CAPERCAILLIE REINFORCEMENT FEASIBILITY STUDY – PHASE 1 REPORT
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Project team:

Dr Mike Daniels, UHI
Dr Ros Bryce, UHI
Dr Helen Senn, RZSS
David Barclay, RZSS
Dr Simon Girling, RZSS
Dr Helen Taylor, RZSS
Dr Alex Ball, RZSS
Dr Erlend Nilsen, NINA
Dr Duncan Halley, NINA

This report summarises the results of a contract to:

1.1 Develop a set of possible scenarios for reinforcing the UK capercaillie population and the potential risks and benefits of each scenario.

1.2 Review and narrow down the possible scenarios with a group of key stakeholders in a workshop convened by the Cairngorms National Park Authority.

1.3 Produce a final report with recommendations regarding the scenario/s that should be investigated in more detail ecologically, socially, practically and from a disease perspective.

Tender background

The Capercaillie Emergency Plan recognises that if management actions outlined in the plan are insufficient to reverse population declines, it may be necessary to reinforce the Scottish capercaillie population with birds from outside the UK. The National Species Reintroduction Forum advises that any reinforcement project (for any species) be carefully coordinated with ongoing conservation efforts. To ensure a swift response should capercaillie population declines continue, this tender is the first step in exploring the feasibility of reinforcing the capercaillie population with birds from Europe and performing exchanges within the Scottish capercaillie population.

Report sections

This report is in three sections:

PART A. Scenario analysis for capercaillie conservation translocations based on a review of the literature with input and discussions among the project team

PART B: Report of stakeholder workshop held on 22nd May 2025 at the Cairngorms National Park Authority office Grantown-on-Spey to discuss the scenario analysis. The workshop was attended by 27 land managers and representatives of landowners in capercaillie SPAs within the Cairngorms National Park, members of the Capercaillie Emergency Plan Programme Board, the Scientific Advisory Group for the Capercaillie Emergency Plan, the Roy Dennis Wildlife Foundation and members of the project team.

PART C: Recommendations and proposed next steps arising from the analysis and the workshop.

PART A: Scenario analysis for capercaillie conservation translocations in Scotland 2025

Introduction

The Cairngorms Capercaillie Emergency Plan (Cairngorms National Park Authority and NatureScot, 2024) '*identifies actions that will maximise existing opportunities and address specific gaps across a range of interventions to rapidly benefit capercaillie, from improving habitat to reducing the impact of predation and disturbance at scale'*. Section 8 of the Capercaillie Emergency Plan also includes an action to evaluate the feasibility of reinforcing the Scottish capercaillie population by introducing birds from Europe and performing exchanges within the Scottish capercaillie population. This report takes forward that objective.

In this risk / benefit analysis, we have examined possible ways one might reinforce the capercaillie population in Scotland via translocations. The following questions will also need to be considered by the Programme Board and Scientific Advisory Group for the Capercaillie Emergency Plan, with input from stakeholders.

1. Would the current vision* for the Capercaillie Emergency Plan need to evolve to incorporate the delivery of a reinforcement project? For example, would we consider it a success to have the species maintained in existing locations or should we be aiming for the species to become more widespread? A classic species recovery vision would be for the target species: "to be secured and expanding in multiple populations of suitable habitat with limited external help/with threats understood and managed/in collaboration with and benefiting local people."

   * *To improve capercaillie breeding success and survival across the core of the capercaillie range in the Cairngorms National Park.*

2. When would it be appropriate for reinforcement to be enacted? For example, should the decision be made while there is still a minimum viable population?

3. The Capercaillie Emergency Plan is focused on delivering immediate and targeted action to rapidly benefit capercaillie by expanding and improving habitat, reducing the impacts of predation, removing and marking fences and reducing disturbance. In addition, which threats would a reinforcement project seek to address?

Reinforcement

Regarding the purposes of the translocation, we consider several scenarios here that meet the criteria of a "reinforcement" of the Scottish capercaillie population as a whole, depending on what the vision for the geographic scope of this species is under a successful conservation outcome. These include:

- **Reinforcement translocation** – a translocation directly into an existing population to bolster population size, genetic diversity, or both.

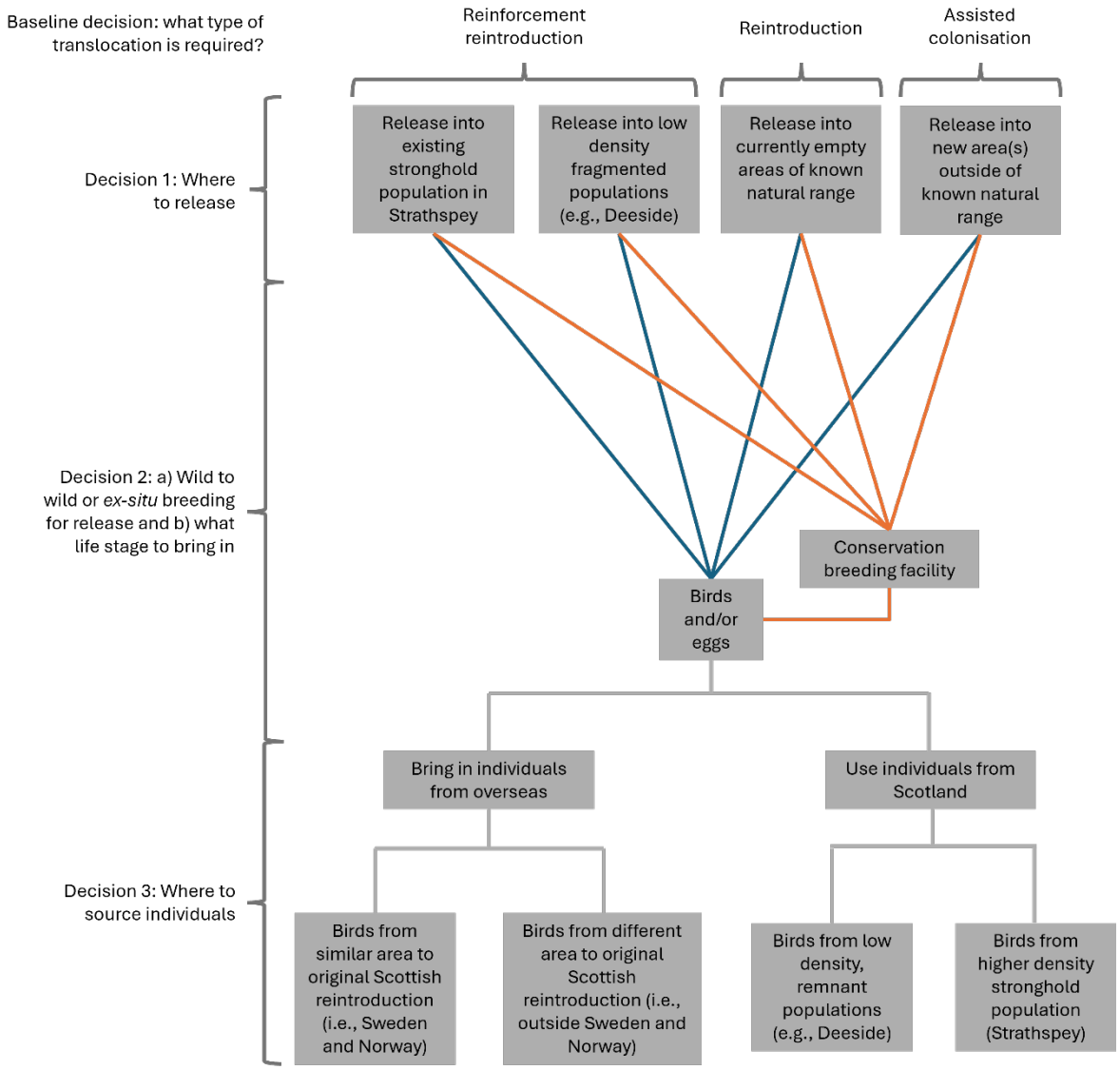
- **Reintroduction translocation** – a translocation into an area where the species existed historically but has been extirpated. This action seeks to establish a new population but, in doing so, still acts to reinforce the national population as a whole. Bear in mind that any new population successfully established could be managed as part of a national meta-population with individuals being moved between sub-populations to produce connectivity if needed.

- **Assisted colonisation translocation** – a translocation into an area where the species has not existed previously, but where conditions are felt to be suitable and where the species will be able to fulfil its ecological role. Assisted colonisations are variously used to restore an ecological function to an area where it is missing (e.g., Hansen et al., 2010) or to help a species outrun climate change (e.g., Bouma et al., 2020). As with a reintroduction, assisted colonisations within Scotland would still act to reinforce the national population as a whole and any new populations established could be managed as part of a meta-population.

For more information on different types of conservation translocations, please see the global and national guidelines on this topic (International Union for the Conservation of Nature (IUCN) Species Survival Commission, 2013; National Species Reintroduction Forum, 2014).

Note: The scenarios presented in this document are not mutually exclusive. For example, depending on the purpose of the translocation, a mix of source populations could be selected, multiple types of release site could be trialled, and a mix of release techniques could be used. This was the approach taken by the Polish EULife project where a total of 406 capercaillie were released from three Polish breeding centres, plus translocations from Scandinavia and Russia (Kobielski et al., 2019). See Figure 1 for a schematic of options and decision points considered in this document for capercaillie translocations in Scotland.

Figure 1: Decision tree depicting the various conservation translocation scenarios and strategies considered in this document for reinforcing the Scottish capercaillie. Orange lines = *ex-situ* breeding and release route. Blue lines = wild to wild translocation. As noted in the text, scenarios and strategies are not mutually exclusive and could be used in combination to achieve conservation goals.


Baseline decision: what type of translocation is required?
Reinforcement reintroduction
Reintroduction
Assisted colonisation
Decision 1: Where to release
Release into existing stronghold population in Strathspey
Release into low density fragmented populations (e.g., Deeside)
Release into currently empty areas of known natural range
Release into new area(s) outside of known natural range
Decision 2: a) Wild to wild or ex-situ breeding for release and b) what life stage to bring in
Conservation breeding facility
Birds and/or eggs
Bring in individuals from overseas
Use individuals from Scotland
Decision 3: Where to source individuals
Birds from similar area to original Scottish reintroduction (i.e., Sweden and Norway)
Birds from different area to original Scottish reintroduction (i.e., outside Sweden and Norway)
Birds from low density, remnant populations (e.g., Deeside)
Birds from higher density stronghold population (Strathspey)

Decision 1 – Where to release birds?

Overall considerations – Translocations do not exist in a vacuum and, wherever the birds are released, it is necessary to look at **all factors** such as habitat quality, disturbance, predation etc. which could cause reintroduction failure

There are different **cost implications** depending on the type of translocation being undertaken. For example, a relatively small number of birds into an existing population for a reinforcement versus establishing a new population. A full-scale translocation reintroduction programme for capercaillie with a mixed strategy of releasing wild and captive-bred birds is likely to cost millions of pounds.

Option	Benefits	Risks	Knowledge Gaps
Into existing stronghold population in Strathspey (reinforcement)	Within the Cairngorms National Park	Climate may become unsuitable, negating any efforts to reinforce this population. Inability to upscale measures piloted in Cairngorms Capercaillie Project to address disturbance. If population in stronghold is in decline at time of reinforcement, it is possible the agents of this decline have not been addressed, increasing the number of birds that would need to be released to render this approach successful.	Population viability analysis required to assess number of birds needed to result in a useful improvement in genetic diversity. Note: Even a reinforcement release may require hundreds of birds (Kobielski et al., 2019).

Into low density, fragmented populations such as Deeside (reinforcement)	Some sites within National Park	Climate may become unsuitable, negating any efforts to reinforce this population. If population in site is in decline at time of reinforcement, it is possible the agents of this decline have not been addressed, increasing the number of birds that would need to be released to render this approach successful.	
Into previously occupied range where species has been extirpated (reintroduction)	Opportunity to identify site with better conditions than current range. Some sites within National Park – there are areas of established woodland within the National Park that do not currently hold capercaillie (Cairngorms National Park Authority, 2015 Figure 2) and areas that could be established with habitat management (Cairngorms National Park Authority, 2015 Figures 3-5). Opportunity to increase extent of occurrence and area of occupancy while creating	Climate may become unsuitable, negating any efforts to reintroduce this population.	Do we have a full understanding of why the species was extirpated from area?

	insurance populations should current stronghold and/or low-density Scottish populations decline/disappear – spread the risk.		
Into new areas outside the known natural range of the species in Scotland (assisted colonisation)	Opportunity to identify site with better conditions than current range. Opportunity to identify site with more long-term climate suitability for the species based on climate change predictions – could address challenges with poor rainfall and invertebrate availability identified in Belgium and Netherlands (Hilde et al., 2024). Opportunity to increase extent of occurrence and area of occupancy while creating insurance populations should current stronghold and/or low-density Scottish populations decline/disappear – spread the risk.	Sites likely to be outwith National Park – additional partnerships required. Possibly difficult to justify Park Authority support for work unless a clear link is established to supporting populations in the National Park.	What is our confidence in predicting suitable habitat for capercaillie both at present time and under conditions predicted under climate change? Is there habitat considered more suitable than that in the known/historic range?

Decision 2 – a) Wild to wild or conservation breeding and release, and b) what life stage to bring in?

Overall considerations – it is likely that establishing successful, self-sustaining populations of capercaillie in Scotland (or even reinforcing current populations) will require the **release of hundreds of birds over several years**.

It is key to remember that in the event that an *ex-situ* conservation breeding programme is commissioned, it would likely **take several years before the programme was ready to release birds**.

Option	Benefits	Risks	Knowledge Gaps
Wild to wild translocation of birds	Possible to capture females post-copulation, but before egg laying – could have a clutch almost immediately (Hilde et al., 2024). But if eggs laid in transportation – have to be reared in a breeding centre (see risks). Birds seem to survive transport well. Of a total of 519 birds captured and transported from Sweden, there have been nine fatalities during transportation or just after release (within two weeks) (=1.7% of birds) (Hilde et al., 2024). Lower cost than building breeding centres but, as noted above and to right, some kind of incubation and rearing facility may still be	Large numbers of birds likely required to be transported. From (World Pheasant Association and IUCN/SSC Reintroduction Specialist Group, 2009): "*when considering the reintroduction of capercaillie to southern Scotland, simulations estimated that a minimum of 60 individuals would be required across 5000 hectares of habitat in order for the population to have a >0.95 probability of surviving for 50 years. Supplementation of populations with two unrelated individuals every five years reduced the minimum viable population to ten individuals (Marshall and Edwards-Jones, 1998). Alternatively, collation and analysis of numerous grouse re -*	

	required in addition to suitable quarantine facilities. Opportunity to collect data and learn more about the species in Scotland using radio tagging of released birds.	*introduction projects using captive-reared birds, suggests that annual releases of at least 30 birds are necessary for at least six years, in order to establish a population with 50% probability of survival and reproduction (Seiler et al., 2000).*" It may only be possible to source wild birds in relatively small numbers each year. From NINA 2024 report for Swedish EPA: "Mean numbers of captures per year are 19 for capercaillie" (Hilde et al., 2024). For certain source populations, it may not be advisable to take large numbers of birds for translocations as they would not be able to withstand the harvest of large numbers of individuals. Small-scale incubation and rearing facility may still be required if females lay eggs in transit. Could be negated by transporting females outside breeding season but would also lose potential benefit of females laying eggs on arrival.	

Wild to wild translocation eggs	Minimal handling of birds required – all handling done at egg stage. Potentially less stressful for individuals to be transported as eggs than as birds. Potentially less impactful on source population if females are able to re-lay after eggs have been taken.	Novel approach and thus untrialled (as far as we can tell). Has to be into existing populations so that eggs can be placed in nests of wild capercaillie – cannot be used to found new population. If not enough nests are located to place all eggs, it could lead to need for unplanned *ex-situ* incubation and rearing. It is unlikely that eggs from the wild would be allowed to be transferred into Scotland. If they were, chicks would need to be held in quarantine for at least three weeks post-hatching to allow for additional disease screening. Timing of egg translocation and nesting birds in Scotland would need to be very precise. Females could abandon nests if disturbed by egg placement as happens in other bird species (e.g., Carney and Sydeman, 1999).	How easy is it to transport fertile capercaillie eggs and have them remain viable? Feasibility of putting eggs under wild black grouse hens for fostering. This was done historically in the successful reintroduction of capercaillie to Scotland, but at a time where black grouse were more numerous. There are also concerns regarding fostering of capercaillie by black grouse, leading to a tendency to hybridisation between the two species.

		Difficult to monitor birds that have hatched out – cannot tag pre-hatch and would not be able to identify which bird came out of which egg.	
Ex-situ breeding and release birds	Potential for a continuous supply of birds. Facility could double as a quarantine facility and could also have an egg incubation facility. May require fewer birds to be sourced from wild as intent would be to breed large numbers of birds for release (but see genetic risk to right). Having animals in a breeding facility provides research opportunities regarding diet and behaviour that could enhance reintroduction efforts. Opportunity to collect data and learn more about the species in Scotland using radio tagging of released birds.	Risk of inbreeding and loss of genetic diversity in captive breeding population if not managed effectively. Additional birds may be required to be introduced into *ex-situ* population depending on success and genetic mix of founders. Most captive breeding and release programme for capercaillie have failed. This is thought to have been due to a lack of predator avoidant behaviour and changes in gut morphology in an *ex-situ* setting (D Merta et al., 2015). Relatively large amount of space needed to reduce antagonistic contact between nesting females and increase nesting success. From (Rosenberger et al., 2020): it is suggested that antagonistic behaviour between females	No *ex-situ* capercaillie in the UK currently, but there are private owners in the UK – the status of this privately held *ex-situ* population is unknow so further research is needed. There is seemingly a well-established *ex-situ* breeding programme for capercaillie in Europe, but more information is required on current successes of *ex-situ* capercaillie rearing methods as, historically, successful parent-rearing with this species *ex-situ* was very rare. There is some evidence from France (pers. comm. to D Barclay) that recent successes have been achieved with capercaillie husbandry and rearing.

	Use techniques from the EULIFE-funded project in Poland – "Born to be Free" methods (Krzywiński et al., 2013) where chicks are reared in semi-liberty by their mother and released next to their mother's pen, which show longer post-release survival times vs. traditional rearing and non-mother-assisted release methods (Dorota Merta et al., 2015). This is thought to be due to released juveniles roaming less widely and being able to heed their mother's warnings re: predation. "Born to be Free" method birds have also been shown to have lower endo-parasite burdens (Sokół and Pluta, 2022). Greater control re: selection of animals for release (e.g., age and relatedness). Potential to double-clutch birds to build up a larger captive population quicker. Could still facilitate eggs being placed under wild birds if this approach was felt to be appropriate/useful.	observed even at nesting densities of one bird per 132m^2. "Born to be Free" method requires release aviaries to be constructed in the release site.	

Ex-situ breeding and release eggs under hens	After first clutch of imported eggs are hatched, this allows for promotion of double-clutching by female capercaillie from second season onwards, as the first clutch can be reared by broody hens while the female capercaillie incubates a second clutch – if successful, allows for up to double *ex-situ* population growth rate. This has been done successfully at RZSS Highland Wildlife Park in the past.	Use of domesticated hens could introduce additional disease risks if robust disease/biosecurity controls are not in place. May lead to reduced predator avoidance behaviour in released animals. Requires construction of a rearing facility. If used as only approach it may lead to reduced skills/expertise with capercaillie parent rearing. Increases husbandry requirement and holding space re: number of animals (capercaillie and domestic hens).	Need to understand the impact of potential foster rearing vs wild behaviours e.g., predator avoidance and mate seeking/reproductive behaviour.

Decision 3 – Where should birds be sourced from?

Overall considerations – The latest **genetic data** (Ball and Ritchie-Parker, 2023) suggest that, when compared to other populations in Europe, Scottish capercaillie have relatively low genetic diversity. Interestingly, genetic diversity within the Scottish population has not changed over the 20th century, suggesting the population has not experienced a genetic bottleneck in that time. Within the Scottish populations, Abernethy stands out as a reservoir of genetic lines that are not found elsewhere in Scotland at high frequency. The genetic makeup of Scottish capercaillie reflects their Scandinavian origins, with Scottish birds being most genetically similar to those from Sweden and Norway. Out of eight populations examined in detail (Scotland, Sweden, Finland, Germany, Austria, Norway, Poland, and France) the Scottish population was most distinct from Finland ,(with the exception of France, which is, itself, genetically isolated and has low variability).. Finland also has some of the highest genetic diversity of the populations examined, both in mitochondrial and nuclear DNA. While there are not officially any *ex-situ* capercaillie in the UK currently, there are private owners in the UK – the status of this privately held *ex-situ* population is unknow so further research is needed as to how genetically distinct they may be from the Scottish population and other populations in Europe.

Option	Benefits	Risks	Knowledge Gaps
Overseas (overall)	Opportunity to introduce novel genetic variation not currently found in Scottish population, improving resilience to changing circumstances and reducing risk of inbreeding. Opportunity to source birds from populations that are apparently robust to harvesting for translocation (Hilde et al., 2024). Potential to explore both *in-situ* and *ex-situ* sources of birds given the breeding centres currently established in locations like Poland, as well as importing of	Longer transport distances – greater risk of stress to animals. Longer quarantine requirements both before and after import, with additional testing required for avian influenza and paramyxovirus both before and after import. Depending on purpose of translocation, multiple imports in successive years may be required – each import will require temporary holding for quarantine and the testing described above.	

	eggs and/or semen in addition to live birds.		
Overseas, from similar populations as previous Scottish reintroduction (i.e., Sweden)	Established and well-run programme for capture and transport of birds already exists in Sweden. Birds moving to (currently) similar climate as source population. Current Scottish population does not represent all known genetic variation in Swedish population (Ball and Ritchie-Parker, 2023), thus bringing animals in from Sweden could introduce novel genetic variation to the Scottish population (but see risks). Potential existing collaborations between Scottish organisations and conservation projects/facilities in Sweden (e.g., Nordens Ark) that could potentially assist with temporary holding, quarantine, additional *ex-situ* breeding etc.	*Not a risk but note that all the projects receiving birds from Sweden must report their monitoring results annually to get a permit for continuing captures, including survival during the first months after release and reproduction the following season. "Starting in 2023, the Swedish EPA will request a PVA for projects applying to capture capercaillie in Sweden." (Hilde et al., 2024)*. Local communities not always in favour of birds being removed – may attempt to sabotage capture (Hilde et al., 2024). Risk would be for supplier (e.g., NINA) to bear, but could impact numbers of birds supplied to Scotland from Sweden. Unlikely to improve genetic diversity given similarity of current Scottish population to Scandinavian stock (Ball and	

		Ritchie-Parker, 2023) (but see benefits).	
Overseas, from different populations to previous Scottish population founders	Entirely new genetic diversity if new source population selected based on latest genetic data (Ball and Ritchie-Parker, 2023). E.g., Finland could be a suitable source population to enhance genetic diversity in Scotland. Good chance of increasing resilience against changing circumstances (e.g., disease and climate change) and reducing risks of inbreeding. Depending on source population selected, birds moving to (currently) similar climate as source population. Some contacts exist between organisations in Scotland and the European *ex-situ* breeding programme plus other breeding for release projects for the species (e.g., in Northern Spain) – these could act as additional sources of birds from other genetic stock and geographic origin.	Could result in longer transport distances and travel times than birds from Sweden and associated risk and increased stress to birds being transported. A lot of mainland European populations are fragmented and/or in decline (e.g., Spain, France, Germany) (Coppes et al., 2015; Gil et al., 2020; Jahren et al., 2016; Mikoláš et al., 2015) and so, for some populations, it may be difficult to get permission to take birds to Scotland if there is a potential for a negative effect on donor population.	Availability of birds from countries outside Sweden or Norway. Understanding what climatic changes capercaillie in other locations are subject to and how they are responding would help select a source population that is best adapted to the current and predicted Scottish climate. Need to investigate various different licensing processes, government approval from additional source countries as these could vary from country to country. There is some evidence that capercaillie in different bioregions have different diets (Gonzalez et al., 2012), which could affect the suitability of birds from certain populations for life in Scotland. More understanding of this is required.

	If climate change is thought to be a threat to Scottish capercaillie population, sourcing birds from a climate more similar to what Scotland has/is shifted/shifting towards could create more resilience to this threat.		
Within Scotland (overall)	Shorter quarantine requirements (though note, this is dependent on the avian influenza situation at any given time). Likely shorter timeline for translocating birds.	No new genetic diversity introduced (improved connectivity and larger population sizes could slow the loss of genetic diversity and reduce inbreeding, but this loss will still occur).	May require robust population estimates of all sub-populations in Scotland to enable evidence-based decisions.
Within Scotland, collect up birds from low density populations (e.g., Deeside)	Opportunity to use birds from extremely low-density populations that may not otherwise have the chance to breed and contribute to the Scottish population, by moving them into higher density areas. Relatively low-cost method to boost numbers and (if density dependent) reproductive success in stronghold populations with a higher long-term survival probability in the first place,	Could be perceived as giving up on certain populations/forcing their extirpation if communications and engagement around decision not very carefully handled. There is no "unique" genetic variation in the samples from any of the low-density populations (Ball and Ritchie-Parker, 2023), so this move would not add anything new (but see benefits and unknowns).	A PVA analysis might help untangle exactly how beneficial (if at all) this strategy might be. There are fewer data on genetic diversity of capercaillie in these populations due to the understandably low sample sizes available. For example, previous studies of birds from Ross and Cromarty have identified an mtDNA haplotype not seen in the most recent study (Ball and Ritchie-Parker, 2023; Segelbacher and Piertney, 2007). This variation

	minimising chance of species extinction in Scotland. While not adding any new genetic material, adding in individuals and (hopefully) boosting the size of the breeding population could act to slow the loss of genetic diversity from the population.	If inbreeding has occurred in low density populations, then it may have led to inbreeding depression, which could lead to negative effects on survival and/or reproduction.	could have been lost, or still be present and just not sampled.
Within Scotland, from within stronghold population in Strathspey	Opportunity to introduce genetic diversity from Abernethy, which is unique within Scotland (Ball and Ritchie-Parker, 2023), into other Scottish populations. This would strengthen genetic resilience across the board if translocated birds breed with recipient population individuals and make it less likely that these genetic variants will be lost if anything happens to the Abernethy population. Opportunity to enhance and retain populations outside of the current stronghold in Strathspey.	Stronghold population in Strathspey may not be able to withstand harvest of number of individuals required to maximise chance of survival and reproduction in recipient population/breeding facility.	

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PART B: Report of stakeholder workshop on 22nd May 2025 at Cairngorms National Park Authority office in Grantown-on-Spey

Purpose:
The purpose of the workshop as stated in the initial invitation to participants was: "*....to review a set of potential scenarios for reinforcing the UK capercaillie population. The workshop marks the first step in exploring reinforcement options, alongside the intensified conservation measures outlined in the Capercaillie Emergency Plan. Should the positive effects of those conservation measures prove insufficient to reversing population declines, it may be necessary to reinforce the UK capercaillie population with birds from outside the UK. To prepare for a swift response in the event of population declines, we have commissioned the University of the Highlands and Islands (UHI) Centre for Mountain Studies, the Royal Zoological Society of Scotland (RZSS) and the Norwegian Institute for Nature Research (NINA), to develop a set of possible reinforcement scenarios, along with an analysis of the risks and benefits of each. The aim of the workshop is to review and refine the scenarios, identifying those that should be explored in greater detail.*"

Attendees:
The event was attended by 27 participants with representation across stakeholder groups: land managers and representatives of landowners in capercaillie SPAs (Abernethy, Balmoral, Mar Lodge, Glen Tanar, Rothiemurchus, Strathspey Estates, Forestry and Land Scotland, Wildland Ltd and Anagach Woods Trust), members of the Capercaillie Emergency Plan Programme Board (Park Authority, NatureScot, Forestry and Land Scotland, Scottish Forestry), the Scientific Advisory Group for the Capercaillie Emergency Plan (RSPB, Forest Research, GWCT, RZSS, NatureScot, University of Aberdeen, University of St Andrews, University of Glasgow) and the Roy Dennis Wildlife Foundation. The discussion was facilitated and notes collated by David Robertson, Wild Thinking, with help from staff from the Centre for Mountain Studies, UHI. Staff from NINA joined online for the opening and closing Q&A sessions.

Format:
Participants were sent the outputs of the scenario analysis developed by UHI, RZSS and NINA in advance of the workshop. The workshop was structured around the decision tree that formed the core of the scenario analysis. Participants were divided into three groups and each group rotated in turn around three tables, with a different decision to be taken in advance of a potential reinforcement explored at each table:

1) **Where to release birds**?
2) **What translocation method(s) to use**?
3) **Where to source birds from**?

Participants were encouraged to consider and discuss the benefits, risks and knowledge gaps associated with a range of different options identified in the scenario analysis. It was emphasised that the workshop was not a decision-making forum, with the purpose instead being to gather expert opinion and elicit information to ensure that any future decision-making would be based on a full understanding of the potential benefits and risks associated with different management options. Each group spent 45 minutes in a facilitated discussion at each decision point table. Note takers captured key points and posted them on boards visible to all participants.

Points raised and caveat:
The following is a summary of the key points identified by participants during the discussions. Note: this section represents a summary of the main views expressed, it is not a complete record of all comments and opinions.

Decision 1. Where to release birds?

- Discussion focussed on the need to establish criteria to evaluate the suitability of release sites. A range of population and external pressures - fencing, climate, food availability, habitat quality, disturbance, predators, presence of gamebird releases - interact to influence conditions for a successful release and a clearer understanding of which factors are most important is needed.
- Participants thought there was the need for a 'population viability assessment' (PVA) model and a Scotland wide habitat suitability map for capercaillie. CaperMap was also mentioned.
- It was mentioned that disease risk and number of ticks should be taken into account when choosing release sites.
- Participants stated that habitat quality would have to be good enough to mitigate impacts of ongoing disturbance (recreational and management). There was also discussion on the importance of continuous cover forestry and high-quality understory in facilitating population expansion. Regardless of the release site, it was deemed important to simultaneously focus on habitat connectivity to ensure that dispersal could take place from reinforced populations.
- It was felt to be important to consider the full range of release site options i.e. including those outside of the Cairngorms National Park that don't currently have Capercaillie populations, in the context of climate change and a need to understand the future range of suitable habitat. There was a suggestion that conditions might be more suitable to the north and west of Scotland for example. In relation to the option to reintroduce into areas where Capercaillie have existed in the past, a question was raised as to the reliability of historical records. There was a suggestion about drawing on data from occupied range from across Europe, but it was concluded that this data was too coarse to inform site evaluation in the Scottish context. There was general support for releases into Deeside being considered before the population went extinct there.
- The role of disturbance was considered a key factor. There was some support for a closer focus on sites in Deeside where it is perceived that disturbance pressure is lower than the "honeypot" sites in Strathspey. To mitigate against challenging levels of disturbance, there was some discussion about potential levers for managing areas of woodland as 'quiet areas' with access limitations through the re-direction of visitors and use of fixed penalty notices. It was noted that such areas would need to be large and hence would impact both residents and visitors. Reinforcement sites could attract more disturbance.
- There was some support for a multi-site reinforcement programme, with releases in less disturbed habitat in Deeside and Badenoch for example. Some expressed the view that the extant Deeside remnant population is already so small that reinforcement would present less risk than into the stronghold population.
- The genetic impacts of reinforcement on existing populations were discussed. Participants stated that it is very difficult to gather evidence on inbreeding depression in the wild and there have been no studies on capercaillie, but current genetic surveys on Scottish capercaillie suggests this is a likely concern. Some participants raised concern about the risk of outbreeding depression if new birds are added, although it was also noted that the risk

of outbreeding depression is likely to be low and could potentially be minimised by using birds from Central/Northern Europe.

- The genetic impacts of reinforcement on existing populations were discussed. It was felt that there is not currently definitive evidence of inbreeding depression in the existing populations. It was felt that it would be useful to measure inbreeding/outbreeding effects pre- and post-reinforcement. Some participants expressed concerns that potential outbreeding effects could be a risk to reinforcing existing 'stronghold' populations. Reinforcement was deemed less risky in remnant populations already considered to be on the brink.
- It was felt that there would be a need for consultation with and support from local communities where reinforcements or reintroductions were planned to take place. Release sites could attract attention and there would be a need to minimise disturbance at them.

<u>Decision 2. What translocation methods to use?</u>

- Discussion focussed on the challenges of regulation and practicalities of capturing and transporting birds and / or taking and transporting eggs. The need for derogations to minimise the time birds needed to be kept in quarantine, to minimise stress was discussed. Lessons can be learnt from other bird reinforcements across Europe including capercaillie, white tailed eagle, osprey etc. Comparisons were made in relation to the import and movement of pheasants and other game birds. The need to have all relevant authorities - EU, UK, SG – aligned as part of the planning was emphasised.
- There was discussion around the numbers of birds needed and the timescale over which they would need to be released (i.e. over several years). It was felt that the numbers required would vary depending on the purpose e.g. to boost genetics or build new populations. Participants queried what would constitute a minimum viable population (MVP) for this species. It was suggested that if the goal was increasing genetic diversity - fewer birds might be needed. Questions arose around whether to establish a captive breeding flock and, if so, could captive populations be used as part of this?
- The merits of the different techniques were explored: wild to wild; eggs from wild birds; eggs from captive bird; 'born to be free' methods. The practicality and legality of placing capercaillie eggs under greyhens was discussed (as was used in the original re-introduction in the 1800s). It was noted that the conservation status of black grouse and disease risk management could mean that this method could be undesirable and / or impractical. The behavioural naivety of captive bred birds to life in the wild, particularly predation, was felt to be an important issue.
- There was a discussion about the large amount of predator control that had occurred in the Polish release site and whether that was desirable or practical in Scotland.
- Some participants flagged research on gastro-intestinal development of captive game birds compared to wild birds, as a risk of a captive breeding approach, in that there could be diet transition difficulties faced by captive birds once released.
- It was felt that rather than putting 'all eggs in one basket' a range of techniques should be tried, with flexibility and adaptive management used to adjust to successes or failures and changing circumstances. This could include mixing the use of wild bird techniques and captive breeding techniques.
- Participants queried whether trap and immediate release from wild populations in Europe could be used (as being used in the Vosges mountains in France from Norwegian population). It was felt quarantine considerations from donor countries should be as minimal as possible to reduce stress on birds.

- The importance of following the Scottish Translocation code was recognised although it was noted that there was an inherent challenge in meeting the criteria that all negative factors were removed, given the current status of the population.

Decision 3. Where to source birds from?

- It was agreed that current populations are too fragile to consider moving birds around from one area to another e.g. Strathspey to Deeside or vice versa. It was felt that there was also likely to be public concern around taking birds from fragile populations.
- Much of the discussion was around international source populations and the need to consider disease screening requirements in donor countries and the UK, how to hold birds during transportation.
- There was also a discussion of whether "rogue" birds could form part of a reinforcement programme. It was considered that their behaviour was very individual - some could be disruptive and they would not be adding genetically. It was also mentioned that 'rogue' birds can be found in multiple countries and it could be a more widespread behaviour that is observed in places with high human population density.
- The need to ensure the viability of populations from donor sites and consultation and support from local communities where birds would be coming from was stressed. It was mentioned that thousands of capercaillie are still shot annually in Scandinavia. It was noted Finland had the most genetically diverse population.
- Donors may need reassurance around the condition of the habitat birds are going to be released into.

Further conclusions

1. There was general support for starting the process of planning and evaluation now, subject to resources to do so not detracting from other Emergency Plan action funding. Indeed many participants questioned why translocation is not already occurring, although several thought it might be too late. With so few birds remaining, some participants questioned whether the population is viable and some were worried that just one difficult breeding year would push it over the edge.

2. If reinforcement / reintroduction was to go ahead, it was thought to be important to manage expectations to deal with potential scenarios such as:
    a. High mortality rates of released birds
    b. Failure
    c. Injured or wandering birds

3. It was recognised that there would be a need for adaptive management during the reintroduction programme based on research. It was emphasised that it would be important to research and learn from behaviour of released birds and to gather genetic data, and from captive and wild techniques during reinforcement. Data collection and evaluation would be essential.

4. It was recognised that there would be the need for significant resources, particularly around managing release sites. This could be attractive to some funders that may not be interested in funding other Emergency Plan measures.

PART C: RECOMMENDATIONS

This contract aimed '*to produce a final report with recommendations regarding the scenario/s that should be investigated in more detail ecologically, socially, practically and from a disease perspective. This deeper investigation of one or more scenarios will form Phase 2*'. Based on the Scenario Analysis and the workshop conclusions above, the project team recommends that Phase 2 is initiated with the following actions:

1. The research team and stakeholder workshop participants believe there are sufficient grounds for progressing further with this work.

2. That the Capercaillie Emergency Plan Programme Board and the Scientific Advisory Group should agree on which – and how many – potential translocation sites to progress to a more detailed assessment from the following prioritised list:
    a. Deeside
    b. Speyside – adjacent to the existing stronghold
    c. Capercaillie SPAs outwith the National Park (Easter Ross, Moray and Nairn, or Perthshire)
    d. Other areas of Scotland

3. A decision-making framework for site selection should be agreed, factoring in criteria within the Scottish Conservation Translocation Code, and decision making should be informed by existing data e.g. CaperMap (rather than waiting for more data). Approaches commonly used in translocation planning[1], such as running an expert elicitation in a workshop setting, should be utilised to create the decision-making framework.

4. A detailed assessment and ground truthing of ecological conditions and risks for the selected sites should be carried out, using the decision-making framework. Expressions of interest from landowners to host a release should be sought, alongside local community consultation, to understand levels of support and opportunities for co-design of implementation.

5. In parallel, a population viability analysis (PVA) model[2] should be produced, to provide:
    a. A rationale for a 'trigger point' for when to move forward with reinforcement.
    b. Evidence to understand the necessary carrying capacity of a release site, to support final site selection decisions.
    c. Evidence on the number of birds that would be needed to carry out a reinforcement, and what a sustainable survival level would need to be.

[1] https://www.cpsg.org/sites/default/files/2024-05/CPSG%2520Principles%2520%2526%2520Steps_English.pdf
[2] https://www.cpsg.org/our-work/what-we-do/population-viability-analysis

6. In parallel, specific reinforcement information should be assessed in more detail, especially:
    a. Logistics of egg transfer (how long are they viable etc.).
    b. The status of the current UK *ex-situ* population – numbers and provenance.
    c. Status of wider European *ex-situ* population – especially within EAZA accredited zoos.
    d. Feasibility of obtaining derogations on quarantine requirements for importing birds or eggs from Europe.
    e. Expert interviews to produce a short review of current knowledge on ex-situ capercaillie rearing and reproduction to assess range of methods and techniques being used and what data actually exist on success of these methods.
    f. Evaluation of potential in-situ source populations in Europe.