GROUSE NEWS

Newsletter of the WPA/BirdLife/Species Survival Commission Grouse Specialist Group

Issue 28 *November 2004*

Contents

Editorial

In autumn 2005 the 10th International Grouse Symposium will be held in the Pyrenees in France hosted by Emmanuel Menoni and his colleagues. So you should start planning for this event to be sure you may be able to attend this conference. Emmanuel Menoni has sent out the first circular. Deadline for returning this first pre-registration is 31st December. I hope very many of you will register and attend the conference in France.

In this issue you will find information on a study visit to a hazel grouse area in France. In Conservation News there is information on capercaillie in France, Caucasian black grouse in Azerbaijan, and increase in the capercaillie population in Scotland is found. Further, there are research reports on ruffed grouse in the Appalachian Mountains region in USA and on Caucasian black grouse genetics and also genetic studies on capercaillie in Finland. Reports on Cantabrian capercaillie in Spain and hazel grouse in France are also found. Under the heading Snippets you will find information on the next WPA grouse conference and WPA galliform genetic group. There is also information of a new book on blue grouse.

We are still waiting for contributions from the Far East. There should be much interesting research on grouse from China, Japan and other countries in that area. I believe many grouse people would be interested in having some news from that part of the grouse range.

Issue 29 of GN for next spring is planned to be a special issue covering different aspects of grouse hunting depending on the interest. Themes may be how/under what circumstances grouse hunting can be sustainable or the importance of grouse hunting in social and/or economic context. Should we hunt grouse at all or protect all the species all over. Also hunting legislation in different parts of the world could be of interest. Your ideas and contributions are welcome.

Anne Westerberg has edited the language of some of the articles.

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From the Chair

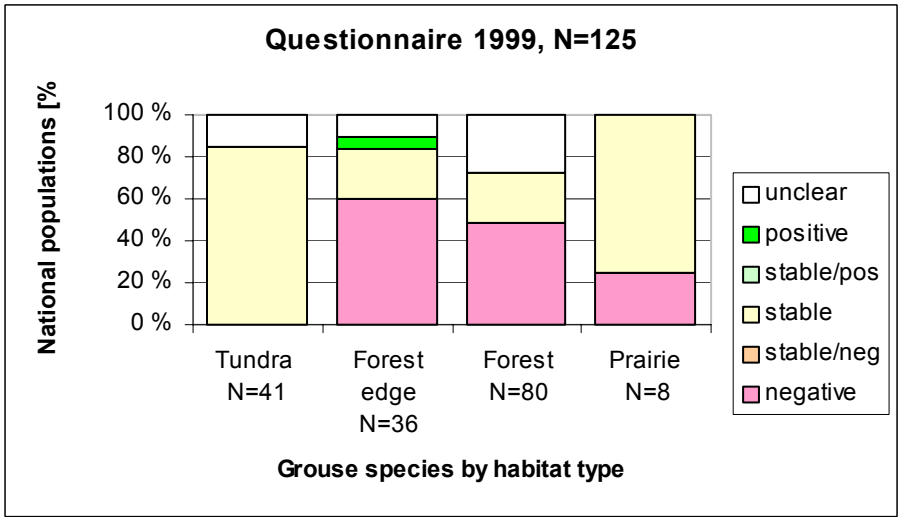
As I explained in early summer in issue 27 of GN, the Grouse Specialist Group is in the process of revising the IUCN Grouse Action Plan. The first issue was published in the year 2000 for the period 2000-2004; the update is due in 2005 and will cover the years 2005-2009. The approach is similar to the first Action Plan: A species-by-country questionnaire is circulated among grouse specialist group members and other biologists and conservationists knowledgeable about grouse. Where such direct contacts are lacking, conservation agencies and ornithological organizations (such as national BirdLife partners) are contacted for information. Thanks to the many of you who have taken your time to revise grouse population and conservation status information.

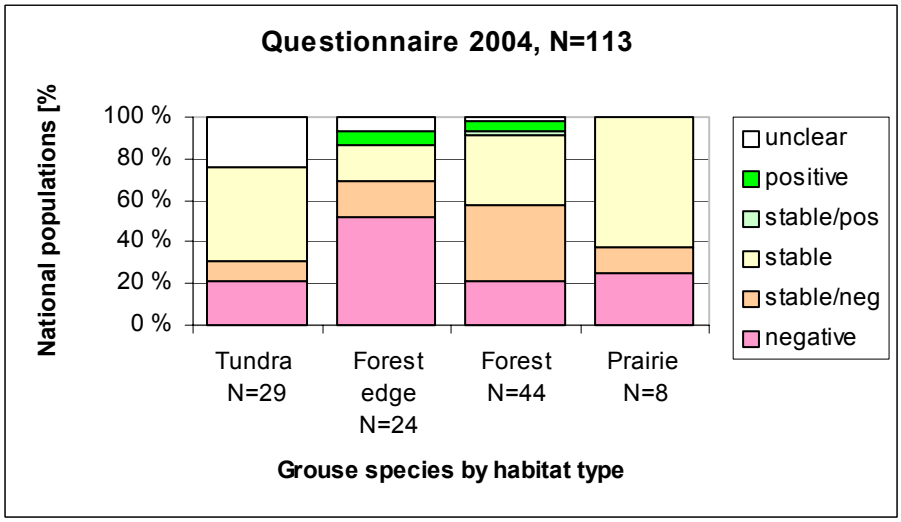
The 18 species of grouse occur in 52 countries and account for 166 species-by-country questionnaires to be sent out and filled in. Reliable contacts exist in about two thirds of the grouse countries - others are more difficult. For the first Grouse Action Plan in 1999, 125 of 165 possible species-by-country questionnaires were returned. Today (1 October 2004), I have counted 113. For some countries it is difficult to find contacts; for others, emails keep returning, "recipient unknown"; some people do not respond. The "difficult" countries of 2004 appear to be: Albania, Bosnia/Herzegovina, Bulgaria, Greece, Hungary, Iceland, Kazakhstan, Kyrgyztan, Lithuania, Mongolia, North Korea, Serbia/Montenegro, Tajikistan, Ukraine (*if you can help with contacts, please let me know*). But also: Italy (!), Finland (!!).

Compared to the results of the 125 (of 165 possible) questionnaires from 1999, the first 113 (of 166 possible) species-by-country questionnaires returned so far suggest the following (see figures):

- The overall negative trend of grouse populations worldwide is continuing (>50% of national populations declining)
- Information or at lest concern about grouse population trends is increasing (proportion of national populations with "unknown" trends reduced from 20% in 1999 to <10% in 2004).
- Increasing awareness of declines in the tundra grouse (*Lagopus spp*.). Proportion of national populations with reported negative trend increased from zero to 30% since 1999.
- There is still reason for hope. Increasing regional and national populations have been reported from several countries for hazel grouse and black grouse, and also for capercaillie in Scotland. The latter

may partly be due to favorable weather during the past few years, but would not have been possible without the efforts of our Scottish colleagues Robert Moss, Kenny Kortland, and others, and the large-scale conservation measures they brought on the way.





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NEWS FROM GSG

Hazel grouse meeting in Auzet (France) 19 – 23 April 2004

Patrick Leonard and Marc Montadert

The hazel grouse meeting in Auzet

A study of hazel grouse is being carried out in France by the Office National de la Chasse et de la Faune Sauvage in the Alpes de Haute-Provence. Most studies are being conducted on the commune of Auzet, a small village situated about 30 km north of Digne les Bains in the South-eastern French Alps. Auzet is close to the southern limit of the distribution range of hazel grouse in France. The investigation, part of a European programme "Objectif 2", is entitled: "Management for biodiversity in mountain forests: the example of the hazel grouse". The four main sponsors are the European Union, the regional council of Provence Alpes Côte d'Azur, the department of Alpes de Haute-Provence and the O.N.C.F.S. The principal objectives are the following:

- Follow the changing distribution of the species.
- Study its demography and habitat relationships.
- Establish demonstration sites showing favourable silvicultural and pastoral practices.
- Determine whether the hazel grouse is an indicator species.
- Provide technical training to wildlife managers.
- Promote conservation of natural resources through public information and education.

A visit to the study area was organized by Patrick Leonard and Marc Montadert for interested researchers during 3 days from 19 to 23 April, 2004. The hazel grouse colonized the area rather recently (about 30 years ago). The population density of hazel grouse is high (at least 5 to 7 pairs per 100 ha) and young forests characterize the habitat. The commune of Auzet covers an area of 3,550 ha. Hazel grouse occupy about 1,600 ha comprised of four main forest habitats.

Programme of the visit

During the 3 days, 45 delegates, including 10 researchers from countries outside France, participated in the field trips or attended the talks and discussions. The first day was devoted to an excursion to the mountain passes of Fanget, Fissac and Peyronnière. Hazel grouse and their signs (singing, dropping, tracks) were quickly found, thus showing the exceptional abundance of the species in the habitats of the southern French Alps. Methods of capture were discussed, for example the nets and calls used in spring and autumn, and the walk-in cages employed in summer for trapping broods. At the end of the day, the following talks were presented:

- Ilse Storch (Germany): "Status and conservation of hazel grouse worldwide: an overview".
- Patrick Leonard (France): "Hazel grouse Programme".
- Marc. Montadert (France): "First results of hazel grouse population study in the South-eastern French Alps".

During the morning of the second day, one group visited the beech groves of Pinée, while a second group toured "Les Clues de Barles" (a geological curiosity) and met with local inhabitants. The afternoon was reserved for the presentation of the following talks:

- Siegfried Klaus (Germany): "Thirty years monitoring of a hazel grouse (*Bonasa bonasia*) population in the Bohemian Forest (Czech Republic)".
- Markus Handschuh (Germany): "The suitability of young forest stands on former windthrow areas in the northern Black Forest as habitat for the hazel grouse: a comparison with forest stands inhabited by hazel grouse in the southern Vosges Mountains".
- Torstein Storaas (Norway): "The work on the hazel grouse in Norway".
- Michèle Loneux (Belgium): "Situation of hazel grouse populations and habitats in Belgium".
- Jean Jacques Pfeffer (France): "A comparison between potential and occupied hazel grouse biotopes in the Vosges".
- Jacob Höglund (Sweden): "Conservation and genetic studies of grouse".
- Jonas Sahlsten (Sweden): "Graph theory applied to a fragmented landscape".

Finally, the third day was highlighted by a visit to mountains around "le col du Gyp", Vallée of Ubaye. The hazel grouse is also present in this valley, located in the northern part of the department of the Alpes de Haute-Provence, at the edge of the Mercantour National Park. During our hike, we traversed an area where rock partridge are counted in spring using tape-recorded calls of cocks, as part of a national monitoring scheme. Rock partridge were heard calling, and several were seen, along with ibex and a

bearded vulture. This area has been recently recolonised by wolves originating from Italy. The day ended with the following presentations:
- Ariane Bernard-Laurent (France): "Demographic traits of rock partridge populations in the Southern French Alps."
- C. Duchamp (France): "About wolf expansion in France".

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Language edited by Anne Westerberg.

CONSERVATION NEWS

Decline halted in Scottish capercaillie

Kenny Kortland

The third national winter survey of capercaillie in Scotland has indicated that the population decline has been halted and that the number of birds has increased to nearly 2000 individuals, from approximately 1000 in 1998/99 (table 1). Recent significant conservation action and more favourable weather conditions for breeding between 2001 and 2003 are thought to explain the positive result.

Although the 2003/04 estimate is not significantly greater than that of 1998/99, it does suggest that the population has at least been stabilised for the time being and may even have increased to some extent. This is supported by evidence from lek counts, which have shown an overall increase of 7% per year between 2002 and 2004. However, these counts should be treated with caution because improved knowledge of lek sites has led to better counting of leks in 2004.

Table 1. Nnational surveys of capercaillie in Scotland.

Year	Count (Cocks and hens)	95% confidence limits
2003/04	1980	1284 – 2758
1998/99	1073	549 – 2041
1993/94	2200	1500 – 3200

National survey methodology

The capercaillie range in Scotland was stratified into two layers based on the most up-to-date knowledge: a primary stratum where capercaillie were known to have been present recently (since 2000) and a secondary stratum of woodland for which there were no recent reports, but where capercaillie were known to have been present within living memory. Within these two strata, transects were selected using a regular grid pattern with a higher intensity of sampling within the higher strata, where most birds were believed to be present.

Estimates of capercaillie density within the two strata were produced from sightings made by the surveyors while walking transects (using DISTANCE methods) and then extrapolated to produce an overall population estimate. Six fieldworkers worked for five months, surveying 643 2km-long transects.

Regional differences, genetic analyses and conservation implications

There were major differences in the number of birds recorded in the national survey in the different areas of Scotland. This is again corroborated by lek survey work throughout Scotland. The majority of birds in Scotland are now located in Strathspey. Table 2 illustrates the differences in the number of birds seen per km of transect in the different areas.

Table 2. Regional breakdown of national survey results.

	Total area primary strata (km^2)	Total area secondary strata (km^2)	No. of transects surveyed	No. Capercaillie recorded	Birds/km transect surveyed
Badenoch & Strathspey	246	16	152	80	0.263
Deeside & Donside	105	299	107	13	0.061
Moray coast & Easter Ross	304	371	227	24	0.053
Tayside & the Trossachs	164	611	157	3	0.009

Capercaillie in Scotland are distributed in six discrete subpopulations within the four regions in table 2. An ongoing project investigating the population genetic structure of capercaillie in Scotland has shown that these six subpopulations are genetically distinct with low levels of gene flow.

The results of the national survey, lek surveys and the ongoing genetics work are being used to guide future efforts for this species in Scotland. Conservation action is now being focussed on linking the separate subpopulations by improving habitat in strategically located woodlands. Formal, large-scale plans are being developed to manage capercaillie at the landscape scale – this depends upon the cooperation of private foresters and state foresters. The involvement of the state forestry agency (Forestry Commission Scotland) is crucial and they are now managing fourteen of their forests (over 12,000ha) with capercaillie as a high priority.

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Conservation of Caucasian black grouse in Azerbaijan

Elchin Sultanov

Introduction

The Caucasian black grouse is classified as a Data Deficient Species and is endemic to the Caucasus region. It is the grouse species with the smallest (about 12,000 sq. km) and highly fragmented distribution. The 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 six 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. Caucasian back grouse is a species of which very little research has been carried out because habitats at the elevation 2000-2500 m are not easily accessible for the scientists. Bad weather conditions at the habitats also have an influence on this. Lack of data the last 40 years for Lesser Caucasus at the border of Azerbaijan, and absence of an Action Plan for Caucasian black grouse prevents a more energetic conservation activity for this species.

Project description

The project will take place at 2 pilot sites, Dashkesan and Klhanlar districts. The following activities are proposed to achieve the goals:

Receiving data about current status of Caucasian black grouse at the Lesser Caucasus in Azerbaijan, generalization of collected information for Greater and Lesser Caucasus and preparation of an Action Plan for the species in Azerbaijan. Experienced researchers of Azerbaijan Ornithological Society will conduct fieldwork. Dr. Elchin Sultanov, chairman of Azerbaijan Ornithological Society and head of ornithological laboratory of National Azerbaijan Academy of Sciences, will be the team leader. During the breeding season 6-8 leks will be observed to identify habitat requirements and number of species in selected areas. Extrapolation will allow estimation of the current number of Caucasian black grouse in the Azerbaijan part of Lesser Caucasus. On the basis of the results an Action Plan for Caucasian black grouse will be prepared and presented at the final round table discussions at the end of the project.

A public awareness campaign will be started. The following educational material prepared in beforehand will be distributed among target audience: (a) a brochure, describing status and importance of high mountain ecosystems of the Caucasus, conservation approaches with international experiences, and Caucasian black grouse and its role in maintenance of the ecosystems; (b) a poster with similar content; (c) popular articles in local and central news-papers.

The materials will be distributed during meetings and workshops organized under the second activity. Target groups are resource users and managers, local governments, NGOs, mass media, protected areas, educational organizations and donors.

Public participation in the monitoring and management of pilot areas will be important. The stakeholders identification process will be carried out at each site and the working groups will be established with several purposes: (a) to carry out basic inventory work to assess the current status of the species and its habitats, (b) to initiate the areas management planning process, (c) to initiate the monitoring, and (d) to establish new community based organizations for implementation of management plan and monitoring. Workshops (one in each site) and training-seminars (two in each site) will be organized for these groups. Round table discussions about project results will be organized.

Importance of the project will be 1. organization of field researches at the Lesser Caucasus in borders of Azerbaijan. 2. involvements of local communities in conservation activity for this species. 3. promotions for conservation of Caucasian black grouse in Azerbaijan.

Outcomes of the project

1. Receiving of new data about distribution and number of Caucasian black grouse in Lesser Caucasus.
2. Generalization of all data for Azerbaijan.
3. Increased knowledge about Caucasian black grouse between local people.
4. Preparation of an Action Plan for Caucasian black grouse on the basis of collected information.

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Talk with chairman of hunters association of Dashkesan district

Talk close to big forest in this district

Birch tree habitat of CBG in Goy-gol reserve.

Development of the reintroduced capercaillie population in the Parc national des Cévennes

Christian Nappée and Guillaume Douhéret

Introduction

In April 1999, in Grouse News No. 17, we presented the case of the capercaillie in the Parc national des Cévennes in the south of the Massif Central, after three centuries of absence there. The purpose of this reintroduction attempt, which was unique in France, was not only to re-establish this bird in a part of its former range, but also to fill the biggest existing gap in its present distribution in Europe i.e. a distance of 430 km between the Jura and Pyrénées.

Between 1978 and 1994, more than 600 birds, all from the PNC's breeding station, were released into the wild. It should be noted that the main mountain ranges of the PNC zone, that is to say the Mont Lozère, the Bougès, Fontmort and the Aigoual, contain 8,000 ha of habitat at altitudes of over 1,000m, which are reasonably suitable for capercaillie. In addition, there are over 10,000 ha of young stands, which could become favourable within the next thirty years.

In 1994, it was decided to suspend the releases for a few years in order to investigate the neo-population's own dynamics in more detail. Since 1987, counts and other methods of follow-up have enabled us to establish a minimum number of birds present in summer (MNS) and to observe the development of our small population in each mountain area.

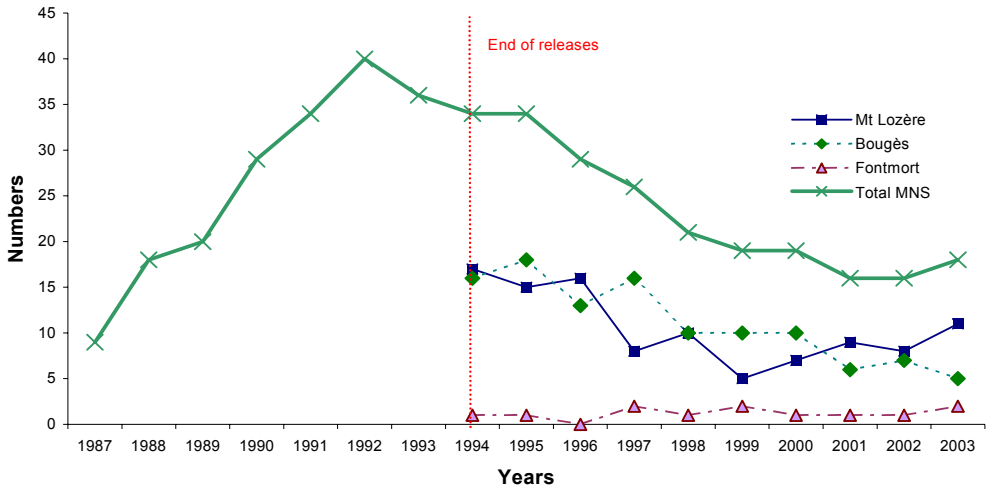

Figure 1. Development of the number of adult capercaillie in each mountain massif (from MNS).

The development of the minimum number present in summer between 1994 and 2004 indicates a gradual decrease in the small neo-population (Figure 1). An annual decrease of 9% of this minimum summer number can be estimated, which more or less equates to the demographic changes of some declining spontaneous populations in western Europe (Scotland, the Cordillera Cantabrica, the Vosges and the Black Forest).

Limiting factors

The limiting factors that affect the demography of the Cévennes neo-population are probably the same as those that are generally observed:

Sylvicultural methods which are often fairly inappropriate for habitat conservation.

Intense predation by fox and pine marten. (Another important predator could be wild boar, which is a potential clutch predator).

High density of ungulates (red deer, roe deer and wild boar) leading to damage of the lower forest vegetation layers, encouraging landowners to erect protective fences which prove fatal to capercaillie.

Increased disturbance from recreational activities in forest land and particularly by mushroom-picking at a time of year when capercaillie need to be able to feed undisturbed on ground vegetation to build up their physiological reserves before the onset of winter.

The change of the climate towards mild, windy winters followed by cold, rainy springs.

Dispersal

One limiting factor more specific to the Cévennes' neo-population is that of dispersal. During the period of releases from 1978 to 1994, capercaillie were observed many kilometres from release points indicating that captive-bred birds are able to migrate over long distances. This behaviour might have been attributed to an ethological perturbation affecting captive-bred birds, had this dispersal not also been observed in the case of wild-born capercaillie.

Since 1994, more than fifty observations of capercaillie, involving at least 29 different individuals known to be wild birds, were recorded far from the reintroduction area (Table 1). Probably, the observations, which have been reported, testify to only a part of the phenomenon. The most numerous and longest migrations were towards the north where vast areas of potential habitat occur in the Margeride, the Cantal, the Vivarais and even the Forez. Towards the south, the farthest point reached was Lingas Mountain, to the south of the Aigoual chain. Towards the west (the Causses) and east (Cévennes valleys) the national park is bordered by land insufficiently high to be suitable for capercaillie. Nevertheless, a few observations of erratic individuals have been made. The dispersion polygon for these 29 birds covers 11,400 square kilometres.

Table 1. Observations of wild capercaillie after 1994 at different distances from the reintroduction area in Parc national des Cévennes in the south of the Massif Central.

Distance between neo-population and individuals	Direction	Areas	Number of observations	Years	Number of individuals	
					cocks	hens
8 km	N	Le Goulet	≥ 2	1995 - 1996 – 1997	1	
10 km	NE	Le Goulet Malanèche	≥ 3	1998 - 2000 - 2001 – 2002	1	1
15 km	NO	Charpal	≥ 7	1997 - 1998 – 2000	1	1
15 km	ENE	Roujanel	≥ 2	2002 – 2004	1	
16 km	NE	La Molette	≥ 4	1995 – 1999	2	1
18 km	NE	Mercoire	≥ 5	1995 - 1999 – 2001	1	1
20 km	ONO	Boulaine	1	2000	1	
22 km	S	Aigoual nord	9	1998 – 1999 2002 à 2004	2	1
25 km	O	Causse Méjean	1	2002		1
26 km	ESE	St Martin de Valgalgues	1	1996		1
28 km	NE	Pratauberat	1	1998	1	
31 km	N	La Borie	1	1999	1	
32 km	N	Croix de Bor	2	1995	1	
35 km	S	Les Pises	6	1995 à 2004	3	1
35 km	NE	Tanargue	4	1995 - 2000 – 2004		2
100 km	NO	Plomb du Cantal	≥ 5	2001 – 2002	1	
140 km	NNE	Forez	≥ 3	1996 – 1997	1	
		Total	≥ 57		18	11

It may be inferred from these observations, that a small population of 20 to 30 adult birds with moderate, or even poor, fecundity (Ri = 0.54 young per hen according to our estimations) is able to produce a minimum of 2.9 young migrants each year. It may also be noted from the same observations that the number of migrating cocks is higher than that of hens, which is the reverse of the normal situation and so does not correspond to the usual philopatry of cocks of this species. This paradox is probably

explained by the fact that hens are more secretive than cocks and also are less easily identified by inexperienced observers.

In the case of the Cévennes, as there are no other populations in the region, the loss is not offset by immigration and inclines us to favour a geographical extension of release operations to favourable zones where migrants have sometimes survived for several years.

In this way, a viable population could gradually be built up in the Massif Central. At present, while regional partners likely to be interested in such a project are being sought, the PNC has decided to reinforce the declining neo-population by new releases in order to offset geographical and genetic loss.

New release

Twenty-four captive-bred capercaillie were sourced in Austria and released between December 2002 and September 2004. Radio-tracking studies indicate a survival rate similar to previous releases (20 to 30 % after 6 months and only about 10% a year after release. The five surviving birds have not been counted in the MNS which concerns only the population established from releases before 1994). Such a survival rate seems low, but should enable a small population to be maintained until the demographic trend is reversed concurrent with the aging of forest stands and the adoption of more sustainable forestry practices.

Indeed, one of the positive outcomes of this reintroduction has been to establish a dialogue between foresters and the PNC with a view to managing forest land in a way more suitable for capercaillie and for biodiversity in general.

Conclusion

If the reintroduction of capercaillie in the Cévennes cannot, at present, be considered a success, neither has it failed. (Since 1999 the sub-population on the Mont Lozère has even shown signs of increase). As habitat improvement is probably the most decisive factor, this reintroduction project should be considered in the long term, since the effects of favourable sylviculture appear only gradually over decades.

Thanks to its judicial, financial, technical and scientific means, the Parc national des Cévennes ought to offer a suitable infrastructure in which to elaborate and apply management which prioritizes the conservation of a species which so aptly illustrates the objective of sustainable development.

Timber merchants and farmers (seeking to recover lost pasturelands recolonized by pine trees) are not, of course, in favour of the comeback of this species, which would hamper their activities. Let us hope then that society and more especially custodians of the environment such as conservation biologists manifest their support for this project in a more pragmatic and determined way.

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Language edited by Anne Westerberg.

RESEARCH REPORTS

Testing existing markers for studying genetic variability in Caucasian black grouse (*Tetrao mlokosiewiczi*) – a pilot study

Gernot Segelbacher and Ilse Storch

The Caucasian black grouse is considered as threatened (national red data books and data deficient (IUCN 2003)). The full extent of the distribution of the species is unknown, but most likely the range is fragmented into distinct populations. Genetic information can be used to provide important information for conservation planning. From genetic markers, one can infer if populations are isolated or connected among each othe, and thus identify functional units based on the spatial genetic structure of populations (Segelbacher et al. 2003). Molecular tools have already been developed to study these questions in capercaillie (Segelbacher et al. 2000) and black grouse (Piertney and Höglund 2001). I tested the suitability of these markers in Caucasian black grouse to assess if we could use them for genetic analyses and implement genetic tools in ongoing management and research plans.

Moulted feathers were collected in three different areas of the distribution range (Armenia, Tsakhkuniats mountains; Azerbaijan, Sudur; Georgia, Kasbegi) in 2002 and 2003. Genomic DNA was extracted from a circa 1 cm segment at the root end of feathers using the DNeasy Tissue Kit (Qiagen) as described by Segelbacher (2002). Individual samples were genotyped at 11 tetranucleotide microsatellite loci (Tut 1, Tut 2, Tut 3, Tut 4, BG 10, BG 12, Bg 15, Bg 16, BG 18, BG 19, Bg 20) and PCR amplifications and genotyping were conducted as described elsewhere (Segelbacher 2002, Piertney and Höglund 2001). PCR fragments were separated by electrophoresis on 6 % denaturing polyacrylamide gels using an automated sequencer ABI377. All unique genotypes were used for the subsequent analysis, when at least 7 loci could be typed per individual. As all feathers could not be genotyped due to DNA degradation (Segelbacher 2002), the overall number of individuals analysed is smaller than the number of feathers sampled. I obtained genotypes for 12 individuals.

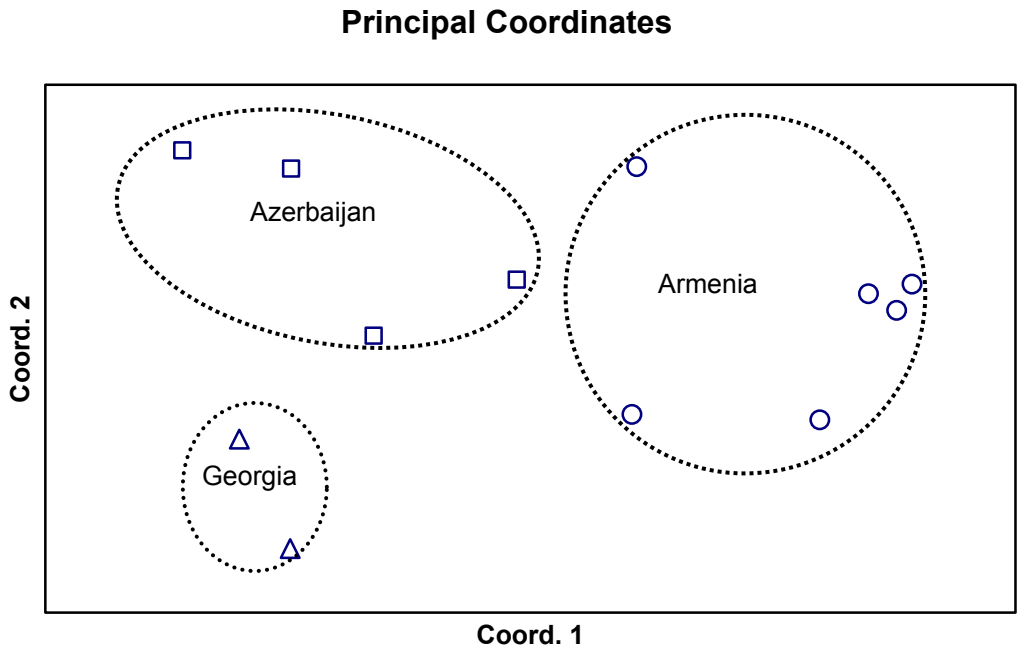

Figure 1. Principal component analysis scores of Caucasian black grouse microsatellite genotypes sampled at three different sites (Armenia, Azerbaijan, Georgia) plotted at the two first axes of a PCA.

Genetic variability and number of alleles was high at all genotyped loci, indicating that these loci could be used for a more thorough study of this endangered species. I found between 2 and 6 alleles per locus in 12 individuals and the mean number of alleles per locus was 4.27. Observed heterozygosity was 0.64 and expected heterozygosity 0.67 for all 12 individuals. Genetic diversity in Caucasian black grouse therefore appears to be similar to that of black grouse within the Alpine metapopulation system analysed by the same set of microsatellite loci (Segelbacher unpublished). Individual genotypes were ordinated in a multidimensional scale by principal component analysis (GenaiXL (Peakan and Smouse (2001)) (Figure 1). Plotting of the individuals of the three different sample sites showed a clear separation of the birds of each population. This may result from the geographic distance between the sites sampled even if the range was contiguous, but may also point to fully isolated populations that lost contact due to habitat fragmentation some time in recent history.

I conclude that genetic analyses in the Caucasian black grouse could be performed using the existing set of microsatellite loci. Genetic information about Caucasian black grouse could be especially helpful to study dispersal and connectivity in this species. Genetic information should be considered in conservation planning to identify management units and assist in captive breeding programs.

Feathers have kindly been provided by J. Etzold, S.Klaus and K. Manvelyan.

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No clear mitochondrial DNA structure in the capercaillie (*Tetrao urogallus*) population in Finland

Tuija Liukkonen

Habitat specialist species have strict requirements for their environments, resulting from a limited ability or propensity to disperse. Isolation may cause formation of local genetically diverged subpopulations. Boreal forests are naturally fragmented by bogs and mires, but also by human impact, for instance clear-cuttings in forests. Of historical reasons, after World War II, forestry in Finland and the NW Russia (Karelia) has differed. When small-scale forestry and agriculture dominated in Karelia they were mechanised to a higher degree in Finland. This difference can be seen as richer fauna in Russian Karelia and Finnish areas next to the border in comparison to remaining Finland. The area between NW Russia and NE Finland may maintain high genetic diversity resulting from large forests and conservation areas across the border.

In Finland, the distribution of the capercaillie follows that of Scots pine (*Pinus sylvestris*) from the southern coast to Lapland in the north. The distribution range is broad but also fragmented. Forests in southern Finland are fragmented to a higher degree than forests in the north. In the south only small patches of optimal habitats exist, isolated from each other by human land use. The capercaillie is assumed a highly sedentary species, and resulting from this forest fragmentation caused by modern forestry can split up populations into small isolated subpopulations. Such small groups may exhibit less genetic variation and suffer from inbreeding effects. Population decline in the capercaillie in Finland has been approximately 70 % since the World War II. This decline has most probably resulted from loss and fragmentation of habitats. The species is still a legal game in Finland, but also classified as near threatened.

The definition of taxonomic units (populations, species or subspecies) is difficult, because there is an evolutionary continuum leading from one to another. Subspecies can be defined as geographically aggregated local populations that differ taxonomically from other subdivisions of the species. Subspecies richness is reported to be high in sedentary species. Opposite results have been obtained on the genetic variation and the subspecies recognition. Subspecies of the grey partridge (*Perdix perdix*), rock ptarmigan (*Lagopus mutus*), wild turkey (*Meleagris gallopavo*) and rock partridge (*Alectoris graeca*) have distinct mitochondrial DNAs. In contrast, morphological divisions and genetics are not comparable, for example, in the sage grouse (*Centrocercus urophasianus*) or in the willow tit (*Parus montanus*).

The Finnish capercaillie is assumed to have three subspecies, *T. u. urogallus* in northern and *T. u. uralensis* in central Finland, and the capercaillie from the southern parts of the country is said to have characteristics of *T. u. major*. This classification is based on plumage colouring, body size, wing shape and skull dimensions. Further, the Finnish capercaillie is divided into two subspecies and a hybrid group by their lekking song structure. The subspecies of capercaillie have also been assumed to represent well-differentiated taxonomical entities based on allozymes. A hybrid zone between *T. u. urogallus* and *T. u. uralensis* is assumed to exist across Central Finland.

What does mitochondrial DNA tell about the present population structure of the Finnish capercaillie? Do we have three subspecies in Finland? Is there a north-south cline in the population structure? I compared the genetic structure of the suggested capercaillie subspecies zones in Finland, as well as subpopulations from southern and northern parts of the country.

A total of 302 samples from capercaillie were collected for this study. Hunters collected most of the samples, tissues or feathers, during the legal hunting season in 1995 – 2003. For details of DNA extraction, PCR amplification of the mtDNA control region 1 and sequencing see Liukkonen-Anttila *et al*. (2004). The data were divided into three subspecies zones, "urogallus" in the north, "uralensis" in central Finland, and "major" in the south. A hybrid zone was designed between "urogallus" and "uralensis" according to literature. The data were also divided into 18 subpopulations, of which seven were used for statistical analyses ($n \geq 10$). Three of these subpopulations were from NE Finland, one from NW Finland, seven from the central parts of the country and seven from the south.

One major haplotype covered 45 % of all capercaillie and it was present in every subspecies zone and subpopulation. Additional 52 haplotypes were found, of which five were common. The northernmost subspecies zone "urogallus" was differentiated from the zones "uralensis" and "major" based on Φ_{ST}s. This most probably resulted from the highly diverse NE Finnish population “Kuusamo”. However, the most common haplotype was also found in this population. According to our results the population was more or less continuous throughout the country.

Low nucleotide and high haplotype diversities, as well as negative Tajima's D values found in each zone may indicate that the Finnish capercaillie population has experienced a bottleneck in the past and expanded thereafter. The analysis of molecular variance showed that 98.0 % of the total variance was explained by the variation within zones and only 2.0 % by the variation between zones. Between-population variation explained 99.5 % of the total variance. Gene flow estimates (number of female migrants per generation) showed that gene flow between zones and between subpopulations have occurred.

In this study I could not find any clear concordance between the subspecies' ranges and the mitochondrial DNA. All four groups birds representing the most common haplotype were found. This kind of pattern may result from recent divergence of subspecies, present gene flow, or both. In the case of the capercaillie, the pattern most probably resulted from present gene flow. Does this mean that we don't have three subspecies? Several studies suggest that we have, but several non-scientific observations suggest that the variation we see in capercaillie is variation between individuals and not necessarily between subspecies.

The mean density of the capercaillie is similar in conservation areas both in the northern and in the southern parts of the country. The gene flow between populations - both directly and indirectly generation-by-generation - could have effectively homogenised differences at the neutral mtDNA marker. Gene flow between populations may have spread genes over longer distances than the dispersal ability of the species might predict. Extensive female-mediated gene flow can have prevented mtDNA divergence and the level of between-populations gene flow has been sufficient in the past to maintain a certain level of panmixia. Similar results are obtained from the Fennoscandian willow tit, another sedentary bird species, which is associated with boreal coniferous forests. Although several haplotypes were found in all four subspecies zones of capercaillie, it is more likely that migration has occurred than that these haplotypes have evolved by parallel mutations.

Of historical reasons the human impact on the taiga habitats in Finland and the NW Russia has been deviant. Rare species and species of old-growth forests are more abundant in Karelia than in Finland. Due to this, the taiga fauna in Fennoscandia is presumed dependent on the condition of the forests in Russia

and on the connectivity across the border between Russia and Finland. In the present study, I particularly found the "Kuusamo" population next to Russian border to be diverse. In addition to common haplotypes, this population consisted of several unique haplotypes as well, which were closely related to each other. It is possible, that the broad conservation areas in NE Finland and NW Russia have preserved high genetic variation. It is known that the capercaillie density is significantly higher in eastern conservation areas in comparison to western areas in Finland. This pattern may be an evidence of gene flow across the border from Russian Karelia, where the genetic diversity may be higher because of extensive population sizes resulting from large suitable habitats.

According to my results, effects of isolation and loss of genetic diversity did not appear in the mtDNA among subpopulations from southern and northern Finland. Thus this marker may not be suitable for detecting recent changes in the population structure. My results show that the capercaillie population in Finland has been more or less continuous throughout the country in the past. However, this may be an ancient pattern and the situation is most probably worse at the moment. Anyway, if we look down on Finland from an aircraft window we understand why this pattern is possible. There are no barriers that an animal with wings could not cross. More information is still needed about the modern genetic structure of the Finnish capercaillie population, and microsatellite data analysis will be completed by the end of this year.

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First results of a hazel grouse population study in the south-eastern French Alps

Marc Montadert and Patrick Leonard

Study area

The studies are being conducted mainly in the commune of Auzet, a small village situated about 30 km north of Digne les Bains in the South-eastern French Alps. Auzet is close to the southern limit of the distribution range of hazel grouse in France. The species colonized the area rather recently (about 30 years ago); the density of hazel grouse is high (at least 5 to 7 pairs per 100 ha) and young forests characterize the habitat.

The commune of Auzet covers an area of 3,550 ha. Hazel grouse occupy about 1,600 ha comprised of four main forest habitats:

- Forests grazed by cattle in summer. These are mostly dense young stands of Scots pine and spruce, with a few deciduous trees like hawthorn, rowan and willow. Examples: sites of Fissac and la Peyronnière.
- Pure beech forests and beech mixed with fir plantations. Example: La Pinée.
- Abandoned farmland colonized by coppices of hazel and hawthorn, as well as by woodlands of oak and pine. Example: Chargerie.
- Forests that include many age classes and comprise of a rich mixture of oak, Scots pine, fir, spruce, beech, maple, birch, willow, rowan, hazel and hawthorn. Example: Sansenu.

The climate is subjected to both Mediterranean and alpine influences. The average annual precipitation is 908 mm and the average annual temperature is 7°C, with 185 days of sub-zero temperatures. Rainfall and snowfall are characterized by their violence and their irregularity. The average number of days with snowfall is 20.

The history of hazel grouse range expansion in the South-eastern French Alps

In general, the various populations of hazel grouse in France are declining or at best stable (Magnani *et al*. 1991, Magnani 1993). However, the populations established in the Southern Alps at the southwestern limit of the European range of the species, seem to be expanding (Deloche and Magnani 2002). This situation provides the unique opportunity to study the dynamics of an increasing population. In contrast,

most recent work has been done in Western Europe in declining or stable populations (Ledant 1992, Lieser 1994, Kämpfer-Lauenstein 1995, Desbrosses 1997).

Initially, we sought to reconstitute the history of the colonization of the southern Alps by consulting the literature. The distribution of the species in France in the 1950s is well known thanks to work of (Couturier 1964). This author does not mention the species being present in the three departments of the southern Alps (Alpes de Haute-Provence, our site of study, Var and the Alpes Maritimes). He fixes the southern limit of the distribution at approximately 40 km northwest of our study area. Given that the southern limit of the currently occupied range is 50 km south of our study area, the colonization front must have progressed about 90 km in the last fifty years.

However, the hazel grouse is a discrete species and it is possible that it went unperceived. Thus, we sought to obtain additional evidence from the people who hunted or trapped various species of birds after the Second World War. The additional information gained from this inquiry allowed us to reconstruct the history of range expansion.

Although anecdotal evidence seems to show that hazel grouse were present on our study area in the 1950s, suggesting that Couturier had underestimated the extent of the range, the species apparently only became firmly established in and around the study area in the late 1960s and early 1970s. This establishment was followed by colonization of the valley of Haut-Verdon in the early 1990s. Currently, we are setting up a network of observers to follow the future evolution of this population, in particular to detect the possible presence of birds in the department of Alpes Maritîmes where there are thousands of hectares of potentially favourable forests. Unconfirmed observations have been reported in this department since the 1990s.

The southern expansion of the range of hazel grouse is probably related to the history of forests in the area. The analysis of old maps (maps by Cassini of the end of 18th century and official maps from the end of the 19th century) shows that deforestation started in the 12th century and by the beginning of the 19th century had reached a level probably incompatible with the maintenance of viable populations of hazel grouse. An analysis carried out on more than 20,000 ha in the Alpes de Haute Provence shows that today forests cover about 50% of the area, whereas two centuries ago it was about 18% on our study area and less than 10% on two other sectors. Regrowth of forests at the end of the 19th century resulted from an exodus of the rural population and reforestation campaigns.

The origin of the actual hazel grouse population remains unknown. Our simple enquiries do not allow us to distinguish between two possibilities: colonization from the populations of the northern Alps or development of small remnant populations that passed unnoticed after deforestation. A comparison of the genetic structure of the various existing populations could perhaps shed some light on the question.

Present hazel grouse density in the study site

I tried to assess the present spring density in two parts of the study site by gathering data from radio-tagged birds and by direct observation of non-tagged pairs during 4 successive years. I assumed that density was stable during this period. The mapping of spring home ranges of radio-tagged birds and localisation of non-tagged, but regularly observed, pairs was carried out in two forests (300 ha and 150 ha) in the study area. In each forest, the estimate of absolute density was 7 pairs/100 ha. This estimate could be slightly conservative owing to the regular presence of several unmated males. Data on spring hazel grouse densities in the literature give large variation in densities, from less than 1 pair/100 ha to 15 pairs/100 ha (Dronneau 1984). High densities of 10 pairs/100 ha or more, are only known from Northern European countries like Finland (Pakkala et al. 1983) or Poland (Wiesner *et al.* 1977). Usually in Central and Western Europe, the highest densities in optimal habitat are around 4 pairs/100 ha, for example in the Jura Mountains of Switzerland (Zbinden 1979). So the present density in the South-eastern French Alps appears to be relatively high.

Demographic traits of radio-tagged hazel grouse population

To investigate demographic parameters, we equipped 71 hazel grouse with radio-collar transmitters between 1998 and 2001. The birds were captured in spring and autumn during the singing period by luring them into nylon fishing nets with a whistle. During these years we set up the net 526 times; on 250 occasions had 1 or 2 - 3 hazel grouse close to the net, and made only 73 successful captures (two birds were not tagged). The success rate was therefore 14% (73/526). We present here a summary of the main results, which have been published in the proceedings of the last grouse symposium. (Montadert and Léonard 2003).

Annual survival rate of radio-tagged adult males was 72 %, and of adult females 60%. We could not detect a significant difference in survival between the sexes. However, the sample size was small for females, and their survival estimate must be considered with caution. Nevertheless, we have documented a difference in seasonal mortality between the sexes. Male mortality occurred mainly during the leafless

period (November to April) whereas females died mainly during the reproductive season from May to July. The female mortality occurred during the pre-breeding period, during incubation (2 hens were killed on their nest) and when hens were accompanied by broods (2 cases). It was revealing to see that those females who lost their eggs precociously (during egg laying), did not subsequently die in summer. The survival rate was also calculated for juveniles from September to mid-June. We could not see any difference in survival between adults and juveniles (two sexes pooled) during this period, even though some juveniles undertake extensive movements between September and June. Causes of mortality were approximately equally partitioned between raptors and mammals.

The reproductive performance of the hazel grouse population seemed quiet modest, with a mean age ratio of 34% as measured by drive-counts in summer (Table 1), similar to the means recorded in two other populations in the Jura Mountains of France. The reproductive rate of the radio-tagged hens was very variable between years, with a peak in 2000, when all 5 hens raised young.

Table 1. Reproduction parameters of radio-tagged hazel grouse.

Size of first clutch	7.4	(n = 10)
Size of second clutch	3.5	(n = 2)
Rate of nest success (first clutch)	58 %	(n = 16)
Hatching success	91 % (97 % with exclusion of one untypical nest)	
Hens renesting	40 %	(n = 5)
Survival of 15-20 days old chicks	66 %	
Survival of full growth chicks	34 %	
Number of juveniles per hen	1.4	
Summer age ratio calculated with drive count method	34 %	

To summarize, our survival estimate appeared surprisingly high for a small galliform. The demographic parameters obtained from radio-tagged birds suggested an increasing population (growth rate = 1.15, deterministic model with two age classes of females). This positive growth rate can probably be explained mostly by high survival rates of adults and juveniles (> 3 months old) living in a well-structured forest habitat, which reduces mortality from predators.

Sex ratio of spring population

Its is well known that in hazel grouse the sex ratio is skewed in favour of males (Swenson and Fujimaki 1994). In our population, we assessed the sex ratio in spring prior to egg-laying by checking for the presence of females near radio-tagged males. Each male was flushed one or 3 times to check the presence of another bird close to him. Because no solitary females were observed in spring we postulated that all solitary radio-tagged males represented a surplus for which no females were available. Taking into account the bias resulting from the fact that solitary yearling males are easier to capture in spring, we have estimated that 21% of males were supernumerary, leading to a sex ratio of 1.26. There was a possibility, but no statistical evidence, that adult males had a higher probability than yearlings of being paired.

We also investigated the link between this empirical measurement of the sex ratio and the demographic parameters of this population. We implemented a simple deterministic population model with two sexes, two age-specific survival rates and an equal sex ratio at birth, to see if the estimated survival and reproductive rates of radio-tagged hazel grouse would lead to the observed sex ratio. This model gave a sex ratio of 1.22 or 18% solitary males, which is very close to our empirical estimate. So the lower survival rate of hens can explain the skewed adult sex ratio.

Dispersal distance of juvenile hazel grouse

Another important demographic trait is the extent and pattern of natal dispersal. This aspect is poorly known for hazel grouse owing to the scarcity of radio-tracking studies (Swenson 1991). The available data on natal dispersal distances from ringing studies are underestimated because long-distance dispersers have a low probability of being recaptured. We studied natal dispersal of juvenile hazel grouse by following postnatal movements of radio-tagged juveniles from brood break-up in September to the following spring.

The main result is that some juvenile males disperse long distances, with a mean dispersal distance of 4 km (n = 12) and a maximum of 25 km, which is much further than previously known for this species. Due to low sample size of hens we cannot detect any difference in dispersal distance between sexes (mean dispersal distance of hens 2 km, n = 4).

Dispersal movements were undertaken mostly in autumn from October to the beginning of December, but one third of the males continued to move in spring, mainly in March-April. We also caught 4 juvenile males (yearlings) in spring, of which 2 had not finished their spring dispersal. They subsequently settled (on 18 April) at 1 and 5 km from their capture site. This spring dispersal was not observed for females, neither for those captured in autumn nor for 2 other females caught in early spring. Long movements were clearly associated with the dispersal phase of juveniles and were almost never noticed for adults. In fact, mean distance between centres of autumn and spring home ranges of adults was only 150 m for males and 180 m for females, and most autumn and spring home ranges of adults overlapped. Nevertheless we noticed two exceptions. One adult male made erratic movements from late autumn to 15 March before finally settling down 790 m from his autumn capture site. A second male, about 9 months old when captured in April, undertook erratic movements in August and September and then settled in September 1.07 km from his spring home range.

These preliminary data on natal dispersal of hazel grouse present a different picture of dispersal abilities from that previously reported on the literature. However, we need more data on female dispersal. If females turn out to disperse less than males it would have important consequences for population dynamics in fragmented habitats. It would also be an unusual trait for a tetraonid species since in grouse, females usually disperse further than males (Caizergues and Ellison 2002).

Home range dimensions

During our four years of work, we have radio-tracked birds throughout the year, with 1 localisation per week in winter and 2 to 3 localisations per week the rest of the year. This allowed us to measure the size of seasonal and annual home ranges (Table 2). An ANOVA implemented with sex, age, season and site as independent variables and home range dimension as the dependent variable showed no effect of sex but a significant effect of season, with winter home range being bigger than other seasonal home ranges. There was also an age effect, with juvenile home range (first winter and first spring) being larger than adult home range

A similar analysis restricted to males revealed that mating status had an effect, but independently of age, with solitary males having bigger spring home ranges than paired males. For females, the reproductive status in summer was also important, with summer range of hens accompanied by broods bigger than that of non-reproductive females.

Table 2. Comparison of seasonal and annual home ranges of male and female radio-tagged hazel grouse calculated with Kernel estimator (K) and Minimum Convex Polygon (MCP). The numbers of individual home ranges are indicated in brackets.

	Adult male K	Adult female K		Adult male MCP	Adult female MCP	
Spring	19.1 (31)*	21.9 (17)		11.2*	13.8	
Summer	22.6 (35)	55.2 (8)**	20.6 (4) ***	14.3	32**	15***
Autumn	27.1 (38)	20.3 (8)		15.7	10.6	
Winter	41 (30)	40.1 (7)		24.5	22	
Annual	38.6 (27)	30.7 (6)		47.2	44.2	

* Mated males, ** females with brood, *** females without brood.

In spring home ranges of adjacent pairs overlapped partially. We did not observe significant changes in occupation of the space from one season to another, if movements by certain unmated males in spring and those of females accompanied by a brood were excluded. The successive seasonal home ranges overlapped, that of winter including the others. These results are comparable with the data obtained in Sweden (Swenson and Danielsen 1995). On the other hand, in the Black Forest, in less favourable habitats (single-layered structure), a seasonal change of ranges was observed (Lieser *et al*. 1995).

In summer, we observed that females with broods developed two types of spacing behaviour. Some of the females (N = 6) occupied a clearly defined core area of about 30 ha, whereas others (N = 2) were much more mobile, sometimes moving more than 1 km from the nest site (Fig. 1). Whatever the type of movement, the nest was always established within the limits of the spring range, but the brood range in

summer was established outside the spring range. The order of magnitude of the annual home range size (40 ha) conformed to the space requirements already suggested for this species (Swenson 1995).

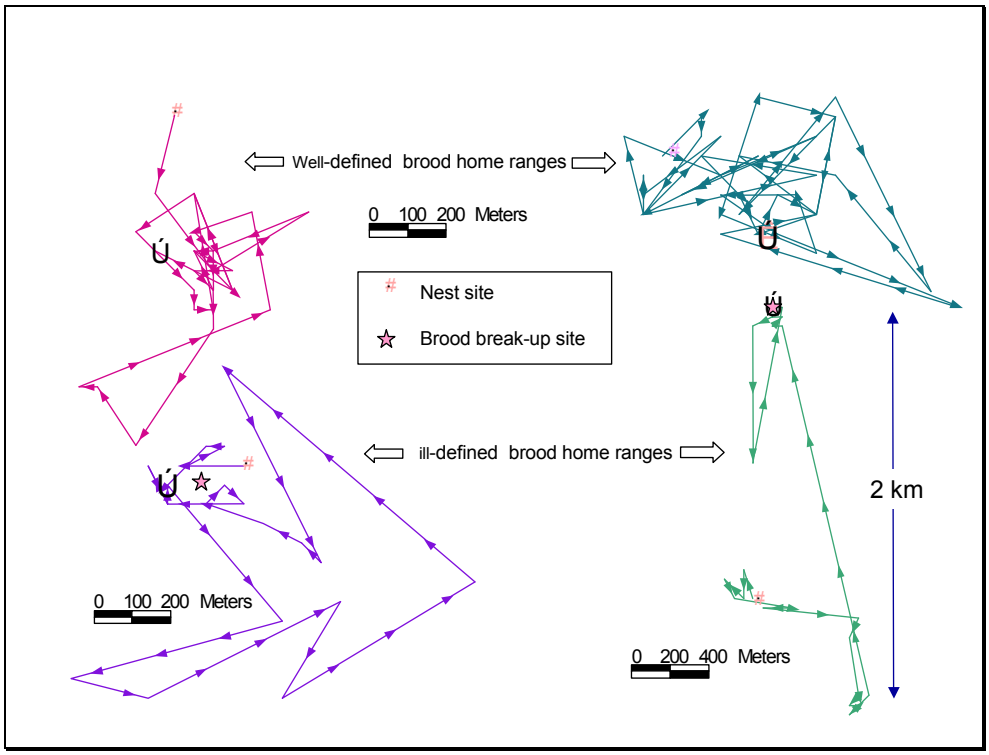

Figure 1. Movement patterns of hazel grouse broods

Conclusion

We have presented part of the information collected in the course of the telemetry study undertaken from 1998 to 2001. Two other themes were not discussed here, habitat selection and the development of a method for monitoring populations. These topics will be treated in a doctoral thesis to be presented at the University of Franche-Comté in 2005. In addition, a new programme "Objectif 2" begun in 2003 should make it possible to fill in the gaps concerning adult and juvenile females (survival, space behaviour, post-natal dispersal). During the next 3 years we will therefore concentrate our capture efforts on females.

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Conservation of the Cantabrian capercaillie (*Tetrao urogallus cantabricus*): A challenge at the edge of the species distribution

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At the edge of the species distribution and close to extinction, the Cantabrian capercaillie (*Tetrao urogallus cantabricus*, (Castroviejo 1967, del Hoyo et al. 1994) is the only subspecies of capercaillie that qualifies to be listed as endangered, according to IUCN Red List Categories (Storch 2000). Located in the Cantabrian Mountains (NW Spain) at the southwestern border of the species distribution, this grouse species is isolated from its nearest neighbours of the Pyrenees by more than 300 km, occupying an area smaller than 2000 km^2.

The Spanish Ministry of Environment recently funded a project with the aim of providing wildlife managers and foresters with the tools to understand and eventually halt the population decline of the Cantabrian capercaillie. The main outcomes of this project were recently compiled in a book (Obeso and Bañuelos 2003) that intends to be an updated reference of the status of this bird, and a starting point for a management strategy. The project was cooperation between the universities of Cantabria and Oviedo, and the regional environmental administrations of all the provinces where capercaillie is present. This made it possible to cover the whole geographic range of the subspecies as the study area, without any limitation caused by administrative boundaries. This project was presented in Grouse News a few years ago, when all we had were the questions we aimed to answer (Obeso 2000). Here we sum up some of the answers of those questions. Some are actual outcomes of the original project; others were achieved in other parallel projects, either finished or still running in our research group.

What does the habitat of the Cantabrian capercaillie look like?

Most of the knowledge of capercaillie ecology comes from central and northern European populations, where the species is considered a habitat specialist linked to old conifer forest (Rolstad and Wegge 1987a, Picozzi et al. 1992). However, evergreen forests are nearly absent from the habitat of the Cantabrian capercaillie. At the border of the eurosiberian climate, this grouse inhabits some of the more southwestern beech (*Fagus sylvatica*) and oak (*Quercus petraea* and *Q. pyrenaica*) forests, in a landscape where limestone and siliceous soils are crisscrossed by steep cliffs, ravines and rocky peaks. A few conifer reforestations (mainly Scots Pine *Pinus sylvestris*) add up to the forested habitat in the region. These forests are mostly semi-natural, with a long history of human use. Forest cover becomes scarce above 1500 m in the area, where moors (e.g. *Vaccinium myrtillus* L., *Juniperus communis* L., *Arctostaphylos uva-ursii* L.) and sub-alpine meadows start to dominate the vegetation. It is a fragmented landscape where forest patches are surrounded by a matrix that may greatly vary in its vagility or quality as food and shelter, thus affecting the response to habitat fragmentation both at the individual and population scales (Vandermeer and Carvajal 2001). Using field surveys throughout the year, we assessed the use of the habitat by capercaillie (Obeso et al. 2001). Beech forest was the main feature in the habitat, being intensely used especially during spring and summer. This intensive use coincides with the mating and chick-rearing periods, and with the peak in the production of beech buds, leaves, bilberry and understory herbs. But also heathers, meadows, and brooms were used throughout the year, and especially during the winter, probably to supplement the low protein diet on beech buds and the low productivity of the understory with resources from outside the forest. The non-forested habitats may also be used as refuge or as corridors between patches in the fragmented landscape, since many of the plants from these areas were not found in the diet of Cantabrian capercaillie (Rodríguez and Obeso 2000).

Change in numbers and lek occupation during the last two decades

The last census of capercaillie leks showed a dramatic decline of 50% the last two decades to about 300 males (Obeso et al. 2003). Local extinctions, especially at the edge of the distribution area and at lower altitudes, have reduced both the number of males and the distribution of the population. Also the Cantabrian capercaillie has almost disappeared from the central part of its range and, if the trend continues, the population could soon be cut in two subpopulations too small to survive according to the minimum viable population estimates for the species (Grimm and Storch 2000).

It seems that the bottleneck in the population dynamics of this subspecies is the extremely low juvenile production rate (0.37 ± 0.30; N = 9). A population model developed for the Cantabrian capercaillie indicates that the probability of extinction for the subspecies before 2020 is quite high (0.2) if the factors causing the decline persist.

Limiting factors for Cantabrian populations

The capercaillie has declined throughout its range (Storch 2000), indicating that there must be some global factors involved. Climatic change has been put forward as one of the potential causes (Moss et al. 2001), and this could play an important role for a boreal species at the southern edge of its distribution, where it is restricted to mountainous areas. However, the steep decline observed in this part of the range, particularly acute in some areas, indicates that there must be some local factors in addition to the negative effect of the global factors as suggested below.

Habitat loss and fragmentation

The forested area is about 22% of the landscape, which is lower than 30-50% described for other temperate and boreal forests (Mladenoff et al. 1993, Löfman and Kouki 2001). The habitat is highly fragmented, with less than 1.5% of the forest patches larger than 100 hectares and more than 55% smaller than 1 hectare (García et al. 2004). The tree species composition of the forests does not seem to be a limiting factor for the existence of the capercaillie, since all available forest types is between 700 and 1700m altitude are used. However, capercaillie remains in bigger forest patches, and it has vanished from those located in areas closer to forest edges and from forests close to the edge of the range, suggesting that fragmentation is playing a role in the population dynamics. Negative effects of fragmentation on the breeding success of grouse have been found also in areas where available habitat is much larger, as documented for the Finnish populations of *T. urogallus* and *T. tetrix* (Kurki et al. 2000).

The structure of the forest in forest patches also plays an important role fro the presence of capercaillie, as it does in more northern populations (Picozzi et al. 1992, Swenson and Angelstam 1993). We have found lower density of trees in display grounds still occupied. This suggests a preference for forest patches with an open structure like other European populations, making it more easy for a big bird to fly (Rolstad and Wegge 1987b, Gjerde 1991, Storch 1993), but may also be related to the light requirements of bilberry (*Vaccinium myrtillus*) development. Bilberry was found to be more abundant in

places where the grouse is still present, emphasising the importance of this key resource that provides shelter and food for both adults and chicks (Storch 1993, Baines et al.1996, Selås 2000).

Predation and competition

In addition to habitat loss, other indirect effects may be important in a fragmented habitat (Andrén 1994, Fahrig 1998). Competition with ungulates may be important (Pimm and Askins 1995). However, a definitive conclusion about the relationship between the competition with ungulates and capercaillie decline cannot be found in this study although there are some indications that ungulates could play a role. We found that bilberry cover is lower at the leks closer to forest edges, although edge areas and open forests provide better conditions for bilberry growth. This could be related to a stronger herbivore pressure in edges and in smaller fragments, causing a reduction on the otherwise higher bilberry cover.

Nest predation may be higher in a fragmented habitat, because generalist predators are more abundant in edges (Kurki et al. 1997, Bátary and Báldi 2004). Moreover, Storaas et al. (1999) found that even with the same predator abundance, the effect on chicks was much higher in fragmented habitats. Our results are not yet conclusive, and additional information is collected to analyze the relationship between the production of juveniles and the predator abundance combined with landscape structure.

Ongoing and future research lines

We have developed a habitat model that assigns a suitability index to the habitat of the Cantabrian capercaillie (Quevedo and Obeso 2002). The model was developed using GIS techniques and a logistic regression to integrate forest and matrix availability, their composition, topography and variables related to human disturbance. Overall we obtained relatively low values of habitat suitability. The few, high quality areas are not well connected, which has important implications in terms of the species conservation. This habitat suitability model will be complemented with a demographic, spatially explicit model. The later is part of an ongoing project carried out by the University of Oviedo and the Doñana Biological Station (EBD, CSIC). We expect these models to be useful tools to determine source and sink areas, connectivity among subpopulations, or areas which should be preferentially protected.

The information we have so far suggests that conservation should at first be focused in the few remaining big forest fragments in the area, independently of the tree species composition. Further, isolation of those fragments should be avoided, and growth of bilberry should be favoured in those areas, mainly by avoiding ungulate overgrazing. Detailed information about the seasonal movements and dispersal abilities of this subspecies, the relationship between predation, habitat and breeding success, and the quality of the non-forestal matrix are our priorities for research to have a better basis for the management of capercaillie in the Cantabrian range.

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Ruffed grouse research and management in the Appalachian region: The Appalachian Cooperative Grouse Research Project

Patrick K. Devers

The ruffed grouse (*Bonasa umbellus*) is the most widely distributed and possibly the most popular gamebird in North America. Ruffed grouse are distributed from Alaska across central and southern Canada and the northern United States to the Atlantic Coast, south into the central Rocky Mountains and Appalachian Mountains. Its distribution overlaps with that of aspen (*Populus* spp.), except in the central and southern Appalachians. Throughout the range of the ruffed grouse young aspen forests are considered to provide optimal habitat. Limited research conducted in the Appalachian region suggested ruffed grouse ecology and management differed greatly between the core of the species range (The Great Lakes region and southern Canada) and the central Appalachians due at least in part to the absence of aspen.

Over the past 15-20 years wildlife managers, researchers and hunters have become increasingly concerned about the effects of hunting on ruffed grouse populations, particularly in the Appalachian

region. In the Appalachian Mountains, the majority of harvest is suspected to occur between December and February, after the end of the juvenile dispersal period. Yet, little research has directly investigated the effects of regulated sport harvest on ruffed grouse populations.

The Appalachian Cooperative Grouse Research Project (ACGRP) was a 6-year research effort initiated in fall of 1996 to investigate the apparent decline of ruffed grouse in the Appalachian region. Cooperators included the US Fish and Wildlife Service, U.S. Forest Service, Mead/Westvaco Corporation, the Richard King Mellon Foundation, the Ruffed Grouse Society, and state natural resources agencies in Kentucky, Maryland, Ohio, Virginia, West Virginia, Pennsylvania, Rhode Island, and North Carolina, and departments of wildlife sciences or biology at Eastern Kentucky University, University of Tennessee, West Virginia University, California University of Pennsylvania, Fordham University, University of Rhode Island, and Virginia Tech. Prior to the initiation of the ACGRP, ruffed grouse management in the Appalachian region was based on research conducted in the northern United States and Canada. The goal of the ACGRP was to investigate ruffed grouse ecology in the Appalachian region and provide information necessary for the successful management of the region's ruffed grouse. The objectives of the ACGRP were:

1. Estimate survival and identify factors influencing survival,
2. Estimate reproductive effort and factors influencing reproduction,
3. Determine if harvest mortality is compensatory or additive,
4. Evaluate habitat selection and quality.

The cooperative nature of the ACGRP resulted in one of the largest ruffed grouse research projects ever conducted. During the course of the 6-year project, 3,118 ruffed grouse were captured on 12 study areas in 8 states. Ruffed grouse were fitted with radio collars and tracked ≥ 2 times per week allowing ACGRP researchers to collect data on survival, cause-specific mortality factors, reproductive effort and success, and habitat selection.

The task of addressing the objectives of the ACGRP fell to graduate students at Virginia Tech, West Virginia University, California University of Pennsylvania, University of Tennessee, Fordham University, University of Rhode Island, and Eastern Kentucky University. To date 9 graduate projects (8 M.S.'s and 1 Ph.D.) have been completed and 5 graduate students (1 M.S. and 4 Ph.D.'s) are in the final stages of their programs. We anticipate the last graduate project will be completed in late 2005. Several manuscripts resulting from the early work of the ACGRP have been published in peer-reviewed journals (see below) and several are in the review process. Still, we anticipate submitting additional manuscripts as the final graduate projects are completed. We recently submitted a final report entitled "Ruffed grouse ecology and management in the Appalachian region" to our funding agencies summarizing the main findings of the ACGRP. Parties interested in receiving a PDF version of the final report should contact me at pdevers@vt.edu. Additionally, ACGRP personnel are developing plans to write a semi-technical book for biologists, managers, and the public covering ruffed grouse ecology, management, and hunting in the Appalachian region.

My contribution to the ACGRP is to investigate ruffed grouse population ecology and the effects of hunting on population dynamics. I anticipate completing my dissertation entitled "Ruffed grouse population ecology and the effects of hunting in the Appalachian region" by December 2004 and submitting manuscripts for publication in early 2005. Preliminary results indicate ruffed grouse population dynamics differ greatly between the Appalachian region and the core of the species range. Ruffed grouse productivity was lower and adult survival was higher in the Appalachian region compared to published rates from the core of ruffed grouse range. Within the Appalachian region, population dynamics differed between study areas dominated by oak-hickory and mixed-mesophytic forests. Productivity (i.e., nest rate, nest success, clutch size, and chick survival) was lower in oak-hickory forests than in mixed-mesophytic forests. In contrast, adult survival was higher in oak-hickory forests than in mixed-mesophytic forests. Harvest in the Appalachian region was lower than published rates form the core of ruffed grouse range and appears to have little effect on ruffed grouse populations in the Appalachian region.

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BOOKS REVIEWS

Zwickel, F.C. and Bendell, J.F. 2004. Blue Grouse: Their Biology and Natural History

Fred Zwickel and Jim Bendell have followed up 5 decades of research on blue grouse (*Dendragapus obscurus*) with a book dealing with its biology and natural history. The book examines in detail many of the topics studied by Zwickel and Bendell, as well as their numerous students. These topics include taxonomy, evolution, morphology, habitat selection, food habits, reproduction, and territoriality. The book also includes an examination of the relationships between behavior, predation, disease, and habitat on the population dynamics of blue grouse.

Although most of the research for the book was done in western Canada on Vancouver and Hardwick islands, the authors also conducted research in other parts of the range including (but not limited to) Colorado, Nevada, California, and Washington. The willingness of the authors to challenge paradigms of blue grouse behavior, habitat suitability, and population dynamics with well-designed experiments is one reason why this book has been anticipated for many years. It is clear that this book will be considered an important reference on grouse for many years into the future. The book can be ordered from the National Research Council of Canada Press, or from the following web site: http://pubs.nrc-cnrc.gc.ca/cgi-bin/rp/rp2_book_e?mlist4_561

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SNIPPETS

Xth International Grouse Symposium 26 – 30th september 2005 Bagnères de Luchon, département of the Haute Garonne, (Pyrenees), France

First announcement

Office National de la Chasse et de la Faune Sauvage, and others, are pleased to invite you to the 10th International Grouse Symposium in «Bagnères de Luchon» (commonly called Luchon) in the French Pyrenees (south western France) 26 - 30 September 2005. An excursion will follow the Symposium 1st - 5th October 2005.
The official language will be English.
Abstracts should consist of the title, the author's name and address including E-mail address, and the text should be maximum 50 lines. The abstract should be sent as a Microsoft Word file by E-mail. Instructions for full-length papers will be sent together with a second announcement. Abstracts should be sent to the contact person by no later than 30th Marsh 2005 and will be published before the conference. Those of you who have ideas of workshops should send the ideas to E. Ménoni by e-mail for discussion.
Deadline for pre-registration is 31/12/2004.
Deadline for registration and sending the abstracts is 30/03/2005.
The pre-registration should be sent to the contact person before the 31st December 2004. The second announcement will be sent in January 2005 to those persons who return the pre-registration form. Registration fee will be 250€ (regular fee) or 125€ (student fee).
Contact Persons are Emmanuel Ménoni and Claude Novoa.

Emmanuel Ménoni and Claude Novoa, Office National de la Chasse et de la faune sauvage, Impasse de la Chapelle, 31800 Villeneuve de Rivière, France, Tel: ++33(0)562008100,Fax: ++33(0)562008101, E.menoni@oncfs.gouv. fr, prades@oncfs.gouv.fr

WPA Galliform Genetics Group

During the International Galliformes Symposium in India it was decided that all the people around the world doing Galliform genetics should be given a forum by which they can share ideas and empower each other. The result is that Brant Faircloth, from the University of Georgia, Athens (brant@uga.edu) and I (gbaker@uwc.ac.za) will be coordinating a Galliform Genetic Group. Our plan is to launch a website and to write an on-line newsletter to keep everybody up-to-date. Our objectives are:

- To provide a platform for the discussion of Galliform Genetics.
- To provide open-source access to tried and tested methods.
- To facilitate communication between Galliform geneticists worldwide.

The website will have links to the following:

- GROUP MEMBERS (list of names, email addresses and areas of expertise with links to people's web pages)
- DNA STORAGE AND EXTRACTION (methods that we and other members are willing to share)
- GENETIC MARKERS (data on variability and usefulness of particular markers in Galliforms)
- PRIMERS TESTED (table that includes primer names, seqs, Ta and species amplified)
- PHOTO LIBRARY (un-copyrighted photos and slides for use in presentations)
- EQUIPMENT REVIEW

If you would like to be on the email list or have any material that you would like to submit to the page please contact Brant or me. Thanks.

Gillian Baker, University of the Western Cape, South Africa. gbaker@uwc.ac.za

English-German interpreting and translating services

Brigitte Geddes has completed her BSc degree (BSc Environment & Heritage). Brigitte also holds a BA Hons, has been a Member of the WPA since the 1980s and is a founder member of the highly respected Institute of Translation & Interpreting). Brigitte has 30 years experience as sci-tech translator and conference interpreter in a wide range of areas including water research, game biology, ornithology and now also environmental impact assessments. Rehabilitation of degraded habitats, nature conservation, biodiversity, biosphere reserves, permaculture, ecology, global environmental issues and environmental impact assessments are some of the subjects that Brigitte studied as part of her BSc.
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