Translocation of capercaillie and black grouse from Sweden to central Europe

An evaluation of ongoing translocation projects

Christoffer Høyvik Hilde, Nina Dehnhard, Erlend Birkeland Nilsen

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Preface

Capercaillie and black grouse are two species of fowl that are numerous in Sweden with a stable population trend over time. For many countries in Europe, however, the situation is different. Several countries have witnessed sharp declines in populations, which in some cases have led to the species disappearing from areas where they once were abundant. In an attempt to repair this damage, which is often linked to human exploitation of the birds' habitats, several countries have undertaken extensive restoration efforts in the areas where the birds once thrived. Subsequently, the projects have applied to capture wild black grouse and capercaillie in Sweden for release in the restored areas around Europe. Since 2010, the Swedish Environmental Protection Agency (the Swedish EPA) has granted several such applications from Belgium, the Netherlands, Poland and Germany, on the condition that each project complies with the directives described in the decision documents. These directives are mainly focused on that the projects should follow the guide-lines states by the International Union for Conservation of Nature (IUCN) regarding the translocation of wild animals. To be able to make well-founded decisions in the future, it is necessary that the measures are followed up and evaluated. As part of that, the Swedish EPA has commissioned an external party to summarize and evaluate the projects and investigate the potential effect that the removals of individuals may have on the Swedish populations.

This report has been prepared by the Norwegian Institute for Nature Research (NINA) on behalf of the Swedish EPA and will be a valuable knowledgebase for future decisions regarding applications from conservation projects that wish to capture capercaillie and/or black grouse in Sweden.

The report is written by Christoffer Høyvik Hilde, Nina Dehnhard and Erlend Birkeland Nilsen, all of whom are employed at NINA. During the course of the work, Christoffer Høyvik Hilde acted as coordinator for the assignment and was the main contact person for the Swedish EPA. The authors themselves are responsible for the content, conclusions, and any recommendations in the report. Malin Åhl, Nils Mårtenson, Michael Schneider and Kerstin Hultman-Boye have acted as editors at the Swedish EPA during the process. The work has been financed via the Swedish Environmental Protection Agency's grants for measures for valuable nature.

Stockholm 25 January 2024

Claes Svedlindh
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Förord

Tjäder och orre är två arter av skogshöns som är talrika i Sverige med en stabil utveckling över tid. För många länder i Europa är dock situationen annorlunda. Flera länder vittnar om kraftiga minskningar av populationerna, som i vissa fall har lett till att arterna har försvunnit från områden där de en gång varit talrika. I försök att reparera denna skada, som ofta är kopplad till mänsklig exploatering av fåglarnas livsmiljöer, har flera länder genomfört omfattande restaureringsinsatser av de områden där fåglarna en gång trivdes. Därefter har projekten ansökt om att få fånga in vilda tjädrar och orrar i Sverige för utsättningar i de restaurerade områdena runt om i Europa. Naturvårdsverket har sedan 2010 beviljat ett antal sådana ansökningar från Belgien, Nederländerna, Polen och Tyskland, under förutsättning att respektive projekt följer de direktiv som beskrivs i beslutsdokumenten. Direktiven handlar främst om att projekten förväntas följa de riktlinjer som The International Union for Conservation of Nature (IUCN) har sammanställt gällande förflyttning och utsättning av vilda djur. För att kunna ta välgrundade beslut i framtiden krävs det att åtgärderna följs upp och utvärderas. Som en del av det har Naturvårdsverket uppdragit en extern aktör att sammanställa och utvärdera projekten samt undersöka den potentiella effekten som uttagen kan ha på de svenska populationerna.

Den här rapporten har tagits fram av Norsk institutt for naturforskning (NINA) på uppdrag av Naturvårdsverket. Den ska utgöra ett kunskapsunderlag till framtida beslut rörande ansökningar från bevarandeprojekt som önskar fånga orre och/eller tjäder i Sverige.

Rapporten är skriven av Christoffer Høyvik Hilde, Nina Dehnhard samt Erlend Birkeland Nilsen som samtliga är anställda vid NINA. Under arbetets gång har Christoffer Høyvik Hilde agerat koordinator för uppdraget och varit främsta kontaktpersonen gentemot Naturvårdsverket. Författarna ansvarar själva för innehåll, slutsatser och eventuella rekommendationer i rapporten. Malin Åhl, Nils Mårtenson, Michael Schneider samt Kerstin Hultman-Boye har fungerat som redaktörer på Naturvårdsverket under processen. Arbetet har finansierats via Naturvårdsverkets anslag för åtgärder för värdefull natur.

Stockholm 25 januari 2024

Claes Svedlindh
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Summary

During the last couple of decades there has been an increasing effort to reinforce and increase the populations of black grouse and capercaillie in several areas in Poland, Germany, Belgium and the Netherlands using translocated Swedish birds. Beginning in 2010, a total of 616 black grouse and 519 capercaillie have been captured in different parts of Sweden and translocated to populations in central Europe. The purpose of this report is to summarize the translocation projects in Sweden, investigate the potential effects on the source populations and lastly to evaluate how the progress of ongoing projects could be evaluated. To summarise, we have found that the current translocation projects of capercaillie and black grouse from Sweden are, in most respects, in accordance with the IUCN guidelines of translocation in conservation. However, we have identified three areas which we propose should be improved upon to better assess the success of a translocation project: better monitoring of the source population, analyse population viability of the recipient population from the start and lastly to improve the communication between the translocation projects and the interested parties at the capture locations in Sweden. We believe that improving upon these three areas will provide a solid foundation for assessing the success of the ongoing translocation projects from the perspectives of both the source and recipient populations of capercaillie and black grouse, as well as the local human interests.

Sammanfattning

Under de senaste decennierna har det gjorts ökade ansträngningar för att förstärka och öka populationerna av orre och tjäder i flera områden i Polen, Tyskland, Belgien och Nederländerna med hjälp av translokerade svenska fåglar. Från och med 2010 har totalt 616 orrar och 519 tjädrar fångats i olika delar av Sverige och flyttats till populationer i Centraleuropa. Syftet med denna rapport är att sammanfatta flyttprojekten i Sverige, undersöka de potentiella effekterna på donatorpopulationerna och slutligen utvärdera hur resultaten i de pågående projekten skulle kunna evalueras. Sammanfattningsvis har vi funnit att de aktuella flyttprojekten av tjäder och orre från Sverige i de flesta avseenden är i enlighet med IUCN:s riktlinjer för translokering vid bevarande. Vi har dock identifierat tre områden där vi föreslår att man kan göra förbättringar för att lättare kunna utvärdera resultaten av flytten: bättre övervakning av donatorpopulationen, analysera mottagarpopulationens ursprungliga livskraft och slutligen att förbättra kommunikationen mellan flyttprojekten och intressenterna vid fångstplatserna i Sverige. Vi tror att en förbättring av dessa tre delar kan ge en ökad möjlighet att bedöma resultaten för de pågående förflyttningsprojekten med perspektiv ur både donator- och mottagarpopulationerna av tjäder och orre, såväl som de lokala intressena vid fångstplatserna.

Introduction

Populations of western capercaillie (*Tetrao urogallus*) and black grouse *(Lyrurus tetrix)* have experienced a strong decline in continental Europe during the last half-century (Jahren *et al.*, 2016; IUCN, 2022). These dramatic decreases can be attributed mainly to habitat loss and degradation due to intensification of agriculture and livestock grazing (Jahren *et al.*, 2016). For the remaining populations additional pressures have arisen due to climate change and an increase in generalist predators (Storch, 2007). Few populations of capercaillie and black grouse remain in continental Europe, and as many of these populations outside of the Alps are isolated, loss of genetic diversity has been identified as an additional threat (Segelbacher, Höglund and Storch, 2003; Segelbacher *et al.*, 2014). To counteract the population declines and increase the genetic diversity in the fragmented populations, during the last couple of decades there has been an increasing effort to reinforce and increase the populations in several areas in Poland, Germany, Belgium, and the Netherlands using translocated Swedish birds. Translocation is defined as the human-mediated movement of living organisms from one area to another with the aim of reinforcing or reintroducing the target population (Seddon, 2010). The International Union for Conservation of Nature (IUCN), of which Sweden is a member, have made guidelines for reintroductions and translocations in conservation, which functions as a roadmap for identifying and evaluating new and existing translocation projects (IUCN and SSC, 2013). When assessing the success of a translocation project it is necessary to investigate its effects on both the source and destination populations. One should also consider how the project is affecting human interests, including the interests of landowners and hunters. The purpose of this report is to summarize the translocation projects in Sweden since the start in 2010, analyse the potential effects on the source populations and lastly to evaluate how the progress of ongoing projects could be evaluated.

The translocation projects

Overview

The first translocation project in Sweden was initiated in 2010 when nine male and two female black grouse were captured in Ljusdal, Gävleborg county and transported to the Rhön biosphere reserve in northern Bavaria, Germany. The first capercaillie project started in 2012, when 28 females from Tärnaby, Västerbotten, were translocated to Lower Lusatia, Brandenburg, Germany. In total 616 black grouse and 519 capercaillie have been translocated from Sweden to six populations in four countries between 2010 – 2022 (Table 1, Figure 1). Data from 2023 is not fully compiled at the time of publication of this report. 94.9 % (500 individuals) of the black grouse have been caught in the county (län) of Gävleborg while the remaining 5.1 % (27 individuals) were caught in Västerbotten. Capercaillie captures are distributed over five counties, of which 63.8 % (330 individuals) were caught in Västerbotten and 28.8 % (149 individuals) were caught in Jämtland. The remaining 7.3 % (38 individuals) were caught in Norrbotten, Dalarna and Gävleborg (Figure 2). Mean numbers of captures per year are 19 and 17 for capercaillie and black grouse respectively, but the difference between years is high and the number of captures has increased markedly since 2016 due to an increase in both number of active projects and number of catches per project (Figure 1).

Sex differences

In general, more females than males were caught in all the translocation projects, with a marked difference between species. The percentage of females captured in the capercaillie projects are all above 90 %, while for black grouse it ranges from 51.6 - 64 % (Table 1). For capercaillie it is a deliberate strategy to focus the capturing on females in spring, after copulation but before egg-laying. That way, the recipient population might receive a litter of chicks in addition to an adult female. For example, in 2022 the Thuringian project captured 40 females during the spring catch and when arriving in Germany there was 39 eggs laid in the transport boxes. Eggs laid during transportation usually are reared in breeding centres. Because the goal of the translocation projects is to increase the population size and genetic diversity as fast as possible, it can be beneficial to release more females than males. As both capercaillie and black grouse are lekking species with highly polygamous males, a male can mate with several females during lekking season and thus the yearly reproductive output of the population is more limited by the number of females than by the number of males. Translocating ten females and two males could ideally give ten broods the following season while six females and six males only gives six new broods. The majority of the capercaillie captures are done using scoop nets from cars driving along gravel roads (Figure 3). Capercaillie often gather along gravel roads to collect gizzard stones (grit) which are used to help digest coarse or hard foods. Most captures were done in late April – early May and during this time male capercaillies are preoccupied with lekking and thus mostly females are caught on the gravel roads. Several capercaillie projects have conducted a

second capture session in September – October to capture males. Black grouse are mainly caught on leks using walk-through basket traps. These lek-captures have been done in periods when both sexes are present, and therefore the sex ratio of black grouse captures are in most cases closer to 1 than for capercaillie.

Figure 3. Capercaillie catching from car in Sweden for the German translocation project in Lower Lusatia. @Alexander Erdbeer

Permissions and transportation

In Sweden, it is the Swedish Environmental Protection Agency that gives permission for how, when, and how many individuals of each species that can be trapped each year. The projects also need a permission from the landowner/the owner of the hunting rights to be able to capture birds on that particular land. To export the trapped birds, the translocation projects need permission from the Swedish Board of Agriculture (Jordbruksverket) and an examination of the birds and the transport boxes from a district veterinarian (affiliated with Jordbruksverket). After capture, the birds are transported to their new country, either by car or by plane. Authorities in the recipient country gives permission for import and release of the captured birds. The birds from both species seem to handle the transportation fairly well and very few casualties or injuries have been registered during the transportation phase. Of a total of 1135 captured birds, there have been 9 and 21 fatalities during transportation or just after release (within two weeks) for capercaillie and black grouse respectively. There is no apparent difference between species or sex in their ability to cope with the translocation process. In all translocation projects some individuals are equipped with radio-transmitters allowing the personnel to monitor the birds after release. This gives valuable information on mortality and habitat use of released birds which can be used to monitor the

success of the translocation project. The projects send yearly reports to the Swedish EPA, as specified in the capture permits, where they summarize the capture effort and monitoring data from the source populations. Based on these reports, no deviations from the capture permits have been found.

Figure 4. Release of Swedish capercaillie hen in Lower Lusatia, Germany. Camera trap photo.

Table 1. Overview of the different projects showing species, time period and total number of translocated males and females. All projects are ongoing as of December 2023.

Country	Population	Species	Time period	Number of birds captured	% females captured
Germany	Lower Lusatia	Capercaillie	2012 – 2022	442	90.4
	Thuringia	Capercaillie	2017 – 2022	53	100
	Rhön Biosphere Reserve	Black grouse	2010 – 2022	217	51.6
Belgium	Nature Park Haute-Fagnes	Black grouse	2017 – 2022	88	54.5
The Netherlands	National Park Sallandse Heuvelrug	Black grouse	2012 – 2022	195	57.9
Poland	Bory Dolnośląskie Forest	Capercaillie	2014 – 2019	121	97.5
	Bory Dolnośląskie Forest	Black grouse	2017 – 2019	27	64

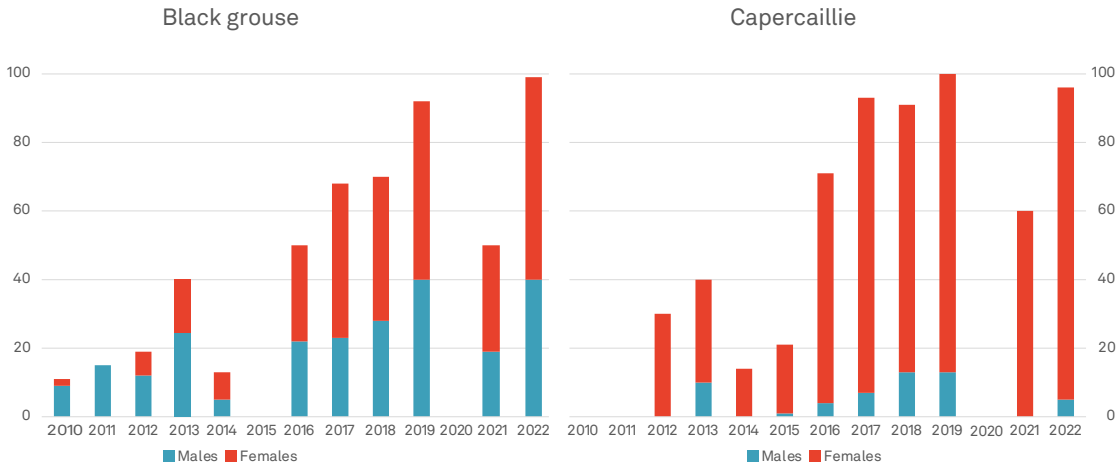
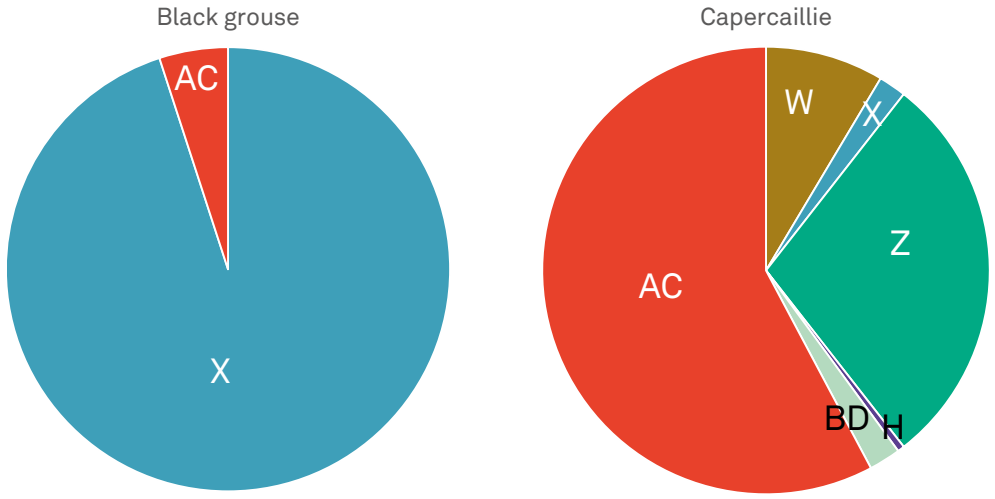


Figure 1. Yearly captures of male and female black grouse and capercaillie. No captures were done in 2020, and for some projects in 2021, due to the COVID-19 pandemic.



SPECIES	COUNTY CODE	COUNTY	PROP. %
Black grouse	X	Gävleborg	94,9
Black grouse	AC	Västerbotten	5,1
Capercaillie	W	Dalarna	8,6
Capercaillie	X	Gävleborg	2,1
Capercaillie	Z	Jämtland	29,1
Capercaillie	H	Kalmar	0,2
Capercaillie	BD	Norrbotten	2,3
Capercaillie	AC	Västerbotten	57,8

Figure 2. Proportion (%) of total captures for each species in each county between 2010 and 2022.

Public relations

Criticism

The IUCN guidelines for conservation translocations stress the importance of communication, engagement and problem-solving between the public and translocation managers (IUCN and SSC, 2013). Both capercaillie and black grouse are important game species in Sweden and some of the translocation projects have received a lot of media attention due to criticism from locals and/or hunters (see e.g., Jakt & Jägare, 2017; djurskyddet.se, 2023). The criticism is mainly related to captures of female capercaillies, especially for the projects capturing in the Vilhelmina and Åsele regions in Västerbotten. Some are opposed to the capturing of capercaillie females during breeding season, arguing that females might get captured and translocated after they have started egg-laying and that the capercaillie population might be reduced because it removes important individuals from the population. The personnel responsible for the captures are trained in recognizing females that have started incubating based on brood patches and there have been instances when captured females were released due to the presence of brood patches (see e.g., Erdbeer and Thielemann , 2022). Brood patches are developed by females on their lower belly by shedding all feathers from this area, so that a feather-free patch is created, which optimises the heat-transfer to the eggs. There have been no studies on brood patch development in neither capercaillie or black grouse, but for some Galliform species (of which capercaillie and black grouse belong) it has been found that the brood patch starts to develop and the birds lose feathers during middle or late egg-laying (Jones, 1971). Whether this is the case for capercaillie is unknown, but we recommend that it should be investigated as capturing incubating females can clearly be problematic from an animal welfare perspective. No reports of any conflicts have been given from the black grouse projects based in Ljusdal, where the majority of the black grouse captures take place. Capture sites and times are coordinated with landowners, and in some cases with hunters.

Correspondence with project coordinators

Little information on potential contact with public interests in Sweden has been published in the reports from the translocation projects. From correspondence with the projects local contacts, we have asked for information on i) how Swedish landowners and hunters experience the cooperation with the translocation projects and ii) if there is any contact between the source population in Sweden and the translocation projects in advance of catching campaigns. From this correspondence we have learned that the degree of contact between the projects and locals interested in conserving the local populations of capercaillie and black grouse seems to differ between projects and areas, depending on the species in

question. The contacts working with the black grouse projects report little interest from locals and hunters. The capercaillie projects receive much more attention, both from hunters and locals. For example, one of the capercaillie contacts reported that they informed hunters and locals in advance of catching the first year of the project, with the result that some individuals used this information to sabotage the capturing by scaring away birds in front of the cars used by the catching personnel. After this incident the project decided to stop informing the locals about the captures.

Proposed solutions

Based on communication with the local project coordinators and available media coverage, it is evident that the potential for conflict is present for many of the translocation projects, especially for capercaillie. The IUCN guidelines, in the "social feasibility" section state that: "*No organisms should be removed or released without adequate/conditional measures that address the concerns of relevant interested parties (including local/indigenous communities)*..." (IUCN and SSC, 2013). There are many possible solutions for contact and dialogue between the two groups that could help in solving the difficulties some groups of locals have with the translocation projects. Initiating a line of communication directly with interested local parties would be a good first step, for example by having a local meeting open for the public in advance of the capture season each year. This type of contact would be a good opportunity for the projects to inform about the motives for the translocation projects and how Swedish birds can help restore populations in other parts of Europe, and should ideally be in place before the startup of a project (IUCN and SSC, 2013).

Effects on source populations

Overview

An important aspect in the management of gamebirds such as capercaillie and black grouse is whether harvesting will have a negative impact on the regional or local populations, i.e., reduce the population size. The size of a population is usually estimated through annual counts of individuals, for example by doing line transects and noting the number of observed animals in an area. Logic implies that by removing individuals from the population one year, for example by shooting or capturing (harvesting), the number of individuals in the population next year will go down. This is not necessarily the case. Mortality from harvesting (shooting and translocation is equally considered mortalities in this context as individuals are effectively removed from the population in both cases) can either be additive to the natural mortality of the population (e.g., predation and diseases) or it can be compensatory. Compensatory mortality happens when the negative effect of an increased mortality is compensated for, by e.g., an increase in reproduction and/or a decrease in natural mortality (Boyce, Sinclair and White, 1999). The potential for compensation is assumed to be highest when natural mortality is high and depends on both the life-history of the species and population size (Péron, 2013). Several studies have shown compensatory mechanisms in other grouse species, (e.g., greater sage grouse (*Centrocercus urophasianus*) (Sedinger *et al.*, 2010) and willow ptarmigan (*Lagopus lagopus*) (Sandercock *et al.*, 2011), but to the authors' knowledge there exist no studies investigating compensatory mortality directly in capercaillie. However, a study of black grouse in Ticino, Switzerland, found evidence for additive mortality of hunting by showing that the sex ratio in a population, where only males were hunted, had a higher percentage of females in the population than what would be expected (Zbinden *et al.*, 2018).

Estimating effects

To estimate whether the current extent of captures and translocations of Swedish black grouse and capercaillie can influence the regional and/or local source populations, three parameters are needed:

1. Yearly data on regional and local population sizes.
2. Yearly data on regional and local harvest rates (hunting and capturing).
3. Population-specific data about the extent of additive vs compensatory effects when it comes to harvest mortality.

Monitoring of the populations at the capture locations is not implemented and we were thus unable to gather data for point three. For points one and two we only managed to gather regional population estimates and harvesting rates provided by the Swedish breeding bird survey (Svensk Fågeltaxering, www.fageltaxering.lu.se)

and Viltdata from the Swedish hunting association (www.viltdata.se). Table 2 summarizes the data on the region-level and shows that the number of captures per year per region is very small, ranging from 0.16 – 0.55 % of the total number of individuals harvested yearly. It should be mentioned that the effect of harvesting on the population dynamics is highly dependent on the timing (Kokko and Lindström, 1998). Harvesting close to the reproductive season in the spring will probably have a much stronger effect per capita on the population dynamics of black grouse and capercaillie, compared to harvesting in the autumn (Brøseth, Nilsen and Pedersen, 2012). The timing of harvest is important because the demographic value of individuals, meaning how much one individual contributes to the population growth next season, increases the closer you get to the breeding season (Kokko and Lindström, 1998). Since most of the captures in the translocation projects are done in- or close to- the breeding season in the spring, the demographic value of these individuals is higher than for birds captured or hunted in autumn. This effect is also sex dependent,
removing a female just before egg laying will have a much stronger impact on the population compared to removing a male. Nevertheless, the number of captured birds, both black grouse and capercaillie, are very small compared to the total harvest in each region and it is unlikely that the regional population of either species is affected by the current extent of capturing. In fact, the regional population trends for capercaillie show a slight increase (except in Dalarna where the trend is stable) while for black grouse the population trends are stable (Table 3). It should be noted that the data on regional trends is at a low resolution and better data is needed to better understand the population trends of capercaillie and black grouse in Sweden (Johansson and Hellenberg, 2018) and would also help to understand the effects of harvest better.

Proposed solutions

To give a more definitive answer and quantify to which extent, if any, the capturing is influencing the local populations of capercaillie or black grouse, better data is needed. To evaluate local population effects, both estimates on population size and harvest from hunting are needed. This would also benefit both the public and the regulatory authorities. We recommend implementing population monitoring at the capture locations to get better estimates of population size. Line transect surveys in the fall are an accurate method for investigating long-term population trends and have been used successfully for both species (e.g., Wegge and Rolstad, 2011). Community-based monitoring of grouse populations, such as the Norwegian-based project Hønsefuglportalen (honsefugl.nina.no), provides an effective method of bringing together volunteer field personnel, managers and landowners to monitor grouse populations over large areas (Nilsen, Pedersen and Vang, 2013). Other alternatives include genetic sampling on fecal pellets or lek counts in the spring. Data on population trends together with data on hunting harvest (available at www.viltdata.se) would provide much better insights into the potential local effects of capturing at the population level. However, to disentangle if the effects of capturing is additive to natural mortality or not, larger-scale experimental manipulations are needed (Sandercock *et al.*, 2011).

Table 2. Region- and species-specific harvest data (captures and hunting) per county, number of years with captures, the proportion of captures for translocations to the total number of harvested individuals (captured + hunted) and regional trends. Regions: NN = Norra Norrland = Norrbotten+Västerbotten+Jämtland, SN = Södra Norrland = Västernorrland+Gävleborg+Dalarn a, ÖG = Östra Götaland = Östergötland+Jönköping+Kalmar+Kronoberg+Gotland. The data for regional trends are given as slopes of the yearly estimates and based on counts from Svensk Fågeltaxering from 2002 – 2022. ^{NS} indicates that the slope is not deviating from 1 meaning the population trend in the area is stable. ** means there is a statistically significant deviation from 1 for the slope. A slope < 1 means the number of birds in the region decreases and a slope > 1 indicates an increase.

Län (region)	Species	Years with captu-res	Number of captured birds per year: mean (range)	Yearly harvest: mean (range)	Capture proportion of total harvest	Regional trends (slope)
Gävleborg (SN)	Black grouse	11	21.7 (5 – 40)	1461 (1029 – 1866)	1.46 %	1.01^{NS}
	Capercaillie	2	6.5 (4 – 9)	1179 (786 – 1556)	0.55 %	1.01^{NS}
Västerbotten (NN)	Black grouse	3	9 (2 – 17)	5575 (4209 – 7411)	0.16 %	1.02**
	Capercaillie	10	21.6 (2 – 40)	4038 (2461 – 7038)	0.53 %	1.02**
Norrbotten (NN)	Capercaillie	1	14	6327 (4379 – 9457)	0.22 %	1.02**
Dalarna (SN)	Capercaillie	4	3.7 (2 – 6)	2210 (1454 – 3826)	0.17 %	1.01^{NS}
Jämtland (NN)	Capercaillie	7	17.3 (1 – 35)	3394 (2505 – 4911)	0.51 %	1.02**
Kalmar (ÖG)	Capercaillie	1	1	80	1.25 %	1.01^{NS}

When is a project successful?

Overview

The aim of the translocation projects of capercaillie and black grouse is to increase the population size of existing, but endangered, or extinct populations in central Europe and ultimately (re-)establish viable populations. The IUCN guidelines emphasize the need to address the causes of previous declines before reinforcing the population with new individuals (IUCN and SSC, 2013). Because the decreases of many populations of capercaillie and black grouse in Europe are caused by habitat loss and degradation (IUCN, 2022), it is necessary to adopt an ecosystem-based management focus when assessing the ongoing translocation projects (Seddon, 2010). Several success stories on translocations of birds exist, such as the Californian condor (Walters *et al.*, 2010) and Lord Howe Island woodhen (Frith, 2013), but several studies have shown that conservation translocations often have a low success rate (e.g., Bubac *et al.*, 2019; Morris *et al.*, 2021).

Estimating viability

The end-goal of a translocation project is a self-sustaining viable population (Seddon, 2010; IUCN and SSC, 2013). An evaluation if translocations are successful should thus focus on this end-goal. A viable population is defined as a population in which survival and reproduction are high enough to sustain a population growth for a period of time such that the population is considered likely to persist without further translocations (Morris *et al.*, 2021). Statistical models, like population viability analyses (PVAs) are useful tools which can be used to evaluate the status and potential success of a project. PVAs use demographic data (survival and reproduction) in combination with data on population size to calculate the probability of population extinction (Morris and Doak, 2002). Monitoring the progress and potential success of a project is vital to ensure the project is stopped when the recipient population is considered viable, but the project should also be stopped in case it doesn't give the preferred result. Ideally, surveys should be done before the translocations start to gather baseline data which can be compared to post-release data.

Assessing the success of translocation projects of capercaillie and black grouse in central Europe is complicated because a multitude of factors, such as habitat quality, anthropogenic stressors, predation and climate, can all have adverse effects on the viability of these grouse species (Jahren *et al.*, 2016). The effects of climate change cannot be alleviated, and for some populations in the low-lying areas of the historical range of black grouse and capercaillie the climate might already be unsuitable for long term-viability. The projects in Belgium and the Netherlands have already reported breeding failures due to little rain and missing invertebrates for the chicks during the breeding season.

Proposed solutions

Monitoring of population sizes or density, e.g., through line-transects, DNA samples or counting individuals at leks, provides a minimum measure for the status of a translocation project. To assess, using PVAs, which part of the life-cycle (survival or reproduction) is restricting population growth in the recipient population, data on both survival and reproduction is needed in addition to population size (Morris *et al.*, 1999). In addition, genetic sampling is recommended to monitor changes in genetic diversity as small populations are vulnerable to inbreeding depression. All the grouse translocation projects using birds from Sweden monitor their populations, and some released individuals are fitted with transmitters. So far, however, no PVAs have been done, except for the Rhön biosphere reserve project in Germany, where a PVA was run prior to the start of the translocation project. All the projects 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 or black grouse in Sweden. To assess if the project is progressing in the right direction, it is important to look at the temporal trends of the populations. If the recipient population is not increasing after releasing new individuals, it is necessary to investigate survival and reproduction, identify the factors preventing one or both from increasing population size, and improve conditions. A general analysis, such as a PVA, would be helpful in providing useful information for assessing both the progress and success of the ongoing translocation projects of capercaillie and black grouse.

Summary and recommendations

To summarise, we have found that the current translocation projects of capercaillie and black grouse from Sweden are, in most respects, in accordance with the IUCN guidelines of translocation in conservation. However, three aspects of the translocation projects should be improved upon to accurately assess the success of a project:

1. Monitoring of the source population, such as line transect surveys or lek counts, to get better estimates of population size and the potential effects of the translocation projects on the long-term population trends. Capturing of female capercaillies in the breeding season should be avoided due to animal welfare concerns.
2. Perform a population viability analysis of the recipient population before, and repeatedly throughout, the translocation projects to assess the population trends and its causes. This necessitates both population counts and monitoring of individuals. If the recipient population is extinct, it should be clearly proven that measures have been taken to restore the habitat for sufficiently supporting a viable population of the species in question. Defining criteria for a successful project (viable population) at the start of the project is needed as a reference point for evaluation of the projects.
3. The IUCN guidelines say that the concerns of relevant interested parties should be addressed, and whether the projects fulfil this concern should be part of the evaluation process. Opening a line of communication with the local communities around the source populations is a first step towards cooperation and can benefit both parties in terms of knowledge sharing and ultimately a successful translocation project.

Implementing these three suggestions would provide a solid foundation for assessing the success of the ongoing translocation projects from the perspectives of both the source and recipient populations of capercaillie and black grouse, as well as the local human interests.

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Translocation of capercaillie and black grouse from Sweden to central Europe

An evaluation of ongoing translocation projects

In efforts to try to save and restore decreasing and lost populations of black grouse and capercaillie in other countries in Europe, several foreign projects have been allowed to capture birds in Sweden for translocation to affected areas. In order to be able to take well-founded similar decisions in the future, the measures must be evaluated and analysed. This report has summarized how well the projects have followed the stated directives from the Swedish EPA and the guidelines from the IUCN. The authors have also evaluated the potential effects the captures might have on the donor populations in Sweden. The report will form a valuable knowledgebase for future decisions. It is written on assignment by the Swedish EPA and the authors are responsible for the content, conclusions and any recommendations mentioned in the report. The work has been financed via the Swedish Environmental Protection Agency's grants for measures for valuable nature.

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