GROUSE NEWS

Newsletter of the WPA/BirdLife/IUCN/SSC Grouse Specialist Group

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Contents

Editorial

In this issue you will find a paper by Robert Moss comparing Distance and King's method when counting grouse. He asks for data to be reanalysed. If someone has data to follow up his appeal, please write to him. A paper on measuring success of sage-grouse conservation plans and information on dysphonia in a male hazel grouse is published, and also information on mid winter display in capercaillie. Two new projects are presented in this issue, one on change of geographic range in Galliformes and one on management for the future of woodland grouse and ptarmigan.

Research articles, conservation news, small notes of what you are doing, suggestions and ideas are welcome. News about status and conservation of grouse species in your country is very important. We will also invite all new members of Grouse Specialist group to write a short note on what they are doing to inform the rest of us, or you may write an article of your research or other. We especially challenge researchers and others from the Far East and also Canada. If Grouse News is to continue I must have more contribution from you. Please think about what you can write and send it when you have something. You do not need to wait till the deadline or two weeks after that.

The list of subscribers and GSG members is growing, and some of you have problems receiving e-mail containing so many addresses. Therefore I have split the mailing list into two lists, one GSG-members and one GN-subscribers. If you have objections on this, please tell me and I may pool the two lists again.

A reminder to those of you who plan to participate at the black grouse conference in Vienna in September 2007. The conference will be held 16th to 21st September.

The 11th International Grouse Symposium will be held in mid September 2008 in Whitehorse, Yukon Territory, Canada. Plans for the conference are proceeding well. Kathy Martin is working on the plans. The date for the conference and more details will be distributed soon. Be sure you are able to join us for the week in September 2008.

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From the Chair

Better late than never: the revision of the IUCN Grouse Action Plan is finally completed and will become available for download in pdf format at the GSG web site in June, after official approval by parent organisations WPA and IUCN). GSG members will be notified of online publication by email. The 2007 Grouse Action Plan provides an overview to the distribution, status, and threats to all 18 currently recognized (BirdLife International) grouse species worldwide and identifies the most immediate conservation needs for red-listed species and subspecies. The Action Plan was primarily written as a reference guide for decision makers, agency officials, resource managers, funding organisations, but also scientists and students who share the GSG´s goal of securing viable population of all species and subspecies of grouse in the wild. The revised Action Plan will not be published in print, but is meant as an electronic working document. Readers are invited to report necessary changes and related documentation to the GSG webmaster Michele Loneux at loneuxmichele@skynet.be. Based on relevant information received, we will update the Action Plan at regular intervals.

As the first 2000-2004 IUCN Grouse Action Plan (Storch 2000), this new 2007 Grouse Action Plan is a product of the joint expertise of the WPA/BirdLife/IUCN/SSC Grouse Specialist Group (GSG; http://www.gct.org.uk/gsg/) and many other grouse biologists, conservationists, and managers worldwide. Many THANKS to all individuals and institutions who provided contacts, information, and photographs, completed questionnaires, and reviewed parts of the manuscript. I am particularly grateful to those colleagues who were supportive and reliable correspondents throughout the process of compiling, drafting, and reviewing this update of the Grouse Action Plan. The last major step was mastered by Michèle Loneux, who prepared the manuscript for online publication. She deserves a special Thank You! The World Pheasant Association (WPA), the major parent organisation of the Grouse Specialist Group, helped the Action Plan fledge by financially supporting online publication.

I hope that the revised Action Plan will find a wide distribution as a source of information on the status of grouse worldwide, and as a tool to promote and implement grouse conservation.

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CONSERVATION NEWS

In Our Opinion: Measuring success of sage-grouse conservation plans

John W. Connelly and Clait E. Braun

Sage-grouse *Centrocercus minimus*, *C. urophasianus* populations have declined in abundance (Connelly & Braun 1997, Young et al. 2000, Connelly et al. 2004) and distribution (Braun 1995, Young et al. 2000, Schroeder et al. 2004). These changes have been long-term (Braun 1998) and have led to concern about sustained viability of distinct as well as overall populations (Young et al. 2000, Connelly et al. 2004). Multiple petitions have been filed to list sage-grouse under the United States Endangered Species Act of 1973; however, the U.S. Fish and Wildlife service found that listing is not warranted for greater sage-grouse [12 January 2005, Federal Register 70(8): 2244-2282]. This finding is now the focus of a lawsuit that may be resolved during 2007.

Concern for possible listing led to development of local conservation plans, starting in the Gunnison Basin of Colorado in 1995 for the Gunnison sage-grouse and expanding for most populations of this species as well as many populations of greater sage-grouse over large portions of that species' range (Hemker & Braun 2001). Local conservation plans also led to preparation of statewide plans in most states. All local and statewide conservation plans are designed to protect sage-grouse populations through a series of conservation actions that often address the species' habitat. The general goals of these plans are to stabilize trends in sage-grouse populations and, in many cases, to increase sage-grouse populations. Monitoring of sage-grouse population trends and condition of habitats is a component of many, if not most plans, but evaluation of the "success" of the plans to achieve their expressed goals is rarely mentioned. The question of how to measure "success" is important because periodic reviews of the status of sage-grouse populations are likely to continue. Moreover, pressure to list sage-grouse as threatened or endangered is also likely to continue because of perceived failures of sage-grouse populations to respond to conservation actions designed to benefit the species in a particular locale. Thus, we address the question "How can success of conservation actions to benefit sage-grouse be measured?"

How can success be measured?

Success must be linked to the overall goals of the conservation plan. If a plan's goal is to stabilize a population, success should be defined as a demonstrated, sustained (at least 5 years) stabilization of the population's distribution and size. If a plan's goal is to increase a population, success should be defined as a demonstrated, sustained (at least 5 years) increase in distribution into formerly occupied habitats and/or a sustained increase in population size (over at least 5 years) of at least 20% not withstanding "normal" population fluctuations caused by presumed cycles, drought, or natural calamities. On the surface, demonstrating success would appear to be daunting because of difficulties associated with measuring populations. Failure of conservation actions may be easier to assess. Does this suggest that all conservation plans to benefit sage-grouse are doomed to stagnation or failure because of the difficulty of measuring success? Will populations have to disappear before anyone will admit the conservation actions have failed? We believe this does not have to be the case.

Measuring success

Success cannot be measured by the number or extent of "on-the-ground projects" or simply linked to the existence of sagebrush-dominated habitat. Instead, we argue that measuring success must be linked to population demographics. We suggest that success can be measured in multiple ways: monitoring distribution, assessing numbers of active leks, counting total males on specific leks or groups of leks representing distinct subpopulations or populations, modeling, and searches of randomized transects for presence of sage-grouse pellets. Each of these metrics provides an index to distribution or abundance but none will provide an estimate of population size. We address each of these possibilities and explain why they could be useful.

Distribution. - Changes in distribution can be measured by searching for new active leks or documenting presence by searches for sage-grouse pellets on a series of stratified random belt transects. Any increases in distribution should result from grouse moving into areas formerly occupied and should not be the result of translocations. This approach will provide a general assessment of a sage-grouse population but by itself is likely not adequate to indicate success or failure of a plan.

Number of active leks. - Selected geographically distinct subpopulations or populations can be identified; then the entire occupied range within the area of interest can be clearly mapped. Searches (both ground and aerial, see Connelly et al. 2003) can be made each spring (March-May) to locate active

leks (defined as 2 or more males at the same site for at least 3 mornings over a 3-week period for at least 2 years). All active leks located should be identified by UTM coordinates and these sites should be checked for activity each spring. Inventorying leks is a relatively inexpensive and straightforward process. A significant increase in the number of active leks may provide compelling evidence of a plan's success.

Total numbers of males counted. **–** Male sage-grouse can be counted each spring (March-May) on all active leks in a given area. We suggest that the "high" count of males resulting from at least 3 counts spaced at 7-10 day intervals for all leks be summed to represent "total males" for the population or subpopulation. A 3-year moving average could be used to demonstrate trend. Estimators are currently being developed to account for leks not located and or counted, males not detected on leks, and female lek attendance. These new techniques may ultimately provide an unbiased method of estimating breeding populations but so far are not available for general use. At a minimum, they should have merit for small populations in limited areas where ingress and egress is not likely. Lek counts can be more costly and difficult than lek inventories but if done correctly can provide compelling evidence of population change and allow assessment of a plan's success.

Modeling. – Techniques are currently available to assess the response of sage-grouse populations to landscape treatments. Although these techniques have not been used to assess landscape treatments implemented by conservation plans, they could provide a valuable tool for assessing success. Pederson et al. (2003) modelled the effects of grazing and fire on sage-grouse populations in southeastern Idaho and concluded that certain combinations of these two treatments could result in the extirpation of local sage-grouse populations. Additionally, Hagen et al. (2007) used a meta-analysis to identify important components of sage-grouse habitat that were reported in numerous publications. A similar approach could be used to assess the efficacy of habitat treatments promoted by different conservation plans. Modeling should be used in conjunction with other metrics to assess success.

Counts of sage-grouse pellets. - Sage-grouse deposit fecal pellets (rounded and elongated green-to-yellow brown fibrous pellets vs. cecal droppings which are black-green viscous masses when fresh to hardened small "black mats" upon drying), which may persist for several years (Wik 2002) . A system of stratified randomized belt transects could be established in both occupied and historically used but presently unoccupied habitat and annually searched for pellets to assess changes in grouse distribution and numbers (Dahlgren 2005). Transects could be permanent (preferred), or established each year. If permanent, all pellets located in each year should be removed at the time a transect is searched. Provided distribution of transects accurately covered the sage-grouse habitats (not including wet meadow or riparian habitats), annual changes in abundance (and distribution) should be detected. Sample size would be dependent upon size of area to be included. Pellet counts may be a useful indicator of use in an area or overall trend but should be used with other metrics to help judge success of a conservation plan.

Management implications

Failure of conservation plans to define and address success results in ambiguity and will likely assure criticism of these plans as well as encourage efforts to list sage-grouse. Provided that success of conservation actions can be demonstrated, management experiments can be implemented to further enhance sage-grouse distribution and abundance using "proven" treatments or strategies. However, many landscape treatments have substantial costs, some of which may far exceed the more traditional methods of habitat manipulation (e.g., grazing, fire). Management agencies may be unwilling or unable to support costly projects and instead settle for inadequate measures that only provide the illusion of positive conservation measures.

If conservation efforts for sage-grouse are to succeed, plans for these efforts must include methods for assessing success. Doing so necessitates rigorous, unbiased monitoring that relates demographic responses to treatments. Conservation plans should budget for and provide detailed discussions of long-term monitoring of populations and habitats. Disregarding the importance of monitoring and embracing inadequate programs while failing to assess success, are likely to have serious negative consequences for sage-grouse and the sagebrush steppe system.

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RESEARCH REPORTS

Distance vs King – counting grouse on transect walks.

Robert Moss

We have come a long way since Leopold (1933) described a strip census method for estimating populations of grouse from the unpublished work of R. T. King. Distance software is an enjoyable computer game that uses sophisticated statistics to analyse pleasurable field work, and produces robust population estimates with appropriate confidence limits. What could be better?

My renewed interest in this topic comes about as a result of two events, cooperation with Russian colleagues and attempts to document a recent increase in capercaillie numbers in Scotland. The focus of this article is how best to measure 'effective strip width' in line transect surveys.[1] It ends with an appeal to your self-interest.

The Russian connection

Much Russian and old Soviet literature contains estimates of grouse density obtained by transect methods that I have found difficult to understand. Recently, by interrogating Vladimir Borchtchevski at length, I gathered that the method is essentially the King strip census, stratified as suggested by Hayne (1949) according to the sex of the bird and the habitat from which it is flushed. Accordingly, the 'effective strip width' is taken as the average distance from the observer to the point at which a bird is flushed, multiplied by two.

Distance gurus (Buckland *et al*. 1993) dismiss this as 'not a robust method' and then go on to discuss the conditions under which their own approach can be used to estimate effective strip width. Their method involves projecting each flushing point onto a line perpendicular to the transect and fitting a curve to the distribution of points along the perpendicular. This curve is the 'detection function'. An important caveat is their 'shape criterion', which states that detectability must not fall off sharply near the transect line or the estimation of density will tend to be poor.

I thought that it would be useful to know more about the conditions under which King's method gives good or poor results. To this end, Steve Palmer and I simulated a strip census. In it, an observer walks a transect from south to north along one line of a grid. At or near each grid intersection sits an unseen bird. If it flushes, it is seen. The probability of flushing each bird declines with the distance between bird and observer. The form of this 'flushing function' varies. It can vary directly with distance, or have some more complex form such as half-normal, cosine, sigmoid and so on. For most intuitively appealing functions, the King method gave estimates of density within ten percentage points of the true value.

The main exceptions were concave curves in which the probability of flushing fell off sharply near the observer. These underestimated density by up to 20%. The worst performance occurred when the flushing probability declined not only with bird-observer distance but also with the perpendicular distance between bird and transect. This particular flushing function amounted to a set of concave curves, a different one for each north-south line of the grid. It underestimated density by up to 50%. In summary, the King method seemed to be quite reliable providing that a 'shape criterion', similar to that of the Distance method, applied to the flushing function.

Capercaillie increase in Scotland

According to Distance estimates, the capercaillie *Tetrao urogallus* population of Scotland in 1998–9 was down to about 1,000 birds (Table 1). By 2003–4 it seemed to field workers that, following much conservation effort funded largely by LIFE monies, numbers had increased. Accordingly, the Distance estimate was about 2,000. Frustratingly, the confidence intervals for these two estimates were so wide that, despite an apparent doubling in estimated numbers, no statistically significant increase was detected.

Having simulated the King method, I thought that it would be useful to see how it applied to real data. The Scottish capercaillie data were available and had the advantage that their numbers had already been estimated by the Distance method. I applied the original, unreconstructed (no stratification by sex or habitat) King method to these data (Table 1). Confidence limits were derived by bootstrapping.

Encouragingly, the King estimates were close to the Distance ones. Furthermore, confidence limits were narrower. Consequently, there was a significant ($P < 0.001$ by a randomisation test) increase in the King estimates between 1998–9 and 2003–4 (95% CL 1.42–2.46 times as many).

[1] The number of birds seen outside a transect's 'effective strip width' equals the number unseen inside it.

Table 1. Capercaillie numbers in Scotland according to the Distance and to the King methods.

Survey	Method			
	Distance		King[d]	
	Mean	95% CL	Mean	95% CL
1992–4[a]	2189[a]	1353–4247[b]	2218	1313–3347
1998–9[b]	1073	549–2041	1060	575–1617
2003–4[c]	1980	1284–2758	1806	1431–2281

[a] Catt et al. (1998)
[b] Wilkinson et al. (2002)
[c] Eaton et al. (2007)
[d] Data truncated at 80 metres flushing distance and stratified into two abundance classes

Bias and precision

The Distance method sacrifices precision (narrow confidence limits) for supposedly accurate (i.e. unbiased) estimates. It achieves its results by fitting complex curves to the data. The uncertainty associated with this complexity results in wide confidence intervals.

The King method involves only two parameters: the number of birds per km of transect and the average flushing distance. Hence confidence limits are narrower but population estimates may be biased. Nonetheless, simulations suggest that any bias is likely to be small if the 'shape criterion' is fulfilled.

One does not have to choose either the King method or the Distance one. Use both. If the two methods agree as to the population estimate (Table 1), then it is tempting to base conclusions about population change upon the King method. Indeed, even if the King method gives means that are biased (relative to the Distance method), one should be able to use it to estimate the significance of changes in numbers – provided that the biases remain the same.

Appeal

Dear reader, it would be useful for all of us interested in counting grouse to know whether the Table 1 is typical. If we had many such comparisons, we could reach some useful conclusions. In particular, it might become possible to identify changes in population size that the Distance method is too insensitive to detect.

Those who have already analysed and published data sets using the Distance method might like to reanalyse their data using the King method. Send your comparison to me and I will collate it with all the others. If you would like to see the results of such an analysis but can't be bothered doing it, I would be happy to reanalyse your data for you. You will be a joint author of any refereed publication that uses your data, unless you specify otherwise. Please get in touch if you would like to join this cooperative project: Robert.Moss111@btinternet.com

Acknowledgements

Thanks to Mark Eaton, Kenny Kortland, Mick Marquiss and Steve Palmer for providing or recovering data and to Vladimir Borchtchevski for patient instruction.

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Dysphonia in a male hazel grouse *Bonasa bonasia*

B. P. Mulhauser & J.-L. Zimmermann

Abstract
During a population study of hazel grouse in the Swiss Jura, we found evidence of dysphonia in an adult male nicknamed "Bille". In spring 2004 this bird had a normal song, but by autumn 2004 the shrillest element of the song had disappeared, followed by the half melody the following spring. A film made in April 2006 shows this male making the impulses for the entire song (successive movements of the beak), but without the sounds. The most likely hypothesis is that "Bille" suffers from a vocal cords crack. In all other respects this bird continues to product the other calls correctly, but more intensively than the other hazel grouses.
Key words, *Bonasa bonasia,* Dysphonia, Vocalisations.

Introduction
It is very rare to discover a bird with a dysfunction of the vocal cords in the wild, and even more so when the bird concerned is the hazel grouse *Bonasa bonasia*, a secretive species with a thin voice. During the course of a study of the hazel grouse a case of dysphonia in a mature cock became evident.

Since 2002 we have followed the males in a group of hazel grouse in the Swiss Jura with the help of recordings of each territorial song (Mulhauser 2003). We identify the birds by establishing a sonogram of each individual's song, which is in effect an identity card of each individual bird (Bergmann et al. 1975). This sound track is the same each year (Mulhauser & Zimmermann 2003), so it is possible to follow the travels of each male and, in the long term, to determine the survival rate and the age pyramid. It was within the framework of this study that we discovered the male "Bille" in spring 2004 (Figure 1). The partial loss of voice was suspected in spring 2005 and proved in spring 2006.

Figure 1. The male "Bille" singins his territorial song (April 2006). Photo J.-L. Zimmermann.

Methods
For the sound recording of "Bille", we used a mini-disc Sony MDPL recorder with a microphone Beyerdynamic MCE 87 S and a preamplifier Sonorax SX-BD1 in 2004 and 2005, then a Kudelsky Nagra 4000 recorder in 2006. We completed the data with a digital video camera Sony DCR-TRV11E which is capable of accurately recording high-pitched sounds. The songs have been analysed with BatSound 3.0. This software is capable of analysing audible sounds and ultrasonic sounds up to 44 kHz.

Results
Many records of "Bille" (n=56) were collected between 5th April 2004 – the date of the bird's discovery (Figure 2) and 1st of June 2006. We heard the first incomplete song of this bird 30th of September 2004,

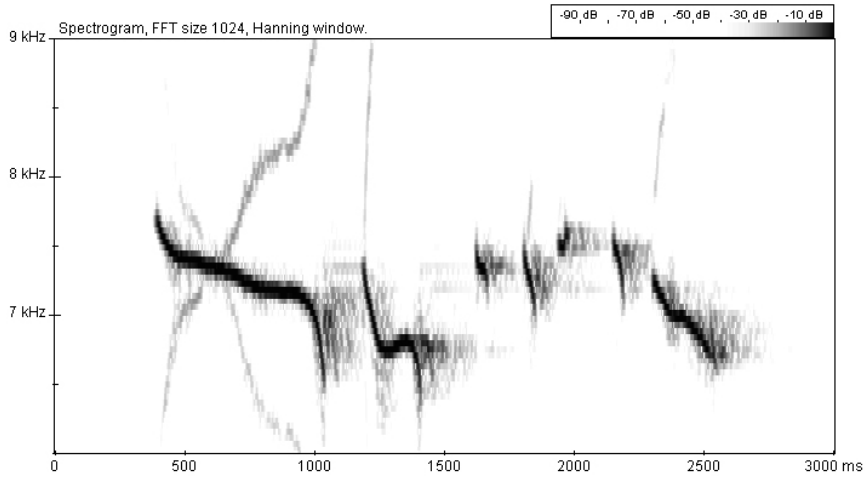

Figure 2. Sonogram of the complete territorial song of "Bille". 5th April 2004

but just the most high-pitched sounds were missing (Figure 3). After a quiet winter the hazel grouse began their courtship behaviour at the beginning of April 2005. On 6th April we recorded the territorial song of "Bille" but this was incomplete (Figure 4). At this point in the study we asked ourselves if this male was lazy.

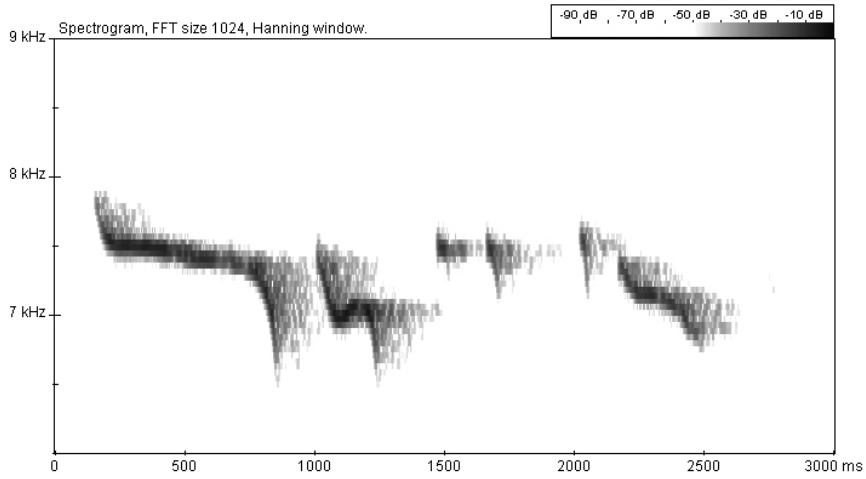

Figure 3. Sonogram of "Bille". 30th September 2004

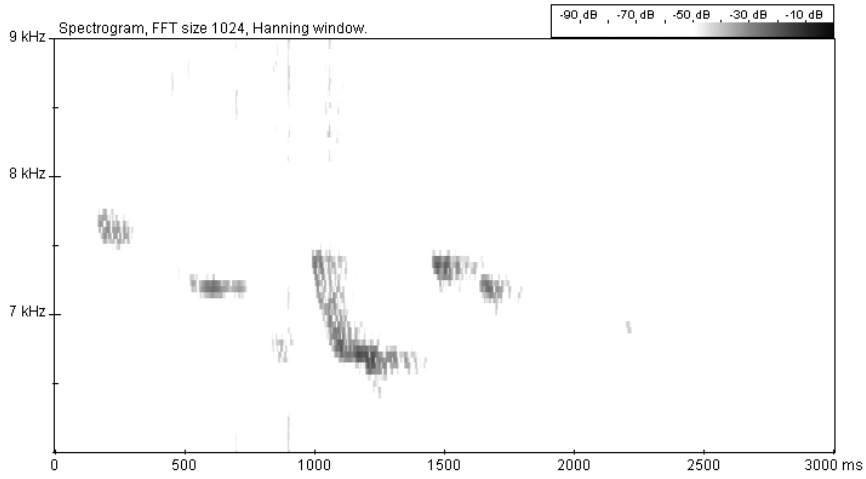

Figure 4. Sonogram of "Bille". 6th April 2005

However one year later, thanks to the use of the video camera, we confirmed the dysphonia. In two films, shot in perfect conditions on 14th and 15th April 2006, we can see the male making seven impulses for the seven elements of the full song (Figure 2), but our human ear registers only the first two or three notes. The utterance of sounds is proved by the sonograms (Figure 5 and 6).

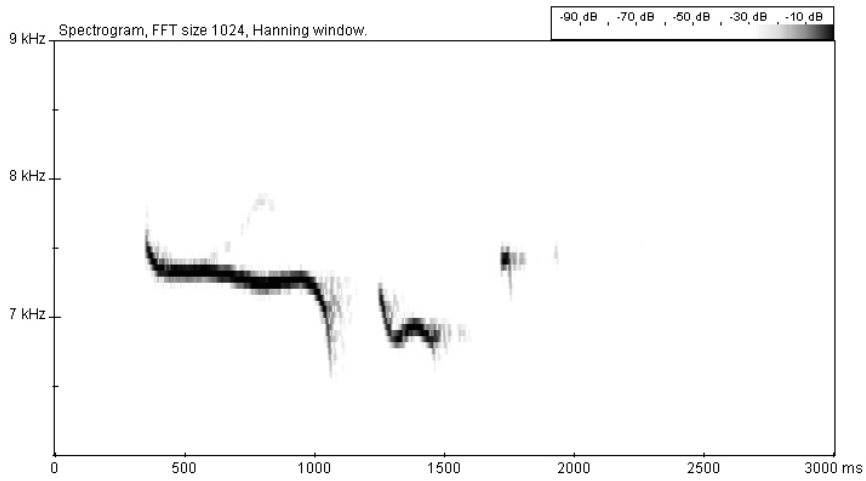

Figure 5. Sonogram of "Bille" 14th April 2006

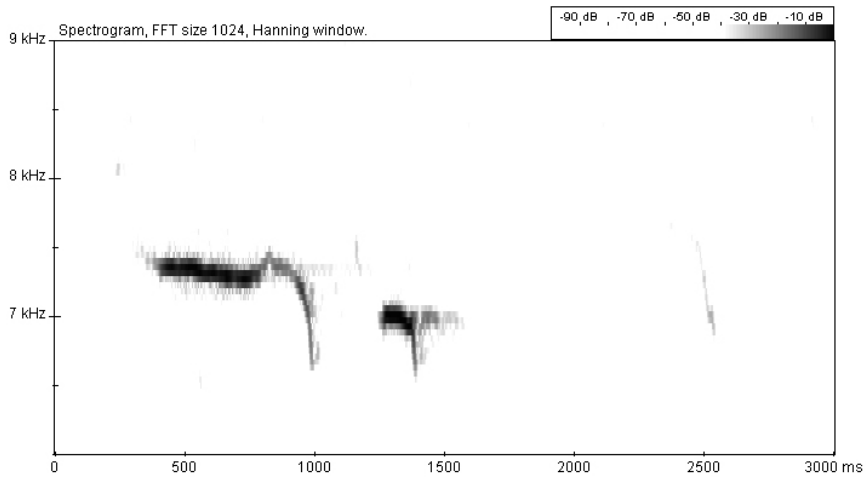

Figure 6. Sonogram of "Bille" 15th April 2006

It should be noted that this aphonia is neither complete nor permanent, because on rare occasions "Bille" has been heard to make almost all of his territorial song (Figure 7).

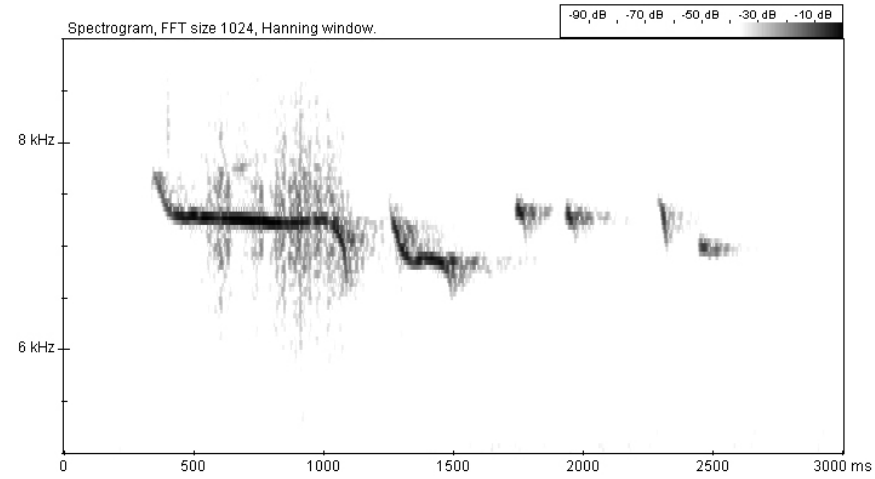

Figure 7. Sonogram of "Bille" 14th April 2006

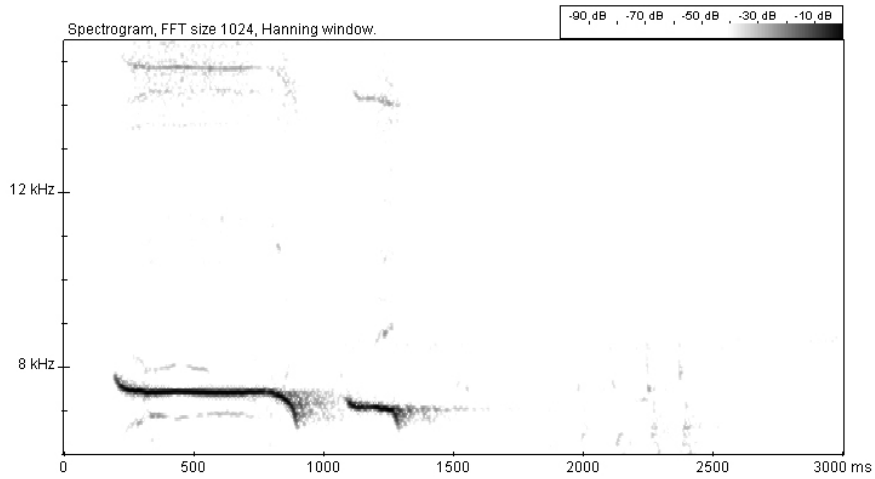

Figure 8. Sonogram of "Bille" with ultrasonic tracks 15th April 2006

Compared to the full song (Figure 9), another analysis shows that during the dysphonia both low and ultrasonic tracks of the same element are missing (Figure 8).

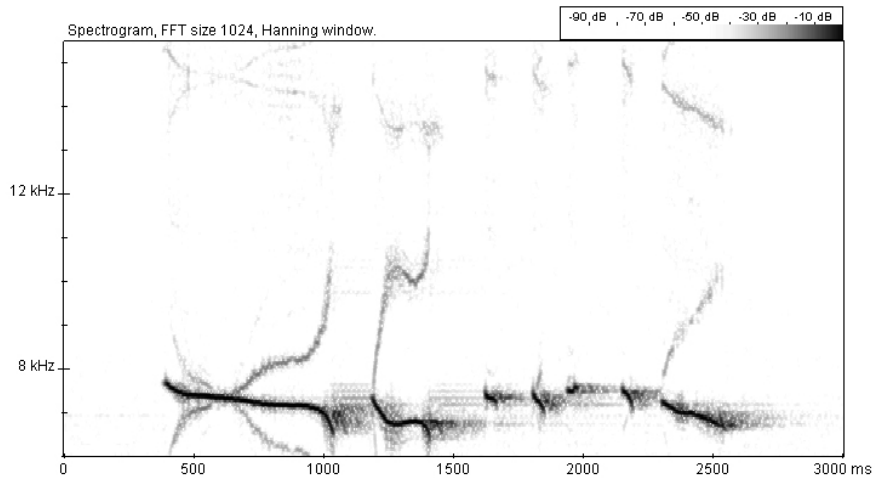

Figure 9. Sonogram of "Bille" with ultrasonic tracks 5th April 2004

Discussion

According to several authors (Scherzinger 1981, Del Hoyo et al 1992, Bergmann et al. 1996, Klaus et al 2003), the vocalisations of the hazel grouse are not limited to the territorial song. We have counted twenty-three different messages in this rich vocal repertoire (Klaus et al 2003), including different calls at short distance between male, female and chicks (Scherzinger 1981).

Except for the problem of dysphonia over the territorial song the repertoire of "Bille" is complete. However, we noticed that this male emitted the contact sounds ("ouit ouit oui" or "gjuk gjuk") with a frequency not exceeding 4 kHz more frequently than the other hazel grouse.

It would seem, therefore, that the dysphonia is only in relation to the high-pitched sounds of the song. The cause of the dysphonia is probably an alteration to the vocal cords due to their over-use – this is well-known in the domestic fowl *Gallus gallus domesticus* and... human *Homo sapiens sapiens*.

The partial aphonia of "Bille" over the high-pitched notes suggests that the territorial song of the hazel grouse can be affected. It is the only emission the male produces with the head held high, which stretches the tympaniforme membranes of the vocal cords over the syrinx and alters the shape of the trachea (Del Hoyo et al. 1992). For this shrill whistling sequence, whose first notes are similar to the alarm calls of small songbirds (Bergmann et al. 1996), the males must inflate their air sacs, which in turn cause the inflation of the breast (figure 1). Most of the muscles in the body are used during the expulsion of air; each note is accompanied by a simultaneous movement of the tail.

The effort required to sing causes the hazel grouse to use a large amount of energy. The dysphonia suffered by "Bille" shows that this action is not without risk. The desire to save energy could explain why some males do not respond to the bird-call (Swenson 1991). These individuals are usually mature males, with a mate, who know their home-range and their neighbours very well. The young, inexperienced males are more vocal and could become victims of a partial loss of voice such as that shown to us by "Bille".

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Capercaillie *Tetrao urogallus* midwinter display

Arne Flor & Øyvind Andreas Duus

Introduction

The background for this article is the midwinter registering of capercaillie *Tetrao urogallus* display at several lekking locations in the municipalities of Grimstad, Froland, Birkenes, and Åmli, in Aust-Agder County, South Norway.

Early in the 1980`s we found several capercaillie lekking locations as a result of having registered display activity, with wing dragging, in the February snow. Male capercaillie display tracks and several fir trees nearby that had obviously provided food, resulted in the areas being revisited in April and new

lekking locations being registered. The centre of the locations turned out to be within 100m from where the tracks were recorded in February. These and other similar episodes in the course of several years were the reason for deciding to visit three lekking locations in February 2003 to see if we could find male capercaillie display tracks in midwinter. Display tracks from male capercaillie were found at all of the locations.

Description of three of the lekking locations.

Location 1: Grimstad municipality, 240m above sea level, a large lekking place with 7-8 displaying male capercaillie in April in recent years.

Location 2: Grimstad municipality, 230m above sea level, a small lekking place with 2-3 displaying male capercaillie.

Location 3: Froland municipality, 300m above sea level, a large lekking place 18km from the other two, with 7-9 displaying male capercaillie.

Observations made at the lekking locations.

To exemplify the display behaviour we include observations made at three of the locations. Location 1 was visited on February 15th 2003. In several places at least two male capercaillie had trodden down an area of about 40m^2. Closer to the centre male capercaillie had left signs of wing dragging and shown aggressive behaviour towards one another. This can be clearly seen by the cock walking forwards with its wing feathers alongside its body, then spreading them more and more while sticking out its neck and raising its tail feathers. It then stops, raises its neck and gurgles at a rival. You can see clear tracks in the snow from the four to six foremost primaries of each wing, as though a large fork has been dragged through the snow Figure 1). In some places the cocks had stood there tapping, leaving behind display droppings (firm, with a white tip). Not far from the centre of the location we also found neck- and breast feathers from a fight.

Figure 1. Display tracks of capercaillie in February. Photo: Arne Flor

Location 2, 2.2 km from location 1, was visited on February 24th 2003. At least one cock had passed through the location, stopping occasionally to display. We found display droppings but no evidence of wing dragging.

Locations 2 and 3 were visited on February 14th 2004. At least one cock had landed and displayed at location 2. At location 3 (about 18km from location 1) a vast activity in the previous few days had occurred. Around 7-9 male capercaillie had been at the lek area, displayed with wing dragging and demonstrated obviously aggressive behaviour. The large amount of tracks in an area covering 0.5-0.6 hectares clearly indicated abundant recent activity, much of which involved territorial borders. A number of the display tracks started on a display mound and ended up at a neighbouring male capercaillie.

Locations 1 and 2 were visited on January 29th 2005. At location 1 four male capercaillie were observed, one of which was "mad". It landed 15m in front of the observer and behaved aggressively several times. You could hear three cocks displaying close to the centre of the lek. There were numerous signs in the snow of wing dragging and of places where the capercaillie had stopped and displayed. Display droppings were discovered, along with tell-tale signs of fighting like several neck-, throat-, and breast feathers, and bloodstains. Location 2: Male capercaillie was seen here as well. Two individuals were flushed close to the centre. Display tracks and display droppings were found in the snow.

Location 1 was visited on February 6th 2005. The "mad" cock was observed at the edge of the location. It kept a distance of about 25-30m from the observer. There were tracks from a number of cocks at the location.

Locations 1 and 2 were visited on February 11th 2005. At location 1 the "mad" cock did not turn up. Two male capercaillie had flown in from the west and, shortly after landing, had started wing dragging while making their way to the centre of the location. Also at location 2 display tracks were observed.

Location 1 was visited on February 19th 2005. No "mad" cock was observed on this day either. A male capercaillie was seen flying from the location and another could be heard. The tracks indicated that five male capercaillie had been there that morning.

Winter display.
From the early 1980s we have observed male capercaillie activity in January and February. We have considered this to be sporadic behaviour caused by changing light, favourable weather conditions, etc. We were well aware of the spring display which starts at the end of March and ends sometime in May, depending, to a certain degree, on latitude and altitude. When we visited a lekking location in the winter of 2003 and discovered signs of much activity our interest in this early display was aroused.

We decided to observe two additional lekking locations. In the winter of 2003 we registered male capercaillie display activity at three locations in Grimstad municipality. From 2003 to 2007 we expanded our registration to include both more locations and municipalities (Table 1). We have made 24 separate registrations including 2007. The amount of data suggests that male capercaillie do display at the lekking location between the end of January and the end of February.

No Norwegian or English literature that describes this behaviour has been found and we are very interested if somebody has similar observations. Much of the research on male capercaillie display behaviour is done in spring and autumn as this traditionally is when they are at the lek. We believe that field observations done in January and February would reveal similar data to ours. We think that the lack of data is due simply to the fact that midwinter field observations have not been considered interesting.

*Table 1. The observation dates of capercaillie winter display in Aust-Agder at the leks with registrations of at least one cock. *asl = above sea level.*

Location/asl*	Municipalities	2003	2004	2005	2006	2007
L 1/ 240m	Grimstad	15.02		29.01 6.02 19.02		27.01 17.02
L 2/ 230m	Grimstad	16.02 24.02	14.02	29.01	14.01 28.01	17.02
L 3/ 300m	Froland		14.02			18.02
L 4/ 320m	Grimstad	26.02				
L 5/ 250m	Birkenes				5.02	28.01
L 6/ 350m	Birkenes					3.02 19.02
L 7/ 460m	Birkenes					3.02 19.02
L 8/ 200m	Froland					19.02
L 9/ 240m	Grimstad					18.02
L 10/280m	Åmli		15.02			
L 11/260m	Grimstad			29.01		28.01

Male capercaillie claim lekking territory earlier than first thought.
At several of the locations we could see that the male capercaillie were in their lek territories. Many capercaillie cocks start their display on their respective display mounds and head for neighbouring borders. After having visited several leks over the past few years we found that it is common for the cock to display at the actual lekking location already in midwinter (end of January to end of February).

All in all we visited 11 lekking locations in Aust-Agder. Several of these visits took place just after a snowfall so distinct tracks in the snow gave a clear picture of the male capercaillie display and behaviour. It was not uncommon to flush up to five capercaillie when we arrived at a lekking place around noon. When displaying the capercaillie usually does not leave any traces of wings in the snow, but when defending the territory the cock often shows aggressive behaviour where it spreads its wings and drags them (Figure 2). These wing dragging tracks turned out to be a common sight as early as the end of January, and we even saw traces of fighting between rival birds. The same observations were made at less densely populated lekking locations, though not as often.

Figure 2. Aggressive behaviour in capercaillie cock in early spring. Photo: Øyvind Duus.

Discussion.

The fact that the male capercaillie is a territorial bird is common knowledge. However, the fact that the cock arrives at the lekking location and defends the territory already in midwinter is new for the authors. We have not come across any literature that describes this phenomenon, apart from the more sporadic display tracks in or around the lekking location.

One theory about the winter display could be that the male capercaillie wants to decide some of the territorial issues at a time of year when it doesn't need to pay attention to the hens. Hen week demands an enormous amount of energy from the dominant males, so it has to be an advantage to be done with some of the fighting before then. They have then had the territories sorted out in good time before the hen week starts which peaks around the 20th -27th April in this region.

We Thank Mark Harris for helping us with the English translations.

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Dear Arne and Öyvind,

You are quite right – common knowledge of capercaillie behaviour still is heavily lek-biased! It is first and foremost male display what makes capercaillie attractive to human observers. Everybody knows that males display at traditional leks in spring – and thus, this is where everybody goes to see them. When? In spring, of course. However, displaying capercaillie cocks, on or off leks, may be met in any month of the year. Yearling males test their skills in late July to early September, and occasional "autumn display" occurs when males return from their summer ranges closer to their leks. In the Alps, just as you describe from Norway, one can find caper display tracks in the snow in any months of the winter, but of course not as regularly as later in spring. I agree that display in winter is sporadic and related to weather conditions, but possibly also to population density. There might be more activity where there are more males (and females), and display activity might (my guess- no data) also be increased by greater population turnover, i.e., more 2-year olds trying to establish themselves at a lek.

There are at least two telemetry studies that have described annual range use patterns of capercaillie (cocks and hens) in detail, one in Norway (Wegge & Larsen 1987, Gjerde & Wegge 1989, Rolstad 1989) and the other in the German Alps (Storch 1995). These studies have documented that males (at least in relatively extended forests) return from their summer ranges to the leks some time between late summer (August) and early winter (December), and spend all of winter in vicinity of their later spring display

sites. In older males (3 years +) this behaviour is more pronounced that in younger (1-2 years) males, and the oldest cocks tend to return to the leks first. Thus, the time between autumn and spring is also the time when young cocks check out leks, try to establish themselves, and older ones reclaim their display ranges. This may involve display behaviour, in the late autumn mist, on warm and sunny winter days, when hens are close by, or competitors.

Thus, from my experience, the "winter display" you describe is perfectly normal, and common, capercaillie behaviour. Thanks for sharing your observations in GN, and thanks for reminding us scientists to not only report our findings in English.

Best regards,
Ilse Storch

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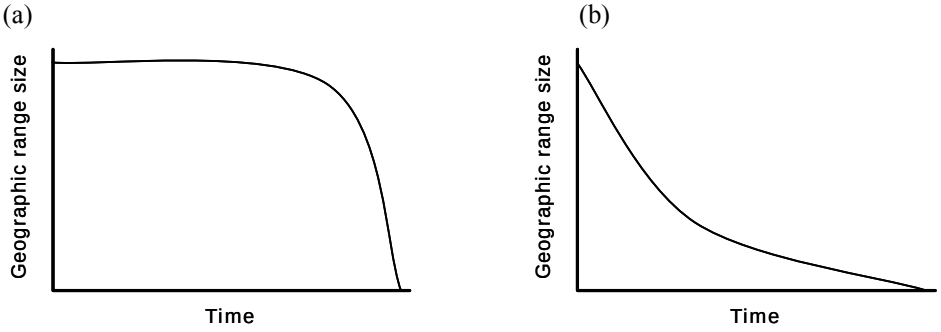
Geographic range change in Galliformes

Elizabeth Boakes

Last year, the World Pheasant Association, in conjunction with partners at the University of Sheffield and Imperial College, London, embarked on an innovative research project, investigating geographic range decline in the Galliformes. This article describes the aims of the research and explains how the project would greatly benefit from the help and advice of Galliformes experts from around the world. The project is currently seeking data on the geographic ranges of the grouse, especially Palaearctic species, and if you might be interested in helping with this aspect of the project then please read on!

The Galliformes face a higher risk of extinction than many other avian orders, with 25% of species being redlisted. Galliformes may be vulnerable to extinction due to their large body sizes and lower fecundity, relative to other birds. However, very little is known about the way in which species' geographic ranges decline prior to extinction. Does range size generally remain relatively constant and then suddenly collapse to extinction, as shown in Figure (a) or does it show a more gradual decline over time, as depicted in Figure (b)? At present nobody knows. It would seem likely that different species, with their different associated life histories and the different human pressures that they face, will exhibit different patterns of geographical range decline. For many grouse, particularly those species in boreal regions, climate change coupled with directional loss of habitat on a large scale may lead to a pattern similar to that shown in Figure (b), but data are not currently available for us to describe the trajectory of range change for most grouse species.



A clear understanding of how species' ranges decline is obviously key to conservation management and the prevention of future declines. In the example shown in Figure (a), which could be caused by local extinction events across the range of a species leading to a sudden dramatic collapse, the decline begins so closely to the time of actual extinction that it may be too late for effective conservation measures to be put in place. WPA hopes a greater understanding of species' range changes over time will allow the

conservation community to identify the types of species that might be more likely to undergo such rapid and catastrophic range change and hence put conservation measures in place in time.

Information on changes in range extent is currently likely to be of higher quality in species with restricted range ranges. WPA is concerned that more widespread species, of which many grouse are prime examples, may be overlooked because a full assessment across their geographic range is difficult to achieve in practice. If some of these species' ranges are punctuated with local extinction events, we may be overlooking, or at least underestimating, the extent to which 'widespread' species may be declining. It is hoped that the project will highlight any such scenarios and provide a platform from which the conservation assessment of widespread species may be improved.

With their diverse life history traits, geographical range sizes and ecological characteristics, the Galliformes provide an excellent study system. Furthermore, they face a suite of anthropogenic threats including habitat loss, hunting, disturbance, agricultural intensification and climate change, enabling us to ask whether different pressures lead to different patterns of range change. Since most of the species are sedentary, accurate delimitation of their current and historical ranges is made more tractable. Additionally, partly because of the history of hunting Galliformes, historical distribution data for this group are more abundant than for other birds.

The project is certainly an ambitious one and its success will be reliant on the collaboration of Galliformes experts from around the world. The first step is to understand how Galliformes ranges have changed over the last 150 years. In order to quantify this, Elizabeth Boakes, a postdoctoral researcher at Imperial College, London, has spent the past year building a database of both historical and current Galliformes sightings. Elizabeth, along with her team of stalwart volunteers, has been collecting data from museums from around the world, from historical journals and from ringing data. Having amassed over 60,000 records of Galliformes sightings, the production of a series of species range maps stretching back to 1850 is now well underway. However, in order to quantify how species ranges have declined, an accurate delimitation of current species' ranges is clearly absolutely essential.

In order to verify the project's estimations of current species ranges, advice and assistance from grouse specialists is crucial. We would be delighted to receive any help that readers may be able to give us. Firstly, we are still looking for recent grouse locality data. If anyone has records of grouse sightings (or indeed sightings of any other Galliformes) we would be very grateful if you would allow us to include them in our database. We are particularly in need of records of widespread species and of records from the Palaearctic, but all information will be of use. Secondly, it would be enormously helpful if specialists in particular species or groups of species were able to look at the current species' range maps that we are developing (we estimate they should be ready by June 2007) and advise us on their accuracy. If anyone is interested in helping the project in either of these ways, or would simply like to know more about the research, then please contact Elizabeth by email (Elizabeth.Boakes@ioz.ac.uk; elizabethboakes@hotmail.com) or by telephone (0207 449 6621).

We aim to wind up the data collection stage of the project in late summer and then begin on the analysis phase. It is hoped that, apart from advancing our scientific understanding of the dynamics of species' ranges, the project will have many practical conservation outcomes. We really would be very appreciative of your assistance, however big or small!

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The user-initiated research project "Grouse Management 2006-2011".

Hans Chr. Pedersen, Oddgeir Andersen, Haaken Christensen, Bjørn Kaltenborn, Frode K. Midtlund & Torstein Storaas.

The management for the future of ptarmigan and woodland grouse for increased benefits of landowners, hunters and other stakeholders will be addressed by the user-initiated research project "Grouse Management 2006-2011".

In Norway, grouse hunting is of great economic importance generating substantial income for landowners, local communities and various commercial sectors. However, managers often lack knowledge-based practical advice to carry out goal-oriented management plans for grouse populations in different types of habitat and with different population densities.

To meet a constantly increasing need of practical management tools for a sustainable harvest of ptarmigan and woodland grouse populations, a user-initiated project called *Grouse Management 2006-*

2011, was initiated in 2006. By studying ptarmigan, woodland grouse, hunters, landowners and managers, the project will develop modern management models needed for future management challenges.

The project is a joint venture between The Norwegian State Forest Commission (Statskog) and The Norwegian Forestry Association (NORSKOG). Statskog is the largest landowner on state property in Norway, whereas the members of NORSKOG are the landowners of the largest privately owned properties in Norway. The research part of the project is conducted through cooperation between Hedmark University College (HiHM), Norwegian Institute for Nature Research (NINA) and Nord-Tröndelag University College (HiNT). In late summer 2006, the project was funded by the Norwegian Research Council, supporting the project throughout 2011. In addition the project is supported by County Governors, Municipalities, and The Directorate for Nature Management, as well as by the four institutions involved.

Why is a project on grouse management needed?

Norwegian public authorities encourage primary industries to increase their efforts to develop employment and commercial activities based on traditional harvesting techniques such as hunting and fishing, outdoor recreation and tourism linked to nature experiences and cultural heritage. However, nature tourism enterprises involving hunting and fishing, often lack experience in marketing, organisation and product development to achieve a full realisation of the economical potential.

During the hunting season of 2004/2005, a total of 147 500 people hunted in Norway, of which 67 % hunted small game. For many years, small game has been a salient part of the economic basis of landowners and local communities. Yet, a range of more or less conscious management models have been employed, often simply based on coincidences, traditions or local beliefs about wildlife stocks and demand. Effect of different management approaches has not been properly systematized and evaluated. Hence, we still have insufficient knowledge to optimize the management in terms of demand, economic potential and the sustainability of grouse populations.

What will the project do?

Population densities of different hunting areas will be estimated from censuses in August (Distance sampling) shortly before the hunting season starts. In addition, information about hunting yield, management regimes and hunters are provided by cooperating landowners. Surveys of hunters and managers/landowners which will identify important characteristics of the hunting activities and related experiences will also provide an important contribution towards designing new management strategies and models.

Based on systematically collected information from a large number of hunting areas throughout Norway, we will; 1) Identify man-made and natural characteristics at the landscape level decisive for habitat quality for ptarmigan/grouse; 2) map goals and strategies for the management of hunting amongst landowners; 3) identify the most important factors affecting the satisfaction of hunters and possible connection between ptarmigan/grouse population density and hunter satisfaction; 4) design tools/principles for goal-oriented management of hunting areas of different quality based on censuses of density; 5) map and suggest relevant changes in framework conditions for ptarmigan/grouse hunting; 6) develop simple tools for ptarmigan/grouse census, density calculations and harvest rules; 7) record effects of user-initiated actions (e.g. predator control) on population density and reproduction in ptarmigan, and 8) analyze economics of actions aimed towards hunters and ptarmigan populations.

As a final product we will produce a handbook (*The grouse management book*) with relevance for landowners and managers who wish to carry out necessary changes for an optimized yield from the small game resources on their property.

More information (in Norwegian) can be found at the home-pages of the project at: http://www.skoginfo.no/. Questions and suggestions can also be sent to hans.pedersen@hihm.no.

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SNIPPETS

Fluctuations in the capercaillie *Tetrao urogallus* (L.) population in relation to past land use and forest structures in the south-east Alps

Miran Čas did his doctoral dissertation at the University of Ljubljana, Biotechnical Faculty, Department of Forestry and Renewable Forest Resources, 2006. Miha Adamič was his supervisor. Below is a short summary of his thesis.

Abstract
The suitability of forests for habitat use is reflected in the population density of rare animal species. In Slovenia the Capercaillie *Tetrao urogallus* (L.) is an endangered species of mountain forest ecosystems. Using the data on hunted Capercaillie males for the years 1874-1984 (without the period of World War 1 and 2), the dissertation studies the influence of past land use on habitat forests and time-space fluctuations in the Slovenian territory. ACF (autocorrelation function) and CCF (crossACF) analyses (Stat.6,0 in StatSoft) were used to study the causes of fluctuations, whereas current threats were determined through an analysis of 3.205 lek activity sheets from the years 1979-2000. Forest structure suitability was determined on the basis of the Slovenian Forest Service data and multivariate analyses of 35 habitat variables in 370 lek plots (r=300 m) in the Alpine part (9 significant variables) and in 35 lek plots in the Dinaric part (3). The share of habitat forests in lands as of 1874 was 25-31%. The Capercaillie inhabits areas at 400-1600 m a.s.l. In 2000 the species persisted above 1200 m a.s.l. (in woody land), recording 7-10 birds/10 km² (peak at 80-100). Out of a total of 681 recorded and 289 active leks, 267 active leks are in the Alpine and 22 in the Dinaric part of the distribution range. From 1874 to 1911 the density (of hunted cocks) increased 3-fold to 1.2/10 km², reaching its long-term maximum density between 1916 and 1925. The development of Alpine coniferous forests overgrowing high-altitude pasturelands (after 18. century in period 1784-2000) had a decisive influence. The forest cover rose from 27% to 82% (in research area of 309 km² in Carinthia and Styria in Slovenia). Simulated development of forests older than 80 years in SE Alps (in this area) showed a rise from 45% to 90% (1874-1925) at a permanent 62% cover and an significant effect on the growth of the Capercaillie population ($p<0,01$***). The peak was further confirmed by migrations into border zones ($p<0.02$), which resulted from an increase in the share of mixed coniferous forests (from 34-64 % of forest surface in period 1890-1930). During heavy harvesting of old forests after 1929, the density started dropping in 1933, the drop intensifying after 1961. A rise in the annual air temperature (on the border of SE alpine area) was an additional influence (in significant temperature interval), positive in the years 1874-1913 ($p<0,03$) and negative in the period 1953-2000 (at lag t=4, $p<0,04$). After 1980 secondary habitats shrank to higher elevations due to a decline in coniferous forests and returning of (autochthonous) deciduous trees (beech). ACF analyses into the Capercaillie population fluctuations confirm the existence of 5-12 annual cycles since 1874 - 1984 and the hypothesis of 18-year-long cycles for the time 1976-2000 (top, 1991) ($p<0,01$***). Furthermore, the negative influence of predators, fox and martens (1920-1940) and the wild boar after 1953-1984 was confirmed (significantly at lag t=1-2). Since 1980 to 2000 the share of active leks dropped 50% and the Capercaillie numbers declined by 37%. Alpine habitat shrank to higher elevations and the Dinaric habitat moved to lower elevations (to 1000-1200 m o.s.l.). The share of active leks by 200-metre altitude belts is reflected in the percentage of habitats in forest structures. Mature forests, regeneration and thinning forests (thf) are suitable for habitat use in the Alpine part, but in the Dinaric part not thf. Small forest clearings, anthills and bilberry sites are important there. General discriminant analysis of 35 variables classifies 370 Alpine leks into 3 activity groups (leks with 0, 1-2 and 3-12 cocks) according to certain variables ($p<0,02$) (elevation /active upper 1100 m/, % of conifers /60-97/), distance from forest roads /200-400 m/, density of overthrown trees /5/ha/). Fluctuations of the Capercaillie density are indicators of past land use and forest development of habitats structures in 220 years and suitability of multi-purpose close to nature forest management in 2000.

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IGS 2008 - North to the Yukon!!!

The 11th International Grouse Symposium will be held in mid September 2008 in Whitehorse, Yukon Territory, Canada. Whitehorse is a major access point to the second largest contiguous terrestrial area on the planet managed for ecosystem and wilderness protection (the Kluane, Wrangell-St. Elias, Glacier Bay and Tatshenshini-Alsek Parks). The Yukon lies on the eastern boundary of Beringia, the unglaciated landbridge that connected North America with Siberia and Europe before the last ice ages. The Yukon supports 288 bird species, including 7 grouse, 3 in alpine-arctic tundra (White-tailed Ptarmigan, Rock Ptarmigan and Willow Ptarmigan), and 4 in boreal forest/parkland (Spruce Grouse, Ruffed Grouse, Blue Grouse, Sharp-tailed Grouse). The Yukon is the site of several long-term ptarmigan and spruce grouse studies, as well as the Kluane Boreal Forest Project, one of the largest scale long-term field experiments on Vertebrate Populations. The region supports many large ungulate and predator species, and is revealing an abundance of fabulous fossils such as woolly mammoth, giant sloth, short-faced bear and scimitar cat. There are direct flights to Whitehorse from Frankfurt (Germany), Vancouver, Edmonton, and Calgary,. We will jointly sponsor some activities with the International Polar Year. Dates are tentative (shortly after Sept 15, 2008). Suggestions for symposia can be sent to Kathy Martin (Kathy.Martin@ubc.ca). Conference details will be distributed in late April 2007.

Banded male Willow Ptarmigan.
Photo: Kathy Martin.

Three forest types in the Yukon.
Photo: Kathy Martin

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New PhD project on capercaillie in Finland.

I did my Master's thesis on capercaillie lekking site viability in 2004 at the University of Turku, Finland. I started my PhD on capercaillie about a year ago. I work at the Finnish Game and Fisheries Research Institute in Helsinki. I'm funded for four years at the Finnish School in Wildlife Biology, Conservation and Management (University of Helsinki).

My PhD project concerns many aspects about capercaillie. The first part deals with capercaillie lekking site persistence in three study areas in Finland. It seems that in fragmented southwest Finland the overall forest cover at 3000 meters radius around the lekking site is important for lekking site persistence. In other study areas the effect was not as strong. Secondly, I'm interested in the attitudes of different interest groups towards capercaillie and its management. Presumably people experience capercaillie very differently in different parts of Finland. Other projects I'm involved in tackle with the problems of human land use and capercaillie numbers at larger scales, as well as the historical decline in capercaillie densities. I'm also interested in the correlation between different land use and stress levels in capercaillie males. In conclusion, I would like to study the confrontation of capercaillie and man from many sides.

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