GROUSE NEWS

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Contents

From the Editor

Grouse News has now been published for more than 20 years and is an important link between researcher, management and other people interested in grouse management. You may get response from others on your work. It all started after the 5th International Grouse Symposium had been held at Elverum in Norway. If we want this Newsletter to continue, we need contributions from you. This is not always easy to get, and we hope many of you will write in the future. It may be short notes on what you are doing, if you have got a new position or other short notices. Also articles of your research are welcome. Just check older issues to see what is published. And if you move and or change e-mail address, please tell us. Each time too many e-mails are returned with address unknown or for other reason undelivered.

The 12th International Grouse Symposium was held in Matsumoto, Nagano, Japan 20-24 July 2012 with a field trip 25-27 July, and hosted by Hiroshi Nakamura and colleagues. It was an interesting conference and the persons in charge of the arrangement had made a great job. After the conference participants had different options for post conference tours. Many grouse people found their way to Japan for this symposium.

During the conference in Japan it was offered by Olafur Nielsen to host the 13th International Grouse Symposium in Iceland in 2015. We will get back to more details on time and place when it is decided.

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From the Chair

Since publication of the previous issue of Grouse News in May 2012, many of us have met at the International Grouse Symposium (IGS) in Japan, or the International Black Grouse Conference (BGC) in Sweden. I had the pleasure of attending both these meetings. Participants will agree with me that they were highly rewarding – see reports below (see reports on p. 28 and 32). However, they will also have noticed that grouse conferences seem no longer as well attended as before.

At the level of individual grousers, there are many different reasons why not to attend a certain grouse conference, such as shortage of funding for international travel, conference venues in high-cost countries, and overlap in timing with other professional or personal obligations. However, my suspicion is that we are also experiencing a kind of generation shift. International Grouse Symposia always had a core group of participants who created that special IGS feeling of a reunion with good old friends, with whom one has shared many years and often decades of one's professional biography. New grouse students eagerly joined the network of grousers and attended the IGS. Many of them continued to study grouse, although not necessarily exclusively, throughout their careers. This has also been my own history as a grouser, with my first IGS attended as a PhD student in 1989.

There are still PhD studies written on grouse, and excellent PhD students attending the grouse symposia. We have met some of them in Japan and Sweden this year. However, today apparently few get a chance to continue studying grouse. There is a strong pressure on young scientists for generating their own funding and for publishing in high-ranking journals; both however is almost impossible to achieve with a taxon-oriented approach. Thus, it is becoming increasingly unlikely that a scientist presenting his PhD on grouse at the IGS will still be working on grouse three, six, and more years later. For young-generation grouse researchers, attending the IGS is not likely to become a habit, as it is for many of us now >50 years old.

If true, we may have to re-think the IGS. Fewer attendants are not necessarily negative. Both the IGS in Japan (registration: 88) and the BGC in Sweden (attendance 30) had an especially intimate atmosphere with time for longer presentations and discussion. In the end everyone had talked to everybody else. But the IGS and the BGC were rewarding in many other ways as well – read more in the reports on p. 28 and 32.

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NEWS FROM GALLIFORMES SG

A new IUCN quadrennium has started with the World Conservation Congress in Jeju, South Korea in September. The Chair of the Species Survival Commission of the IUCN, Simon Stuart, was re-elected. Simon has invited Peter Garson and Ilse Storch to continue serving as Co-chairs of the Galliformes Specialist Group. After consultation with the GSG's membership through WPA, who were supportive of Simon's invitation, Peter and Ilse accepted. One of their first tasks will be the re-formation of the GSG's membership. They will contact you early next year.

RESEARCH REPORTS

Population dynamics of Capercaillie *Tetrao urogallus* on leks in Central Slovakia in the period 1981-2012

Miroslav Saniga

From 1981-2012, population dynamics of the capercaillie *Tetrao urogallus* (L.) was studied on eighty-nine leks in the mountains of Central Slovakia during the spring display activity. Results demonstrate a markedly decrease (>50%) in numbers of cocks on twenty-three (26%) leks, a slightly decrease (<50%) on sixteen leks (18%). During the study period, capercaillie cocks became extinct on twenty-five (28%) leks and their surroundings. More or less constant number of capercaillie cocks was found on twelve leks (14%) and a slight increase was found only on thirteen leks (14%).

Comparing the number of cocks on each of the 43 leks with the percentage of old forests (over 80 year old) with suitable age-space structure (stand density 05-08) within 1 km radius of lek (314 ha), a statistically highly significant correlation between the amount of old forests and the number of cocks attending a lek was found ($r = 0.725$, $p < 0.01$). Average number of cocks and hens visiting leks continually decreased within the study period (6.3 cocks and 6.0 hens per lek in 1981 whereas 1.4 cocks and 1.5 hens only in 2012, respectively). Averagely 2.1 cocks and 1.9 hens visited a lek in the whole study period.

Introduction

Capercaillie *Tetrao urogallus* (L.) is a large ground-nesting grouse species with precocial chicks inhabiting in small isolated populations also a Central-European mixed spruce-beech-fir and mountain spruce forest in the West Carpathians (KLAUS et al. 1986, SANIGA 1996a, b, c). These forests have been undergoing radical changes from a natural regime to a managed system especially in the course of the last century. Continuous multi-aged forests have been transformed to patchworks of even-aged stands.

In recent years, more attention has been directed towards the effects of forest habitat changes on faunal diversity and performance of wildlife populations (e.g. HELLE 1985, VÄISANEN et al. 1986, LINDÉN 1989, STORAAS et al. 1999). In terms of landscape ecology this large-scale change in forest mosaic is expected to have profound effects on spacing pattern and range use of wildlife species, especially those having home ranges and cruising radii within the critical area interval (ROLSTAD & WEGGE 1989). Capercaillie belongs to this area-sensitive category, inhabiting old forest most of the year, and having seasonal ranges between 10 and 1000 hectares in size (WEGGE & LARSEN 1987).

In recent few decades, populations throughout most of Western Europe have declined markedly (e.g. NOVÁKOVÁ & SŤASTNÝ 1982, KLAUS et al. 1986, KLAUS & BERGMANN 1994, SANIGA 1999). A decline in capercaillie populations has also been observed during the last 20-30 years in Fennoscandia and Russia (e.g. RAJALA & LINDÉN 1984, ROLSTAD & WEGGE 1989).

Most Slovakian data concerning the population dynamics of the capercaillie come from hunting satatistics (BANCÍK 1969, FERIANC 1977, RICHTER 1983). Only few serious population studies have been made on this endangered grouse species in the West Carpathians (SANIGA 1996b, c 1999).

This paper reports on the findings of a thirty-two capercaillie population study in the mountains of central Slovakia (West Carpathians). This study is aimed at: (a) monitoring population dynamics of the capercaillie on leks and their surroundings; (b) chick losses during the summer in this forest-dwelling tetraonidae; (c) evaluation of the sex ratio in the chicks; (d) evaluation of the relationship between nest and chick losses and predaceous factors; and (e) explore reasons for the persistent downward trend in numbers that was documented over the study period.

Study area

The field work was conducted in the mountains of central Slovakia (Veľká Fatra Mts., Malá Fatra Mts., Kremnické vrchy Mts., Starohorské vrchy Mts., and Nízke Tatry Mts., 18°50' - 19°10'E; 48°47' - 49°19'N) from 1981-2012. The topography rises from 600 to 1,530 m a.s.l. The climate is moderately continental with a mean temperature of the warmest month (July) of 14.5°C and minus 5.5°C for the coldest (January). Yearly mean precipitation is 1,000 - 1,400 mm, and the ground is usually covered with snow from mid-November to late March or April (depending on the altitude and exposure).

In the study area mixed forest biocoenoses consisting of the spruce-beech-fir vegetation tier dominate (90%) (*Picea abies, Abies alba, Fagus sylvatica, Acer pseudoplatanus*). Coniferous forests of the spruce vegetation tier constitute around 10% of the study area (*Picea abies* dominated, sprinkled with *Acer pseudoplatanus, Fagus sylvatica,* and *Sorbus aucuparia*).

The area is a mosaic of small patches of different groups of forest types (classifications according to RANDUŠKA et al., 1986). *Fageto-Aceretum, Abieto-Fagetum* and *Fageto-Abietum* cover about 80% of the forested study area and *Sorbeto-Piceetum* with *Acereto-Piceetum* about 10%.

As for the age-space structure of forest stands, in the spruce-beech-fir vegetation tier, islands of old forests (over 80 years) very different in size (from 5 ha to maximally 50-75 ha) are broken up into a mosaic of clearcuts and plantations of various ages and sizes. In the spruce vegetation tier, unmanaged natural forests around 150-180 years old predominate (80%).

Ground vegetation changes locally depending on the forest type. In the mixed forests (spruce-beech-fir vegetation tier), ferns (*Athyrium filix-femina, Dryopteris* sp.) are often common. In the habitats of the spruce vegetation tier, dominant ground vegetation is bilberry *Vaccinium myrtillus*, some species of graminoids (*Deschampsia flexuosa, Calamagrostis* sp.) and also ferns *Dryopteris dilatata*.

Main small rodent species are bank vole *Myodes glareolus*, common vole *Microtus arvalis*, and wood mouse *Apodemus sylvaticus*. Potential capercaillie egg and chick predators are corvid birds, particularly jay *Garrulus glandarius* and raven *Corvus corax*, sparrowhawk *Accipiter nisus*, goshawk *Accipiter gentilis*, ural owl *Strix uralensis* and tawny owl *Strix aluco*. Among mammals there are red fox *Vulpes vulpes*, pine marten *Martes martes*, stone marten *Martes foina*, small mustelids (*Mustela erminea, Mustela nivalis*), wild boar *Sus scrofa*, brown bear *Ursus arctos* and lynx *Lynx lynx*.

Material and Methods

Capercaillie are difficult to count at most times of year. One of the most suitable methods of the quantitative research of the capercaillie is census of the birds on the leks during the spring display season (KLAUS et al. 1986). Accuracy of the quantitative investigations depends on the exact timing of the census. In the initial phase of display activity (late March), cocks do not visit leks regularly. The period between 20th April and 10th May is most suitable for surveys of the capercaillie in Central Europe (SANIGA 1998). In this period hens also visit the leks regularly.

In 1981-2012, a total of eighty-nine leks were monitored during the spring display season. The study was largely carried out by observing birds from the vicinity of the leks so that they were left not disturbed. Observation sites were usually occupied in the evening before the arrival of the males and were usually abandoned when the morning display ended. Capercaillie were counted at least twice during the spring display season on the lek. Leks were censused especially during the period 20th April to 10th May (peak of lekking activity). A possible bias in the material is that data from some leks were not obtained during this peak period. The number of hens present on the leks is considered underestimated in comparison to cocks, as hens are much less conspicuous on the leks.

Altogether 768 evening and 1192 morning observations were carried out on the forty-three leks during the spring display season. Leks were found during the spring display season by: (1) systematic search of potential areas during morning and evening display and snow-tracking, respectively; (2) field checks of information obtained from local sources. Indirect evidence of capercaillie occurrence and activity was also collected (faeces, footprints in snow, shed feathers, scraps of unconsumed food, such as broken twigs and absence of buds on seedlings, and findings of nests or egg-shells). All these data helped to guide me to leks, roosting and feeding trees, and eventually, it made clear the seasonal distribution of the birds in the forests of the study area. Investigations of the capercaillie on leks were carried out with regard to the timidity of this tetraonidae.

Results and discussion

Results demonstrate a markedly decrease (>50%) in numbers of cocks and hens on twenty-tree (26%) leks, a slightly decrease (<50%) on sixteen leks (18%) (Table 1). During the study period, capercaillie cocks became extinct on twenty-five (28%) leks and their surroundings. More or less constant number of capercaillie cocks was found on twelve leks (26%) and a slight increase was found only on thirteen leks (14%). Whereas in the year when the quantitative research started average number of cocks per lek was 6.3 and hens 6.0, in the last year fell on the lek averagely only 1.9 cocks ($r = 0.82$, $p = 0.001$, $y = (-0.194x) + 20.806$) and 2.1 hens ($r = 0.70$, $p = 0.0016$, $y = (-0.149x) + 16.202$), respectively (Table 2).

Surrounding habitats are expected to influence lek population size of capercaillie (LARSEN & WEGGE 1985). Forest stands over 80 years old with suitable age-space structure covered 20-90% of the area within 1 km from the lek centres in the study areas. On four leks with the proportion of old forests being only 20-30%, 1-2 cocks displayed, while on six leks with 80-90% proportion of old forests, 5-12 cocks displayed (Table 2).

Table 1. Presence of capercaillies on examined leks during spring display season (West Carpathians, Slovakia, 1981-2012).

Year	Checked leks	Individuals		Average per lek	
		Males	Females	Males	Females
1981	4	25	24	6.3	6
1982	4	24	27	6	4.3
1983	7	31	27	4.4	3.9
1984	7	31	28	4.4	4
1985	7	23	29	3.3	2.7
1986	6	24	17	4	2.8
1987	8	18	19	2.3	2.4
1988	8	27	17	3.4	2.1
1989	13	40	28	3.1	2.2
1990	23	74	43	3.2	1.9
1991	23	78	52	3.4	2.3
1992	21	68	52	3.2	2.5
1993	23	67	62	2.9	2.7
1994	17	53	55	3.1	3.2
1995	25	71	61	2.8	2.4
1996	22	50	46	2.3	2.1
1997	22	41	46	1.9	2.1
1998	10	21	27	2.1	2.7
1999	10	19	25	1.9	2.5
2000	9	16	22	1.8	2.4
2001	10	17	26	1.7	2.6
2002	62	118	104	1.9	1.7
2003	72	116	128	1.6	1.8
2004	69	124	119	1.8	1.7
2005	79	137	110	1.8	1.4
2006	73	124	108	1.7	1.5
2007	66	112	93	1.7	1.4
2008	73	110	116	1.5	1.6
2009	74	111	108	1.5	1.4
2010	56	84	82	1.5	1.5
2011	52	79	78	1,5	1,5
2012	60	86	91	1,4	1,5
Total	1127	2184	2039	2.1	1.9

Table 2. Relationship between the amount of old forests (over 80 years old) within a 1 km radius of the lek centres and the maximum number of cocks attending a lek (West Carpathians, Slovakia, 1981-2012, r = 0.025, p < 0.01).

Old forest	Number of cocks								Sum
%	1	2	3	4	5	6	8	12	leks
21-30	3	1							4
31-40	2	2	1						5
41-50	2	2	1						5
51-60			3	1					4
61-70			3	2					5
71-80			4	8	1	1			14
81-90					1	3	1	1	6
Sum leks	7	5	12	11	2	4	1	1	43

In contrast to the situation in Fennoscandia and Russia, long-term population studies based on the censuses on leks during the display season are scarce in Central Europe (MÜLLER 1974, 1978). In Central Finland, RAJALA (1974) found the capercaillie density to be 5.98 ind/100 ha. According to KLAUS et al. (1986), this upper limit value corresponds with optimal habitat. During especially favourable years, the population density could be even higher and theoretically it could reach the value 24 ind/100 ha (SEMENOV-TJAN-ŠANSKIJ 1960).

My findings concerning the numbers of cocks and hens visiting the leks during the spring display season agree with KOIVISTO & PIRKOLA (1961), who monitored with collaborators 185 capercaillie leks in Finland. They stated 2.3-5.2 cocks per lek and 2.8-3.9 hens per lek.

In recent years, populations of the capercaillie have declined rapidly not only in Central Europe but also in some parts of Russia (KLAUS et al. 1986, KLAUS & BERGMANN 1994). My long-term population studies on leks in Central Slovakia confirmed this negative trend in local capercaillie populations (Table 1, 2). Factors causing declines of capercaillie are broadly discussed (e.g. SEMENOV-TJAN-ŠANSKIJ 1960, RAJALA 1974, PORKERT 1979, KLAUS 1984, 1991, STORAAS & WEGGE 1985, KLAUS & AUGST 1994).

The loss of suitable habitats is considered to be one of the main factors explaining declines of capercaillie (KLAUS & BERGMANN 1994). Habitats surrounding the leks are expected to influence lek population size (LARSEN & WEGGE 1985). Comparing the number of cocks on the forty-three leks with the percentage of old forest (over 80 years old with suitable space structure) within 1 km radius of a lek, a statistically highly significant correlation between the amount of old forests and the number of cocks attending a lek was found (Pearson correlation coefficient $r = 0.725$, $p < 0.01$). This knowledge supported WEGGE & ROLSTAD's (1986) findings that the leks surrounded by a high proportion of old forests supported more males than leks in fragmented areas. Surroundings in five of seven leks where capercaillie populations became extinct during the study period changed drastically. Presence of old forests with suitable space structure decreased below 20%.

To summarize, the results showed a rapidly decrease in capercaillie population in the mountains of Central Slovakia. Factors as habitat deterioration by forestry practices, pollution, predators, climate (especially in May and June), disturbance and hunting affecting in interaction explane the decline of this grouse.

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Partial recovery of capercaillie in French Jura Mountains

Marc Montadert

Introduction

Capercaillie are highly threatened in western Europe, particularly in the three isolated satellites of the wider alpine range, i.e., Black Forest in Germany, Vosges in France and Jura Mountains on the French-Swiss border. On the French side of the Jura, different sources of information are available since the 1950's to track population changes. From 1950 to 1990, successive surveys of capercaillie presence from testimonies of local hunters and foresters have shown an important range contraction, mostly due to the disappearance of peripheral populations (Couturier 1964, Magnani *et al.* 1991, O.N.C. 1977). However these studies did not give a quantitative picture of population change in the core area occupied. The first thorough knowledge of the status of capercaillie in the French Jura was obtained at the beginning of the 1990's through field work undertaken to assess population size and distribution (Montadert & Chamouton 1997). Also, most of the collective leks have been monitored every year since early 1990. In 2010, a second overall capercaillie population assessment was carried out in the French Jura, giving the

opportunity to compare the situation over a 20-year period. The aim of this paper is to report the changes in distribution and number of lekking cocks recorded since the 1990's.

Methods

The distribution range was assessed by mapping all capercaillie contacts, i.e. sightings or indirect signs (tracks, droppings, moulted feathers ...). Most data came from specific campaigns of field work undertaken by regional non-governmental organizations interested in capercaillie conservation, and by staff of the French National Hunting and Wildlife Agency. Occasional observations from local foresters, naturalists and hunters were also compiled. The contours of presence polygons were defined at a scale of 1:25,000, encompassing the contact locations and including buffers of potential habitats. For the first presence map compiling observational data from 1990 to 1995, the absence of a spatially explicit database led us to resort to the advice of local experts to draw the presence contours. For the second assessment, the 2,542 observations made between 2007 and 2011 were stored in GIS. All the polygon contours were drawn by M. Montadert after he had visited all occupied forests at least once during the 5-year period.

Two levels of presence area were identified: first, the area of high priority, encompassing all the main sites frequented in winter and in spring; second, the area of regular presence, which contained the priority area and also surrounding sites with occasional winter presence or sites with only summer presence of capercaillie. Occasional observations outside the regular range, usually of first-year dispersers, were not taken into account.

An estimate of population size of each occupied forest track was achieved by combining counts of territorial males at leks with maps of cock winter ranges. Interpretation of the maps of winter ranges was necessary because in some occupied forests we could not find any collective leks despite intensive searches in spring. Conventionally when a winter home range was found at more than 1.5 km from a lek we counted a new cock. Two empirical values of population size of each forest are proposed: a minimum number of cocks and a maximum number with a more optimistic interpretation of number of winter home ranges. Total population of both sexes was considered as twice the number of cocks.

Lekking males were counted by direct sightings from hides positioned in the preceding evening before cocks arrived for morning display. Number of hides was adjusted to presumed number of cocks (between one and six) based on distribution of droppings or tracks in the snow. Special effort was made to check for possible changes in lek locations or for appearance of new leks. In the 22 years of study, this point was very important for an accurate estimation of number of singing males as only a minority of leks stayed at the same place (see below).

Trends of lek counts were analyzed by a log linear model with a Poisson error correction for overdispersion and serial correlation by using TRIM software (Pannekoek & Van Strien 1998).

We tested 3 models: a model without a covariate, which postulated that all leks follow a similar pattern of change through time; a model with a covariate, which characterized the forest track where the leks were implanted (7 modalities); and a model with a covariate that described the temporal pattern of change in numbers of cocks on each lek. Three types of change were recognized: fluctuations around a stable mean, continuous decline and both decrease plus increase.

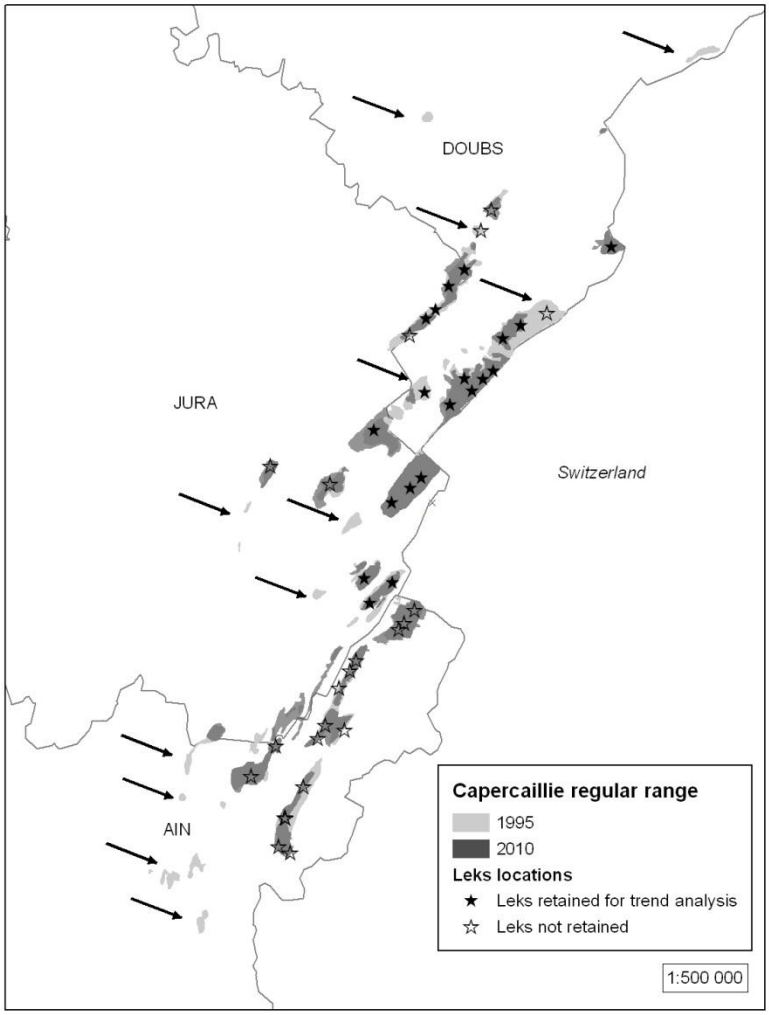
Results

In 2010, capercaillie occupied in the French Jura Mountains roughly 21,500 ha, 21% less than the area occupied in 1995 (Table 1). Priority range was estimated at ≈ 9,900 ha, an 11% regression.

Range contraction was more important in the northern part of the Jura (Doubs department) than in the southern part (Table 1). An apparent augmentation (+5 %) of regularly occupied range in the Jura department could be positively biased by better knowledge or a more “optimistic” interpretation in 2010 of data from a large area of low density in the southern part of this department. Outside this large area the occupied range regressed by 6 %. The number of forest tracks regularly occupied had regressed in all departments, with capercaillie vanishing from 34% of forests during the study period. Permanent populations of capercaillie disappeared mainly from the peripheral forests at lower altitudes, although some small but more central populations also became extinct (Figure 1).

Table 1. Change in area occupied by capercaillie in the three departments of the French Jura Mountains in 1995 and 2010.

		Priority range			Regular range		
Department		1995	2010	Variation	1995	2010	Variation
Doubs	Number of forest tracks occupied	9	6	-33%	12	9	-25%
	Area (ha)	3,336	2,365	-29%	9,547	5,268	-45%
Jura	Number of forest tracks occupied	10	9	-10%	13	9	-31%
	Area (ha)	5,059	4,724	-7%	9,490	9,940	5%
Ain	Number of forest tracks occupied	2	2	0%	7	3	-57%
	Area (ha)	2,817	2,851	1%	8,418	6,374	-24%
Total	Number of forest tracks occupied	21	17	- 19 %	32	21	-34%
	Area (ha)	11,212	9,940	-11%	27,454	21,585	-21%



Total number of cocks in 2010 was estimated to be 170 adult males (min: 140; max: 196), so roughly 340 adults of both sexes. This represents a decline of 28% relative to the 1995 status of ≈ 230 males (min: 199; max: 269), or 460 adults (Table 2).

Figure 1. Changes in area regularly occupied by capercaillie in French Jura Mountains in 1995 and 2010. Black arrows show forest tracks where capercaillie disappeared between 1995 and 2010.

Table 2. Change in population size of capercaillie in French Jura Mountains between 1995 and 2010.

Department	1995 Cock numbers Min	1995 Cock numbers Max	2010 Cock numbers Min	2010 Cock numbers Max	Percentage variation of cock numbers Min	Percentage variation of cock numbers Max
Doubs	55	74	33	45	-40%	-39%
Jura	73	100	56	74	-23%	-26%
Ain	71	95	55	77	-23%	-19%
Total adult cock number	199	269	144	196	-28%	-27%
Total adult number of both sex	398	538	288	392		

During the period study, 42 lek sites were known to have been attended by at least one cock during at least one year. As several of these leks were monitored too irregularly or without enough accuracy, we restricted our sample to 20 leks monitored in the two departments of "Jura" and "Doubs" (see Figure 1). For the third department, "Ain", where 13-15 leks were known, too many values were missing before 2007 to implement an accurate model of trends. Therefore, only 65 % of all populations of singing cocks in the Jura Mountains were retained for an analysis of trend in numbers.

Among the 20 leks * 22 years = potentially 440 lek/year combinations, only 390 were realized (50 missing values due to absence of a count). The first TRIM model without a covariate failed to fit correctly the data set (Goodness of fit test, P = 0.0046). The second model with the covariate "forest track" did not add significant information to the model (Wald test for significance of covariate; P = 0.18). That meant that numbers of cocks on neighbouring leks belonging to the same track of forest fluctuated independently.

The third model with covariate "pattern of temporal variation" fit correctly the data set (Goodness of fit test, P ≈1) and the contribution of the covariate to the model was highly significant (Wald test, P < 0.0001). The stepwise procedure retained a trend that first declined then increased in 2004 (Figure 2 and Table 3).

Table 3. Result of TRIM analysis of trend of capercaillie leks counts in French Jura Mountains (n = 20 leks). The model incorporates a covariate that classifies the leks in three types of temporal variation: fluctuation around a stable mean, continuous decline, decrease and increase □ = multiplicative annual rate, □ : standard error , IC_Inf et IC_Sup : confidence limits of □ at 5% risk, percentage of number variation during two periods, 1991-2004, 2004 – 2012 (one change point in 2004).

Period	Covariates modalities (number of leks)	Annual □	Annual □	Annual CI_Inf	Annual CI_Sup	Period % of variation
1991-2004	Stable (n = 3)	0.99	0,023	0,95	1,04	- 3 %
	Decline (n = 10)	0,86	0,026	0,81	0,92	- 85 %
	Decrease and increase (n = 7)	0,90	0,025	0,85	0,95	- 75 %
2004-2011	Stable	1,00	0,035	0,93	1,07	+ 3 %
	Decline	0,92	0,060	0,80	1,03	- 50 %
	Decrease and increase	1,25	0,053	1,15	1,35	+ 484 %

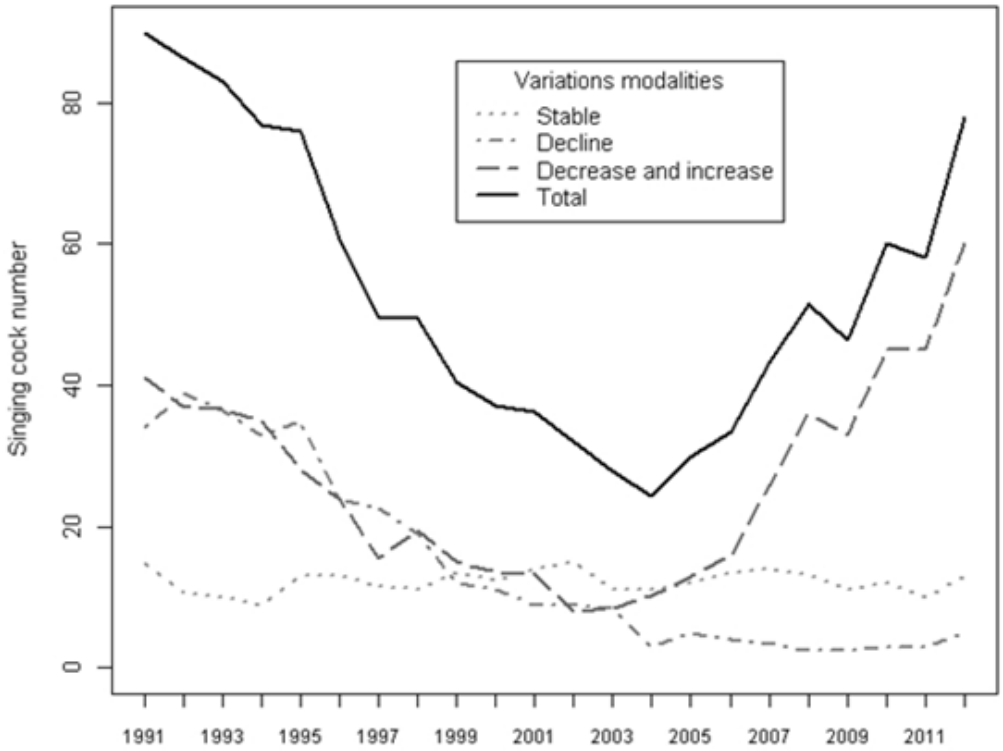


Figure 2. Variation of number of displaying cocks on 20 leks monitored in French Jura Mountains from 1991 to 2012. The individual lek values (imputed values) were calculated by TRIM software after assessment of missing values and were analysed according to three modalities of a covariate qualifying the type of temporal variation of individual leks: fluctuation around a stable mean, continuous decline, decrease and increase.

Among the 20 monitored leks, three leks did not show a clear trend during the 22 years of monitoring. ($\lambda \approx 1$). Ten other leks declined markedly, especially during the first 1991-2004 period when 85 % of cocks disappeared leading to complete extinction of seven leks. During the second period 2004-2012 the annual multiplication rate of these 10 leks was not significantly different of 1. The last seven leks also faced marked decline during the first period with a total loss of 75 % of singing cocks. Yet, after 2004, their numbers increased steadily, at an annual rate of 1.25 that led to a final increase of nearly 500 %. Despite this increase, overall singing cock numbers in 2012 was still 13 % lower than in 1991.

Discussion

Validity of results

Analysis of a trend based on lek censuses can have several shortcomings. First, the quality of the counts relies heavily on the ability of the observers to correctly place the hides to detect all the males. During the study period we paid particular attention to this point because the position of cocks or even leks changed through time. Actually, only 6 of 20 leks stayed at the same place during the 22 years of survey. Apart from the seven that disappeared, three moved progressively more than 500 m, three settled at 500-1,000 m from the previous lek location after complete disappearance of singing males and one was completely new after a emergence of a good habitat. Therefore without a careful screening of signs of presence conducted every spring before the census day, it could be very easy to get a biased picture of trend because new leks would systematically be missed.

Furthermore, the trend we report for the Jura Mountains is based on a non-random sample of leks. For the departments of the Doubs and the Jura, we think that the overall picture is valid because 5 of 6 leks not counted were small, involving only one or two cocks. Only one bigger lek (4 cocks in 2012) was not taken into account. It was discovered only in 2008 and we did not know its story before. Only in 1993, a complete search of this forest failed to find any collective display.

For the leks belonging to the Ain department, which hosts 38% of the total capercaillie population, there is a more serious problem in not including this data set to define an overall trend for the

Jura Mountains. Two large forest units were occupied in 2010. A preliminary analysis of trend was tested on the 13 leks localised on the higher ridge of the Jura Mountains (Montadert *et al.* 2007), which suggested a similar pattern of change, with a continuous decline up to 2004 followed by a probable increase. Yet too many values were missing to arrive at a definite conclusion. Since 2007, there is a clear positive trend for four out of eight leks presently active. Finally it is also important to mention the trend suggested by counts in the Swiss Jura, where a similar pattern has been noticed: steep decline during the 1990's, when 50-60% of singing cocks were lost, followed by a 50-60% increase from 2004-2006 up to 2012 (P. Patthey, *pers. com.*). These convergent data suggest that the broad population trend revealed by our sample set of leks can be generalized to the entire Jura Mountains.

Capercaillie population trend and threat.

Overall, capercaillie appear to be highly threatened in Jura Mountains with about 340 individuals occupying ≈22,000 ha of forests. If one includes the Swiss side, the total population of the Jura Mountains was probably 500-550 adults in 2010. Mollet *et al.* (2003) mentioned only 75 singing cocks in the Swiss Jura in 2001 but the population has partially recovered since. The population of capercaillie in the French Jura is larger than that in the Vosges (≈ 100 adults (Lefranc & Preiss 2008) but far smaller than that of the Pyrenees, estimated at 4,000 individuals (Ménoni & Duriez 2008). The Jura population is now completely isolated from neighbouring populations in the Vosges and Swiss Pre-Alps, so must rely on its own dynamics to survive. The French distribution survey reported here showed a continuous range shrinkage over the last sixty years. In 2010, only 30% of the communes where capercaillie were mentioned in 1950were still occupied (Buffet & Dumont-Dayot 2011). Progressive extinction of peripheral populations at low elevations (800 – 1200 m a.s.l) is probably due to habitat degradation. At these altitudes, forests are more productive and tend to become denser with more rejuvenation of trees and less herbaceous or bilberry (*Vaccinium myrtillus*) cover when timber volume is reduced by forestry (Leclercq 1987). Nevertheless, at higher altitudes it is not so evident that habitat quality has been reduced so much over the past 30 years but populations here also declined. Actually, the population crash observed during the 1990's occurred independently of forest location, habitat quality or human disturbance. It is likely that if a regional survey had been conducted in 2000-2003 at the end of decline phase, it would have yielded a population estimation of only 200 individuals.

In this regional context, the steady increase noticed after 2004 was unexpected and probably saved this population from an inexorable extinction vortex. Despite this, populations have still not recovered the status of 1990. In particular, forests where capercaillie disappeared at the turn of 21th century are not yet recolonized.

Finally, in 2010, the regional distribution appeared to be highly contrasted, with most forest tracks of the core central range hosting healthy populations at rather high densities, even sometime higher than in the 1990's (four leks exceeded 10 males in 2010-2012, and a lek of 16 cocks was known in the Swiss Jura), whereas several other areas with favourable habitat were under-occupied or deserted. While it is difficult to relate the decline to local environmental factors, it seems clear that populations that recovered after the crash were all in large tracks of good habitat at higher elevations (several hundred or thousand hectares). , Furthermore, local populations that failed to recover despite being in good habitats are those which fell below a threshold of ten adults.

There is some evidence that the observed population changes could be linked to a change in reproductive success. Overall reproductive success measured by summer drive counts in three sites was lower between 1995 and 2002 than later (Montadert, *in press*). But we do not know how reproduction is impacted by environmental factors, in particular by changes in spring climate or predator pressure.

All these facts suggest that recent changes in numbers of capercaillie in the Jura are linked more to global change than to the immediate effect of human factors. It is noteworthy that a similar timing of change in capercaillie numbers has been observed recently in other parts of Western Europe: Scotland (Kortland 2004, Eaton *et al.* 2007), Black Forest (R. Suchant *pers. com.*), locally in the Pyrenees (E. Ménoni *pers. com.*) and even in the highly threatened Vosges population (Lefranc & Preiss 2008). Such a general pattern of population trend over such a widespread area, suggests a direct or indirect impact of climate change, as proposed by Moss *et al.* (2001). The fact that important fluctuations of population size seem, at least partly, driven by the effects of uncontrollable factors (climate/ predation interactions?) is a great problem for implementing specific and efficient conservation measures.

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Territorial behaviour of the Mongolian Black-billed capercaillie *Tetrao urogalloides stegmanni*

S. Klaus, K.-H. Schindlatz, A. V. Andreev & H.-H. Bergmann

Introduction

The subspecies *Tetrao urogalloides stegmanni* was first described on the basis of morphological differences by Potapov (1985). This description was based on 18 males in the collection at the Zoological museum of Sankt Petersburg. Compared to the nominate and the Kamtschatkan subspecies, the males are larger, of generally darker plumage with longer, wedge-shaped tail and many lateral white spots on the belly resembling the Siberian spruce grouse *Falcipennis falcipennis*. However, knowledge of the ecology and behaviour of this subspecies living at the southernmost edge of its range is very limited (Nadler, Wiesner in Klaus et al. 1989, Bold 1984). In order to expand this knowledge, field work was carried out over three weeks including the "high season" of display in the Mongolian Gorchij-Terelsh national park in the Khentej mountains. The field work included photo and video recordings. We describe here the territorial behaviour of the Mongolian subspecies. We compare our findings with our earlier studies of the nominate form *T. u. urogalloides* in the Magadan region (62° N) by Andreev (1975, 1977, 1979, 2002), Klaus et al. (1989) and Klaus & Aandreev (2001).

Study area and methods

The study area in the Gorchij-Terelsh national park is 150 km NE (48° N) of Ulaan Baatar in the southern part of the Khentej mountains (main top Asralt Chairchan 2,800 m a.s.l., minimum temperatures in January -23° down to -43°C, annual total precipitation 250-400 mm depending on the altitude, (Bold 1984, Hilbig 1995).

Figure 1. The forest landscape dominated by Siberian larch near to the lek is fragmented and bordered by open grassland (30.4. 2011, photo K.H. Schindlatz)

The Khentej mountains are the Southern part of the Trans-Baikal coniferous forests eco-region (WWF 2000) which are characterized as "Khentej plant-geographical district" (GRUBOV 1982) with dominance of boreal taiga forests (*Larix sibirica* in lower parts, *Pinus sibirica* at elevations of 2000-2200 m a.s.l.). The marginal parts and foothills are part of the Daurian forest steppe eco-region, characterized as "Mongolian-Daurian plant-geographical district" with a typical vegetation complex of coniferous forests at northern slopes, mountain steppes and shrubs at southern slopes and minerotrophic mires in the valleys. The higher parts of the mountains above the timber line are characterized by so called Golets terrasses as a complex of *Kobresia* alpine grassland, rocks and block fields with plants of arctic-alpine distribution pattern. The upper forest belt is characterized by moss-covered cedar forests and cedar-larch mixed forests with *Vaccinium vitis-idea*. Dwarf birch (*Betula rotundifolia*), spruce (*Picea obovata*). Aspen (*Populus tremula*) and birch (*Betula platyphylla*) are pioneer trees after forest fires in coniferous forests. Shrub birches (e.g. *Betula fruticosa*), and willows (*Salix* spec.) dominate valley mires (Knapp et al. 1999). Larch forests (*Larix sibirica*) are found on shaded slopes at lower elevations. The display ground (lek) under study was located in an old-growth larch forests at the border of open steppe on a south facing slope in an undulating landscape (Figure 1). A second less typical lek was detected in a 50-year old succession forest of birch (*Betula platyphylla*) that had grown up after a forest fire. In this forest Black-billed capercaillie and Black grouse displayed in close proximity (Figure 2).

Figure 2. Succession of birch (Betula platyphylla) on a former larch stand where leks of Black grouse and Black-billed capercaillie were found close together (photo K.H. Schindlatz)

Habitat of the lek surroundings

The lek was located in a relatively flat part of a slope the southern part of which borders on open grass land (steppe) whereas the pure old-growth larch forest extends into the shady northern part of the hill. The larch forest was uneven-aged with dead trees and only a few remnants of old cut trees. The birds were seen feeding during the spring season both in the crowns of larch trees and on the ground in and around

the arena. Most preferred was the border of the larch forest because freshly sprouting grass and forbs were more common at the open southern exposition.

Time schedule and methods of observations

The first lek was found on 29 April, 2011, by following the foot-prints of displaying males in fresh snow. In the early morning of 01 May a calling cock was recognized and, on closer approach five other cocks were seen nearby in the display arena. During the day, when the birds were absent, a hide was built near the centre of the lek from which to make observations and take photographs and videos. The hide was used for two weeks for all observations starting from 18:00 p.m. and running until 10:00 or 11:00 in the mornings when display stopped and the birds left the arena. Disturbance of the lekking birds was carefully avoided. From 14-20 May observations were continued at the second lek in an untypical habitat described above.

Results and discussion

Time schedule of activity on the arena

The first female visited the lek on 03 May and two more females were seen feeding nearby indicating that the "high season" was approaching. On May 5 and 6 fresh snow covered the ground and trees. One female was noted feeding on larch trees. Two males were actively displaying on the ground. On 06 May the males were highly active, displaying in deep snow and on 07 May, the first female was seen in copulation posture with wings touching the ground close to the circling male. Two more females were nearby feeding on the ground. The distances between males and females dropped to only 1-2 m indicating their readiness to copulate. A first copulation was recorded on 07 May, the next ones on 08 and 09 May. Combats between males have been rarely described in the literature. From four combats seen on different days one example observed on 13 May was documented by photography.

Figure 3. Male of the Mongolian subspecies. Tarsal feathers are shorter as in the nominate form and toes visible (07 May, 2011, national park Gorchij-Terelsh, Khentej, photo K.H. Schindlatz)

Territorial behaviour of males including combats

Because of the position of the hide, most observations were focussed on one dominant cock with 3 females visiting this cock's territory. Territory size was about 10 x 10 m, similar to black grouse territories and typical for this species. 3-5 other cocks were displaying at distances of 30-40 m of each other. A stump of an old larch (1 m diameter) was the preferred centre of the dominant male under observation. Normally, around 6:30 p.m. most cocks arrived at the lek by flight, landing in larch trees and some (not all) started singing from trees for about 1-2 hours. With increasing darkness they stopped singing and rested up to the start of morning activity in the early dawn. Morning activity lasted up to 10:00 or 11:00 a.m. during the high season. Females arrived at the lek in late evening or early morning mainly by flight.

Activity and general behaviour of the Mongolian subspecies did not differ from the description of the nominate subspecies (Andreev 2002). After a silent phase during the dark hours of the night, males started displaying in the early morning from their resting tree, flew to the ground and continued singing

with only short interruptions for several hours. One typical example of the varying activity during the whole display season from a lek near Magadan (Omchik valley) is shown in figure 4.

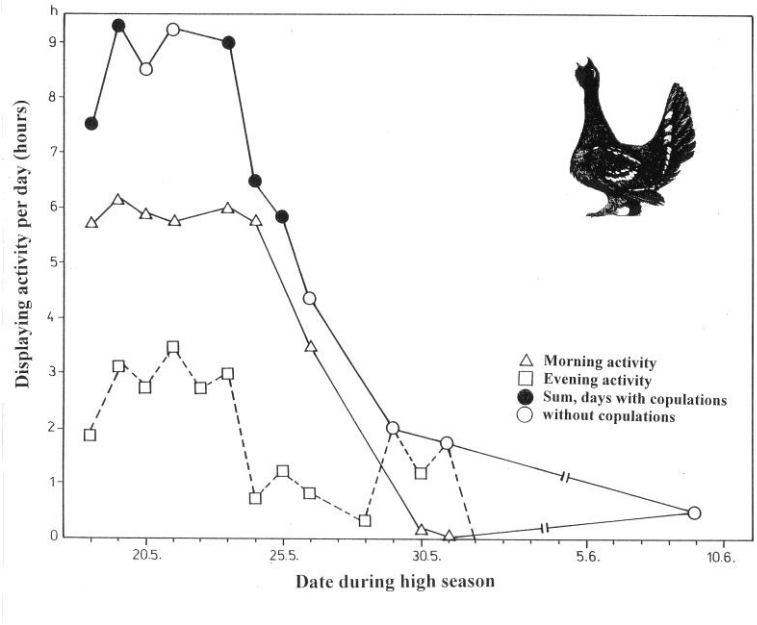

Figure 4. Activity pattern of a dominant cock on a lek in Omchik valley (Magadan region, 62° N) during the whole display season (May 18- June 19, 1994). Dates of copulations (filled dots) are indicated in the upper curve (morning and evening activity combined, Klaus & Andreev, unpublished)

During the high season (May 18-23) at Magadan the evening song activity varied between 2 and 3.5 hours. The duration of morning activity was about 6 hours and dropped down after the last copulation had occurred (May 25). The sum of morning and evening song activity culminated to 6-9 hours per day during the presence of females. The activity pattern in the Khentej Mountains was similar but the peak of activity occurred about one week earlier than in the Magadan region. The exact times of daily periods of activity at Khentej were not documented throughout the study period.

The typical posture and coloration of the displaying male is shown in Figure 3, 5 and 6, demonstrating the black bill, the smaller reddish eye combs, the white patches on the wing covers and tail and the typical shape of the expanded breast –all these features differed from the common Capercaillie male (Klaus et al. 1989). The females are more similar to black grouse females because the red-brownish patch on the breast is missing. The castanet-like song, a continuous clapping with an accelerating phase is much louder than in *T. urogallus* and can be heard up to 1.5 km, depending on the weather conditions. As in the common capercaillie *T. urogallus*, flutter-jumps (>2 m high and 8-10 m wide were measured) are common to attract females at longer distances by the strong sound of the wings and sometimes by breaking twigs and branches. These jumps produce two loud wing-drumming sounds during the rise and the landing phase, separated by a short gliding similar to *T. urogallus* (Figure 5).

Figure 5. Flutterjumps are an impressive feature in the morning display (photo K.H. Schindlatz)

Combats at the territory border have been rarely described but were four times observed in our study area. One example (May 13) is shown in figure 6. In this case a serious combat occurred. At the start both rivals approached, walking side by side along a territorial

border 2-3 m apart. When reaching a short distance of 1-2 m they started to take frontal position, continued singing with bill wide open, tail and crest feathers erect and wings touching the ground. They stopped calling and began intense threat behaviour when they approached at a very short distance (0.7-1 m) from each other. They started head bowing with erect neck and head feathers. Then a short fight with use of bills and wings was seen, both of them tried to hit their opponents. In one case in Magadan region one cock has been recorded to be seriously wounded on its head (Andreev unpublished). In most cases the conflict at the border was reduced to threatening, walking side by side along the territorial border or standing in front of each other with bowing. At the end of the morning display the birds left the arena and walked to the nearby feeding grounds 200-300 m away.

Figure 6. Two males in aggressive posture just before fighting (13.5. 2011, national park Gorchij-Terelsh, Khentej, photo K.H. Schindlatz).

Conservation

The preservation of old-growth forests of larch and mixed forests with larch and cedar form necessary conditions for the survival of a viable population of this "umbrella species" of the avifauna of the northern Mongolian taiga. In addition, the naturally fragmented pattern of forest distribution in parts of the Mongolian mountains causes a higher sensitivity of the Black-billed capercaillie to disturbance, whether natural (forest fire) or man-made (clear cutting, hunting), compared with the closed taiga of North and Northeastern Siberia. The system of national parks and other nature reserves in Mongolia form a substantial precondition for the protection of this impressive large Galliform subspecies and other forest birds of the Mongolian avifauna (WWF 2000).

Summary

During one field season (April 29 – May 20, 2011) territorial behaviour of the Black-billed capercaillie at one lek (6 males, 3 females) was studied 150 km north-east of Ulan-Bataar in the Mongolian Gorchij-Terelsh national park. The lek was found in an old-growth forest of Siberian larch, only 200 m from the southern edge of the forest with transition to open grassland, where the birds preferred to feed on the first shoots of grass and forbs. The first female was visiting the arena on May 3, copulations occurred on May 7, 8 and 9. Fighting between males was observed 4 times. One serious combat was documented and described. In contrast to common capercaillie, aggression between females was never observed. The milder climate and often missing snow cover allows the birds to feed on ground vegetation much earlier and copulations occurred 7 days earlier than in the Magadan region. The protection of old-growth forest is basic for conservation of the Mongolian subspecies of *T. urogalloides.*

Key words: Black-billed capercaillie, Tetrao urogalloides, behaviour, ecology, Mongolia, Gorchij-Terelsh national park.

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Territorial behaviour limits spring numbers of Scottish ptarmigan in mild winters

Adam Watson

Summary
In several mild winters with incomplete snow cover, the number of territorial cock ptarmigan (*Lagopus muta*) in April–early May just before the breeding season was close to that in the previous winter and not materially below the winter values. This was evidence for limitation by territorial spacing, given that the spring number changed greatly between years.

In snowy winters, all birds were in flocks and I observed no territorial behaviour. This is like the usual situation in less oceanic climates further north, such as in the Arctic, where spring numbers are limited by factors other than territorial winter spacing.

Introduction
There is much evidence with marked red grouse (*Lagopus lagopus scoticus*) that territorial spacing in autumn can limit the number of birds next spring (Watson & Jenkins 1968; Watson & Moss 1990; Mougeot *et al.* 2003). Here I consider this key question for unmarked ptarmigan. Marking birds is necessary only if one asks whether the same individuals are involved in autumn and spring. That is a separate subsidiary question, not necessary for and irrelevant to considering the key question (Watson & Moss 2008).

Figure 1. Looking north from Derry Cairngorms during a brief sunny spell on a stormy day of frequent snowfalls and severe drifting, when all ptarmigan were in flocks, typical conditions in most winters on Scottish high alpine land.

Study areas and Methods

One area was on Derry Cairngorm (Figure 1) in the granitic Cairngorms massif about 100 km west of Aberdeen and north-west of Braemar village. Another was on the Cairnwell, a hill with a greater proportion of base-rich rocks, in the Mounth massif south of Braemar. Other papers have described these areas, illustrated them with maps, and described methods for counts of all ptarmigan present and for observing territorial behaviour (Watson 1965, 1972; Moss & Watson 1984; Watson, Moss & Rae 1998).

Results

Table 1 presents data from several mild winters (as in Figure 2). One can compare the numbers of territorial cocks and hens paired with them in midwinter or late winter with the numbers of them in the subsequent spring. It is clear that the two resemble one another, and of more importance that the spring values are not materially lower than those recorded in the previous winter on days which were usually months earlier.

Figure 2. On Derry Cairngorm on 12 January 1964 (the first date in Table 1), when ptarmigan were dispersed on territories throughout the day in calm conditions with little snow on the ground, a cock stands prominently on a rock, guarding the hen.

Discussion

Other cases of spring numbers limited by territorial behaviour

In two years (1952 and 1954) during a cyclic decline in spring numbers on Derry Cairngorm, the winter number of territories set an upper limit, but the number of territories later fell suddenly in late spring before breeding began (Watson 1965). Because the number of carcases and concentrations of white feathers plucked were so few, comprising such a very small proportion of the winter loss (Watson 1965, Table 2), a reasonable inference was that the large declines occurred due to emigration.

Table 1. Number of territorial cocks and paired hens in winter and next spring.

Winter	Area*	Cocks	Hens	Spring	Cocks	Hens
12 Jan. 64	Da	4	4	6 May 64	4	4
	Db	6	4		6	5
	Dc	5	5		5	5
	Dd	9	9+4		9	8
26 Jan. 64	De	9	10		10	8
1 Feb. 64	Da	4	4		4	4
	Db	5	3		6	5
	Dc	6	6		6	6
	Dd	8	7		8	7
	De	11	6		10	8
	Df	4	4		3	3
29 Feb. 64	Ca	16+2	11+7	2 Apr. 64	14	12
	Cb	16	12+4		14	11
20 Mar. 66	Da	3	1+4	May 66	3	3
	Db	6	5		6	6
2 Feb. 67	Ca	12+3	7+8	27 Apr. 67	10	10
	Cb	12+13	12+21		12	13

** D is Derry Cairngorm, with Da the corrie below the top, Db east of Little Cairngorm, Dc the steep corrie below Db, Dd Coire na Cloiche, De Coire an Lochain Uaine, and Df Carn Crom. Da–Dd were covered on 12 January and 1 February 1964, offering a check of the same parts twice in a winter. Ca is Cairnwell and Cb the nearby Meall Odhar.*
Values after + are non-territorial birds in flocks.

Subsequent research on red grouse at Kerloch with marked birds as well as numbers recorded during total counts showed that many paired birds which had been on territories on mild days since the previous autumn suddenly left and did not return, immediately before nesting and breeding (Watson *et al.* 1984; Watson & Moss 2008). We called this 'spring emigration', as distinct from 'summer emigration' when parents left study areas with their chicks and did not return with them. Spring emigration occurred at very high population densities when territories were very small, whereas most of the summer emigration occurred during years of big declines in spring numbers.

The large declines of territorial ptarmigan in late spring 1952 and 1954 just before the breeding season fit with the finding of spring emigration as reported from intensive studies of red grouse. Ptarmigan numbers in 1952 and to a lesser extent 1954 were at high density, and subsequently fell in a prolonged decline to a low trough five years after 1954 in 1959.

These findings in the two species show that territory is sometimes not a fixed concept. In many years and areas, birds do take territories in autumn or winter and then keep them until they breed in them. In some years and areas, nevertheless, the birds are more flexible and adaptable in relation to population density and the phase of the population fluctuation.

Flexible territorial behaviour in relation to snowfalls in winter and in spring

Many observers have described other examples of adaptability when spring snowfalls cover much of the birds' plant food. In north-east Scotland I have observed cases of this every winter, and frequent cases in snowy winters. During winter months, deep snowfalls lead to birds abandoning their territories and roaming in flocks to ridges, hillocks and other exposed spots where wind has blown the snow off, exposing their food plants.

However, during heavy spring snowfalls later in winter or spring, as in late March for red grouse and April for ptarmigan, ptarmigan as before abandoned high alpine land with complete snow cover, and red grouse likewise abandoned high moorland hilltops. On these occasions, birds of both species moved to lower land with less snow, a common feature in any winter. The ptarmigan moved to the lower parts of the alpine land, the red grouse to lower moorland.

The difference in late winter and spring was that the time was now near the breeding season, and most cocks and hens stayed paired instead of going into roaming flocks. On that lower ground, intruding cocks and hens from higher up were aggressive and in such numbers that they took temporary extra territories for some days, forcing the existing territorial cocks to give way. All paired birds, i.e. apart from non-territorial flocks, remained within these new small territories and fed there. Territorial activity was intense, with cocks showing frequent songs and boundary disputes because of the high density, and hens taking part in agonistic

disputes with hens paired with cocks on neighbouring territories. As soon as subsequent thawing had exposed snow-free patches higher up, the intruding cocks and hens gave up their temporary territories, the original territorial cocks and hens on the lower ground re-established their former larger territories, and cocks and hens occupied territories again on the higher land (Watson & Moss 2008).

Another interesting example is the Corrie of Lochnagar, which has for decades been a favoured place for ptarmigan territories, and many cocks use tiny flat spots on the steep cliffs (up to 200 m high) as lookout posts, from which they take off in spectacular song flights rising two or three times into the air and singing in mid flight. I have often watched this in the Corrie of Lochnagar, whose cliffs are so tall and steep that the corrie is often sheltered from the wind and fairly calm.

For instance, on 6 April 1955 I heard a burst of song activity, and on looking down the cliff I saw eight cocks standing at lookouts on Parallel Buttress and at least three on Tough-Brown Face, all on the lower part of the cliff but as high as 90 m up Parallel Buttress. Deep snow covered the vegetated slopes that sweep down from the foot of the cliff to the loch, where many ptarmigan nest in vegetation dominated by blaeberry (*Vaccinium myrtillus*) amongst boulders as good cover. However, some of the scanty vegetation on ledges along the lower part of the cliff had become snow-free. I saw no feeding by these cocks, just territorial behaviour. No hens accompanied the cocks, the hens being in flocks elsewhere. In later afternoon, the cocks had left the cliffs to join flocks of hens and cocks elsewhere

By late May, many hens were nesting on the lower slopes, guarded by cocks on territories there, and I saw no cocks on the cliffs. It seemed likely that cocks so near the breeding season maintained territorial behaviour as close to the lower slopes as possible, even though the cliff ledges afforded insufficient food for even the cocks, let alone the hens.

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Abstracts of recent theses and dissertations on sage-grouse and prairie-chickens.

Blomberg, E. J. 2012. Population ecology of Sage-grouse in the Great Basin: predictable patterns in a variable environment. Ph. D. Dissertation. University of Nevada, Reno.

ABSTRACT - The greater sage-grouse (*Centrocercus urophasianus*; hereafter sagegrouse) is an iconic species endemic to the sagebrush (*Artemesia* spp.) ecosystems of western North America. Sage-grouse have experienced dramatic contemporary declines in distribution and abundance, coincident with human disturbance of sagebrush habitats. These declines have led to sage-grouse being listed as a candidate species for protection under the United States Endangered Species Act, and listing as an endangered species by the Committee on the Status of Endangered Wildlife in Canada. Increased legal protection, coupled with long-term interest in sage-grouse conservation, has prompted considerable interest in sage-grouse ecology and the response of populations to environmental variation across multiple spatial and temporal scales. My dissertation research focused on the population ecology of sage-grouse in Eureka County, NV, and is comprised of 4 main chapters.

In chapter 2, I used robust design and Pradel capture-mark-recapture models to evaluate the influence of climatic processes and disturbance associated with post-wildfire exotic grass invasion on annual survival, per-capita recruitment, and population growth of breeding male sage-grouse in eastern Nevada, USA. Climatic processes, indexed by annual rainfall and maximum summertime temperatures, had a strong relationship with recruitment and adult survival, respectively. The range of variation in recruitment during the study was greater than the range of variation in survival, consistent with a life-history strategy that features lengthened lifespan to capitalize on periodically favorable reproductive conditions. Annual variation in precipitation variables (e.g., rainfall or snow depth) explained as much as 75% of the annual variance in population size during the study. These results are consistent with bottom-up regulation of sage-grouse populations, where abundance is determined in large part by climate-driven variation in resource availability. Exotic grasslands had a negative influence on recruitment that was interactive with annual rainfall; recruitment was low in areas with a substantial exotic grassland footprint even following years of favorable rainfall. I found males breeding at leks with substantial exotic grassland impacts had lower annual survival compared to males at leks surrounded by native sagebrush habitats. However, models containing an interaction between exotic grasslands and maximum summer temperature were not clearly superior to models that considered only additive effects of the two variables.

In my 3rd chapter, I investigated tradeoffs associated with reproductive costs to survival for female greater sage-grouse in our study system, while also considering reproductive heterogeneity by examining covariance among current and future reproductive success. I analyzed survival and reproductive histories from 328 unique female sage-grouse captured between 2003 and 2011, and examined the effect of reproductive success on survival and future reproductive success. Female survival was variable within years, and this within-year variation was associated with distinct biologic seasons. Monthly survival was greatest during the winter (November – March; $\Phi W = 0.99 \pm 0.001$ SE), and summer (June – July; $\Phi S = 0.98 \pm 0.01$ SE), and lower during nesting (April – May; $\Phi N = 0.93 \pm 0.02$ SE) and fall (August – October; $\Phi F = 0.92 \pm 0.02$ SE). Successful reproduction was associated with reduced monthly survival during summer and fall. This effect was greatest during the fall, and females that successfully fledged chicks had lower annual survival (0.47 ± 0.05 SE) than females who were not successful (0.64 ± 0.04 SE). Annual survival did not vary across years, consistent with a slow-paced life history strategy in sage-grouse. In contrast, reproductive success varied widely, and was positively correlated with annual rainfall. I found evidence for heterogeneity among females with respect to reproductive success; compared with unsuccessful females, females that raised a brood successfully in year t were more than twice as likely to be successful in year $t+1$.

In chapter 4, I used 8 years of banding data from male sage-grouse in eastern Nevada, and capture-mark-recapture analyses, to evaluate the effect of breeding propensity on annual and long-term trends derived from lek counts. I estimated the proportion of variance in annual lek count trends that corresponded with an independent estimate of λ, versus variance associated with breeding propensity. Annual male breeding propensity (the probability a male attends a lek at least once) during the study ranged from a low of 0.56 (± 0.22 SE) to a high of 0.87 (± 0.11 SE). Variance in annual lek count trends was associated with both realized λ (semipartial $R2 = 0.57$), and sampling error associated with breeding propensity (semipartial $R2 = 0.40$). I found substantial discrepancies between lek count and realized λ in 3 out of 7 intervals, whereas estimates of long-term λ were extremely similar between count-based and capture-mark-recapture methods ($\lambda = 0.90 \pm 0.05$ SE and $\lambda = 0.91 \pm 0.05$ SE, respectively). Male density during the previous year appeared to have the most substantial influence on breeding propensity, perhaps driven by density-dependent competition and availability of food resources. Lek counts are well-suited for deriving long-term estimates of sage-grouse population growth, whereas short-term estimates of λ should be viewed cautiously if breeding propensity is not directly incorporated.

In my fifth chapter, I developed an alternative approach for classifying diet of prefledging sage-grouse using carbon (δ13C) and nitrogen (δ15N) stable isotopes in feather tissue. Sequential sampling of δ13C and δ15N from feather tissue that was synthesized throughout growth allowed me to distinguish between plant and invertebrate contributions to chick diet during the first 28 days post-hatch. Feathers became progressively depleted in δ15N throughout growth, and Bayesian mixing models confirmed that the proportional contribution of invertebrate nitrogen declined with chick age. I estimate that invertebrate contributions to the protein in chick diets decreased from 33% at 1 week of age, to 14% at 4 weeks of age, consistent with previous research that used traditional diet sampling methods. I found a quadratic relationship between diet composition and chick size at 28 days; chicks that consumed a mixed-diet during growth had larger tarsi and body mass than chicks that were more strictly herbivorous or insectivorous. These growth patterns were consistent with an optimal diet strategy, where supplemental nutrients provided by invertebrates decreased in importance as the digestive capacity of chicks increased and facilitated greater herbivory. In contrast to δ15N, δ13C produced anomalous results that we believe were the product of digestive development as chicks aged. My research has significant implications for

sage-grouse persistence in a changing climate, and demonstrates that multiple aspects of sage-grouse ecology are tied to water balance in the sagebrush ecosystem. In climate change results in more frequent drought and/or increased spread of exotic grasslands, negative impacts to sage-grouse populations may be expected.

Dusang, D. E. 2011. Impacts of energy development on the Lesser Prairie-Chicken ecology and management. M. Sc. Thesis. University of Oklahoma.

ABTRACT - Habitat management of the Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) has been ongoing throughout its range for many decades. In recent decades the focus of that management has been conservation. Habitat fragmentation caused by anthropogenic sources has reduced the area of suitable habitat throughout the species prehistoric range by greater than 90%. I used MaxEnt to generate models for four habitats used by the species. The predicted suitable habitat tended to be centered on local breeding grounds. In those models, minimum January temperature and annual precipitation were the factors that contributed most to model predictions. In addition, this species avoids anthropogenic structures. I used the MaxEnt habitat models to estimate potential loss of habitat resulting from avoidance of these structures. Of the four habitats examined, nesting habitat was impacted most severely by avoidance of man-made structures.

Grisham, B. A. 2012. The ecology of Lesser Prairie-Chickens in shinnery oak-grassland communities in New Mexico and Texas with implications toward habitat management and future climate change. Ph. D. Dissertation. Texas Tech. University, Lubbock, Texas.

ABSTRACT - The decline in population and range of lesser prairie-chickens (*Tympanuchus pallidicinctus*) throughout the central and southern Great Plains has raised concerns considering their candidate status on the United States Endangered Species Act. Despite their warranted but precluded listing, baseline ecological data are lacking in shinnery oak (*Quercus harvardii*)-grassland communities of Texas.To address these concerns, I investigated the cause- specific mortality and male and female survival, nest ecology, and brood-rearing ecology in Texas. Additionally, I examined these parameters among four combinations of treatments with tebuthiuron (0.60 kg/ha) and a short-duration, rotational-grazing system being used to restore shinnery oak-grassland communities in New Mexico. Additional study objectives included an examination of phenology and the thermal aspects of prairie-chickens nesting in Texas and New Mexico, an assessment of the potential changes in reproductive parameters in relation to future climate change, and a demonstration the conceptual framework I developed to assess changes in reproductive parameters in relation to climate change. Results suggest that brood survival 0-14 days is the primary limiting factor for lesser prairie-chickens in Texas. Breeding season survival and nest survival were among the highest reported. Reduced rates of tebuthiuron and short- duration grazing appear to have no detrimental effects on female survival during the breeding season. Additionally, treatment types were used as expected by nesting lesser prairie-chicken hens, and evidence suggests that nesting females select nest sites based on structural characteristics, not treatment type. Brood-rearing females used treatment types as expected and brood age was the best predictor of brood survival in New Mexico. Data collected on both study sites suggests lesser prairie-chickens exhibit a boom-bust reproductive pattern, with high breeding season survival, below average clutch sizes, few renests, and dynamic nest and brood survival. I provide evidence to suggest that loss of useable space, particularly brood-rearing habitat, is the primary ultimate limiting factor for lesser prairie-chicken populations in shinnery-oak grassland dominated systems. Lesser prairie-chickens are susceptible to drought through a reduction of vegetation that provides nesting, escape, and roosting cover as well as food. Although the specific environmental conditions that create boom years are not detailed here-in, data suggest that nesting lesser prairie-chickens regulate thermal conditions at the nest, and nest temperature and relative humdity are consistent throughout the daylight period when the hen is incubating. Thus, below-average spring and summer temperatures coupled with above-average rainfall during this time may create optimal conditions for nesting and brood-rearing hens. Data from the 2011 drought indicate that on the ground temperatures exceeded >54°C. In 2011 only 3 of 15 (20%) radio-tagged lesser prairie-chicken hens attempted to incubate eggs. The low incubation rates witnessed in 2011 differed from 2008-2010, when >85% of all radio-tagged lesser prairie-chicken hens attempted to incubate eggs. These results indicate that future climate change may have serious impacts on nesting lesser prairie-chickens; therefore, I

developed a new conceptual framework to assess potential changes in reproductive parameters for nesting lesser prairie-chickens. Results indicate that average nest survival will be below the threshold that is considered required for population persistence by 2050. However, my new framework assessed changes in nesting parameters only, and these effects may be offset by changes in vegetation communities and other demographic parameters.

Therefore, I detail my conceptual framework in efforts to provide natural resources managers with a starting point for climate change impact assessments, and use my data as an example. Results indicate that a more detailed impact assessment is warranted for the lesser prairie-chicken, although preliminary findings indicate that the effects of climate change on lesser prairie-chickens in shinnery oak-grassland communities will be negative.

Stevens, B. S. 2011. Impacts of fences on Greater Sage-Grouse in Idaho: collision, mitigation, and spatial ecology. M. Sc. Thesis. University of Idaho.

ABSTRACT - Conservation concerns over greater sage-grouse (*Centrocercus urophasianus*; hereafter sage-grouse) have drawn attention to the lack of empirical data on impacts of fences on this species. Research suggests grouse as a group may be vulnerable to collision with anthropogenic infrastructure, and sage-grouse fence collision risk has not been systematically studied in any part of their range. Therefore, I studied sage-grouse fence collision on Idaho breeding areas during spring of 2009 and 2010. I sampled fences within breeding areas to quantify relative collision frequency across the landscape, and conducted field experiments to quantify fence sampling biases and effectiveness of fence marking mitigation methods.

I used female ring-necked pheasant (*Phasianus colchicus*) carcasses as surrogates for sage-grouse to study survival and detection bias associated with avian fence collision surveys in sagebrush steppe during spring 2009. I randomly placed 50 pheasant carcasses on each of 2 study areas, estimated detection probability during fence-line surveys, and monitored survival and retention of carcasses and their sign over a 31-day period. Survival modeling suggested site and habitat features had little impact on carcass survival, and rapid scavenging resulted in estimated daily survival probabilities that ranged from 0.776-0.812. Survival of all carcass sign varied by location, and daily survival probabilities ranged from 0.863-0.988. Detection probability of carcasses during fence-line surveys was influenced by habitat type and microsite shrub height at the carcass location. Carcasses located in big sagebrush (*Artemisia tridentata*) habitats were detected at a lower rate (0.36) than carcasses in little (*A. arbuscula*) and black sagebrush (*A. nova*) habitats (0.71), and increasing shrub height reduced detection probability. Avian fence collision surveys in sagebrush-steppe should be conducted at ≤ 2-week sampling intervals to reduce the impact of sign-survival bias on collision rate estimates. Researchers should be aware that local vegetation influences detection probabilities, and apply methods to correct for detection probabilities to ensure accurate collision estimates.

I used a stratified cluster sampling design to sample fences in breeding areas (2009: n = 16; 2010: n = 14), quantify fence collision frequency, and estimate fence collision rates across the landscape. I found 86 sage-grouse collisions over 2 field seasons, and found evidence for spatial variation in fence collision rates across sampling areas (2009: *range* = 0-5.42 strikes/km; 2010: *range* = 0-2.63 strikes/km). Despite variation among sites, landscape scale sage-grouse fence collision rates corrected for detectability were consistent across years (2009: = 0.70 strikes/km; 2010: = 0.75 strikes/km). These data suggest sage-grouse fence collision during the breeding season was relatively common and widespread, and corroborate previous studies suggesting grouse are susceptible to infrastructure collision.

I collected site-scale data at random and collision fence points, quantified broad-scale attributes of sampling areas using geographic information systems (GIS), and modeled the influence of site and broad-scale features on sage-grouse fence collision. Discrimination between random and collision fence points using site-scale data suggested collision was influenced by technical attributes of the fences. Collisions were more common on fence segments bound by steel t-post and > 4 m wide, whereas random points were more common on segments with ≥ 1 wooden fence post and widths < 4 m. Broad-scale modeling suggested probability of collision was influenced by region, topography, and fence density. Probability of collision presence was greater in the Big Desert and Upper Snake regions, and lower in the Magic Valley. Increasing terrain ruggedness reduced probability of collision presence, whereas increasing fence length per km2 increased probability of collision. Broad-scale modeling also suggested collision counts per km2 were influenced by distance to nearest active sage-grouse lek, where increasing distance reduced expected collision counts. These data suggest 2 km mitigation buffers around leks in high risk areas may be necessary. However, increasing topographic variation appeared to attenuate the influence of other factors, suggesting high risk areas are most likely at relatively flat sites.

I also conducted a field experiment testing effectiveness of fence marking at reducing sage-grouse collision on high risk breeding areas during spring of 2010. Using 8 study sites, I experimentally marked 3, 500-m segments of fence at each site using reflective-vinyl markers, with 3, 500-m unmarked control segments at each site, and surveyed study segments 5 times during the lekking season. Modeling suggested collision count summed over the lekking season was influenced by marking treatment, lek size, and distance to nearest lek. The top model predicted marking reduced collision counts by 74.0% at the mean lek size and distance from lek. Increasing lek size and decreasing distance to lek increased expected collision counts. Although fence marking reduced sage-grouse collision risk, expected collision counts in high risk areas (i.e., maximum lek size = 127, minimum distance = 104 m) were high (unmarked fence = 8.3 birds/500 m/season, marked fence = 2.2 birds/500 m/season), suggesting these fences may require removal to eliminate collisions. Further, expected collision counts in low risk areas (i.e., minimum lek size = 1, maximum distance = 4,650 m) were very low (unmarked fence = 0.08 birds/500 m/season, marked fence = 0.02 birds/500 m/season), suggesting not all fences require marking mitigation efforts.

Timmer, J. M. 2012. Relationship of Lesser Prairie-Chicken density to landscape characteristics in Texas. M. Sc. Thesis. Texas Tech. University.

ABSTRACT - Ground-based lek surveys have traditionally been used to index trends in prairie grouse populations (*Centrocercus* and *Tympanuchus* spp.). However, indices of abundance or density can be fundamentally flawed and techniques that account for incomplete detection should be used. Distance sampling is a common technique used to estimate the density and abundance of animal populations and has been used with aerial surveys to monitor avian populations. With an increase in renewable energy development in native prairies and sagebrush steppe, there is a greater need to effectively monitor prairie grouse populations. One such species, the lesser prairie-chicken (LPC; *T. pallidicinctus*), has faced significant population declines and is thus, a species of conservation concern. In addition, much of the current and proposed wind energy development in the Great Plains overlaps some of the extant LPC distribution and few peer-reviewed studies have been conducted to investigate this potential disturbance to LPCs. Hierarchical distance sampling models can relate LPC lek density to landscape features and help predict the potential impact from wind and other energy development on lek density. Thus, the main objectives of our study were to estimate lek density in our sampling frame and to model anthropogenic and landscape features associated with lek density. We accomplished this by flying helicopter lek surveys for 2 field seasons and employing an aerial line-transect method developed at Texas Tech University.

We inventoried 208, 7.2 km × 7.2 km survey blocks and detected 71 new leks, 25 known leks, and observed 5 detections outside the current LPC range. We estimated 2.0 leks/100 km^2 (90% CI = 1.4–2.7 leks/100 km^2) and 12.3 LPCs/100 km^2 (90% CI = 8.5–17.9 LPCs/100 km^2) for our sampling frame. Our state-wide abundance estimates were 293.6 leks (90% CI = 213.9–403.0 leks) and 1,822.4 LPCs (90% CI = 1,253.7–2,649.1 LPCs). Our best model indicated lek size and lek type (w_i = 0.235) influenced lek detectability. Lek detectability was greater for larger leks and natural leks rather than man-made leks. We used hierarchical distance sampling to build spatially-explicit models of lek density and landscape features. Our most competitive model included average grassland patch size + percent grain field + paved road density + active oil and gas well density (AIC = 909.655, w_i = 0.807). Based on the spatially-explicit model, we estimated 248.4 leks (*cv* = 0.139) for our sampling frame. This model indicated an inverse relationship between lek density and average grassland patch size, percent grain field, paved road densities, and active oil and gas well densities. Our state-wide survey efforts provide wildlife managers and biologists with population estimates, new lek locations, and indicate landscape features that are related to lek density. Our spatially-explicit models predicted lek density, which can be used to predict how lek density may change in response to changes in habitat conditions, paved road densities, and active oil and gas well densities.

CONFERENCES

Synopsis: 12th International Grouse Symposium, Matsumoto, Japan

Rocky J. Gutiérrez

The 12th International Grouse Symposium convened on 20-24 July, 2012, in Matsumoto, Japan. The meeting was organized expertly by Professor Hiroshi Nakamura. The Japanese Rock Ptarmigan Meeting, Institute of Mountain Science, Shinshu University, and the city of Matsumoto were hosts. This meeting was originally scheduled for July 2011, but the tragic events following the large earthquake and subsequent tsunami forced postponement of the meeting until July 2012. Eighty-six participants from 20 countries began arriving in Matsumoto City on the 18th of July. Matsumoto City is the gateway to the Japanese Alps and participants arrived by train, bus, and plane. Most arrived by train, which is an efficient and timely mode of travel in Japan. Arriving in Tokyo, the largest city in the world can be a bit intimidating, but everyone negotiated the trip through Tokyo's Shinjuku station without mishap. The timing of the meeting was nearly perfect as it occurred between the rainy season and the beginning of the hot, humid season of summer so the weather was generally excellent.

Field Trips

The first conference field trip was the day preceding the conference and was an excursion to Mt. Norikura to visit one of the Rock Ptarmigan study areas of Professor Nakamura. Participants left Matsumoto City in warm weather and overcast skies, but the weather grew more inclement as the bus gained greater altitude in the Alps. Participants who had dressed for the warmer climes of Matsumoto were in for an unpleasant surprise as cold wind and rain provided a chilling experience! Professor Nakamura led an intrepid band of grousers across the alpine in dense fog and rain. Nevertheless, the trip was immensely successful despite the weather because we saw several color-banded Rock Ptarmigan, old nest sites, interesting flora, and some alpine birds (e.g., Japanese and Alpine accentors). We also discussed issues related to Rock Ptarmigan research and conservation in Japan so the excursion was not only fun but biologically interesting. During the conference there were two morning birding trips and one afternoon excursion to local natural areas. I was told by several participants that rising early for these trips after a night of strenuous karaoke participation was a challenge, but I cannot speak to this from personal experience. Nonetheless, these field trips provided an opportunity to see some local fauna and habitats so they were well worth the effort. There were two concurrent field trips following the conference; each was 3 days in length. One field trip was a backpacking trip in Chūbu-Sangaku National Park near Mt. Tsubakuro, Mt. Otensho, Mt. Yokodoshi, and Mt. Jonen. Participants stayed at Enzano Lodge and Jonen Lodge when en route. The other field trip included one day at Mt. Norikura and two days near Mt. Tateyama. Both field trips converged for a final gathering at the Omachi Alpine Museum. Participants observed Rock Ptarmigan and were exposed to throngs of Japanese hikers, which apparently made for a good opportunity to understand the potential impact of recreation on ptarmigan and alpine environments. Other participants availed themselves of the opportunity to travel within Japan either before or after the conference. Colleagues visited such places as Kobe, Hiroshima, Mt. Fuji, and Hokkaido and all reports were positive about experiences.

Social Events

Perhaps the most unique feature of this meeting was the wonderful effort our Japanese hosts put forth to integrate the meeting with cultural and social events. I personally have not been to an international meeting where such integration has been as extensive or successful. We began our social events with an opening reception that allowed introductions and renewal of old friendships among grousers. On the second evening we had an optional dinner that was held in a traditional, old restaurant in Matsumoto just a short walk from the conference venue. A local man, during dinner, reproduced bird calls using a blade of grass which was both entertaining and interesting. In general, Matsumoto was an ideal location for the conference because many restaurants, hotels, and shops were immediately available to participants.

On the third evening, we attended a "Friendship Party" with citizens of Matsumoto City. Professor Nakamura had advised us to bring an inexpensive gift to exchange with a citizen of the city. "Gift giving" is a time-honored tradition in Japan and one that can range from elaborate with structured decorum to simple with friendship and courtesy as its center premise. Of course, being absent minded some grousers forgot to bring presents, but others brought more than they needed so it was great fun seeing colleagues distribute extra gifts to their colleagues who had forgotten. I think there was some trepidation among participants about the party because none of us had done anything like this before. But

it was not long before everyone was fully engaged in the event. The citizens of Matsumoto arrived from work, from home, and from travels – all dressed according to their circumstances. Most citizens were dressed in western-style clothes but a number of folks donned traditional attire, the kimono. The idea was simple – mingle and meet. With a very nice buffet, home cooked food brought by the citizens, and copious amounts of beer, sake, and Japanese wine, mingling was not a difficult task! If you struck up a conversation with a person, and decided you wanted to exchange a gift with them you simply gave it to the person and you would receive a gift in return. Amidst the mingling, there was a wood carver demonstrating his art while carving, what else, ptarmigan! There was also a person dressed as Samurai soldier explaining his attire and accoutrements, an artist carving a watermelon to resemble a red rose, and a person explaining kimonos to interested participants. At the halfway point of the party we were escorted to the main symposium room to watch live performances of traditional Japanese music, played on the traditional 13 string koto with the accompaniment of a flute, and poem reading (singing). It was truly a magical demonstration and one that greatly pleased both citizens and conference participants alike. Following the performances we returned to the buffet room where we continued to party! Did I mention the bee larvae and roasted locust were especially good with the beer?

The following afternoon we went on a tour of Matsumoto Castle, one of the last intact daimyo castles in Japan, with the tour guides being the citizens with whom we had enjoyed the previous night's companionship. So it was like a friend taking you on a tour of their city's most famous architectural feature. This was a clever idea because the experience was more meaningful to have someone you knew provide explanations and dialogue about the castle.

On the closing evening of the conference we had a banquet in the Buena Vista Hotel on the high floor with a view of the city. While the food was excellent, the highlight of the evening was the closing conference talk by Princess Hisako Takamadonomiya. Princess Takamado was incredibly gracious and charming as she went to every table and personally visited with all conference participants. Her presentation featured her favorite birds to photograph in Japan – and of course the Japanese Rock Ptarmigan was featured prominently in her photographs! I think everyone was honored to have such a famous person who is also devoted to bird conservation and environmental causes provide the banquet's closing talk. After the banquet, participants leaving the hotel were greeted by yet another cultural event – a festival organized around a famous author. The streets were filled with traditional floats and food vendors as well as other activities so the meeting was an extravaganza of cultural exposure. Indeed, there was much discussion among participants about the uniqueness and success of this cultural exchange. To me, this meeting exemplified the primary reason I try to attend these grouse congresses – all them are interesting, provide a chance to learn about a new area and its people, the hosts provide an excellent program, and it is a chance to renew old acquaintances and hear new research on grouse. In my opinion, the Japan conference exceeded expectations on all of these levels.

Scientific Symposium

The scientific program began each day with a plenary lecture. Each plenary provided a general theme for the day's program. The first plenary, by Professor Nakamura, highlighted the Japanese Rock Ptarmigan research. This paper was followed by an entire day devoted to a diverse array of presentations on Japanese Rock Ptarmigan. The papers ranged from parasites to habitat and population dynamics. Collectively, they provided good context on the depth and breadth of interest in ptarmigan and concern for their conservation in Japan. The bird is revered in Japan and is consider a national treasure. Its future is of great concern because of climate change, human impacts (recreation), limited habitat, small population sizes, and population isolation so the concern is justified. Linked to this first day's theme was a roundtable discussion on the second afternoon that brought many Japanese researchers and conservationists together to discuss ptarmigan research with the intent of receiving feedback from conference participants. It was a vigorous and lively debate that provided insight into differences of opinion on basic approaches to conservation and research within Japan. It was fascinating to observe the interaction and manner in which the debate unfolded.

The second day plenary was presented by Professor Brett Sandercock of Kansas State University, USA. His paper centered on life history variation in ptarmigan and its consequences for harvest, translocation, and environmental change. His ideas were insightful and provided a general theme for a wide range of talks that day about grouse population dynamics. The topics included hunting harvest, census methods, population changes, nest predation, and general population dynamics issues.

The third day's plenary was on human disturbance on grouse by Professor Ilse Storch of the University of Freiburg, Germany. Her paper provided an introduction to a potpourri of talks ranging from effects of recreational disturbance to phenotypic and genetic variation of grouse to impacts of weather on ptarmigan nesting phenology and reproduction.

The last day's plenary talk was on climate change and grouse population dynamics. Unfortunately, Dr. Robert Moss of Scotland who was the scheduled speaker was unable to attend the meeting. In his stead, Dr. Torstein Storaas of Hedmark University, Norway was a masterful substitute speaker. Dr. Moss provided some provocative ideas with respect to global climate change and relationships with grouse population dynamics including some retrospective analysis of response of grouse to long-term trends in global climate change in the past. Dr. Moss' ideas were articulated clearly and eloquently by Dr. Storaas, which is always a difficult task when the material is not your own. This plenary lecture set the stage for a series of papers on climate change and grouse. Climate change is a topic germane to the fate of grouse in many places of the northern hemisphere in the face of climate change. The afternoon talks were devoted to habitat ecology, which is both directly and indirectly related to climate change, human disturbance, and conservation of grouse.

Collectively, the papers presented at the 12th International Grouse Symposium provided a wide spectrum of interesting ideas and data on grouse biology and conservation. The first day's topical devotion to Japanese Rock Ptarmigan followed in the tradition of many symposia where scientists of the host country highlight the important research and conservation they are doing. It helped set the context for local research endeavors for an international audience. The scientific conference ended with an IUCN meeting that was chaired by Dr. Ilse Storch.

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The Future
On the last day of the conference, the IGS participants received a bid from Iceland to host the 13th IGS. The plan is that the next meeting will be held in Iceland summer or fall of 2013 and details will be forthcoming in a future issue of Grouse News. In the future, I encourage any country wishing to host an IGS in the future to present a formal proposal at the Iceland conference.

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IGS participants at Matsumoto Castle. © IGS website

Habitat of Japanese ptarmigan overlaps with intensive Alpine tourism and its dense infrastructure of huts and trails. © Ilse Storch

Japanese ptarmigan hen with chicks, watching grousers during field trip. © Ilse Storch

At the symposium banquet: Ilse Storch thanking IGS host Hiroshi Nakamura. © Albin Zeitler

The 6th International Black Grouse Conference, Gysinge, Sweden

Jacob Höglund

The 6th International Black grouse Conference was held in Gysinge, Sweden 17-20 September 2012. The list of participants contained 30 researchers from 11 different countries. The topic of the talks included: Population dynamics and trends; Habitats; and Genetics and conservation. There were posters presented and a one day excursion to visit local black grouse habitats. The conference was financially supported by generous contributions from The Swedish Ornithological Union, Jägareförbundet (the Swedish hunter's organisation) and Upplandsstiftelsen.

On the first day, Jacob Höglund gave the opening presentation on population dynamics and trends of black grouse in the provinces close to the conference venue as well as available data from the whole of Sweden. He showed that black grouse numbers fluctuate up to 200% between years, that black grouse are far more abundant in the north of Sweden than in the south and that there are no clear population trends. Frances Atterton presented a study where translocation of males was shown to be a successful method of increasing the range of black grouse in northern England. Egbert Strauss showed that the numbers of black grouse in northern Germany has increased slightly in the last years and Christian Marti showed that lek locations changed as the vegetation has changed as a result of climate changes in the Swizz Alps. Tormund Jahren presented data on how nest predation by pine marten and fox on black grouse and capercaillie has increased with changed forestry in Norway.

The second day started with Patrick White showing how commercial forest practices have affected the presence of black grouse in Scotland and Albin Zeitler discussed the habituation of birds to human disturbance in skiing areas in the Bavarian alps. Hugh Jansman talked about the bleak prospects of the last remaining black grouse in the Netherlands, a population in which augmentation of numbers by transporting males from Sweden have been tried during the last breeding season. Mieke Zwart presenteted data on wind farms and black grouse in southern Scotland. In the afternoon there was a session on conservation genetics in which Bogdan Kasperczyk talked about work led by Andrzej Krywinsky in Poland in which captive black grouse are used to fertilise females in the wild. Tanja Strand's presentation was given by Jacob Höglund and discussed genetic variation in major histocompatability loci in populations of different threat status. Heli Siitari showed how identification and preservation of the most successful cocks on hunted leks in Finland had a positive effect on numbers and that this was a very successful conservation strategy. Mariia Pavlovska presented the first genetic study of Ukrainian black grouse and Carolina Corrales talked about the phylogeography of the black grouse and how this have been affected by the last glaciations and later human impact.

During the last day the topics returned to habitat related issues. Ilse Storch talked about human disturbance on grouse and on how and why different populations and species may respond differently. Tobias Ludwig discussed the preservation assessment of black grouse in the Austrian Alps and Juri Kurhinen ended the talks by presenting data on population trends and distribution changes in the boreal forests of Russian Karelia.

During the excursion day of the conference, black grouse habitats in and around the Färnebofjärden national park were visited. It was possible to see both pristine areas and sites affected by humans, mainly through forestry and peat harvesting. The day ended with a conference dinner at Gysinge where the conference was held. Plans for the next Black grouse conference have been made and further information on this will be forwarded as soon as more concrete plans have been decided.

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Participants at the 6th International Black Grouse conference in Sweden 2012. Photo Jacob Höglund

Jacob Höglund during the excursion at the Black Grouse Conference in Sweden. Photo Ilse Storch.

A black grouse area in Sweden with lek in the middle of the bog and breeding along forest edge. Photo Ilse Storch.

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SNIPPETS

Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) Status

The U. S. Fish and Wildlife Service had planned to make a decision on listing the Lesser Prairie-Chicken under the Endangered Species Act by 30 September 2012, but has now postponed that decision (http://news.wildlife.org/featured/lesser-prairie-chicken-listing-postponed/). Additionally, over the past few months, there have been some new conservation plans and tools developed, including the Southern Great Plains Crucial Habitat Assessment Tool (http://kars.ku.edu/maps/sgpchat/), and the Oklahoma Lesser Prairie-Chicken Conservation Plan (http://wildlifedepartment.com/wildlifemgmt/lepc/cons_plan.htm). A similar range-wide five state plan is also being developed by the Lesser Prairie-Chicken Interstate Working Group. Also, in spring of 2012, range-wide helicopter surveys were conducted to estimate the current population. A full report of the survey effort can be accessed here: http://www.wafwa.org/html/aerial_surveys.shtml.

The 13th International Grouse Symposium in Iceland

The 13th International Grouse Symposium will take place in Iceland in the summer or autumn of 2015. This will be particularly attractive for the many ptarmigan researchers around the globe, but grousers with a different focus will also be rewarded by the many other attractions of Iceland. Local host and organizer is Ólafur K. Nielsen of the Icelandic Institute of Natural History, e-mail: okn@ni.is. Details will be announced in due time.

The 7th International Black Grouse Conference in Russian Karelia

The 7th International Black Grouse Conference is planned to take place in Russian Karelia in the summer or autumn of 2014. Local host and organizer is Juri Kurhinen, jkurhin@hotmail.com of the University of Helsinki in cooperation with colleagues in Russia. Details will be announced in due time.

IN MEMORIAM

Tragic passing of Patrick Léonard

Emmanuel Ménoni, Claude Novoa, Ariane Bernard-Laurent, Yann Magnani

As a technician at the National Hunting and Wildlife Agency (ONCFS France), Patrick Léonard had been working for 30 years in the Mountain Galliformes team of this Agency. Many from the grouser community knew him, because he organized a Hazel grouse workshop in Auzet some years ago, and took part in some of the international grouse symposia, and also some Black grouse symposia. He was trained by Larry Ellison, and became very good at capturing, counting, and radio-tracking any species of mountain Galliformes. He spent his professional life in the French Alps, and most of these activities were involved in Black grouse, Hazel grouse, Rock ptarmigan and Rock partridge. He was also a valued colleague, because he knew many people concerned with nature conservation in the French Alps, such as foresters, staff of National Parks, administrations, hunters associations, but also mayors and other elected people, and was very effective in terms of helping us build our projects.

In early July, after locating a Rock partridge hen in the Vercors mountains (northern PreAlps), he suddenly died, and this event was an enormous shock for all of his colleagues, everybody who worked with him, and for our team.

It is certain that he will be missed for a long time, and we wish to pay homage to Patrick, for his personal and professional devotion to the cause of the studies and the conservation of the mountain Galliformes.