MASTER'S THESIS

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Nesting habitat selection and the influence of habitat characteristics on nest predation of capercaillie and black grouse

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Nesting habitat selection and the influence of habitat characteristics on nest predation of capercaillie and black grouse

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Preface

This master thesis marks the end of my 5 years at Nord University. It has been a long and difficult process, but it makes me proud to say that I completed my master's degree! It would not have been possible without the great guidance and help with both the writing process and R-analyses from Jan Eivind Østnes (Nord university), Torfinn Jahren (Innlandet University College) and Erlend Nilsen (NiNA and Nord University). Also, a big thanks to Pål Fossland Moa and Torfinn Jahren for giving me the opportunity to use their dataset in this thesis.

Trondheim, November 2021

Kristian Kleveland

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Abstract

During the last century, the nesting success of capercaillie and black grouse has been declining. This might be because of predation and habitat fragmentation. An increase in predation has been suggested to be a result of man-made habitat fragmentation since the changes in forestry in the 60`s.

So far, only a few studies have investigated the nesting habitat of capercaillie (*Tetrao urogallus*) and black grouse (*Lyrurus tetrix*) and the influence habitat characteristics can have on the nest predation rates. During the period 2009 – 2015 a total of 62 black grouse nests and 250 capercaillie nests were monitored in Innlandet and Trøndelag counties in southern Norway. Habitat data were collected at each nest site (microhabitat scale), and the outcome of these nests were identified mainly by use of game cameras. In addition I used data from Satveg and AR50 to investigate the habitat on a home range scale. I fitted seven general linear mixed models with carefully selected habitat variables to test the difference in habitat and if habitat had an influence on predation. The models were evaluated using Akaike information criterion (AICc). For the predation models, the two species was tested separately.

Unexpectedly, I found that capercaillie and black grouse nested in very similar habitats. Nest cover, dense coniferous forest and tree density seemed to be the habitat characteristics that had the most influence on predation (with regards to AICc). However, for black grouse the probability for nest predation decreased with more nest cover (microhabitat scale) and the probability for predation increased with more dense coniferous forest (home range scale). For capercaillie, nest cover and tree density had no relation to nest predation rates.

The remarkable similarity in choice of nesting habitat of capercaillie and black grouse contrasts with previous literature and is important knowledge for future management of capercaillie and black grouse. Continuing to explore capercaillie and black grouse nesting behaviour will improve our understanding and management of these two species.

1. Introduction

A habitat can be defined as the natural environment where an organism chooses to live during the year or parts of the year (Lindenmayer & Fischer, 2006). The habitat is a trade-off between what the organism prefers and what is available (Smith & Smith, 2015). This area must provide the organism with necessary resources and sustain basic life processes (Hall et al., 1997). Habitat loss is the leading cause for population declines and extinction of species (Devore, 2014), and loss of habitat is often caused by human activity (Lindenmayer & Fischer, 2006). Having knowledge of a species habitat can help to prevent habitat loss and reduce the risk of a decline in a population (Smith & Smith, 2015).

Capercaillie and black grouse are the two largest forest grouse species in Norway (Lindström, 1994), and both species are precocial ground nesters (Wegge & Rolstad, 2011). Black grouse and capercaillie live sympatrically during the breeding season but select different stages of forest succession (Swenson & Angelstam, 1993). The smaller species, the black grouse, is known to select forests that are in the early successional stage (Swenson & Angelstam, 1993). Usually they select open young forest that are no older than 0-20 years old, but also grasslands, peatbogs and marshes are included in their preferred habitat (Swenson & Angelstam, 1993; Ludwig et al., 2009). The capercaillie prefer older successional stages and preferably pine (*Pinus sylvestris*) dominated forest (Swenson & Angelstam, 1993).

The capercaillie and the black grouse are polygynous, and the males does not take part in the chick-rearing (Brittas & Willebrand, 1991; Wiley, 1974). The capercaillie and the black grouse mate during spring at leks where males display themselves to be selected by females, and this is the only interaction between the two sexes (Wiley, 1974). After mating the females place the nest at random distances from the lek location, but each female often select the same nesting home range year by year (Storch, 1997; Marjankangas & Kiviniemi, 2005; Wegge, 1985). The capercaillie and black grouse female lay one egg per day, sometimes two (Hjeljord, 2008). Incubation starts when the egg laying is completed and during the incubation the hen leaves the nest two to three times a day to feed (Hjeljord, 2008).

In the 1950s forest management in Fennoscandia changed from selective cutting to clearcutting and, as a result, the forests became massively fragmented (Wegge & Rolstad, 2011). During the 1960s the capercaillie populations declined dramatically in Fennoscandia (Wegge & Rolstad, 2011; Sirkiä et al., 2010). Due to the temporal match in events, changes in forest management have been suggested as a plausible reason for the decline in capercaillie and black grouse populations in Fennoscandia (Kurki et al., 2000; Wegge & Rolstad, 2011). However, the exact mechanisms for the decline in capercaillie and black grouse population remains unknown.

The main nest predators on forest grouse in the boreal forest are red fox (*Vulpes vulpes*) and pine marten (*Martes martes*), being responsible for nearly all identified predation on capercaillie and black grouse nest (Jahren et. al, 2016; Wegge & Kastdalen, 2007; Storaas & Wegge, 1987). There is a lot of uncertainty about the population development of red fox and pine marten, but after 1945 the red fox populations is believed to have increased (Hjeljord, 2008). The increase in the red fox population is often assumed to be due to habitat fragmentation, reduced hunting pressure as a result of the decline in fur prices and the incline in prey availability (Jahren et al. 2016; Selås &Vik, 2006; Speed et al., 2019; Järnemo & Liberg, 2005). Pine marten populations has varied due to fur prices, but the population increased during the 1980`s (Hjeljord, 2008). During the last 15 years, however, the harvest statistics for pine marten has been stable (Statistisk Sentral byrå, 2020). The heavily modified landscapes may be the ultimate cause for a potential increase in predator efficiency, because of edge-related effects (Wegge & Rolstad, 2011). Edges will make it easier for a predator to locate pray that aggregate in edge habitat (Andren & Angelstam, 1988).

There are only a few studies that have investigated nest loss for capercaillie and black grouse in the boreal forest (Ludwig et.al, 2010; Jahren et.al, 2016; Storaas & Wegge, 1987; Brittas & Willebrand, 1991). Different nesting habitat could potentially influence predator efficiency. For example, Ludwig et al. (2010) found a relationship between earlier successional stages and black grouse nesting success. Storaas and Wegge (1987) concluded that capercaillie and black grouse are nesting in all available habitat except in treeless peat bogs, but plantations was the least favourable habitat. Capercaillie had a higher rate of nest loss than the black grouse, but still they found no significant correlation between choice of nest habitat and nest

losses (Storaas & Wegge, 1987). Their results indicated a tendency to a lower predation rate on capercaillie nests in clear-cuts.

The purpose of this study is to investigate the nesting habitat of black grouse and capercaillie on two scales: home range and microhabitat. In addition, I will investigate whether habitat characteristics influence the nest predation rates for these two forest grouses. Based on the previous literature presented above my two hypotheses are:

1: There is a difference in choice of nest habitat between capercaillie and black grouse.

2: Nest predation rates of capercaillie and black grouse will be affected by different habitat characteristics.

2. Material and Methods

2.1 Study area and dataset

Data used in this study were collected in parts of Innlandet and Trøndelag (former Hedmark and Nord-Trøndelag county, respectively) during a six-year period from 2009 to 2015 (Figure 1, Torfinn Jahren & Pål Fossland Moa, pers. com., 2020). Forests in Innlandet and the northern parts in Trøndelag are heavily managed and are dominated by conifers. Norway spruce (*Picea abies*) is the most dominant species, but Scots pine (*Pinus sylvestris)* is also frequent. Some stands are mixed with deciduous forest, of which birch (*Betula pubescens*) is the most common species (Statistics Norway, 2009). In both counties black grouse and capercaillie are quite common species (Solvang et al., 2009).

Habitat data were collected from 312 unique nest locations of which 62 were black grouse and 250 where capercaillie nests. At each nest location habitat data on a microhabitat scale, such as nest cover, tree density, tree type, felling class and vegetation type was gathered (appendix 1). With the help of camera traps, the outcome of the nests was classified as either deserted, predated, or hatched. Since the cause of nest desertions were unknow, I did not include deserted nests in further analysis. To interpret the fate of the nest in cases where the cameras failed, or for nests without camera traps, the remains of eggshells were studied to interpret the fate of the nest. If the eggs were perfectly cut in half with membrane still intact, the eggs were interpreted as hatched (Torfinn Jahren, pers. com., 2021). Eggs that had been predated were either completely removed or eggshell fragments were scattered around or inside the nest. Nests where the eggs were still intact were classified as deserted.
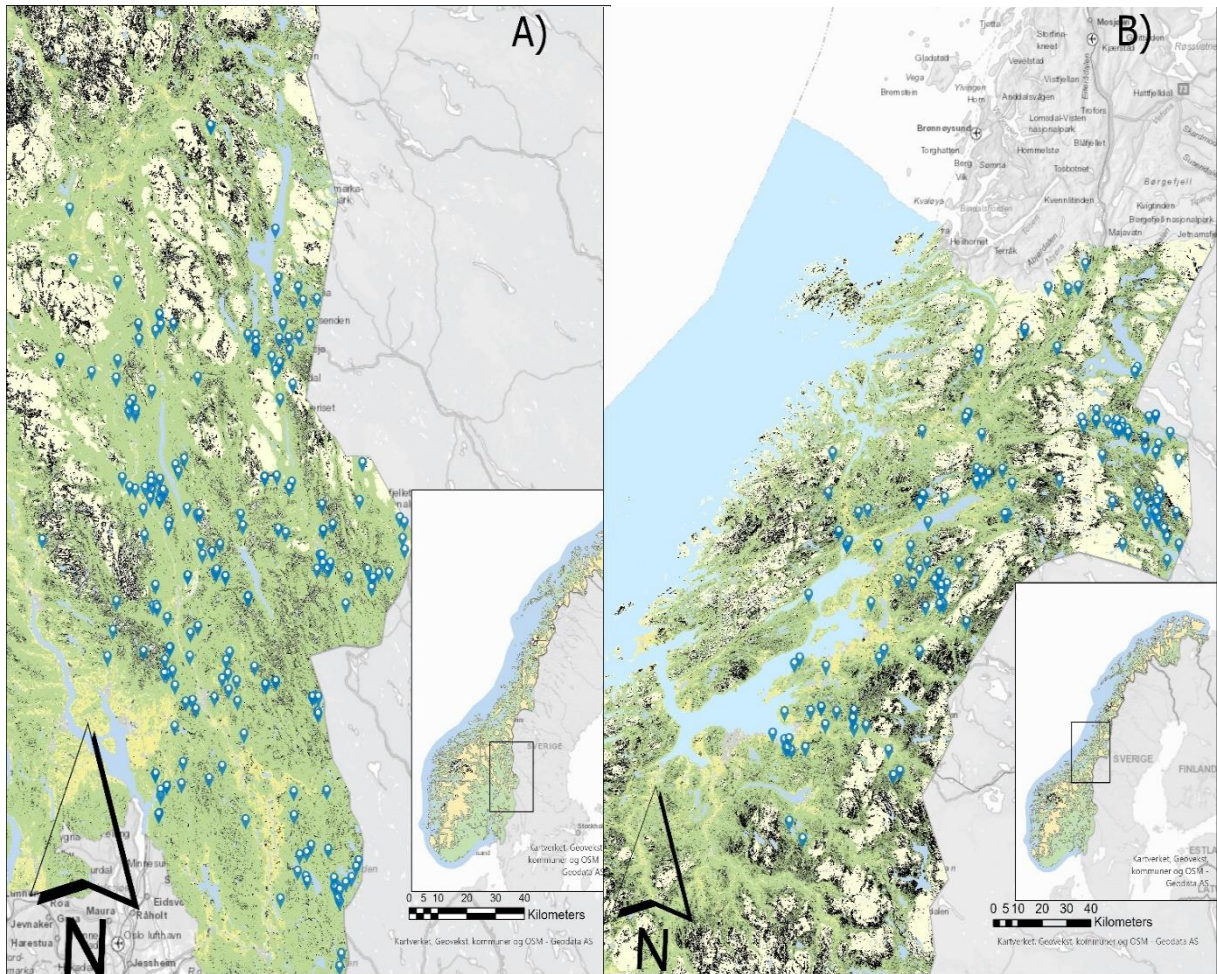
Figure 1: Nest locations of black grouse and capercaillie included in the study in A) Innlandet county and B) Trøndelag county. Source: Kartverket.

2.2 Habitat analysis using GIS

Habitat analysis were performed using Esri ArcGIS Pro (Esri inc. 1999-2020). To generate large scale habitat variables, vegetation data from Satveg and AR50 (Norut Tromsø, Norsk Romsenter, Miljødirektoratet, 2012; Nibio, 2019) were used. These datasets contain a wide range of habitat classifications, many of which are similar in their potential effects on nest success. To reduce the number of variables in the analysis, I deleted classes that where not of interest for the thesis. I combined the classes that were similar and ended up with a total of six vegetation categories. These were classified as: birch forest, bogs and swamp forest, dense coniferous forest, herb and deciduous forest, open coniferous forest and meadow and heather (appendix 2).

The variable tree type and forest quality from the AR50 data (Nibio, 2019) were also used as vegetation variables in the habitat analyses. The tree type data (Heggem et al., 2019) included the classes coniferous, deciduous, and mixed forest that were used in further analysis. The AR50 variable site quality (Nibio, 2016) included classes that were of interest for the thesis: impediment site quality, low site quality, medium site quality and high to very high site quality.

The habitat data from Satveg and AR50 were selected by creating a buffer with a radius of 250 meters around each nest sites. The buffer was assumed to represent the home range of forest grouse hen`s during incubation, and this area was based on previous studies showing that the home range of incubating forest grouse hens is approximately 20 ha. (Wegge, 1985; Kolstad et.al, 1985). Within each buffer ten random points were created by using the random points tool in ArcGIS Pro. These points functioned as sample locations for vegetation data from the different layers in ArcGIS Pro. By adding vegetation data on a home range scale, I was able to investigate both the potential effects of home range habitat as well as the effects of the microhabitat at each nest location.

2.3 Statistical analysis

Before the analysis, pairs of independent variables were checked for collinearity. No collinearity was detected. I fitted seven generalized linear mixed model (glmm) to investigate the potential differences in nesting habitat between black grouse and capercaillie with species as the dependent variable. The generalized linear mixed models predict the probability that the nest in question is a capercaillie nest (capercaillie nest = 1). The probability for a black grouse nest increases when the probability is less than 1. All other statistical test was done using generalized linear mixed models.

To test the potential influence of habitat on the predation of the nests I fitted seven models that was carefully constructed. The variables that I selected are identical to or approximates variables that have been highlighted as important habitat variables in earlier studies (Table 1). I analysed each species separately. All models had random effects, main effects and a maximum of one interaction. A model with just the intercept (the null model) was used as a

reference. The random effects were parameterized with the variables year and county. The random effects accounted for some of the temporal and spatial variation in the data. All models were evaluated using Akaike information Criterion (AICc). The AICc, Delta AICc and Akaike weight (AICcwt) were reported. After preliminary model testing, I found that models including the variables birch forest and open coniferous forest produced models that had greater support (with regards to AICc) than models with all other predictor variables for both species. This indicated that birch forest and open coniferous forest explained most of the habitat variation. Therefore, each model also included either birch forest or open coniferous forest. I added a threshold model with just either birch forest or open coniferous forest as a reference. All models and the visual representation of these models were created using the program R (R Core Team, 2018).

Table 1: Variables used for analysis of the effects of habitat on predation. Home range = buffer around nest, Microhabitat = nest site.

Variable	Abbreviation	Scale	Variable type
Birch forest	BF	Home range	Numerical
Nest cover	NC	Microhabitat	Numerical
Dense coniferous forest	DCF	Home range	Numerical
Felling class	FC	Microhabitat	Categorical
Open coniferous forest	OCF	Home range	Numerical
Tree density	TD	Microhabitat	Numerical
Impediment site quality	ISQ	Home range	Numerical
High to very high site quality	HSQ	Home range	Numerical
Herb and deciduous forest	HDF	Home range	Numerical

3. Results

3.1 Distribution of nesting habitat

I found that the distribution of home range nesting habitat was similar between capercaillie and black grouse. Visual inspection showed that the nesting home range of both species had a majority of dense coniferous forest (Figure 2), middle site quality (Figure 3) and coniferous tree types (Figure 4). On micro habitat scale the two species nested in similar felling classes, but the largest proportion of capercaillie nests were found in felling class three and four, while black grouse nests were mostly situated in felling classes two and five (Figure 5). I found a small difference in nest cover (microhabitat (β: -0.016 ±SE: 0.008, z: -2.086, p: 0.037)), and no difference in tree density (microhabitat (β: 0.013 ±SE: 0.036, z: 0.354, p: 0.723 (Figure 6)).

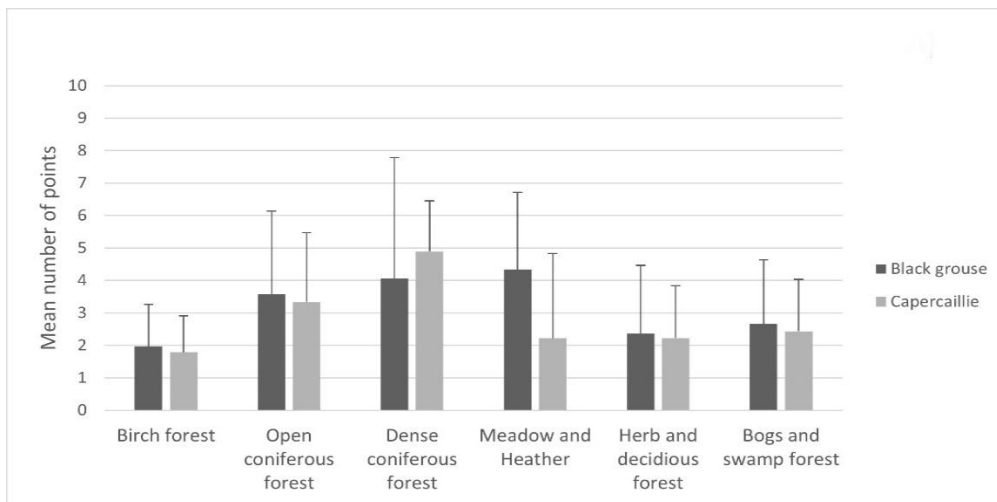*Figure 2: Mean number of points (±SD) within different vegetation types from Satveg inside the nesting home ranges of black grouse and capercaillie.*

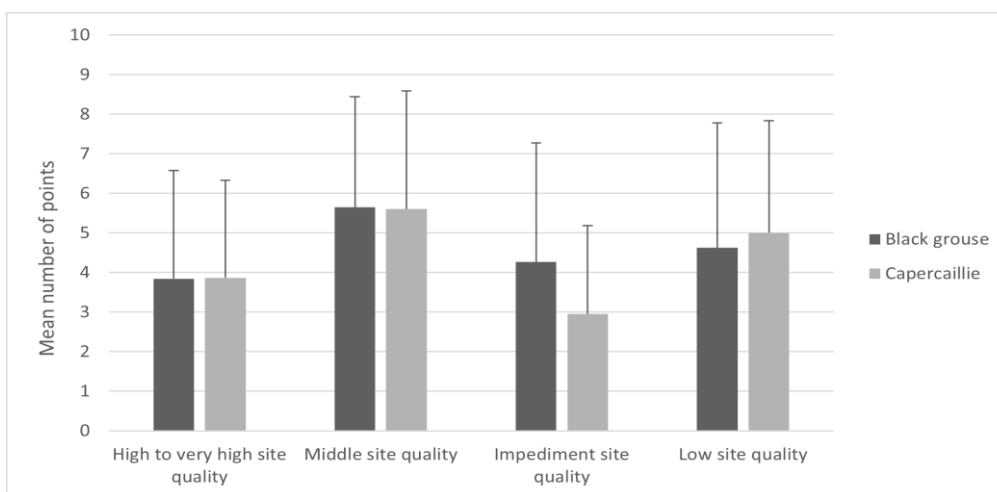*Figure 3: Mean number of points (±SD) within different site qualities from AR50 inside the nesting home ranges of black grouse and capercaillie.*
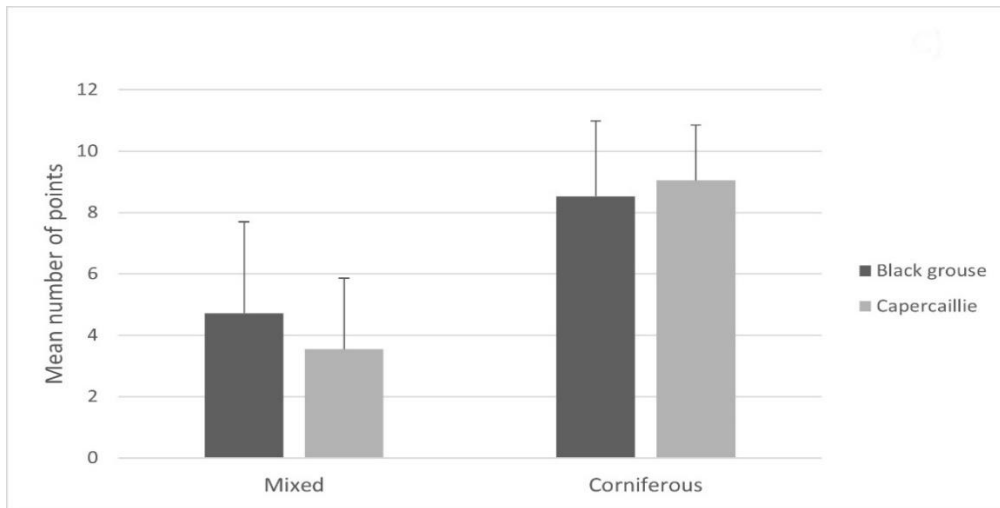
Figure 4: Mean number of points (±SD) within different tree types from AR50 inside the nesting home ranges of black grouse and capercaillie.
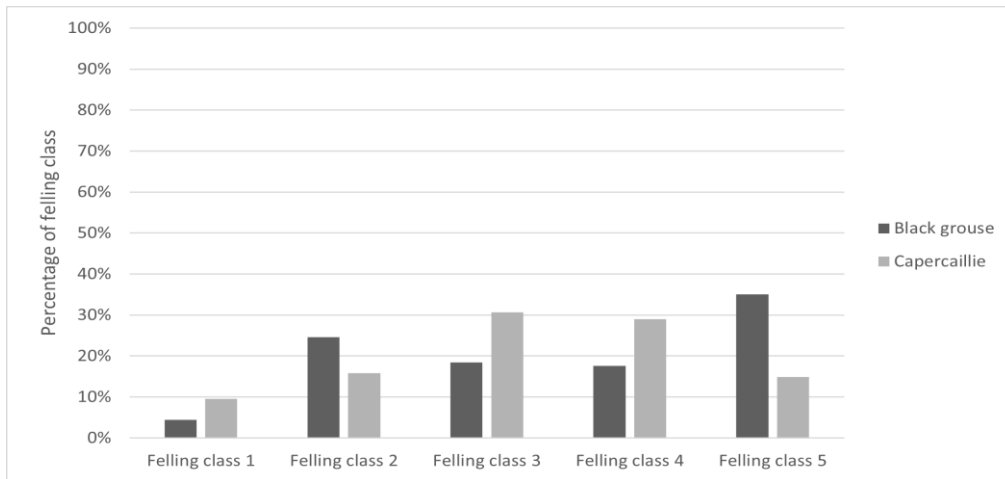

Figure 5: Distribution of black grouse and capercaillie nests in different felling classes. Because of small sample size the mean in felling classes is calculated by percentage of total nests found for each species separately.
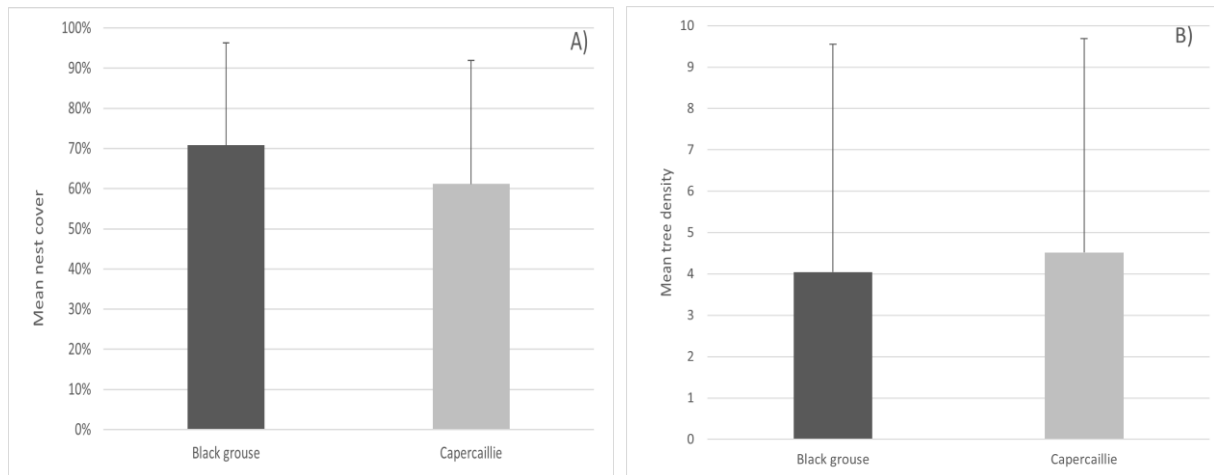
Figure 6: Mean nest cover (A (±SD)) and mean tree density (B (±SD)) for black grouse and capercaillie nests.

I found that the best models for differentiating between nesting habitat for capercaillie and black grouse was the ISQ (impediment site quality) + HSQ (high to very high site quality). The other models had substantially less support than the ISQ and HSQ model (delta AICc< 2 (Table 2)). The probability for a black grouse nest seems to increase when ISQ (β: -0.956 ±SE: 0.887, z: -1.081, p: 0.280) increases, although not significant (Figure 7).

Table 2: Candidate models that was used to analyse the habitat preference of black grouse and capercaillie ranked according to AICc. Parameters are the number of variables. The null model had the lowest AIC score. Note that the variable BF is used in every model.

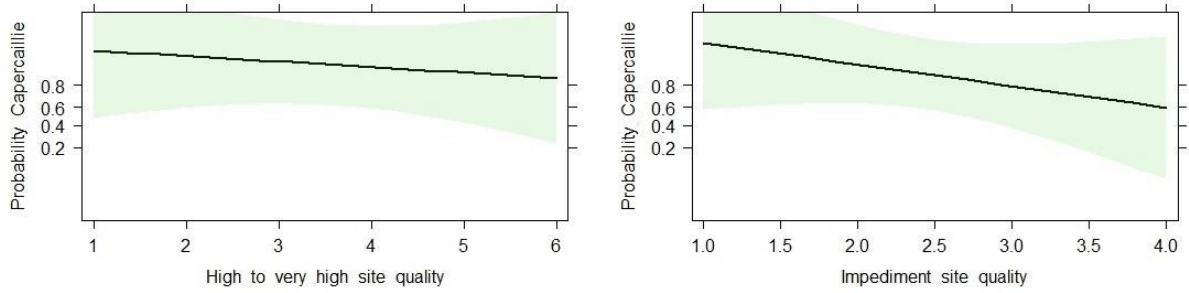| Species Models	Parameters	AICc	Delta AICc	AICcwt
ISQ+HSQ	6	30.39	0.00	1.00
OCF+HDF	6	85.20	54.91	0.00
DCF+NC	6	103.62	73.23	0.00
DCF*NC	7	105.53	75.14	0.00
DCF+FC	9	109.63	79.24	0.00
BF	4	174.96	144.58	0.00
Null model	1	313.15	282.76	0.00

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Figure 7: The relationship between hight to very high site quality and species (left) and impediment site quality and species (right). The y-axis shows the probability for capercaillie, 1 = capercaillie and 0 = black grouse.

3.2 Habitat type and nest predation

I found that the best model to explain the relationship between habitat and the predation of black grouse nests was the NC (nest cover) + DCF (dense coniferous forest) model. The rest of the models had substantially less support (delta AICc> 2) (Table 3). The probability for predation on black grouse nest seems to have decreased with increasing NC (β: -0.127 ±SE: 0.095, z: -1.332, p: 0.183), although not significant. The amount of DCF (β: 0.724 ±SE: 0.513, z: -1.413, p: 0.158) within the species home range seems to have increased the probability for predation, although not significant (Figure 8)

Table 3: Candidate models used to analyse the predation on black grouse (BG) ranked according to AICc. Parameters are the number of variables in the model. The null model had the lowest AIC score. Note that the variable BF is included in every model.

BG Models	Parameters	AICc	Delta AICc	AICcwt
NC+DCF	6	33.08	0.00	0.89
NC*DCF	7	38.12	5.04	0.07
HDF+DCF	6	39.79	6.71	0.00
BF+NC	5	44.90	11.82	0.00
TD+NC	6	47.46	14.38	0.00
BF	4	49.69	16.61	0.00
Null model	1	82.83	49.75	0.00
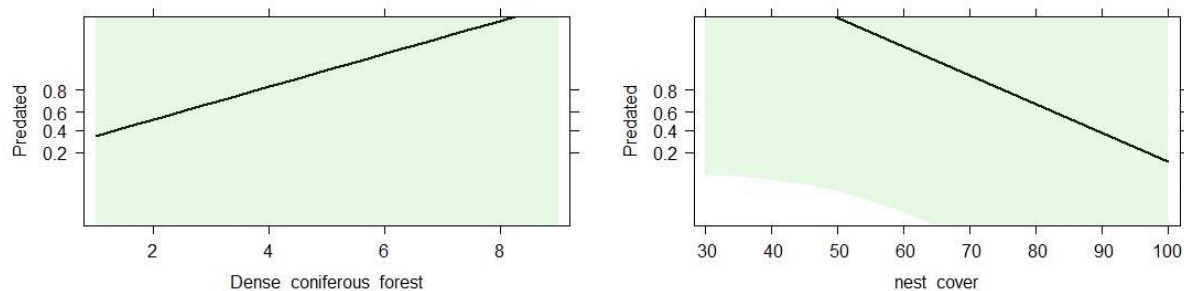
Figure 8: The relationship between dense coniferous forest and predation on black grouse (left) and nest cover and predation on black grouse (right).

I found that the best model to explain the effect of nesting habitat on predation for capercaillie was the TD (tree density) + NC (nest cover) model. All the other models had substantially less support (delta AICc > 2, Table 4). The TD+NC model seems to indicate that predation had no relation to TD (β: 0.047 ±SE: 0.038, z: 1.256, p: 0.209). Predation also seems to have had no relation to NC (β: 0.006 ±SE: 0.008, z: 0.937, p: 0.349 (Figure 9)).

Table 4: Candidate models used to analyse the predation on capercaillie (CAP) ranked according to AICc. Parameters are the number of variables in the model. Note that the variable OCF was included in every model.

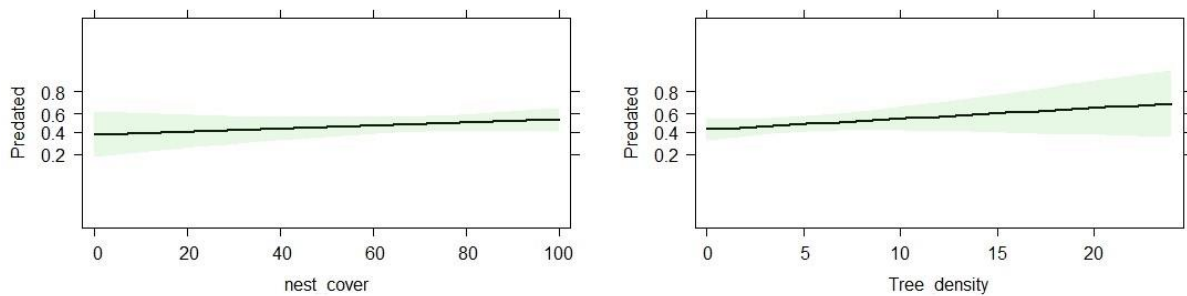| CAP Models	Parameters	AICc	Delta AICc	AICcwt
TD+NC	6	202.96	0.00	1.00
FC+TD	9	205.40	2.44	0.00
FC*TD	13	206.52	3.56	0.00
OCF+FC	8	216.80	13.84	0.00
DCF+OCF	5	251.80	48.85	0.00
OCF	4	284.62	81.66	0.00
Null model	1	341.29	138.77	0.00

Figure 9: The relationship between nest cover and predation on capercaillie (left) and tree density and predation on capercaillie (right).

4. Discussion

In this study I found a remarkable and unexpected similarity in choice of nesting habitat between the capercaillie and black grouse. Different habitat characteristics might influence the predation rates on nests. Nest cover, tree density (microhabitat) and dense coniferous forest (home range) seems to be the most important habitat variables that influence the nest predation of both capercaillie and black grouse. For capercaillie, predation had no relation to nest cover, but for black grouse the probability for predation decreased when the amount of nest cover increased.

From preliminary model testing I found that birch forest and open coniferous forest was the two variables that explained most of the variation in home range habitat. The species models with birch forest had greater support (with regards to AICc) than models without the birch forest variable, these models seemed to indicate that the probability for a black grouse nest seemed to increase when birch forest increased, this result was significant. Although, through visual inspection the difference is remarkably small (Figure 2). Black grouse nest predation models with birch forest had greater support (with regards to AICc) than models without the birch forest variable, but birch forest seemed to have no relation to predation. Capercaillie nest predation models with open coniferous forest had far greater support (with regards to AICc) than models without the open coniferous forest variable, but open coniferous forest seemed to have no relation to predation. Because birch forest and open coniferous forest had far greater support, I decided to add them to every model because I wanted to look at the underlaying patterns in nest habitat selection. These results might be due to misclassification of habitat characteristics, which is a common problem when using habitat data from satellite maps. The validity of my study may have been affected by this phenomenon to an unknown degree (Norut Tromsø, Norsk Romsenter, Miljødirektoratet, 2012).

Earlier studies on nesting habitat, black grouse and capercaillie preferred to nest in their realized niches, for capercaillie that means older forest that are pine dominated and for black grouse that means younger forest with grasslands, peatbogs and marshes (Swenson & Angelstam, 1993; Storaas & Wegge, 1987; Ludwig et al., 2009). These differences in results might be because of changes in forest structure the last 30 years, such as the declining amount

of younger successional stages and the increase in older successional stages (Tomter & Dalen, 2018).

The majority of nests in my study were found in the middle – aged felling classes. Plantations has been suspected to be unsuitable nesting habitat for capercaillie and black grouse (Wegge & Rolstad, 2011). After hatching the grouse chicks require protein rich food, such as insects and larvae to grow. During the forest grouse chicks first few months the lepidopteran larvae is the main food source (Picozzi et al., 1999; Wegge & Kastdalen, 2008). The lepidopteran larvae are usually associated with bilberry shrubs (*Vaccinum myrtillus*) and clearcutting reduces the amount of bilberry shrubs (Picozzi et al., 1999; Wegge et al., 2005; Kvasnes & Storaas, 2007; Wegge & Rolstad, 2011). Lakka and Kouki (2009) discovered that the larvae and bilberry recovered 30 – 40 years after clearcutting. Wegge and Rolstad (2011) found that an increase in plantations does not affect the chick production for capercaillie and black grouse, which explains why the majority of the nests in my study were found in the middle-aged felling classes.

There was a substantially lower number of black grouse nests than capercaillie nest in the data set and my habitat analysis is therefore weaker for black grouse. The difference in sample size might be due to the difference in behaviour at the nest (Storaas et al., 1999). Earlier studies show that the capercaillie hen has a flush distance of 4,2 m, while the black grouse hen flushes from her nest at 2,3 m (Storaas et al., 1999), this seems to make the capercaillie nest easier to detect. Nonetheless when flush distance is longer, the chances of the nest being located is higher (Ludwig et al, 2010). The difference in sample size was not due to a difference in population size, the population numbers of capercaillie and black grouse where similar during population counts in both Innlandet and Trøndelag throughout the study period (Solvang et al., 2009).

Because of small sample size, I could not evaluate potential effects of felling class on the nest predation of black grouse, but Ludwig et al. (2010) found a positive relationship between early successional stages and black grouse nesting success. Storaas and Wegge (1987) however, found no relationship. In my study the probability for predation on black grouse

increased when the amount of dense coniferous forest increased. Early successional stages, such as plantations usually have dense vegetation (Ludwig et al., 2010). The increased probability for black grouse nest predation in earlier successional stages could be because of less nest cover, in dense earlier successional forest where trees are thin, nest cover could be low (Ludwig et al., 2010).

In earlier studies on nest losses, capercaillie used clear-cuts frequently when nesting (Storaas & Wegge, 1987). Capercaillies preference for clear-cuts might be due to site tenacity (Hilden, 1965). A capercaillie hen tends to choose the same nesting home range, based on previous nesting success (Wegge, 1985) and therefore nests may aggregate in favourable nesting habitats. Storaas and Wegge (1987) also found that nest predation was lowest in clear-cuts (although these results were not significant) and Storaas (1988) found higher nest predation on capercaillie when nest cover decreased. Due to the possible numerical changes of predator populations, such as the increase in pine marten population during the 80`s, my results might be different due to the differences in red fox and pine marten niches (Hjeljord, 2008; Lindström, et al., 1995).

In the best models explaining the predation on both capercaillie and black grouse nests nest cover was included. For black grouse hatching success it seems like the concealment of the nests is key, because the radius for visual detection increases when there is less nest cover (Ludwig et al., 2010). Since red fox and pine martens detect prey mainly through olfaction (Storaas et al., 1999) and predators that hunt visually like corvids are not important (Jahren, 2017), it`s hard to believe the observed pattern is because of visual detection. Also, carnivore predators like red fox are usually not very efficient at locating grouse nests, the nests are likely found by chance (Ludwig et al., 2010). Therefore, the difference in hen behaviour in different habitat instead of the efficacy of predators is a plausible explanation for the observed pattern (Storaas et al., 1999).

For a lot of bird species there has been reports that they are able to adapt to the perceived risk of predation (Ludwig et al., 2010; Fontaine & Martin, 2006a; Eggers et al., 2005). For example, some bird species can adapt to the perceived predator density or the risk of predation by reducing or increasing the egg mass or clutch size (Fontaine & Martin, 2006a;

Eggers et al., 2005). If habitat influence the risk of predation or the predator densities, choosing habitat is critical and prey populations such as bird species may choose nesting habitat to minimize the predation risks (Morris, 2003; Ludwig et al., 2010; Fontaine & Martin, 2006b). If capercaillie and black grouse can perceive the predation risks and choose nest habitat based on the predation risk is unknown, but a very interesting question for future studies.

5. Conclusion

The choice of nesting habitat was remarkably similar between capercaillie and black grouse. Based on previous literature I expected there to be a difference in the choice of habitat between capercaillie and black grouse (Swenson & Angelstam, 1993; Ludwig et.al, 2009; Storaas & Wegge, 1987), but my results show a different pattern. Nest cover, tree density and dense forest seems to be the biggest influences on the probability of nest predation. These results could be important knowledge for future forest and grouse management. For instance, capercaillie and black grouse could be managed separately, due to the different habitat influence on nest predation. For black grouse young forests with nest cover and high resources availability would be important (Ludwig et al., 2010; Wegge & Rolstad, 2011). Nest cover had no relation to the predation of capercaillie nests. Variation in the landscape should be kept in mind. Continuing the work to explore nesting habitat selection and nest predation will increase our understanding and improve our management of these species.

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Appendix:

Appendix 1: Schema used to gather habitat data at the nest location.

Habitatskjema

Dato:	Observatør:	
Kommune:	Sted:	Frekvens hvis radiomerket høne:
		UTM-koordinat hvis umerket høne:

Habitat

	Reir	RdmN	RdmØ	RdmS	RdmV
Skogtype					
Vegetasjonstype					
Hogstklasse (hvis i skog)					

Reirdekning (Målt med gjennomsiktig sjakkbrett, 30 x 30 cm med 100 ruter a 3x3cm)

	Ovenfra	**N**	**Ø**	**S**	**V**	**Total**
Reir						
RdmN						
RdmØ						
RdmS						
RdmV						

Sikt i skogen og treslag (Stående over reiret, se i 4 himmelretninger, hvor stor del av tenkt linje 15 m borte ville man se?
Prosent av sirkel: Måles med sirkel (av papp el.lign.) med r = 4 cm. Treslag/areal: Måles med kjepp med snor på 264 cm).

	N %	Ø %	S %	V %	% av sirkel	Furu/areal (r = 264 cm)	Gran/areal (r = 264 cm)	Bjørk/areal (r = 264 cm)
Reir								
RdmN								
RdmØ								
RdmS								
RdmV								

Ta 3 bilder fra reirlokaliteten: 1 rett over, 1 fra 5m avstand (vilkårlig himmelretning) og et fra 10m avstand (vilkårlig himmelretning). *Bildene sendes feltansvarlig samtidig med levering av skjemaet.*

Veiledning til utfylling på baksida!

Feltinstruks habitatskjema lirypereir

Dette skjemaet skal føres så snart som mulig etter at reiret har blitt avsluttet ved røving eller klekking. Hvert reir får et unikt skjema. For hvert ekte reir opprettes det en fiktiv reirplass – 50m avstand for fire himmelretninger (RandomN, RdmØ, osv..) (se figur). Det skal gjøres vegetasjonsmålinger for ekte reirplass + fire fiktive reirplasser.
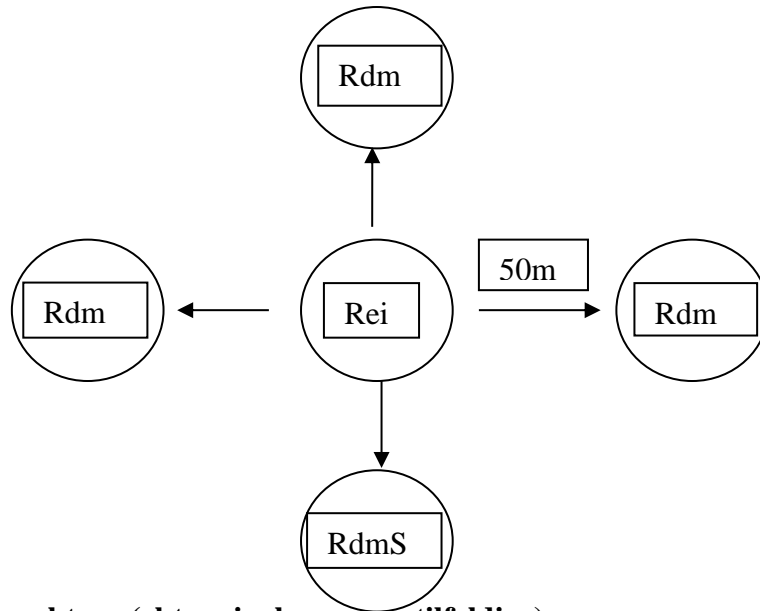
For alle fem punktene (ekte reirplass + fire tilfeldige):

<u>**Habitat**</u>

Registrer skogtype (dominerende treslag og om det er blandingsskog, homogen skog etc.), vegetasjonstype (dominerende bakkevegetasjon – bærlyng, lav, myr osv.) og hogstklasse (I-V).

<u>**Reirdekning**</u>

Legg sjakkbrettarket horisontalt i reiret/punktet, stå over punktet og se ned. Antall ruter på sjakkbrettet som er **dekket** av vegetasjon registreres.

Sett så sjakkbrettarket loddrett på bakkenivå i reirpunktet, gå på 5m avstand og stående telle antall ruter **dekket** av vegetasjon. Gjør dette for alle fire himmelretninger.

<u>**Sikt i skogen og treslag**</u>

Stå i punktet og anslå for fire himmelretninger hvor mye (%) av en tenkt, horisontal linje (15m borte) er **dekket** <u>av vegetasjon i busksjiktet.</u> (Eksempel: 15m fra punktet opprettes en tenkt linje fra NV til NØ. Bak denne linjen må du se for deg en helt åpen "horisont". Hvis den tenkte linjen i busksjiktet i eksempelet er <u>totalt ugjennomsiktig</u> på grunn av busker og kratt blir N her 100%).

Med hodet i punktet, se rett opp gjennom en pappsirkel (r = 4 cm) – sirkelen holdes med 90° bøy i albuen. Anslå hvor stor del (%) av sirkelen som er **dekket** av vegetasjon.

Deretter, i hvert punkt opprettes en sirkel (r = 264 cm) med kjepp med snor. <u>Antall trær over knehøyde</u> per angitt treslag registreres

Appendix 2: *The Reclassification of Satveg classes*

Reclassification	Original Satveg classes
Birch forest	Blåbær- og småbregnebjørkeskog Kreklingbjørkeskog Lavrik bjørkeskog
Bogs and swampforest	Høgvokst mattemyr (Høgstarrmyr) Tuemyr og lågvokst fastmattemyr Blautmyr og åpen sumpvegetasjon
Dense coniferous forest	Barskog – tett tresjikt
Herb and deciduous forest	Lågurtskog og edellauvskog Høgstaude- og storbregnelauvskog
Open coniferous forest	Barskog og blandingsskog – åpent tresjikt Lavrik furuskog
Meadow and heather	Urterik eng (lavland og fjell) Lynghei og frisk rishei (lavland og fjell)
Deleted	Eksponerte rabber, blokkmark, berg i dagen (lavland og fjell) Gras- og frytlerabb Lyngrik rabb Lavhei Lyngrik leside Gras- og musøresnøleie Ekstremsnøleier Bre og snø Vann Dyrka mark

| Deleted (continued) | By og tettsted |
| | Skyggeområder og andre restområder |