the number of hares killed each year on individual sporting estates suggests that around 50% of mountain hare populations are cyclic and show regular changes in density every 5–15 years.

The reasons for these regular fluctuations remain unclear. Parasites and food availability can cause population cycles – however the relative importance of these two factors compared to the many other factors that affect population density is not always clear, and remains an important question.

Undertaking parasite reduction and supplementary feeding experiments, our research aims to provide a better understanding of the role of disease and nutrition on mountain hare populations and population cycles.



Removing parasites in winter has no impact on survival or condition, but it improves female breeding success the following summer.

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Living with change

Suggestions that deer are moving into upland areas previously grazed by sheep are currently being investigated by the Macaulay.

Researchers are measuring grazing impacts on heather moorland in areas with and without sheep, to investigate the consequences of sheep removal for these important habitats.

Project leader, Dr Justin Irvine said: “Whilst recent Common Agricultural Policy reform has led to a steady reduction in sheep numbers on hillsides, deer numbers have been reported to have simultaneously increased – possibly due to changes in both habitat and climate.

“There is some evidence that deer are now moving in to graze these areas vacated by sheep – but what will this mean for these vitally important habitats?”

Initially sixteen study sites have been selected along an east-west gradient in northern Scotland. Eight of these sites have reduced sheep numbers, and eight nearby or adjacent sites have sheep at conventional stocking densities.

Measurements at each site include the amount of grazing on heather, the vegetation height, recording the plant species present, and dung counts for deer, sheep and grouse.

To see if deer are moving into sites without sheep, dung count data will be analysed to determine if sites with reduced sheep numbers also have higher deer dung counts than sites that are grazed by both deer and sheep.

“We are analysing data on heather browsing from across all the sites, to determine if sheep differ from deer in their impact on heather,” said Dr Irvine.

“Although the grazing impact on heather is likely to vary in relation to sheep and deer grazing pressure, what is more important is the impact this has on the biodiversity of these habitats,” he added.

The researchers predict some areas will be able to support more grazing animals than others and still maintain their biodiversity. Soil fertility, and snow or rainfall may well be partially responsible for this variation.

“In addition, the survey is supported by experimental work at the Macaulay’s Glensaugh Research farm,” said Dr Irvine.

“Using satellite tracking we are investigating how deer habitat-use and grazing impacts respond to the removal of sheep. The technology allows intensive monitoring of free ranging deer and sheep grazing together over an area representative of the open hill.”

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Age old problem

Using its teeth to estimate the age of a deer is common practice – but just how accurate is it?

Stalkers and deer managers regularly use the pattern of teeth eruption and the degree of teeth wear to estimate age in deer (see top right image).

With somewhere between 60,000 and 70,000 red deer culled annually across Scotland – with many of them in remote areas – it would be impossible to assess the age of all of them with any other method, so it is important then to evaluate how accurate this technique can be.

The age estimated by stalkers from the lower jaws of 522 red deer were compared against the age measured in the laboratory by counting the cement layers deposited on the root pad of

the first permanent lower molar (see bottom image).

A third of the samples estimated by stalkers were in agreement with the age estimated in the laboratory, and a further 31% and 16% within a year or two of being correct.

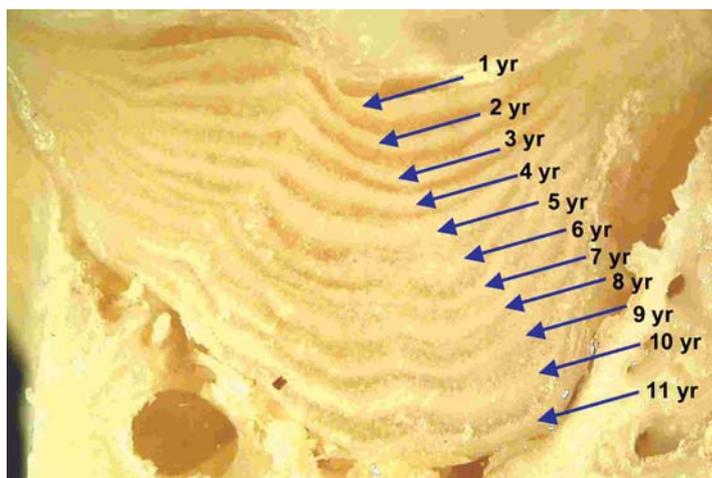
There was almost complete agreement when estimating the age of animals younger than a year old. However, stalkers over-estimated the age of the males for most of the age classes.

They also had a tendency to overestimate the age of hinds younger than 7 years, and to underestimate the age of those older than 7 years.

The Macaulay's Dr Javier Pérez-Barbería, who led the study said: "Accurate estimate of age is of paramount importance in understanding many aspects of animal life.

"Without a reasonable estimate of the age of the animals in a population we cannot make any interpretation of their body size, age of reaching maturity, reproductive condition, life span, and ageing processes."

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Teeth wear, as shown in this 11 year old stag (below), is regularly used to estimate the age of deer after culling. Laboratory measurements use the number of cement layers from a molar (left) with each band corresponding to a year of life.



Ticked-off

The recent explosion in tick numbers is already having a huge impact on the Scottish countryside, according to Macaulay researchers.



Intensive hare culling, smaller grouse bags and localised exclusion of deer, have all been brought about by the increase in ticks and tick-borne diseases, says Dr Lucy Gilbert.

“Ticks are of increasingly urgent concern because of the diseases they spread, such as Lyme Borelia and Louping ill,” she said, “and we have seen a number of estates respond to their greater tick numbers within the last few years.

“These measures are bound to have an impact on biodiversity and the rural economy – but the key question is: *‘will they actually control ticks or these diseases?’*”

Spiralling tick numbers, along with increased awareness, are largely responsible for the 11-fold increase in cases of human Lyme disease reported in Scotland over the last decade.

Ticks are also responsible for transmitting the Louping-ill virus, which kills almost 80% of infected red grouse, and – depending on the circumstances – large numbers of sheep.

Fears over Louping-ill effects on grouse-bags has led some estates to carry out large-scale culls of mountain hares. Hares have been shown in the lab to support direct transmission of the disease between ticks.

However, recent models predict that culling hares in areas with deer will not reduce Louping ill, said Dr Gilbert.

Some estates are also reported to be excluding deer – which are often associated with high tick numbers, or introducing sheep dosed in acaricide to act as ‘tick mops’.

Dr Gilbert said: “If done properly, the use of tick-mops has proved effective in some parts of northern

England where alternative tick-hosts are absent.

“It is not known how well they will work in Scotland on estates where deer or hare are also present.”

The Game & Wildlife Conservation Trust is looking into this with field trials, whilst the Macaulay – together with Stirling University – is modelling the effectiveness of tick mops under different deer management regimes.

As well as looking at the effectiveness of these control measures, Macaulay researchers are also investigating what role climate change and land management play in influencing tick numbers.

“Will these measures actually control ticks or these diseases?”

Dr Gilbert said that their work suggests that ticks will spread further up hillsides as Scotland gets warmer.

Much of this work is being carried out as part of the EPIC (Epidemiology of Infectious Disease Control) Centre of Excellence, funded by the Scottish Government.

“Initial results also show that woodland has 10 times more ticks than open areas such as heather or grassland, and that woodland with deer has more ticks than fenced-off woodland,” said Dr Gilbert.

The next step is to look at the presence of Lyme across woodlands that differ in the number of deer and other mammals, she added.

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Lyme disease is caused by spirochaete bacteria, *Borrelia*, which are transmitted by infected ticks. There are several types that differ in their ability to cause disease, differ in the clinical symptoms, and differ in the hosts that support transmission between ticks feeding on them.

Lyme disease is the most prevalent arthropod-borne disease in Europe and Northern America. Human cases have increased by 350% over the past decade in the UK, and in Scotland 171 cases were reported in 2006.

Borrelia can be transmitted by various birds and small mammals such as voles and mice. Deer do not support transmission, but they can support large tick populations.

Of the three active tick stages, nymphs (1.5mm long and grey in colour) cause the most cases of Lyme disease in humans. This is because larvae will not have fed on infected hosts, and tend not to carry the bacteria; and adults are less common – as well as being large and more easily spotted before biting.

Lyme disease causes a characteristic bull’s eye rash in about 80% of infected people, and can be treated with antibiotics – professional medical treatment must be sought. If untreated or if initial treatment is unsuccessful, further chronic neurological and/or rheumatological symptoms may develop.

Louping ill virus is the western-most variant of the tick-borne encephalitis complex of viruses, which cause death in humans in some areas of Europe. However, louping ill virus has a different ecology and, thankfully, human cases are rare. Transmission occurs when infected ticks bite, or are eaten by, hosts.

It causes death in almost 80% of infected red grouse, and variable mortality in livestock, especially sheep. Therefore, it is of great economic importance to many rural areas of Scotland.



*“We will use hunting
as a lens through which we will
examine how people interact
with biodiversity”*



Hunting for sustainability

The controversial and emotive topic of hunting will come under the spot-light in two major EC-funded projects recently awarded to researchers at the Macaulay.

The projects, worth more than £3.2 million, will primarily be implemented through the Institute's ACES partnership with Aberdeen University.

'HUNT' will assess the social, cultural, economic and ecological aspects of a variety of hunting traditions in both Europe and Africa. Working with partners in eight European and African countries, the project seeks to understand what influences attitudes to hunting, how these attitudes determine individual and societal behaviour, and finally, how hunting behaviour influences biodiversity.

Project leader Dr Simon Thirgood said: "Throughout the project we will use hunting as a 'lens' through which we will examine the wider issue of how people interact with biodiversity.

"The project results will be interpreted in respect to current and future EU policy on hunting and biodiversity conservation, and they will contribute to the global debate about the sustainable use of biodiversity.

'HUNT' is thus an extremely good fit to the Macaulay's remit of providing the science base to underpin environmental sustainability."

The project is financed by £2.3 million from the European Commission 7th Framework Programme and will involve several staff from the Macaulay Institute, as well as colleagues from the Universities of Aberdeen, Stirling, and London, and international partners from Norway, Sweden, Spain, Croatia, Slovenia, Ethiopia and Tanzania.

The second project, 'Sustainable Hunting Tourism in Northern Europe' plans to promote the development of sustainable hunting tourism to help diversify the economic activity of under-developed regions in Northern Europe.

According to Dr Thirgood, the project will focus on the international exchange of information and expertise on hunting tourism.



"This will reduce obstacles to entrepreneurship and enhance the activities of small businesses – as well as provoking discussion and raising awareness of the potential of tourism based on northern hunting cultures."

As part of the process the project will create sustainable models for hunting tourism and tools for managing sustainability in different institutional settings.

This EC project is financed by £950,000 from their Intereg Northern Periphery Programme, and as well as Macaulay staff, it also involves

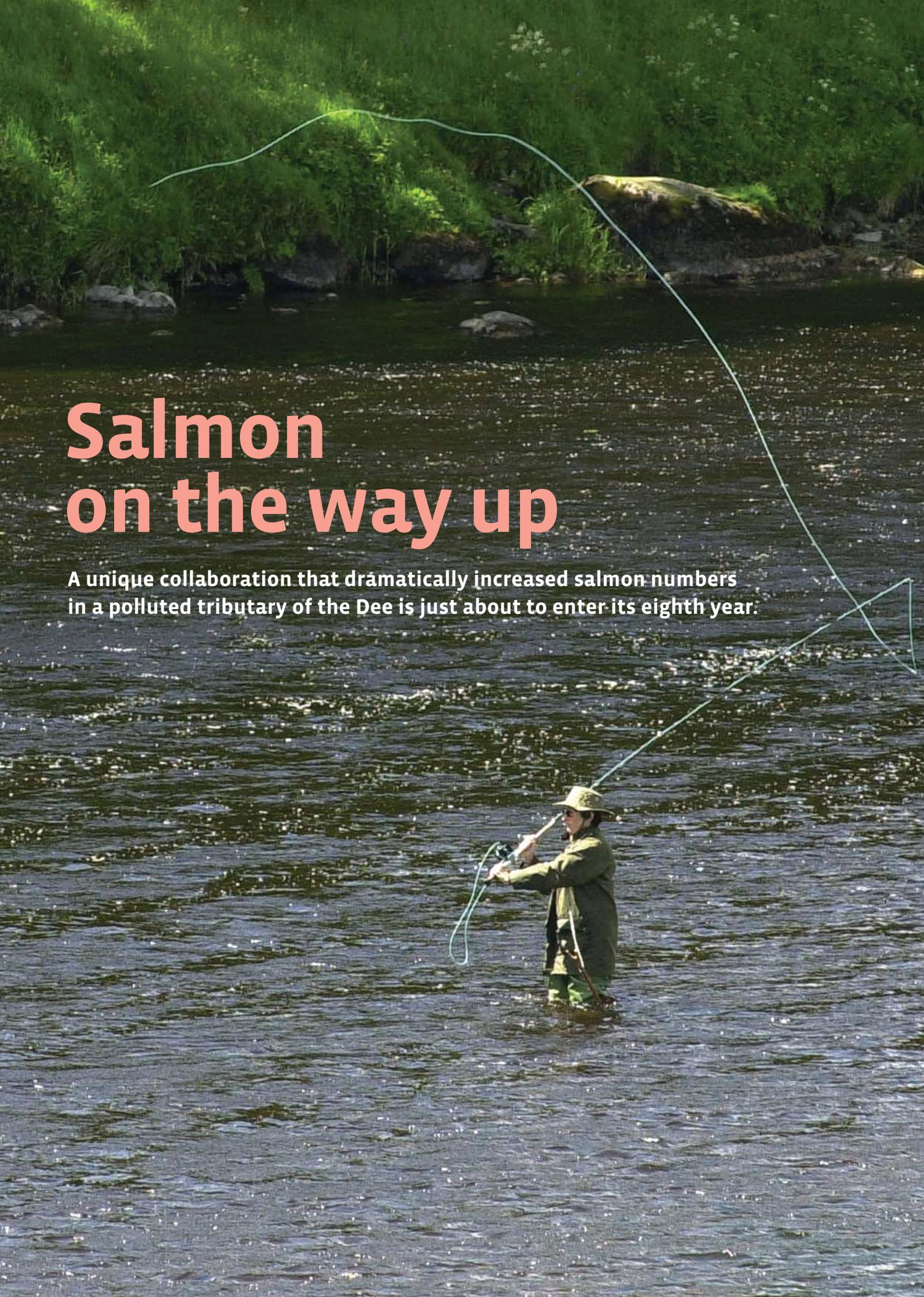
the University of Aberdeen, and international partners from Finland, Sweden, Iceland and Canada.

"These two projects are very complementary," said Dr Thirgood, "as the first will provide much of the cutting-edge, interdisciplinary science to underpin EU policy on hunting, whereas the second is focussed mainly on interactions with European stakeholders – particularly the hunting

industry and the government organisations that regulate hunting."

The projects provide an excellent opportunity to showcase the relevance of the research conducted at the Macaulay to the wider community of land-use stakeholders in Scotland, Europe and beyond, he added.

**For more information on these projects email
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or visit www.aces.ac.uk**

A person wearing a green waders and a hat stands in a river, holding a long net that spans across the water. The net is made of a light-colored material and is held taut by the person. The river is dark and has some rocks visible. The background is a lush green bank with some rocks.

Salmon on the way up

A unique collaboration that dramatically increased salmon numbers in a polluted tributary of the Dee is just about to enter its eighth year.

“...a raft of very simple measures could drastically improve local streams”

Salmon had been absent from many parts of the Tarland Burn for several years when work started there in 2000 – but within four years fish had returned, and numbers continue to increase.



4 images this page Callisto Productions

The project to improve water quality and habitat variety in the stream was set-up by Macaulay scientists, and involves local farmers, estate managers and agency staff, as well as the Dee Salmon Fisheries Board.

The Dee District Salmon Board records show that with the improvements trout numbers have increased and lampreys have also returned to the Aberdeenshire burn, which is important because it is the uppermost tributary of the River Dee to drain from farmland.

The subsequent recovery of salmon was most noticeable in the early life stages from salmon redds, to fry and parr survival rates.

Project leader Dr Simon Langan said: “When we first looked at the burn it was obvious that various land management practices had degraded both the water quality and range of habitats within it.

“We then engaged with the estate

owners, the MacRobert Trust, their tenant farmers and a range of local people to show them how a raft of very simple measures could drastically improve local streams.”

These measures included removing poorly maintained septic tanks, replacing the village sewage treatment plant and putting in small wetland areas.

The scientists also encouraged farmers to create ‘buffer strips’ – by fencing off several metres of bankside on either side – which in turn stopped both cattle and contaminated field run-off entering the stream.

Importantly, according to Dr Langan, this was undertaken in a systematic manner-tributary by tributary.

Sections that were previously canalised were allowed to return to their natural course, and it is this, along with the reduction in pollution, that has allowed salmon fry and parr to develop to smolts, he added.

“Previously, salmon recruitment had been poor or absent due to the pollution and lack of suitable habitat in the early stages of their life cycle.

“Salmon redds were frequently smothered by excessive sediments transported down the stream and



the very fine grained substrate was unsuitable habitat for salmon fry and parr.

“As a result salmon had been absent from this burn for some considerable time.”

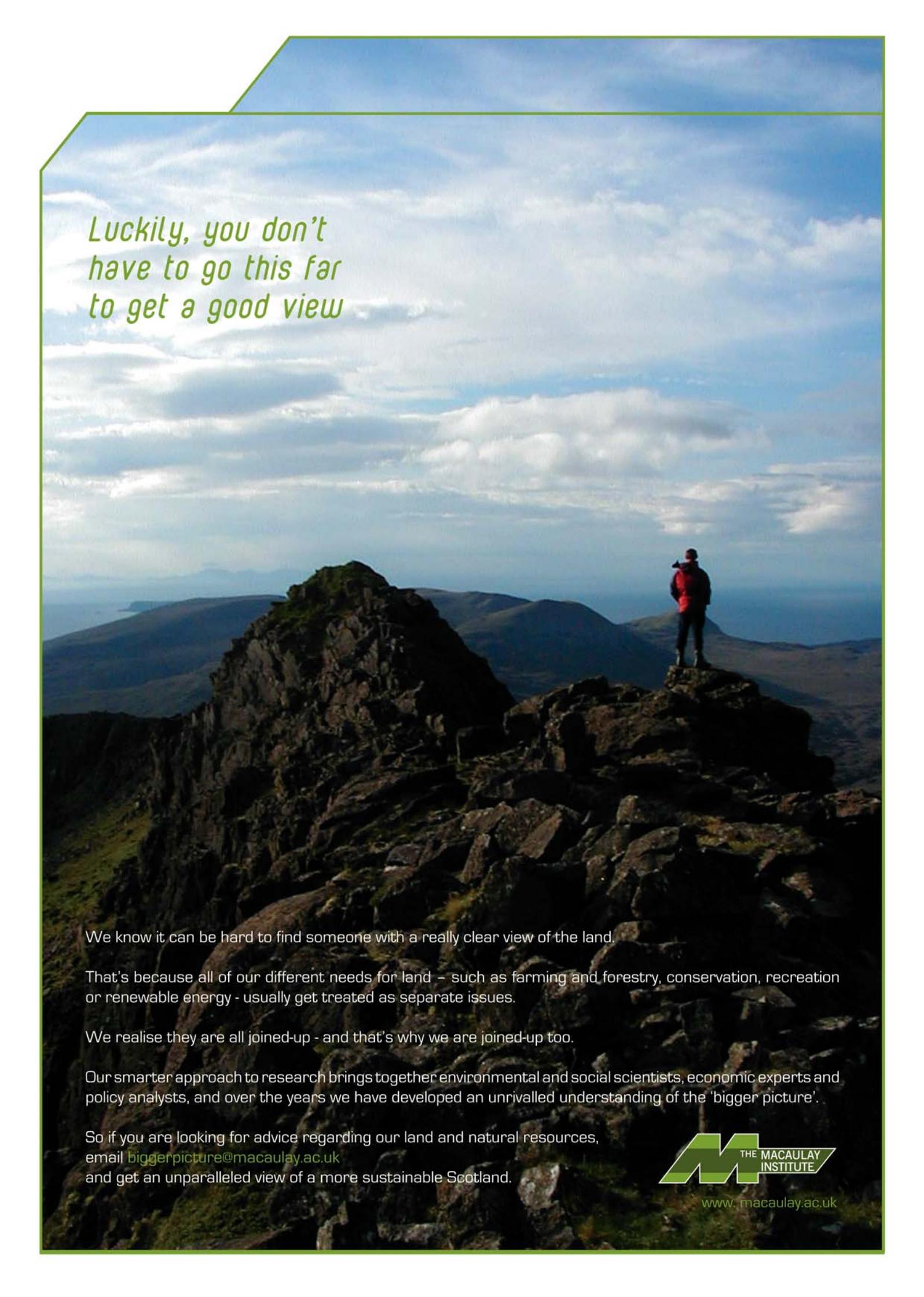


The Tarland Catchment Initiative has also helped a range of other aquatic wildlife – from lapwings and redshanks to aquatic invertebrates.

“Our future aim is to roll this programme of measures and lessons learnt to other parts of the River Dee – and indeed other river catchments across Scotland,” said Dr Langan.

**For more information contact
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A film featuring this work, *Water under Pressure*, can be seen at macaulay.ac.uk/videos



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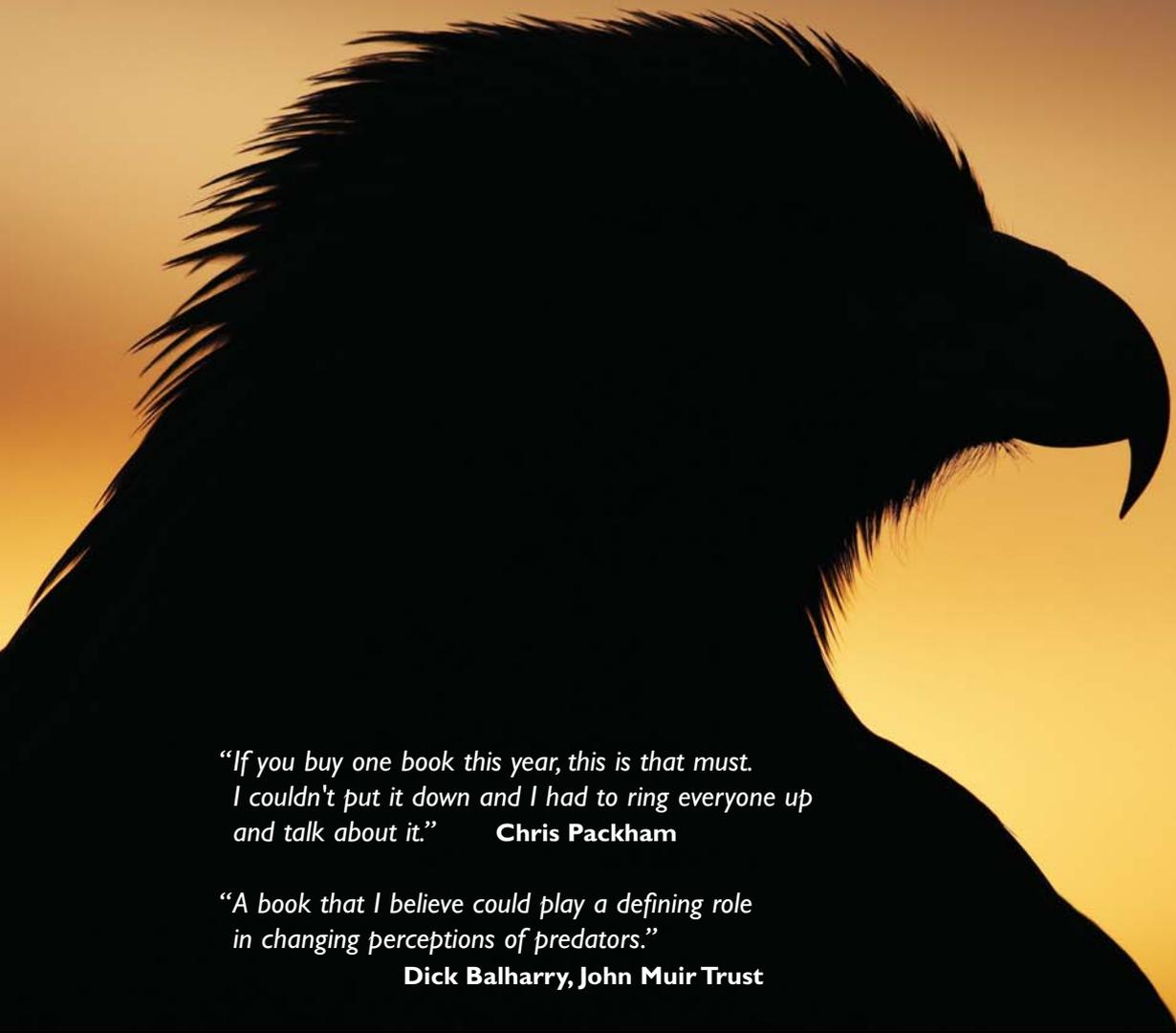
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