GROUSE NEWS

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

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Contents

Editorial

Since the start in March 1991 after the Elverum Conference, with Diana Lovel as editor, 30 issues of Grouse News have been published in 15 years. It was a suggestion from Professor David Jenkins that resulted in this newsletter. And it has been a success. Hopefully, the next 15 years will be as the covered 15 years.

Many of you repeatedly contribute to Grouse News. I would like to thank you very much. Please continue to write to keep Grouse News going. The articles do not need to be long; also ideas, hypothesis and short news about people and other things are welcome. If Grouse shall continue to be interesting, I need a continuous flow of contributions. You are the ones that have the success and continuation of this newsletter in your hands.

If you know of anybody that has not received Grouse News, or those who would like to have it, please tell me. It is only published electronically, so I need their e-mail addresses. However, if someone does not have e-mail, we may make exceptions and mail a paper copy if not too many.

We offer our congratulations to Karl Jobs Karlson for receiving his PhD on grouse last fall. His dissertation was at the Faculty of Science and Technology, Uppsala University, 21 October 2005.

Very many thanks to Anne Westerberg who edited the language of some of the contribution. She has done a great job as she always does.

I will also remind you of the forthcoming events.
2007 September 16th-21st, 4th International Black Grouse Conference, Vienna, Austria.
2008 September International Grouse Symposium, Yukon, Canada.

Tor Kristian Spidsö, Editor Grouse News
Nord-Trondelag University College, Faculty of Social Sciences and Natural Resources, Servicebox 2501, N-7729 Steinkjer, Norway. tor.spidso@hint.no

From the Chair

A grouse is a grouse is a grouse – or is it?

The grouse are among the best-studied bird taxa worldwide. Yet, they are not "safe" from being re-named taxonomically as new systematic studies and interpretations come along. The long-standing debate regarding the taxonomic treatment of the spruce grouse and the Siberian grouse continues. Despite recent phylogenetic studies that support the separation of the genera *Falcipennis* with the species *F. falcipennis* and *F. canadensis* and *Dendragapus* (Dimcheff et el. 2002, Drovetski 2002), BirdLife International currently classifies the Siberian grouse into the genus *Dendragapus* together with the spruce grouse *D. canandensis* and the blue grouse *D. obscurus*. The American Ornithologist Union (AOU) however, continues to separate the genera *Falcipennis* (*F. falcipennis* and *F. canadensis*) and *Dendragapus (D. obscurus).* Also the hazel grouse is at risk of being renamed once again: although BirdLife continues to use *Bonasia bonasia,* the AOU went back to *Tetrastes bonasia.* These debates will certainly continue as new phylogenetic studies come along.

The new spelling of the scientific names of the Rock ptarmigan as *Lagopus muta* and the White-tailed ptarmigan as *L. leucura*, however, is likely to last. The changes in spelling from ending –us to –a reflect new determination of the gender of the generic name *Lagopus* (David & Gosselin 2002a, b) and are to cause gender agreement of specific with the generic name. "*Lagopus*" has been treated virtually universally as a masculine noun in ornithological literature of the last decades. Yet, the Latin noun *Lagopus* (white grouse, ptarmigan) is feminine. To Pliny, who should have known, *Lagopus* was feminine, and also Brisson, who first described the genus in 1760, consistently used feminine adjectives in combination with *Lagopus*. We, who are less firm in Latin grammar, can look it up in Latin dictionaries: no doubt, *Lagopus* is female. The nominate form, the willow ptarmigan, consequently remains to be named *L. lagopus*.

In the past, the GSG has not played an active role in grouse taxonomy, although GSG members are among the scientists who provide new phylogenetic insights. I would very much welcome a Taxonomy working group within the GSG that keeps an eye on these developments, and is prepared to argue for a consistent grouse taxonomy based on best available knowledge.

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Ilse Storch, Chair Grouse Specialist Group
Department of Wildlife Ecology and Management, Institute of Forest Zoology, College of Forest and Environm. Sciences, Univ. of Freiburg, D-79085 Freiburg, Germany, ilse.storch@wildlife.uni-freiburg.de

RESEARCH REPORTS

Capercaillie as a tool of forest planning and as an indicator of forest environment quality

Janne Miettinen

This work is a cooperative project between University of Joensuu, Finnish Game and Fisheries Research Institute, and Finnish Forest Research Institute. The final product of this project will be a doctoral thesis at faculty of forestry at the University of Joensuu in Finland. The first objective of this project is to define which forest structure characteristics are determining the quality of capercaillie habitats in Finnish conditions. A lot of previous knowledge concerning capercaillie is available, but for being usable in forest planning, more precise information is needed. In addition, the biological knowledge would be easiest to apply in forest planning if the used variables would be the same as used in forestry. Further objectives of this project are (1) to characterize the current condition of capercaillie habitats in Finland and (2) to evaluate future conditions from the species point of view. These evaluations are performed based both on earlier research results from different areas or countries and on our own studies. The ultimate goal and most important objective of this project is to find new tools for forestry to manage capercaillie habitats properly in different levels of scales. A special weight is put on the effectiveness of these tools in the measures of economical costs and ecological benefits.

Capercaillie habitats are studied at a broad range of scales from the smallest at forest stand level and/or habitat of an individual to the widest with 2500 km^2 resolution throughout Finland. Both forest planning data and satellite-based forest data are used in this project. In the small scale studies forest planning data were possible to employ, and in the widest scales the satellite-based forest data were used. Both types of data are providing benefits for landscape ecological studies. Satellite-based data include 100% cover of the study area, while the strength of forest planning data lie in the accuracy of data. Variables available in forest planning data include for example basal area, average diameter at breast height (dbh), and average height etc for each stand. In our study, capercaillie habitats were first studied according to forest stand development stage (i.e. according to stage of succession). In addition, capercaillie habitats were studied according to both stage of development and density. Diameter at breast height can be used to describe forest stand development stage.

However, when in addition the stand density is studied, describing stand structure makes some problems. Available measures as basal area, number of stems/ha and total timber volume all include some shortages. Number of stems is not recorded in older stands, but basal area is used instead and basal area is absent from the youngest stands since it is impossible to measure in stands with low dbh. Total timber volume, which is used in many studies, tends to mix old sparse stands with younger dense stands. As a solution, one could use both dbh and some density measure. This, however, leads to many classes, which is a problem in testing. We used stand density index (SDI) to describe the stand structure. It is derived from dbh and basal area (or number of stems/ha in young stands), and it is relatively constant throughout the age scale.

Capercaillie lekking sites and their surroundings were studied in Eastern Finland in our first paper (Miettinen et al. 2005, Scandinavian Journal of Forest Research) Middle-aged stands (i.e. thinning stands) were preferred by capercaillie. A hypothesis is put forward about first commercial thinning as a critical threshold in stand development towards habitats suitable for capercaillie. This hypothesis is based 1) on the results suggesting the suitability of thinning stands, and 2) on the results suggesting negative impact of high density of the stand suitable for capercaillie. If the hypothesis were true, it would offer a clear threshold for capercaillie habitat evaluation in landscape ecological planning.

The first commercial thinning hypothesis was the starting point for our further studies. Results from the study using the locations of individual capercaillie and forest planning data suggested that stands, on average, reach a structure suitable for capercaillie clearly before first commercial thinning in northern Finland. Stands with an average of as low as 10 cm in diameter at breast height (dbh) were already preferred, while the first commercial thinning is done normally at dbh of 15 cm. In addition, a positive linear relationship between stand density (SDI) and capercaillie preference was detected. In other words, no peaking preference curve with upper limit and negative slope (indicating overstocking from capercaillie's viewpoint) was observed. Capercaillie has been observed to have such a response in earlier studies from other areas. Earlier studies have used other variables (like canopy cover), and direct comparing of results with different variables is impossible. The effects of forest density could be relatively similar throughout species distribution, although some differences between sub-species might

exist. Growth conditions are poor in northern Finland, and due to that the maximum densities of forest stands are low. This could explain the linear type of result.

All our studies (2 based on wildlife triangles and 1 based on lekking site locations) are suggesting high suitability of young thinning stands (dbh 8-16 cm) for capercaillie. Simultaneously capercaillie is showing relatively low preference towards mature forests in all data sets. Some signs of lowered suitability after first commercial thinning were detected in our data, but that seemed to occur only temporarily. In other words, it is recovered at least partially in 5-10 years. (Reason could be openness or cutting residues.) But from our data it is impossible to measure if it recovers completely. If it doesn't, the lower preference towards mature forests could be explained by this degradation connected to thinning. If it recovers completely, the reason has to be found from somewhere else. The suitability of forest is thought to be relatively constant after some limit in succession. According to that, both middle-aged forests and mature forests should be preferred. In forest stand scale relatively constant suitability could be true, but all our results are from wider scale. Those all include also spatial aspects in addition to forest stand level. In our results the low preference for mature forests could be caused by a special spatial pattern in present Finnish forest landscapes. Middle-aged forests constitute a high proportion of the total area, which is a result of logging vast areas after Second World War. After these clear cuttings, large uniform (relatively old) forests remained. In later decades, these forest areas have been cut piece by piece with more and more fine-grained manner all the time. At the landscape scale, a strong negative correlation between middle-aged forests and mature forests was observed in our data. Additionally, mature forests have a positive relation with clear cuts and seedling stands. Much of the mature forests are surrounded by clear cuts and seedling stands and is located in such a way, that it is almost useless for capercaillie, while middle-aged forests are distributed mostly as large, uniform areas. This spatial pattern might be a relatively new phenomenon. The 'large age classes' (i.e. areas cut after war) of Finnish forests have most probably recently reached characteristics needed by capercaillie. And most probably, mature forests have become too isolated and fragmented also quite recently.

Cues about the reasons behind low preference of mature forests in our results could be gained by studying older capercaillie habitats. Ten or fifteen years ago mature forests could have formed units large enough for capercaillie in northern Finland. In older data, mature forests might appear clearly as preferred. If they do, the spatial pattern is supported. If they don't, the forest stand scale quality alteration is supported.

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Janne Miettinen Finnish Game and Fisheries Research Institute Oulu Game and Fisheries Research Tutkijantie 2E, FIN-90570 Oulu, Finland, janne.miettinen@rktl.fi

A Study of Caucasian black grouse *Tetrao mlokosiewiczi* population dispersion confined in Iran.

Mohammadreza Masoud and Leila Mehdizadeh Fanid

Introduction

The ecology of the Arasbaran area is unique within Iran. Part of Arasbaran has been protected as the Arasbaran Biosphere Reserve on account of its landscape and scenery, and this area also forms the habitat of the rare Caucasian black grouse *Tetrao mlokosiewiczi*.

The Caucasian black grouse population is distributed within the mountainous northern region of east Azerbaijan province in the districts of Ahar and Kalaibar. It is located between 38°, 43' and 38°, 53' longitude and 46°, 48' to 46°, 32' latitude, in an area of approximately 10,000 hectares within Arasbaran Biosphere Reserve and 20,000 hectares in western open areas, in the two basins of the Illgene and Mardanghom Rivers, comprising a total land area of 30,000 hectares. (Masoud 2004).

Native Turkish speakers and local tribes call this bird "Qara Khorowz" (black rooster). Since 1950, the species was thought to occur exclusively in the Caucasus mountains and the mountains of northeastern Turkey. However, in 1970, evidence of the bird's presence in the mountainous forests of Kalibar in the north east of Azerbaijan (Iran) was found. The first report of black grouse in 1971 was described by the former Director General of Environment of East Azerbaijan, Mr. Shahsavarinia, who reported his findings to the environment agency. Subsequently, other experts such as D. A Scott - 1971,

Ghahramani – 1971 and J. Mansouri - 1974-1975, visited the region. Dr Scott estimated the population of black grouse to be between 200 and 250 birds. F.B. Argyles, consultant for the environmental protection organization in 1977, the envoy team of the central environmental agency in 1985 (Majnounian, Mansouri, Zehzad) as well as Behboody in 1995, after separate visits to the Kalan and Doghron valley also reported the presence of the bird (Behboodi 1995 and Majnounian 1985).

The present research project was carried out in order to give an updated estimate of the Caucasian black grouse population in the northern regions of East Azerbaijan. Within this report, habitat conditions and populations estimates within each of the recognized bio-regions are given.

Data and Observations

According to the studies carried out, the bird's body length of Caucasian black grouse is between 38 and 52 cm, the tail 15-19 cm in length and the wingspan 58-62 cm. Both males and females of the species are smaller in size than their European counterparts black grouse *Tetrao tetrix*. Although both species have common characteristics, they differ significantly in their tail and wing biometrics. The male coloration is black with green iridescence. The tail is brown and grey with the top square-ended. There is minimal patterning around the wing, especially near the body. Thus, the top portion of the wing is without any pattern, while the inner side of the tail has no white pattern. Also, the underside of the body is tarnished and, unlike the European species, is without white marks. The Caucasian bird has smaller marks on the shoulder and leg feathers. The species is the same as the European one except for its grey and darker colours.

Caucasian black grouse lives in the Ilganeh and Mardangam river basins within and outside the protected region, in Arasbaran province (Masoud 2004). The habitat occupied by the bird in Iran, unlike its location on the southern slopes of the Caucasus region, is in the northern parts of the district due to a lack of forest cover on the southern slopes. (Masoud 2004).

In the study of the Kalan valleys, the following details (Masoud 1995) were recorded; each is considered as a significant factor with respect to the bird's ecological requirements:

Geographical location of habitat: Northern parts
Degree of slope: Average 60%
Bushy forest 2000 metres a s l
Grassland, 2000-2200 metres a s l
Alpine meadow, over 2200 metres
Presence of bare rocks
Presence of dwarf shrub species such as: *Viburnum lantana* and *Quercus pedunculata*.

The identification of the above characteristics, gave us guidance in finding new habitats. Two groups of mating birds were identified within the areas studied. However, as a result of the unregulated grazing of livestock, the bird's nest sites and suitable breeding habitats have been wiped out.

Field studies have shown that the total population of the bird over the whole area, in 26 habitats, lies between 200 and 250 birds. The population, after nearly 30 years of the protection program, has not only not increased, but also has diminished. The Kalan protected area includes 28% of the entire population of this grouse (Masoud 2004).

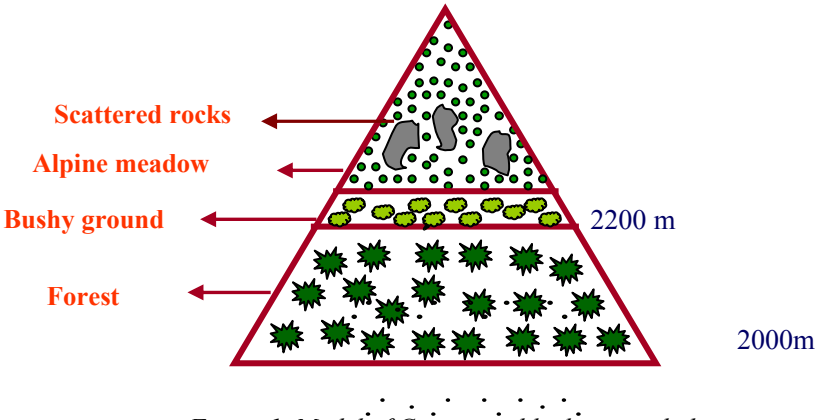

Figure 1. Model of Caucasian black grouse habitat.

Field observations and studies of 22 locations in and around the Arasbaran protected region have shown that females and males are equal in number in 70% of cases, hence occurring in equal proportions (Masoud 2004). Dr. Scott (1971) estimated the total number of grouse within the protected areas to be 200 - 250 birds in 10,000 hectares of land. On the basis of this report, today only 51% of the 1971 population, consisting of 110 birds within the protected area remains (Figure 1).

Schematic figure of black grouse habitat includes forest, 2000 to 2200 metres above the sea level and Alpine meadow with scattered rocks above 2200 m. The slope has a northerly aspect and averages a slope angle of 60 %. In this study, the black grouse population counted within an area of 30,000 hectares was estimated at 200-250 birds (Table 1).

Table 1: Caucasian black grouse populations in different regions.

Row	Name and position of region	Number of birds	Percentage of bird's total population	Percentage Occupancy of region by birds	Extent of region (hectares)
1	The KALAN core zone	59	28%	16%	366
2	Protected border zone	52	23%	0.005%	9000
3	Western free region	104	49%	0.005%	20000
4	Total occupied region	210	100%	0.007%	30000

Mating behaviour

In spring, black grouse assemble around trees. Male birds don't show mating behaviour until March. Both sexes approach rocky areas just after sunset (about 6pm), having spent most of the day resting and feeding. Birds, which were counted after dark using night vision goggles, have not shown any mating behaviour. After sunrise, both sexes remain at their roosts until 8am and then fly towards the forest. The courtship display (lekking) takes place after sunset from around 6 to 7:30pm, and then subsides. With the arrival of females at around 8pm, jumping behaviour becomes very strong again and the males pursue the females. The mating display starts once again at around 4:30am until 8pm. After 8 pm a few birds remain at the lek site until 9:30 am (Masoud 2004).

The mating display takes place in two stages; first the bird runs with short and fast footsteps (similar to a partridge running) and jumps suddenly in the air. Second, the bird stands and also jumps suddenly upwards. The time between these two facets is about 60 to 90 seconds and 2-3 jumps are made continuously. When males come within 4 to 5 metres of one another, they elevate their tail about 80º and open it upwards about 25º. They then go into irritated mode and walk parallel to one another (Masoud 2004). It is believed that this situation happens in younger males or in males that are equally matched.

One of the decisive factors leading to the fluctuation in population of black grouse is the nature of climate within the habitat. Generally, birds begin to form flocks and later begin to disperse towards the end of April, reaching a peak two weeks later. Habitat studies have revealed that black grouse live mostly in the southern slopes of the mountains, except in winter when food becomes short on the southern slopes and birds inhabit the northern slopes. In Iran, however, several visits to the region by the author, have indicated that the birds prefer the northern slopes and only rarely in winter are seen in the southern slopes (Masoud, 2004). A lack of forest on the southern side could be the reason for this. Furthermore, the lekking and nesting areas, and the preferred area for digging snow tunnels, all occur on the northern slopes. A few leks were also found by field inspections within the lower meadows of the eastern slopes.

Conclusion

Some discrepancies were found between the present study and other documented habitat studies of the Caucasian birds. The findings from other studies show that the Caucasian black grouse lives in uplands between 1500 and 3000 m in altitude. The present study, however, has shown that the bird doesn't live outside altitudes of 1800 - 2400 m. The discrepancy between these findings could be due to the division between the northern and southern sides of the Caucasus region and the difference in climate between the

two districts: the population of birds on the northern side of the Arras River is higher than the black grouse population on the Iranian side of the river.

Field studies have also indicated that the black grouse in the areas studied, live in specially separated habitats and if they are not disturbed during winter, they tend to remain on site. Generally the studies carried out have indicated that the main reason for the decline in population is fatalities in younger birds. This is due to the extreme mountain climate with heavy rain, hail, freezing fogs, and freezing conditions, as well as over-hunting. Field studies confirm this, in that in years of heavy rainfall and fog the population decreases, while in drought years the numbers increase.

Generally speaking, this bird lives in harsh habitats. Therefore, any general increase in the population of Caucasian black grouse tends to be lower than in other game birds such as partridge and pheasant. At the time when the decline is reaching a critical level it is important to make a few points regarding causes:

- Deforestation: deforestation of the area around Songun copper mine with associated noise pollution due to daily explosions and the sound of heavy machinery and traffic; this has pushed birds to migrate to a place called Kafshan Kakaver.
- Harvesting of wheat and grass
- Alteration of territorial utilization
- Hunting
- Avalanches
- Road construction.

Thus, any attempt to prescribe management for the species and the habitat in which it lives, prior to undertaking a comprehensive study of the area and recognizing the full implications of territorial utilization by grouse, would be to simplify a complex matter.

Converting parts of the protected area and the western open area to a national park, performing environmental education programs for those families who profit from the area, raising the quality of the protection by assigning trained rangers, and auditing pastures and controlling the numbers of livestock, must be considered by the authority of the environment protection agency and other related organizations.

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Notes:

KALAN: a valley located in Arasbaran region, which is the most important population area for grouse.

Mohammadreza Masoud, Environmental Protection Agency of East Azerbaijan province of Iran.
r_masoud84@yahoo.com
Leila Mehdizadeh Fanid, Tabriz University, Department of Animal Biology, L.fanid@Tabrizu.ac.ir
***Corresponding author:** Leila Mehdizadeh Fanid*

The language is edited by Anne Westerberg

A habitat and habitat-connectivity model for capercaillie *Tetrao urogallus* in the Black Forest as a tool for sustainable conservation planning (a PhD project in progress)

Veronika Braunisch

Introduction and objectives

In view of the limited area within Central Europe suitable as wildlife habitat and the resultant need to integrate wildlife ecology concerns into landscape planning procedures, the question, 'Which areas are relevant to an endangered species?' grows in importance. But how should priority areas for conservation measures be defined? Considering only areas where a species is currently present is obviously not sufficient, although this is still common practice in nature conservation and landscape planning. Especially for species requiring large territories and with continuously declining distribution ranges, this approach is not appropriate as it fails to take into consideration potential habitats required arising from population dynamic processes, nor does it account for spatial and functional linkages between the inhabited patches. Employing capercaillie *Tetrao urogallus* as an example, the main aim of this ongoing PhD project is, in a first step, to identify areas with long-term species relevance, i.e. areas, where the landscape ecological conditions support the development or maintenance of suitable habitat structures on local scale. In a second step, the connectivity between these habitat patches is quantified in order to localise areas which provide the best conditions for dispersal. Since the methodological approach is directed to transferability and applicability in land use- and nature conservation planning, methods are employed or developed, which allow using generally available data in a way that optimises the trade-off between applicability and precision, practical conservation planning has to deal with.

Study area and species data

The study area comprises the Black Forest, a forest-dominated lower mountain range in south western Germany of about 7 000 km² in size, defined in this study by the growth areas *Schwarzwald* and *Baar-Wutach* (Aldinger et al. 1998). Elevation ranges form 120 to 1.493 m a.s.l.. Capercaillie is actually present on about 51 000 ha in the higher altitudes with 258 cocks have been counted in 2003 (Braunisch & Suchant 2006). A continual decline in the population has been evident for the last one hundred years, which is connected to a retreat into the higher reaches and a strong fragmentation of the inhabited area (Suchant & Braunisch 2004).

In the Black Forest the capercaillie is systematically monitored since 1988. Every five years distribution areas are mapped evaluating all direct and indirect proofs of capercaillie presence provided by foresters, hunters, and ornithologists as well as data collected during research projects within the last five years period. Furthermore, the locations of lekking places are mapped and the number of cocks counted annually (for details see Braunisch & Suchant 2006).

To assess spatial patterns of spacing behaviour and dispersal, a telemetry study is conducted since 2001. Birds were captured in autumn and equipped with a radio transmitter which is combined with a satellite-supported telemetry unit, which facilitates a relocation of individuals after long-distance movements. Up to now about 1800 locations of 17 birds, 7 males and 10 females are available.

The habitat model on landscape scale

Several models have been developed in order to localise potential habitats for endangered species in order to define conservation relevant areas (e.g. Mladenoff & Sickley 1998, Kobler & Adamic 2000, Schadt et al. 2002, Graf et al 2005). These models are usually based on a comparison between currently inhabited and uninhabited areas, the identification of relevant habitat parameters and the derived localisation of potentially suitable habitats. However, for species like capercaillie in Central Europe, whose habitats have and continue to be massively influenced by anthropogenic land use and silvicultural methods, and whose distribution ranges are in a continuous state of decline, such approaches may be of limited use, as they analyse and extrapolate a momentary status in an ongoing dynamic process. For sustainable management planning it is important to know whether those areas that are actually identified as potential habitats will in future remain suitable with no or little human support, or whether the preservation of the habitat status will require permanent or increasing management efforts.

To tackle this problem, the first part of this study was targeted on an analysis of the landscape ecological niche conditions for capercaillie, which define the preconditions for the development of suitable habitat conditions at the local scale. The hypothesis was that a habitat model based on a small set of relatively stable landscape ecological descriptor variables with meaningful indirect explanatory power towards local scale habitat conditions and developed considering only areas with preferably stable population development will be able to identify areas with long term relevance to capercaille at the

landscape scale. The model was therefore restricted to landscape ecological descriptor variables only, differentiating between landscape and land use pattern variables. The former is expected to have an influence on the forest structure, whereas the latter is instrumental in defining the areas that capercaillie can avail of. The *landscape variables* tested included characteristics of climate, site and soil conditions, as well as topography. The *land use pattern variables* describe the availability and spatial distribution of landscape and land use features, including the distribution of potential sources of disturbance such as linear infrastructure and settlements.

In a first step, the landscape parameters were evaluated with regard to their potential to support favourable habitat conditions at the local scale. Therefore, local scale habitat structure data were taken from the national forest inventory. For a total of 4308 sample plots distributed over the afforested parts of the study area, selected habitat structure variables, describing the forest type, forest structure, forest age and ground vegetation, were correlated with the prevailing landscape conditions.

In a second step, capercaillie presence data and an Ecological Niche Factor Analysis (Hirzel et al 2002) were employed to identify *landscape* and *land use pattern* variables relevant to capercaillie habitat selection. Different spatial resolutions, corresponding to ecologically relevant spatial units such as forest stand-size, homerange-size or size of a patch inhabited by a local subpopulation, were compared. In addition, a distinction was made between the impact of landscape and land use variables on capercaillie distribution. To restrict the landscape analyses to areas with preferably 'stable' population development, only records from habitat patches which have been consecutively inhabited over the entire monitoring period were included.

Although the Black Forest has been profoundly influenced by forestry activities and although parameter values vary greatly between sample plots, correlations between landscape conditions and forest structure were detected. These were greatest for those landscape variables also found to be most important with respect to habitat selection by capercaillie. The modelling results show that a high degree of capercaillie habitat selection can be explained by only a few landscape scale variables, which largely correspond to the results of related studies (e.g. Sachot 2002, Suchant 2002, Graf et al. 2005). Additionally, for the first time the influence of different altitude-correlated climate variables was compared and the importance of soil and site conditions in relation to habitat selection was quantified. The results of this part of the study will be given in Braunisch & Suchant (submitted).

Long-term development of capercaillie distribution and habitat conditions

To compare the model results with the spatial pattern of the long term and short term development of capercaillie distribution in the study area, historical capercaillie presence data have been collected, covering a period of about 100 years. Furthermore, to distinguish the impact of landscape conditions on long term habitat development from the impact of human land (forest) use practices, the development of selected habitat structure parameters for the last 100 years have been extracted from historical forest inventories in a separate study area of 5000 ha in size. At the same time, the contemporaneous shifts of forestry objectives and the changes of local forest use practices have been assessed.

Habitat connectivity model

Based on the results of the habitat model and an evaluation of the telemetry data, the connectivity between habitat patches will be quantified. The aim of this part of the study is not to model actual population connectivity, but to evaluate the preconditions facilitating movement between habitat patches as determined by the landscape matrix. The effect of the distribution of suitable landscape conditions and corridors on the dispersal probability will then be evaluated by comparing the model results with genetic data (Segelbacher, in preparation).

Application

The purpose of the study is to provide an instrument for the ecological and economic optimisation of conservation efforts by identifying capercaillie-relevant areas sufficient in size to maintain a viable population, and valid for long-ranging management considerations. The location-specific fundamentals can be used for the planning of conservation concepts (especially Natura 2000) as well as for land use planning purposes (especially silviculture, tourism, wind energy). For practical application, the results will be summarised and presented in a map showing capercaillie-relevant areas classified according to their importance and the different functions they serve for the population (e.g. core habitat, marginal habitat, stepping stones / corridors for (meta-) population dynamics). The objective of the map is to show the planner at a glance the areas in which the needs of capercaillie must be taken into consideration. However, the model can only define the spatial framework conditions - the conditions at the local scale must be taken into consideration when planning concrete measures.

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Veronika Braunisch, Forest Research Institute of Baden-Wuerttemberg, Dept. of Landscape Ecology, Div. Wildlife Ecology, Wonnhaldestr. 4, D - 79100 Freiburg im Breisgau, Germany.
veronika.braunisch@forst.bwl.de

Clarifying the Status of the Caucasian black grouse *Tetrao mlokosiewiczi* – methodical approach

S. Klaus & A. V. Vitovich

Introduction

The Caucasian black grouse, endemic to the Greater and Lesser Caucasus and some separated mountains in Armenia, Azerbaijan, Georgia, Iran, Russia and Turkey, was listed by Birdlife International as a Species of European Concern, category 2, its status being "insufficiently known" (Tucker & Heath 1994) and was included in the 1996 IUCN Red List and in the Grouse Action Plan (Storch 2000) as "lower risk-near threatened". Reviews of the older and present knowledge were given by Potapov (1985), Klaus et al. (1990, 2003) and Gokhelashvili et al. (2003).

This paper results from the discussions on the international conference "Caucasian black grouse conservation" in Kazbegi/ Georgia (September 22-23, 2003) with the aim to clarify the present status of the species as a base for better protection in the future. We present our methodical experiences based on the specific behavior of that species which could be useful for mapping the area and for estimating the abundance of this grouse on selected control areas.

Searching for leks - Spring counts on the leks

As in the common black grouse *Tetrao tetrix* counting of displaying males during collective display on the leks seems to be the most effective and less time consuming method. Even in areas hard to access because of deep snow cover in spring, slopes can be controlled from suitable positions on opposite sites. The method has been proved successful by several authors in several countries within the species' area: Etzold (2003) and Sultanov et al. (2003) in Azerbaizan, Adamyan (2003, unpubl.) and Ghasabian &

Ananian (2003, unpubl.) in Armenia, Eriashvili (2003, unpubl.) in Georgia, Vitovich (1986) and Klaus et al. (1988) in Russia, Atkinson et al. (1995) and Baskaya (1997) in Turkey.

The search for leks of the Caucasian black grouse should be concentrated to the timber line where the habitats of this species are normally located. The leks can be found above the timber line not far from winter food resources like birch (*Betula litwinowii*, Figure 1), oak (*Quercus macranthera*), beech (*Fagus orientalis*), juniper (*Juniperus communis ssp. oblonga),* rose (*Rosa* spec.), because the birds continue to feed on buds and catkins in the first part of the lekking period. In areas without forests isolated islands of shrub vegetation delivering food and cover could also indicate the vicinity of leks. Figure 1 shows a typical example of a lek in Teberda/Russia. Depending on the topography and density of grouse the leks were to be found at distances of 1-2 km along the timber line. In optimum habitats like in the Lagodekhi reserve display grounds are forming a "chain" along the timber line as reported by Eriashvili (2003,unpubl.).

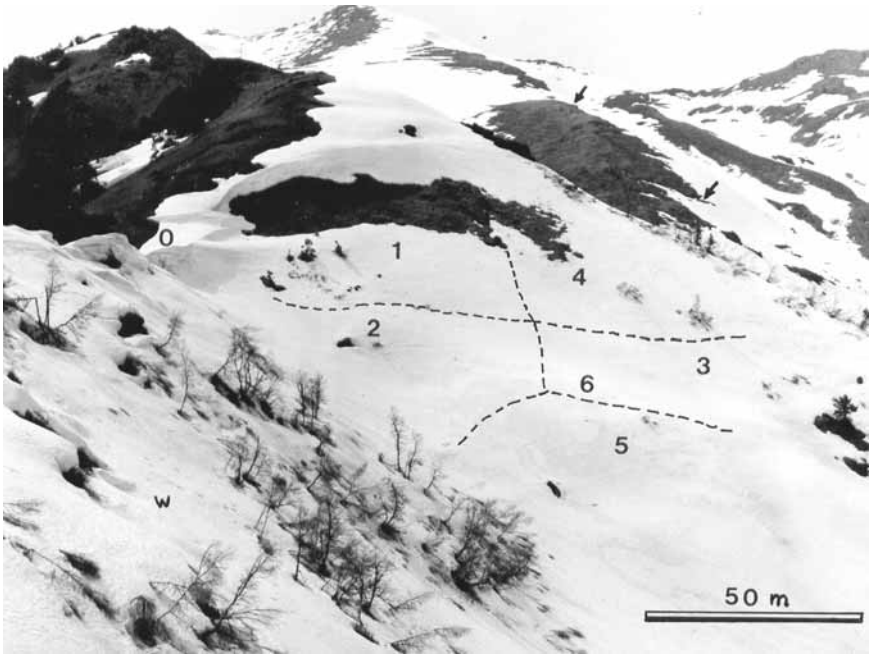

Figure 1. Position of males 1-6 on a typical lek at Mala Chatipara (2,400 m a. s. l., NE exposition). 0- hide for observations, W- winter burrows, arrows: neighboring lek at 1 km distance (Klaus et al. 1988).

Exposition and vertical distribution of leks

According to Vitovich (1986) in Teberda most of the leks were found on slopes of eastern and southern exposition, a few leks were also located on western and northern slopes. In Azerbaijan (Etzold 2003) and in Georgia (unpubl. results) the situation seems to be similar.

Ten leks found in Teberda reserve were between 2,300 and 2,800 m a.s.l. (mean 2,470±116 m). The mean altitude of 37 nests was about 100 m lower (2,367 m). Five leks in Azerbaijan near Sudur, Saribash and Xalxal were between 2,200 and 2,500 m) (mean of 2,350 ± 64 m), four leks near Kasbegi / Georgia were located between 2,000 and 2,700 m (mean of 2,310±230 m, Etzold 2003). All 19 leks together had a mean altitude of 2,405±148 m a.s.l.

Displaying activities on a daily and yearly basis

Knowledge of the activity pattern of Caucasian black grouse on a daily and yearly basis helps to optimize the monitoring success. According to Vitovich (1986) displaying activity starts by mid April. The maximum activity was observed between 1st and 20th May. In the last 10 days of May egg laying starts and the males become more and more inactive. Nevertheless, the most active males visit the lek up to the middle of June. Figure 2 demonstrates the activity pattern of displaying males on a lek at Teberda between May 11th and 25th. The males arrived in the afternoon, started display around 4 o' clock p.m. and finished their activity around 8 p.m. Most cocks spend the night within their territory, resting on the

ground in the grass or on snow. In the early morning, display starts around 4 a.m. and between 7 and 8 a.m. the males were leaving the lek. Having this activity pattern in mind, observers could easily optimize their observation schedule. In an area difficult to visit in the early morning, evening counts may also be useful, but normally result in fewer birds compared to the morning census. For the detection of leks or presence-absence decisions evening visits could be the preferred method.

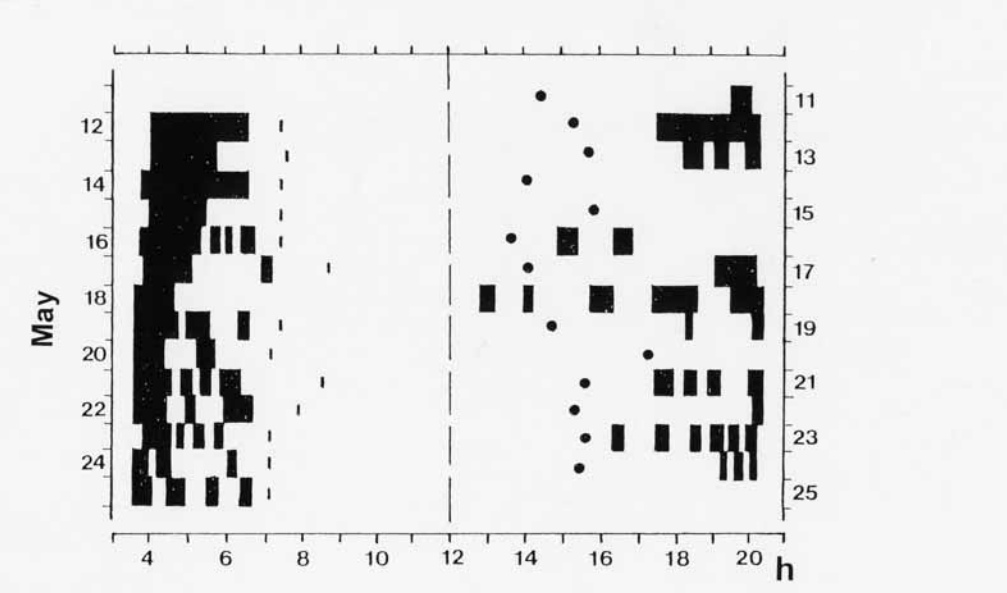

Figure 2. Presence and displaying activity of males (May 11-25) on one lek in Teberda reserve (black boxes): black dot: arrival in the afternoon or evening; stroke: departure in the morning according to Vitovich (1986) and Klaus et al. (1990).

In Teberda copulations were observed between May 15th and 22nd. Only in this "high season" most of the females and yearling cocks were visiting the leks. This is the time when observations should be the most successful and census will result in maximum numbers of birds per lekking site. In addition, the presence of yearling males gives a good chance to estimate the ratio of yearlings (grey plumage) and older cocks (black plumage) as a measure of the reproduction success of the previous year (Klaus et al. 1990). As in the common black grouse, females will visit the leks as singles or in pairs at different days. Thus, the sex ratio could be estimated only during long term observations covering the whole copulation season.

Autumn display

While moulting during July and August, the Caucasian black grouse is very silent and hard to find, becoming more active in autumn. Autumn display was observed only by few authors (Tkachenko 1966, Vitovich 1986). According to their observations, old males are flocking and becoming active on the traditional display grounds. As described by Vitovich (1986) a territory system is not established.

Between September 24th and 26th 2003, we observed a flock of up to 18 Caucasian black grouse (black old males, grey yearlings and few females) in the Kazebegi reserve /Georgia Klaus & Storch 2003). The birds were intensively feeding in a northern slope between 2,500 –2,700 m a. s. l covered with extended shrub areas of *Rhododendron caucasicum* intermixed with fruiting shrubs of *Vaccinium myrtillus, Vaccinium vitis-idea* and *Empetrum nigrum.* The birds spent the whole day in this dense and food delivering shrub cover. At 4.30 p. m. the first males left the cover, became active and started to expose themselves on rocks or open areas. Rarely they performed flutter jumps, territorial flights or very seldom running one after each other or courting around a nearby female. The dominating "activity" was "standing on the post", a typical behaviour in this species, used to demonstrate their presence without spending much energy, interrupted by intensive feeding. Individual distances between standing or feeding cocks was very small, sometimes less than 1 m, showing that aggression in autumn is very weak in this species. The birds disappeared into the dense shrub cover before 8 p.m. spending the night on the ground.

During morning the birds were intensively feeding and less active in displaying. In addition, only a part of the flocking birds were visible.

Flock formation in winter

In autumn and winter flocks are formed, sometimes by all birds of a given area around one or several leks within or nearby the winter food resources (birch woods, juniper ect.) along the timber line. Vitovich (1986) observed the biggest flock of 34 males in which all males of a valley were concentrated. According to his observations flock composition frequently changed. The flocks were composed predominantly by one sex, the grey young cocks were observed together with females. The census of flock members could give information on the abundance and on the sex ratio. Successful surveys in winter time depend strongly on the weather, snow cover, mountain topography and accessibility as winter conditions of the high mountains are often hard. Preferred wintering areas could also be detected in early spring by searching for brown spots resulting from snow burrows easily to be seen from a distance in the melting snow.

Figure 3. Male Caucasian black grouse on a lek near timberline (photo S. Klaus).

Conclusions

- Leks of the Caucasian black grouse concentrate above the timber line (2,000-2,800 m a.s.l., mean between 2,300 and 2,400 m) and could be found using telescopes also from an opposite slope.
- The preferred method for detecting and counting the grouse is the lekking time in spring during morning and evening display. Maximum numbers of birds per lek will be found in the "high season" when copulations occur and also yearling males visit the lek (May 10-25). In areas difficult to access the observation of evening display is recommended.
- In September and October flocks near to the traditionally used leks were formed feeding mainly in northern slopes (*Rhododendron caucasicum, Vaccinium* spec.). Old males become active there during the early evening and in the morning and can be counted. Additionally, it seems that the birds can be easily flushed in autumn. Therefore a useful technique seems to flush the birds while walking on horizontal transects in suitable feeding habitats especially those of Rhododendron. Densities can be estimated by calculating the area of habitat disturbed and assuming that all birds present were flushed. The concentration of birds from a bigger area near to the lekking site should be kept in mind. For the detection of leks and counting of birds the autumn seem to be an appropriate time but needs further investigations.
- Census in winter depends strongly on snow cover, mountain topography and limiting accessibility, but could result in precise data on bird abundance within a given area.

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Siegfried Klaus, Thüringer Landesanstalt für Umwelt und Geologie, Prüssingstraße 25, D-07745 Jena, mailto:siegfried.klaus@gmx.de>
Oleg Anatolevich Vitovich, RUS-357192 Teberda, per. Badukskij 35,

Could competition with ungulates be a limiting factor for Cantabrian capercaillie? A new Ph.D. project

Bea Blanco-Fontao, Mario Quevedo

The Cantabrian Capercaillie *Tetrao urogallus cantabricus* (Castroviejo 1967, del Hoyo et al. 1994) is an isolated capercaillie population situated in the southwest limit of the species' distribution range (Storch 2000). This peripheral population shows several distinct traits, perhaps best summarized by its adaptation to the distinct habitat: the montane, deciduous forest of the temperate NW Spain (Quevedo et al. 2006). As such, it has a great conservation value, both as observatory of adaptation in the face of environmental change (Hampe & Petit 2005) and as part of the species' evolutionary potential (Lesica & Allendorf 1995). Although capercaillie are not globally threatened and still occur in good numbers throughout most of their boreal range, there is a general trend of decline in lower latitudes, which is leaving behind small, isolated populations (Storch 2000). Particularly acute seems the case of Cantabrian capercaillie, which has declined well beyond 50% in the last two decades, showing a concurrent shrinkage both in range and elevation down to an area of occupancy of about 2000 km^2 (Quevedo et al. 2006). As a consequence of this declining process, it has been recently (July 2005) moved to the highest category of threat in the Spanish Red List. Such a change in the listing status entails some administrative and management procedures, like the elaboration of a specific recovery plan, which should contain a set of actions for the recovery of the population and the management of the habitat. Often management actions are hastily

implemented, a part of the well-known timing mismatch between conservation science and practice (Soulé 1985, With 1997). The case of Cantabrian capercaillie might be another example, for we feel that to build up sound conservation plans our understanding on its peculiar ecology must improve substantially. And this is no minor task, because the effective conservation of this capercaillie population, nowadays appearing often in the Spanish media, would help to preserve the last remnants of wildlife in SW Europe (Suter et al. 2002, Pakkala et al. 2003).

Nearly all the potential causes of grouse decline mentioned in the 2000-2004 IUCN Grouse Action Plan (Storch 2000) can be heard in diverse forums as responsible for the decline of Cantabrian capercaillie. However, facts is missing to clearly pinpoint any of them. Scaling down from global to local, the most commonly mentioned factors are climate change, habitat degradation, inbreeding depression and hatching failure, chick and nest predation, or overgrazing by ungulates. This last factor constitutes the central line of a new project and PhD thesis at Oviedo University, stimulated both by the attention drawn from stakeholders and general public, and by an apparent increase in the densities of wild ungulates concurrent with the decline of Cantabrian capercaillie. However, we do not neglect that in complex systems like the temperate montane forest, several of those stressors would act in a synergistic way. Theory predicts an increased limiting effect of interspecific interactions, like competition and predation, at the edges of species distribution range, where their abundance decrease as their tolerance range narrows (Grant & Antonovics 1978, Guo et al. 2005). The strength of such interactions might even modify the ecological niche width of a population, and the degree of overlap between its different elements (Bolnick et al. 2003). Given that a population is not assembled by a sum of identical individuals, sexes or age classes, individuals that differ, say, in behaviour and feeding habits might be differentially affected by stressor factors. In the Cantabrian range, capercaillie is not competing for resources with any other grouse species, but herbivore competitors are not at all missing. In this mountain range, capercaillie uses a variety of habitats including fairly open ground (Quevedo et al. 2006), and shares them with red deer *Cervus elaphus*, roe deer *Capreolus capreolus*, Cantabrian chamois *Rupicapra pyrenaica*, wild boar *Sus scrofa*, the endemic broom hare *Lepus castroviejoi* and large numbers of free ranging livestock, mostly cattle and horses. Purely herbivorous birds like capercaillie, due to their much smaller body size and gut capacity, are susceptible to be outcompeted by large, wide-ranging ungulates and their complex digestive tracts (Sedinger 1997).

The historical and ongoing human pressure on top predators has accounted for the so-called mesopredator release, and for increased densities of large herbivores (Crooks & Soulé 1999, Terborgh et al. 2001, Ripple & Beschta 2004). The expand in range and increased abundance of deer seems to be a generalised process that has profound, negative effects on the primary producers, indirectly affecting the rest of the food web (Côté et al. 2004). However, when considering the effect of ungulates in the Cantabrian range, free ranging cattle and horses should not be left aside, as they could dominate ungulate biomass in a substantial part of the range. Changes in vegetation structure and diversity caused by all these ungulates might greatly modify ecosystem function, with cascading effects to plant-animal trophic interactions (Berger et al. 2001), and decreasing the quality of the habitat as refuge. For instance, overbrowsing reduces the abundance of woody species, and is associated with a shift in plant community composition from shrubs and forbs to grasses and ferns (Stockton et al. 2005). Deer overabundance might result in reduced populations of songbirds depending on understory vegetation, due to decreased food resources and nest site quality (Allombert et al. 2005). In the particular case of capercaillie a likely affected resource is bilberry *Vaccinium myrtillus*, a key species for capercaillie (Storch 1993, Selås 2000) and much less abundant in the Cantabrian range than in boreal areas. Ungulate browsing on bilberry has a dramatic effect on its height, surface cover and fruiting ability, and leads to a decrease in its biomass and nutritive value (González Hernández & Silva-Pando 1996). Furthermore, bilberry not only constitutes an important source of food for capercaillies; it is also a refuge and a source of invertebrates for the chicks (Baines et al. 1996).

In this project our main aim is to find out whether the use of trophic resources by ungulates could modify the availability for capercaillie, and then whether it could constitute a stressor for the population. Given the previous reasoning and evidence of generalised increase in ungulate densities and impact (Côté et al. 2004), we feel that these questions could be passed to (and beyond) other grouse populations. To assess the impact of interspecific competition we will look at variation in capercaillie niche width and individual specialisation, using microhistological analyses of droppings and stable isotopes in feathers and ungulate hairs. Population niche width represents a balance between the diversifying effect of intraspecific competition, which tends to favour differentiation among individuals of a species, and the constraints imposed by the competition with other species (Roughgarden 1972, Bolnick 2004). In other words, capercaillie organise their resource selection as a consequence of the interaction among conspecifics, but high competition from ungulates might reduce the availability of profitable choices. Thus, the degree of trophic overlap with ungulates might determine the niche availability for the overall

capercaillie population, but also reduce the available choices for the individuals. And these competitive interactions could arise not only in the form of direct resource competition, but also as behavioural responses to the presence of competitors in the preferred habitat.

Our point with this line of research is that, though intrapopulation variation has been traditionally overlooked, it bears profound implications for sound conservation plans. For instance, a management plan that protect an "average" feature of a species may put at risk individual specialists, or a certain age class or sex, if their feeding habits, habitat requirements, behaviour, etc are significantly different (Durell 2000). This research will be coordinated with another project that will study another aspect of interspecific interactions, looking at the relationship between habitat configuration (degree of fragmentation and type of matrix habitat) and relative densities and impact of predators.

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Bea Blanco-Fontao, Dpt. Biology of Organisms and Systems, Ecology Unit, Oviedo University, Spain, uo184423@uniovi.es

Current status of black grouse in Slovenia – assessment of landscape change

Jurij Gulič

Abstract

In Slovenia four Special Protection Areas have been defined (in total 102 700 ha), on account primarily of their importance for black grouse. Black grouse in Slovenia are at the southern-most limit of the species' Palaearctic range; and it can be predicted that this range will decline further, on account of the edge effect. The black grouse population in Slovenia is estimated between 2300 and 2600 individuals within an area of approximately 600 km^2. Black grouse habitat is widely distributed between 1500 and 1800 metres a. s. l. in the Alps, while in NE Slovenia they occur above 1400 metres. Where black grouse occur just below the timber line, they probably occupy secondary habitats; here they have found suitable habitat created within the period of intensive woodland cultivation and traditional land use practices from the 17th to the mid 20th century. The decrease in suitable black grouse habitats is primarily associated with changes in traditional land use (forest clearance, improvement of pasture). The black grouse population has declined in all probability largely because of the overgrowth of mountain grasslands, the expansion of forestry and due to habitat degradation (tourism, traffic, etc.).

Introduction

Grouse species are a good indicator of the alteration or preservation of the landscape. As distinctive specialists, they can occupy their narrow ecological niche only under favourable living conditions (Ingold 2005). The main habitat of the black grouse nominate species *Tetrao tetrix tetrix* in Slovenia today lies within the extreme southern part of the species' range (Radović *et al.* 2003, Cramp 1994, Matvejev & Vasić). In the Alps, the bird's habitat is found between 1500 and 1800 metres a.s.l. (Smiljič 1995), and on Pohorje and Kobansko (Slovenia) above 1400 metres a.s.l. (Gulič 2002). The proportion above 1500 m a.s.l. represents 2.5% of the total Slovenian land area (Perko 2001). Approximately 2300 to 2600 black grouse individuals were estimated in Slovenia in 2003/2004 (estimated number of black grouse in Slovenia 2004). According to Sovinc (1994) there are between 1500 and 2500 black grouse, while Geister (1995) claims the population at between 500 and 1000 individuals.

The Slovenian population, defined in terms of the area within which the species occurs, is affected by larger scale population fluctuations. According to Bauer & Kalchreuter (1984), the distance from other populations also presents a problem, since it can lead to edge extinction. A heterogeneous landscape, and more specifically matrix heterogeneity, can have various effects on metapopulation dynamics which contribute to isolation in patches (Revilla et al. 2004). In middle altitude mountains and in the alpine parts of north-eastern Slovenia, the home ranges of black grouse are limited to patches within the heterogeneous landscape. Today's sub-populations of black grouse are found in secondary habitats, where they have been able to find favourable conditions within habitats created between the 17th and mid-20th centuries by intensive forest exploitation (glass-fabrics, mining) and by traditional land use methods (Gulič *et al*. 2003, Gulič 2005 in press). Similar conditions were also reported from Austrian Styria (Wöss

& Zeiler 2003). The large number of suitable black grouse habitat patches in the Kamnik-Savinja Alps occurs today as a result of earlier management of these alpine pastures. The number of black grouse in the alpine area of the north east and western parts of Slovenia is basically stable (Report on counts of black grouse 1997-2004, Numerical status of the black grouse in Slovenia 2004). The alpine and mountainous areas mentioned above are quite heterogeneous. The present day heterogeneity of the landscape is a reflection of past management practices. Landscape evolution is a dynamic process, the continual interaction of shapes and functions (Petek & Urbanc 2004).

Continental biogeography and metapopulation theory suggest that space consists of patches of suitable habitat, within a matrix of habitat unsuitable for the long-term survival of the species. It is assumed, that the matrix is homogeneous and sufficient to allow migration of individuals (Voss *et al.* 2001, Hanski 2002). Animals do prefer certain habitats over others and so are influenced by "landscape quality". This quality can limit or ease movement between different landscape types. The animal will usually avoid moving from good to less favourable habitats. If, for example, an individual moves within the boundaries of a particular type of landscape and comes across a different landscape type, it then has to choose whether to continue its way across the new landscape or stay within the old type. The movements could be explained by the degree of connectivity between patches, which determines the level of migration which occurs between local populations (Moilanen & Hanski 1998). For each species, the inter-patch connectivity is a product of the interaction between the behaviour of the species and the heterogeneity of the matrix between individual dispersion movements (Ricketts 2001). The movement of individuals between patches is a key process in the dynamics of spatially structured populations. It provides a link between spatial sub-unit populations, resulting in the colonisation of unoccupied areas (Revilla *et al.* 2004).

The first study of the structure of black grouse habitat in Slovenia was carried out in Triglav National Park (Smiljič 1995). The display ground features were described and evaluated through the interpretation of digital ortophotos. Adamič (1982) contributed greatly to our knowledge, allowing us to devise strategies for protection of the species and its habitats with his first ever description of the status of black grouse and capercaille. Gulič (2002) has been studying the use of space on abandoned display grounds of black grouse in Pohorje. To compare active and former display grounds, the recently abandoned display grounds were also included in the study. The study showed that active display grounds are relatively similar to each other, in contrast to non-active display grounds which are clearly different. On these plots, the value of the herb and shrub layers (in terms of usefulness to the bird) as well as of anthills has been estimated as rather low. A comparison between vegetation types and the density of certain herb and shrub species showed that the most suitable areas for black grouse are places in the transition zone between marsh ecosystems and overgrown patches. The area must also be relatively open and have as small a human population as possible. In a survey by Gulič *et al.* (2003), a detailed analysis of the vegetation at display grounds in terms of its suitability for black grouse was carried out in Pohorje.

Since black grouse is listed in Annex I of the European Directive on the Conservation of Wild Birds (Council Directive 79/409/ EEC, OJ C 139, 13.6.1977), the continuation of research will be important to preserve the species in Special Protection Areas (Božič 2003, Božič & Rubinič 2004).

Methods

The research focused on the changes in the abandonment of farmland in Slovenia, and has shown that the present state of forest spread/expansion is a reflection of the change in agricultural use (Čas 1988, Leban 1998, Hočevar *et al.* 2004). As a good tool for researching and evaluating of landscape dynamic for the past centuries the Franciscan cadastre is very useful (Ribnikar 1982, Triglav 1995), as well as Josephine surveys - Landesaufname I (Korošec 1993). The research in relation to these historical sources has shown them to be a good method of habitat evaluation (Petek 2004, Petek & Urbanc 2004).

The present research is based on examples that point out the importance of former landscape and habitat changes in relation to the present-day situation and the suitability of black grouse display areas in the Slovenian and mid-altitude mountains. It is too soon to speak of concrete results, but the examples presented indicate certain legalities. These trends will be investigated further in future research leading on from this contribution.

Results and discussion

Based on the inventory of black grouse display areas in north-eastern Slovenia and on the data collected on lek sites in the country, we have found the species to be present in almost all the areas identified in the early 1980s. The exception is within the range of mid-altitude mountains in western Slovenia, where black grouse are now absent. Satisfying data on the species only exists in areas where yearly spring counts of display areas are carried out (bipartite international agreement with Austria; region by the state

border), in a few hunting areas of special significance, and in the region of Triglav national park (western Slovenia) (Fig 1).

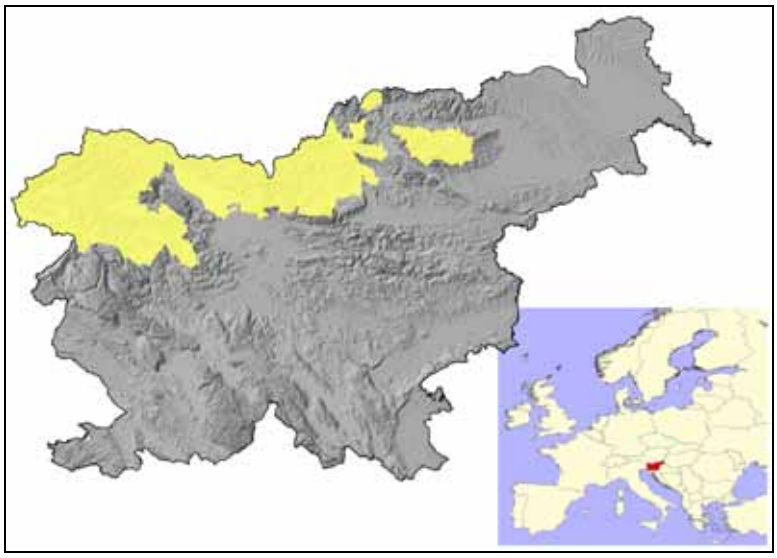

Figure 1. The occurrence of black grouse in 46 hunting organisational units (including 42 hunting association units, 3 state hunting reserves, 1 Special Protection Area) in Slovenia.

Prior to 1993, when grouse hunting was still permitted, the species was generally better controlled and managed within the different areas. During that time black grouse were monitored and managed for hunting interests alone. The interest of hunting associations in actively conserving the species diminished with the prohibition of hunting. Recently, however, there has been a renewed interest in the species – from both hunting managers, and the nature conservation profession. The species is gaining in significance on account of its charisma, and this is why so many regional land users wish black grouse to be preserved.

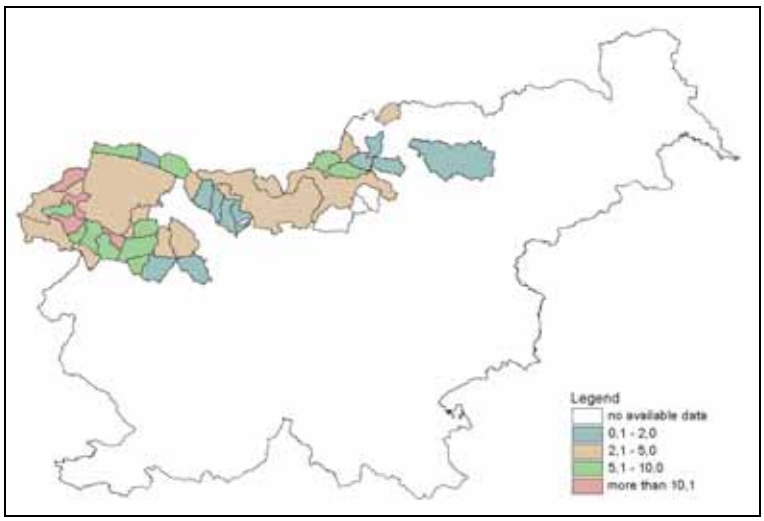

Figure 2. Density of black grouse males per 1,000 ha at the state hunting organisational units in 2003, 2004.

Figure 2 shows the density of black grouse within the current range of the species in Slovenia (2.1 to 5.0 males per 1000 ha). The range includes the central Julian Alps in the west, and the central area of the Kamnik-Savinja Alps and Karawanken Mountains in the north of Slovenia. Areas with a relatively high

population density (green and red) (Fig 2) are located far from roads where human population tends to be at low density. Areas with more birds also show a strong tendency towards an overgrowth of mountain vegetation, providing suitable habitat; in these areas the amount of suitable habitat may even be increased. The areas with a low density of black grouse (blue) lie on the periphery of more suitable areas and largely occur in middle altitude mountains and on solitary ridges not exceeding 1600 metres a.s.l (Fig. 3). There is little available data for three areas on the southern part of the Kamnik-Savinja Alps.

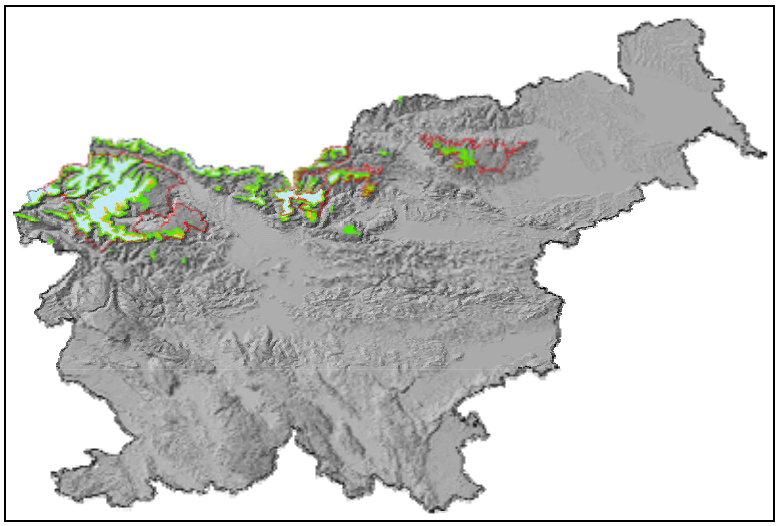

Figure 3. Altitude regions within the range of black grouse: green colour represents areas between 1400 and 1500 metres a.s.l., ochre: areas between 1500 in 1600 metres a.s.l., light blue: areas 1600 metres to 2800 metres a.s.l., the red line represents borders of special areas of protection (Natura 2000 areas), where black grouse was one of the qualifying bird species in the determination of SPA regions.

Forest is dominant in the altitude zone 1400 – 1500 m a.s.l., covering 78% of the area, followed by extensive grasslands (8%), rocks (7%) and dry grasslands (5%) (Table 1, Fig 4). In the mid zone, forest (69%) is also the main habitat type. This zone also includes rocks (13%), dry grassland (10%) and extensive grasslands (6%). In the zone above 1600 m a.s.l. rocks (53%) dominate, and are defined as an unsuitable black grouse habitat. The zone also consists of mountain forests (29%) and dry grasslands (13%). The evidenced areas under abandonment process constitute 2% of the lower zone, 3% of the mid and 1% of the zone over 1600 m a.s.l.

Table 1. Land use in relation to altitude zones for the area, where the presence of black grouse has been confirmed (Land use, MKGP 2002).

Land use	Habitat area within each altitude zone (hectares)		
	1400 -1500 m a.s.l.	1500 -1600 m a.s.l.	above 1600 m a.s.l.
Wetlands	6	3	13
Mixed land use (urbanization)	88	24	16
Extensive grasslands	1474	661	468
Abandoned land	407	262	517
Forest	15092	7190	10848
Dry grasslands	984	999	4850
Rocks	1323	1333	20633
Sum	19375	10471	37346

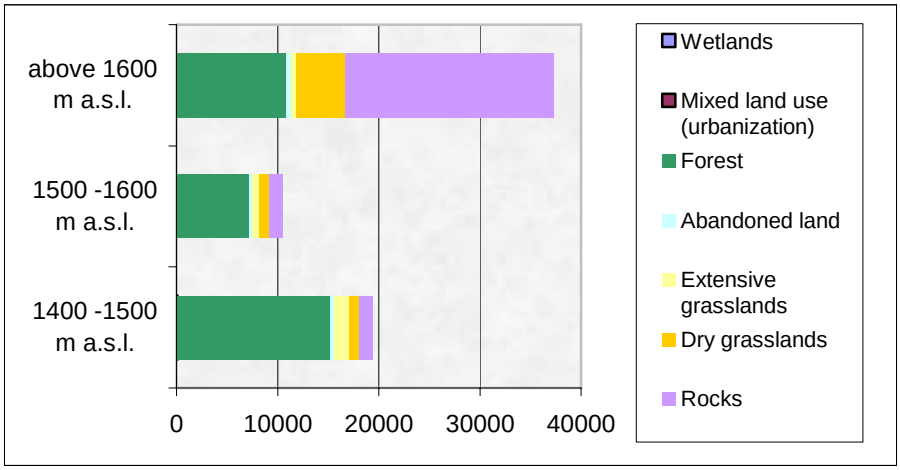

Figure 4. Land use in relation to altitude (Land use, MKGP 2002).

In Triglav national park 7 % of the 95 known black grouse display areas occur between 1200 and 1400 m. a.s.l., 33 % of display areas are between 1400 and 1600 m. a.s.l, 52 % between 1600 and 1800 m. a.s.l., and 8 % of the display areas between 1800 and 1900 m. a.s.l. 85% of all display areas are situated between 1400 and 1800 metres. In north-eastern Slovenia all display areas occur on the highest mountain ridges (between 1400 and 1550 metres).

Black grouse populations in middle altitude mountains are mainly of secondary nature, where satisfactory conditions were present in the period of intensive woodland cultivation and traditional land-use (a form of shifting cultivation) from the 17th to the beginning/middle of the 20th century. The decline in black grouse habitats principally relates to a change in the traditional usage of the soil (clearing of forest, pastoralism), followed by the development of tourism (above all winter tourism), the abandonment of land and habitat fragmentation (Fig 5, Fig 6).

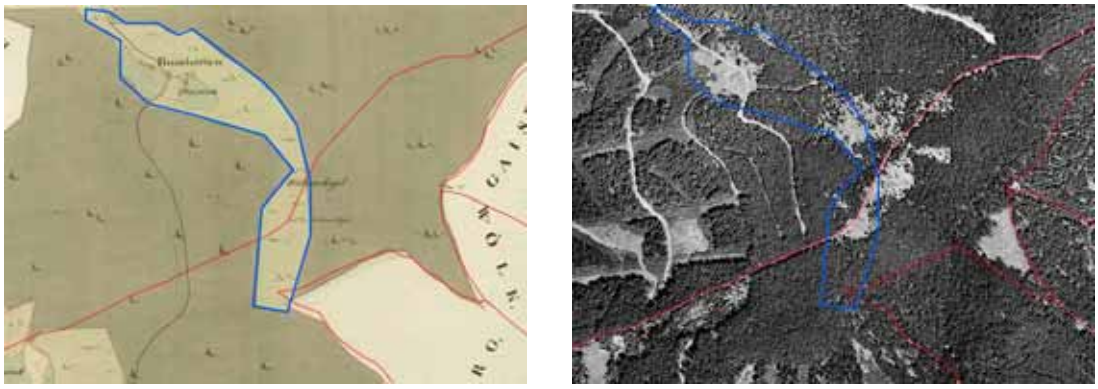

Figure 5. Changes in land use from 1825 (left picture: Franziscean cadastre); size: 1500 x 1100 metres), and the same place in the year 2000 (right picture: Digital ortophoto). This area illustrates a typical anthropogenic habitat of black grouse in middle-altitude Mountains (up to 1500 m a.s.l.). The blue line represents a grassland patch that already existed at the beginning of the 19th century and has now largely disappeared; red lines are cadastral borders.

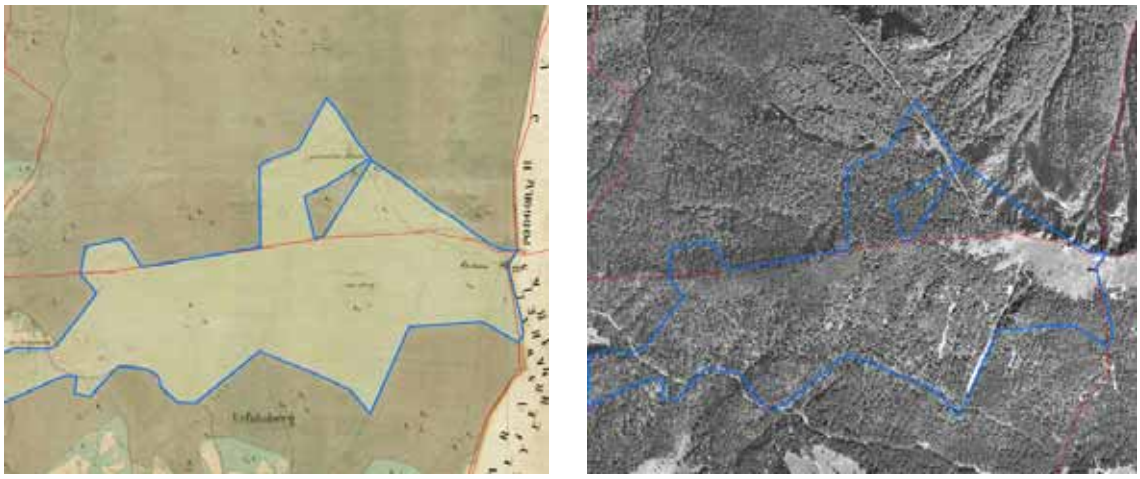

Figure 6. An example of landscape change from Carinthia (Urslja gora, 1699 m a.s.l.), is recognized as a "hot stone" between sub-populations. The left-hand picture represents the situation from the year 1825 and the same place in the year 2000 (right-hand picture); both pictures are of size: 2000 x 1700 metres. The blue line represents a wide grassland patch on the mountain ridge from the 19th century. In the recent landscape (right-hand picture) it is hard to recognize the patch in its previous shape; an open habitat, suitable for black grouse, remains only above 1650 m a.s.l.; red lines are cadastral borders.

The hypotheses, which still need to be tested in the coming years, are as follows:

A. Matrix heterogeneity or non-heterogeneity of a region has a significant impact on the division and structure of black grouse habitat. Within the heterogeneous area, which is being studied with independent variables, the habitats will be arranged at random.

A.1 In the mountainous regions, where the timber line, artificially lowered by man, is elevated after the land is no longer used for agriculture, the distance between habitats will be shorter, as occurs in habitats on ranges of middle-altitude mountains. Pastureland in the early succession phase, which is preferred by black grouse, is thus expanding to the upper forest border.

A.2 In the presence of conspicuous human impact on the environment, black grouse react by retreating from the affected areas. In middle altitude mountains where human disturbance is very high (development of tourism and recreation), the occupation of habitats by black grouse will be lower than in middle altitude mountains where human impact is absent or minimal.

A.3 Habitats will be occupied in exposed places (summits, ridges, on meadows below steep rock walls) because, in addition to good acoustic conditions and food availability nearby, black grouse also have access to a clear escape route.

A.4 We predict that the number of black grouse in the mountains will increase on account of the overgrowth of unforested land, now in the early phase of succession. The extent of the upper timber line area in which this species is found, is also expanding upwards, such that the area of favourable habitat for this species is increasing.

A.5 The central habitat area (radius 400 metres), based upon the presence of a variety of important plant foods (which, along with other factors, have a decisive impact on the presence of species in a given space), is separated from the surrounding area (radius 1000 metres).

B. The connectivity of habitats is one of the key factors affecting the preservation of black grouse in the region.

B.1 The relief of the region, the fragmentation of the habitat and the relative size of the population, which can be defined as a metapopulation, have all an impact on the habitat connectivity. As an area becomes degraded, it forms one of the connecting links, or hot stones to neighbouring regions, and the habitat connectivity is disrupted. We anticipate that, in time, the connecting links on the edge of the region will be lost from this chain.

B.2 The connectivity of the species' habitats is highest in the mountain regions. The position of black grouse habitats, their distance from each other and the relative preservation of the region to which the species moves, all have a significant impact on the connectivity of the habitats.

B.3 The man-made habitat mosaic of the region and the potential for the species to expand its range upwards as the height of the upper timber line increases, is leading to the separation of the Alpine sub-population of black grouse from the population in the mid-altitude mountain ranges.

C. Spatial analyses of black grouse habitat in the 19th and 20th centuries clearly illustrates the continuing processes which result in the preservation and disappearance of the species' habitats in particular mountain regions, and, in addition facilitates the prediction of possible measures which may be taken to preserve or improve habitats in order to conserve the species.

C.1 In the 19th century the regional index of present-day black grouse habitats indicated that these areas were less forested than today. Likewise, a number of undesirable human impacts within these regions were lower than today: pastureland, mountain clearings and initial overgrowth phases (natural succession, fruit trees in cultivated clearings), and a stock of local forest timber prevailed.

C.2 In the past, much more suitable habitat or habitat fragments at a height of 1000 metres a.s.l., was available for black grouse. Enclosed (i.e. fenced), unforested regions occurred mainly on mountain ridges, on mountain tops below 1800 metres, and on larger areas of flat land on mountain ranges of middle altitude.

C.3 During the industrial revolution in the 19th and 20th centuries, intensive migration of country people to industrialized centres and the abandonment of agricultural land resulted in the loss of suitable habitats, leaving the land open to natural succession processes (afforestation).

C.4 In those areas still occupied by black grouse today (with NE Slovenia holding the greatest numbers of lekking birds), the process of intensive desertion of agricultural land (pastureland, meadows) did not begin before the second half of the 20th century.

C.5 Time and space analysis of regional changes reflect the progress of losses of favourable habitat for black grouse. We anticipate that birds will disappear from the middle-altitude mountain ranges.

As is valid for many other species, the future survival of black grouse also depends on our capability of understanding the metapopulation dynamics and how they relate to the structure of the landscape. Dispersal is a key process in defining the survival of a metapopulation and in defining the niche of a local population. When formulating strategies for the protection of endangered species it is essential to acquire an insight into the link between dispersal and management plans. The greatest challenge is to incorporate the habitat requirements of grouse into the management process for land which is given over predominantly to forestry and agricultural use.

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Jurij Gulič, Institute for Nature Conservation of the Republic of Slovenia, Department Maribor, Pobreška c. 20/2nd floor, SI-2000 Maribor, Slovenia, jurij.gulic@zrsvn.si.
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Surveys in Caucasian black grouse habitats in Azerbaijan.

Elchin Sultanov

Introduction

The Caucasian black grouse *Tetrao mlokosiewiczi* is classified as a Data Deficient Species and is endemic to the Caucasus region. It is the grouse species with the smallest distribution (about 12,000 sq. km) and highly fragmented range. Total population is believed to be about 70,000 individuals. The species is found in the transition zone between the upper mountain forests and the sub-alpine meadows (1,500 - 3,300 m a.s.l.), using the lower parts in winter. It seems to avoid grazed areas while higher densities are found in hay meadows. The species is found only in the Caucasus and its distribution covers five countries – Russia, Georgia, Azerbaijan, Armenia, Turkey and Iran. About 10-20% of the range and 10-20 % of the individuals are believed to be in Azerbaijan. Some surveys have been carried out, but no regular monitoring takes place and lack of data is one of the main problems. No data for the last 40 years for Lesser Caucasus area at the border of Azerbaijan exists, and absence of an Action Plan for this species prevent for more conservation activity in this species.

Field work

The field work was carried out in Dashkesan, Khanlar (including Goygol State Reserve, future National park), Shahbuz and Ordubad districts of Nakhchivan Autonomic Republic. Most of the field work was conducted during May-August of 2005, but Goygol State reserve was investigated in august 2004 too (Table 1).

Table 1. Area and date of field work, and number of birds censused. Close to 150 km^2 were surveyed. The mean density of birds was close to 1.6/km^2

Site	Date	Team	Leks (males/birds)
Khanlar district. Goygol State Reserve, Dashkesan district	16-22.08 2004	Elchin Sultanov Nigar Agayeva Shahin Isayev Turkan Abbasova	20-25 birds (verbal inf.)
Khanlar, Dashkesan, Geranboy districts	14-23.05 2005	Tahir Kerimov Shahlar Talibov	10 (39/104) (include birds of first row)
Nakhchivan Autonomic Republic, Ordubad district, Ordubad NP	06-12.06 2005	Tahir Kerimov Arzu Mammadov (local participant)	1-2 (7/19)
Khanlar, Dashkesan, Gadabay districts	21-27.06 2005	Elchin Sultanov Tahir Kerimov Shahlar Talibov	10-12 (36/96)
Khanlar district	06-12.09 2005	Elchin Sultanov Tahir Kerimov Nigar Agayeva Turkan Abbasova	2 birds registered 10-15 (verbal inf.)
Khanlar, Dashkesan, Goranbiy, Gadabay districts	16.08.2004 - 12.09.2005	7 persons	24-25 (88/234)

Caucasian black grouse habitat was surveyed in the area of Maralgol Lake on the territory of Goygol State Reserve. It was birch forest at the elevation of 1900-2000m. According to information from workers at the reserve 20-25 birds occur here and habitats of Caucasian black grouse cover about 1500 ha.

In the Khanlar district, Goygol State Reserve 7 km south of Lake Maralgol at the elevation of 2000-2400 m in the area of Kepez Mountain on the area Galin Gayasi the habitat of Caucasian black grouse was surveyed. It consists of birch forest and bushes of Rhododendron, Juniper and meadows of Festuka. Three males were counted on the lek. At a lek close to lake Ayigyol in an area of birch forest 2 males were found.

Caucasian black grouse habitat in Goygol State Reserve

Overgrazing by livestock in Dashkesan Districtş.

Around the village Ezgilli north along the river Kurekchay at Gelingayasi, at the elevation of 2000-2200 m in an area of birch forest with bushes of Rhododendron and Juniper a lek with 1 male was located. Close to the village Dastafurn at an elevation of 1900-2000 m at the site Tozlug with birch forest 5 males of Caucasian black grouse were registered at a lek. Around village Zinzahal 5 km from Dastafur in the same habitat 3-4 males have regular lekking according to local people. Droppings of birds were registered.

In addition to the information from local people 4 lekking males were found close to village Zinzahal at Yagli Chukhur. Five males were found at a lek in the upper part of river Ganjachay around villages Chiragli, Almali and Zivlene. At a lek in Turshsu between Gapagtepe and Astaf along river Goshgarchay 6 males were found. Between villages Chanakhchi and Chiragli along river Ganjachay 6 males were registered. Around villages Gulustan (river Injechay) and Agjakend (river Qarachay) leks with 2-3 birds were found (territory of Geranboy district). All birds were registered at the elevation about 2000-2200 m and above.

Forest which included birch and small trees of juniper with a total area of about 2-3 ha was registered around village Ketam 20 km north-east at the elevation of 2000-2500 m on the slops of mountains Gabagli and Khoshlu. According to local people 5-7 males are regularly found.

Along rivers of Shamkirchay and Kukurdchay birch forests above 1900 m around grazing site Shahmir and south-west of village Astaf at an elevation of about 1600 m along river Gashgachay were surveyed. Fog and rain reduced the possibility of survey of Caucasian black grouse, but according to local citizens and limited field work a few leks occur in this area. One lek normally has 2-4 males.

About 30 km from Astaf at the elevation of 2000-2300 m along river Shamkirchay birch forests around grazing sites Aggaya, Giragirchil, Pirchil, Mollagaya, Ayriboyun, Gyzylpohre and Pirnazar were surveyed. The leks did not have more than 2-4 males and intensive grazing forced Caucasian black grouse to forest areas.

Birch forest south of village Togana were investigated together with local citizen Frizman Hasanov. Birch forest near the border of Armenia was surveyed and 2 birds were found with telescope. According to local people 3-5 males were registered during spring, which gives an estimate of 10-15 birds.

Public participation in the monitoring of Caucasian black grouse

In August of 2004 and May-September 2005 workshops and seminars were held to inform local people about the research. Field guides and a small number of binoculars were distributed. During discussions and training all participants received information about Caucasian black grouse as a rare species included in World Red Data Book, its habits, food and behaviour and most important habitats. The importance of protecting birch trees was pointed out (their cutting is prohibited by government but many people have not information about it), illegality of hunting of this birds and importance of protecting nests during livestock grazing. The most active people were trained in methods of counting and monitoring of Caucasian black grouse. It was recommended to identify leks and count maximum number of males during morning hours. To estimate the total number of birds the same number of females was added and 1/3 of the total number of adult birds as number of young birds was added. Counting of 3 males at a lek gives an estimated population of 8 birds.

The project was frequently in touch with representatives of Ministry of Ecology (Regional office in Ganja, Goygol State Reserve office in Togana, office of Ordubad National Park in Ordubad town of Nakhchivan). In addition information to and consultations with Department of Biodiversity and Protected Areas of Ministry of Ecology and Natural Resources in face of Deputy Head – Eldar Sariyev was done. During implementation of the project and after finishing of field work news agencies and newspapers were informed.

Result of expedition show that inspected area includes about 4-5 leks with each population in 6-12 individuals. Main threats – intensive grazing between May-September which quietly cover breeding period when birds need in nesting sites just in meadows; cutting birch trees because they located just on the upper border of forest for shepherds it is closest source of wood for worming and build temporary dwellings.

Summary of main results

1. Field work showed that Caucasian black grouse still is a common bird in Azerbaijan in typical habitats and elevation for this species.
2. Habitat for Caucasian black grouse in Lesser Caucasus is birch forest and subalpine and alpine meadows at an elevation of 1800-2000 m up to 2500 m. Bush or trees of Juniper occur on the more dry slopes. The connection to birch forest we explain by constant snow cover during the winter at this elevation. Bush of Rhododendron sometimes occurs in habitats of Caucasian black grouse, but its role can not be compared with birch.

3. During long time Caucasian black grouse has been adapted to traditional plain-mountain husbandry, but the population density is 3-4 times lower than in Greater Caucasus where most of the slops are much more steep and conditions for alpine grazing is worse.
4. Main threats for Caucasian black grouse in the Lesser Caucasus are the same as in Greater Caucasus: cutting of birch trees, poaching of birds, disturbance (especially during nesting) by grazing animals and predating from Sheppard dogs. However, grazing is more intensive compared to Greater Caucasus which may result in lower density of birds (about 1.6 ind/km^2 according to preliminary results, compared to 8.9 ind/km^2 in Zagatala State Reserve (Sultanov et al. 2003).
5. Our investigations only covered about 1/4 - 1/6 of total area of Caucasian black grouse in the Lesser Caucasus. So if we extrapolate the number of birds for all the potential habitats of this bird, the population may be estimated to 1000-1500 individuals for Azerbaijan part of Lesser Caucasus.

Recommendations for future action

More data is needed for publication of article. Therefore additional field work is necessary, and monitoring by local working groups has to be organized. For a more exact estimation of the population size of Caucasian black grouse in the Lesser Caucasus area it is necessary to have censuses in the areas that at present are occupied by Armenia. It will be possible after solving of Karabakh conflict between Azerbaijan and Armenia.

Acknowledgements

This project was financially supported by Chicago Zoological Society. It was endorsed by SSC/IUCN group: Crouse Specialist group, Chair - Dr. Ilse Storch. I am very thankful to Dr. Ilse Storch, Chair of Grouse Specialist Group of IUCN, for regular consultations during the project and preparation of final report. Many thanks to all participants in the field: Nigar Agayeva, Shahin Isayev, Turkan Abbasova, Tahir Kerimov, Shahlar Talibov, Tahir Kerimov, Arzu Mammadov. This work would not have been possible without active support from the director of Goygol State Reserve, Bilal Verdiyev, and head of Dashkesan Forest Office of Ministry of Ecology and Natural resources of Azerbaijan, Mahir Sadigov, and all the people of the villages Toganaly, Ezgilli, Chaykand, Dastafur, Zinzahal, Almaly, Astaf, Kotam, Dirnis, and Town Dashkesan for their support during field work.

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Elchin Sultanov, AZ1001, Mukhtarov 13, apt.16, Baku, Azerbaijan, elchin_sultanov@aos.az.

The language is edited by Anne Westerberg

SNIPPETS

Population fragmentation and genetic variation in grouse

Jobs Karl Larson did his dissertation at the Faculty of Science and Technology, Uppsala University, 21 October 2005. Dr. Stuart B. Piertny was opponent and Jacob Höglund his supervisor. Below is the abstract of his thesis.

Abstract.
In this thesis the genetic variation of two grouse species, the Chinese grouse (*Bonasa sewersowi*) and the Black grouse (*Tetrao tetrix*) was examined with neutral genetic markers: microsatellites. Habitat fragmentation and isolation leads to structuring among and loss of genetic variation within populations.

The Chinese grouse in a small population in Lianhuasan nature reserve was found to have undergone a population bottleneck and as a result of isolation and possible inbreeding showed genetic impoverishment hereof.

The Black grouse populations in Europe face various different conditions from widely distributed areas of suitable habitat in the northern and eastern parts of its range to highly naturally and anthropogenically fragmented habitat landscapes in the west.

Structure among populations was found in Great Britain where Wales, Scotland and England showed characteristics of three different genetic entities, indicating very little or no gene flow between these populations.

The Dutch population showed signs of loss of genetic variation as to be expected from a population that has historically decreased in population size from several thousands to tens of individuals in a matter of decades. However the possibility to spot signs of a bottleneck was impaired due to the short time-window in which this can be observed in a population with such a low effective population size (N_e).

The sampled populations in Europe clustered into 5 different groups of genetic identities. The different clusters were: Great Britain-, the Netherlands-, Fenno-Scandian-, Alpine- and lowland German-Austrian populations. The level of genetic variation when compared over all these different populations decreased as a sign of isolation and small N_e. However it was not feasible to separate the impact of these two factors.

Jobs Karl Larsson, Population Biology and Conservation Biology, Dept. of Ecology & Evolution, Evolutionary Biology Centre, Uppsala University, Norbyv. 18D, 752 36 Uppsala,Sweden,
Karl.Larsson@ebc.uu.se

Greater sage-grouse *Centrocercus urophasianus* and sagebrush habitats

Jack Connelly and colleagues Steve Knick, Mike Schroeder and San Stiver recently completed a comprehensive review of greater sage-grouse (*Centrocercus urophasianus*) and sagebrush habitats. The review can be accessed on the Sagemap website (http://sagemap.wr.usgs.gov/) but it is a very large document and downloading it may take some time. This document provides detailed information on virtually all aspects of the species' ecology as well as analysis population trends by state and province. It also examines landscape change within sagebrush-dominated habitats and problems associated with energy development and other anthropogenic disturbances. Because of the limited distribution of this report and the great interest in it, the authors have submitted a proposal for publication of a large portion of the document as a book. The proposal is currently being reviewed by a North American publishing company.

Jack Connelly. Idaho Department of Fish and Game, Blackfoot, Idaho, USA, JCsagegrouse@aol.com.

Black grouse programme in Turkey

Following a meeting in Ankara in mid-November 2005, attended by Ministry of Environment and Forestry Directorate General of Nature Conservation and National Parks staff from throughout north-east Turkey and representatives of the RSPB, the Georgian Centre for the Conservation of Wildlife (GCCW) and Doga Dernegi (DD), and facilitated by BirdLife International, DD has now produced the first draft of the National Species Action Plan for the Caucasian black grouse in Turkey. The draft is being circulated widely for comment, both within Turkey and internationally, before being submitted for formal approval by the Turkish authorities. The principal threats to the species in Turkey are habitat deterioration and fragmentation, especially from the construction of roads into the high mountain areas favoured by the species, associated disturbance, and illegal hunting. There is also a need for a detailed ecological study of the species in order to better understand habitat use throughout the year and to assist in the development of practical habitat management prescriptions.

Geoff Welch, c/o Doga Dernegi, John F Kennedy Cad. 50/19, Kavaklidere, Ankara, Turkey, geoff.welch@rspb.org.uk

Papers for 10th International Grouse Symposium

I received 29 papers for the special issue of Wildlife Biology devoted to the 10th International Grouse Symposium held in Luchon, France last September. All manuscripts have now been sent out for review, which required finding 61 referees. Anticipated publication date of the papers surviving the review process is early 2007.

Laurence N. Ellison, Associate Editor Wildlife Biology, Mas de Dolgue, F-34270 Claret, France, larry.ellison@wanadoo.fr

Re-organizing the GSG

The latest round of re-constitution of the SSC, the Species Survival Commission of the IUCN, and re-invitation of Specialist Group members resulted in 122 registered GSG members from 28 countries. A few members resigned after retirement or change in study species, but most expressed their willingness to continue. The GSG particularly welcomes the new "grousers" who typically join the GSG during a PhD study on grouse.

Ilse Storch, Dept of Wildlife Ecology and Management, Institute of Forest Zoology, College of Forest and Environm. Sciences, Univ. of Freiburg, D-79085 Freiburg, Germany, ilse.storch@wildlife.uni-freiburg.de

Grouse Action Plan revision

During the past 18 months, the IUCN Grouse Action Plan (Storch 2000) (http://www.iucn.org/themes/ssc/actionplans/grouse/contents.pdf) has been updated. The revised Grouse Action Plan will soon be made available on the GSG web site for download. The World Pheasant Association WPA, one of the GSG´s parent organisations, kindly provides some financial support for online publication. The technical side of this task will be mastered by GSG web-editor Michele Loneux.

Ilse Storch, Dept of Wildlife Ecology and Management, Institute of Forest Zoology, College of Forest and Environm. Sciences, Univ. of Freiburg, D-79085 Freiburg, Germany, ilse.storch@wildlife.uni-freiburg.de

GSG profiled in SPECIES

In a special issue of SPECIES, the newsletter of the Species Survival Commission of the IUCN, Specialist Group Chairs were profiled under the heading "Spotlight on SSC´s unsung heros". The GSG and its Chair Ilse Storch was introduced on pages 17-18. Isuue 44 of Species is available online at: http://app.iucn.org/webfiles/doc/SSC/SSCwebsite/Species_/Species44_Web.pdf

Ilse Storch, Dept of Wildlife Ecology and Management, Institute of Forest Zoology, College of Forest and Environm. Sciences, Univ. of Freiburg, D-79085 Freiburg, Germany, ilse.storch@wildlife.uni-freiburg.de

Endangered Species Research- a new multidisciplinary conservation journal

The journal publishes contributions reporting research on all species (and habitats) of conservation concern, whether they be classified as Near Threatened or Threatened (Endangered or Vulnerable) by the International Union for the Conservation of Nature and Natural Resources (IUCN) or highlighted as part of national or regional conservation strategies. Submissions are also welcomed on (among others) the following wider cross-cutting issues and themes pertinent to the conservation of biodiversity: Captive breeding and re-introductions, Sustainable use, Conservation medicine (veterinary), Conservation genetics, Population monitoring, Conservation economics, Restoration ecology, Invasive species, Effects of climate change, Fisheries bycatch, Bushmeat, Biodiversity assessment"
Recent papers include:

Frias-Torres 2006. *Endangered Species Research* Number 1: ***Habitat use of juvenile goliath grouper Epinephelus itajara in the Florida Keys, USA***

Eguchi T, Seminoff JA, Garner SA, Alexander-Garner J, Dutton PH 2006. *Endangered Species Research* Number 2: ***Flipper tagging with archival data recorders for short-term assessment of diving in nesting female turtles***

McGowan A, Broderick AC, Gore S, Hilton G, Woodfield NK, Godley BJ 2006. *Endangered Species Research* Number 3: ***Breeding seabirds in the British Virgin Islands***.

These articles and all other ESR material can be downloaded **free of charge** at the journal website http://www.int-res.com/journals/esr/contents/

Submissions should be via the Managing Editor Penny Khun at esr-submissions@int-res.com or contact me if you would like to discuss anything further. If you would like to receive additional updates about contents to ESR you can subscribe for e-mail updates by sending a message to: esr-contents-subscribe@int-res.com containing the text "SUBSCRIBE esr-contents".

Brendan J. Godley, Marine Turtle Research Group, Centre for Ecology & Conservation, School of Biosciences, University of Exeter, Cornwall Campus, Penryn TR10 9EZ, UK, bgodley@seaturtle.org.

2006 IUCN Red List of Threatened Species

The recent version of the IUCN Red List was published on 4 May 2006 and is available at http://www.redlist.org/. The revision brought no changes in the conservation assessment of the grouse as compared to the 2004 IUCN Red List. As in 2004, the Gunnison sage grouse is listed as Endangered, greater prairie chicken and lesser prairie chicken as Vulnerable, Caucasian black grouse one as Data Deficient and Chinese grouse, Siberian grouse, and greater sage grouse as Near Threatened. This most recent assessment confirmed the deterioration of the grouse situation after 2000, when none of the grouse was considered Threatened according to IUCN criteria.

Ilse Storch, Chair Grouse Specialist Group
Department of Wildlife Ecology and Management, Institute of Forest Zoology, College of Forest and Environm. Sciences, Univ. of Freiburg, D-79085 Freiburg, Germany, ilse.storch@wildlife.uni-freiburg.de