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Ecology of the Black Grouse (*Tetrao tetrix*) on the Grünwald Peat Bog in the Krusne Hory Mts. (*)

by

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SUMMARY

The Grünwald heath Nature Reserve is located in the upper parts of the Krusne hory mountains (district of Teplice, NW Bohemia) and is one of the localities in this area where Black Grouse (*Tetrao tetrix*) appear frequently. Grünwald heath is a raised bog covering an area of about 30 ha and is situated at an altitude of 850 m a.s.l. Some parts of this bog were drained in the past to facilitate turf digging. The central part of the bog is partly overgrown with dwarf pine (*Pinus mugo*), and birch (*Betula sp.*). Species such as cotton grass (*Eriophorum vaginatum*), crowberry (*Empetrum nigrum*), bog-blueberry (*Vaccinium uliginosum*), heather (*Calluna vulgaris*) and blueberry (*Vaccinium myrtillus*) dominate in the herb layer. The main bog is surrounded by young stands of substitute tree species, such as blue spruce (*Picea pungens*), birch, dwarf pine, and European green alder (*Alnus viridis*). There are also large uncultivated fields and grasslands in the close vicinity. Since 1997, a complex research program has taken place on the ecological requirements of Black Grouse, including assessment of numbers, distribution, habitat requirements, diet composition, and spatial activity by means of telemetry.

The numbers and distribution of Black Grouse were studied over an area of 25 km^2. There is only one larger common lek, in the open spaces on the Oldrisky vrch hill, where 10 cocks were observed in the spring of 1997, 10-12 cocks in 1998, 10-13 in 1999, and 5-8 in 2000. Individual cocks can be observed displaying in the remaining parts of the park in

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young stands of birch, spruce and alder, and occasionally in meadows. In 1998, a total of 21-23 cocks were observed displaying in the study area, 19-22 in 1999, and 20-22 in the year 2000.

The ranges of Black Grouse were distributed over the main peat bog and in young stands of supplementary tree species throughout the year. Over the period from spring until early autumn they often visited the common lek. Their occurrence was also recorded in a mature beach forest, with abundant rowan (*Sorbus aucuparia*). The telemetric monitoring of 4 marked cocks, direct observations, and traces found, indicated that birch, spruce, or mixed stands, up to 4 m high and with 60% ground cover under the tree layer, were preferred outside the peat bog. The size of the range occupied by individual cocks throughout the year was of about 100 ha. The highest movement of cocks and the largest occupied range was established in early spring (before the displaying season) (ca. 70 ha), whilst the smallest range was established in winter (ca. 10 ha).

The study of diet was based on faecal analyses undertaken in the spring, autumn, and winter periods. The main components of the spring diet were blooms of cotton grass (22%), buds and twigs of blueberry (19%), blades of grasses (19%), and blooms of coltsfoot (*Tussilago farfara*) (11%). Other components represented less than 5% of the diet. In autumn, rowan (39%) and berries and twigs of blueberry (35%) dominated the diet of Black Grouse. Grasses represented only 15%, and birch in 7%, of the diet. In general, birch constituted 83% of the total volume of winter diet, grasses only 10% and blueberry less than 5%. In many cases, however, birch was the only component found in the winter diet.

The research carried out in this area provides valuable information for improved management activities, thereby providing good conditions for the conservation and development of this Black Grouse population. Besides the revitalisation of the peat bog, a main conservation target is to suggest a suitable composition for surrounding secondary tree stands and to ensure enough food. Co-operation with local authorities for nature conservation and forestry, and especially with local inhabitants, is very important for the success of these aims.

Introduction

In the past a large part of the Krusne Hory Mts. was affected by immissions. After the forest ecosystems had disintegrated, suitable conditions developed for the presence of black grouse the numbers of which considerably increased in the course of the 1980s. Although there is a decreasing trend at present the numbers of black grouse maintain on a relatively high level. The numbers of black grouse in the Czech Republic in 2000 was estimated at 800 to 1000 cocks. Of these, more than one third occurs in the Krusne Mts. (STASTNY *et al.*, in press).

Since 1994 a complex research of the ecological requirements of black grouse is under way in the eastern part of the Krusne Hory Mts. In 1998 our attention was concentrated on the Grünwald model area. The main aims of our research included :

- Monitoring the distribution and numbers of black grouse in the study area
- Establishing their topic requirements
- Establishing their diet composition
- Suggesting suitable management.

Study area

The area under study (14 km^2) lies in the top parts of the eastern part of the Krusne Hory Mts. (NW Bohemia, district of Teplice) at about 850 m above sea level. The geological subsoil are mostly metamorphic rocks (gneiss, mica schist, phyllite) and granite porphyres. This poor subsoil is mostly covered with podsols passing into peaty and peaty humose gleic soils (PLIVA & ZLABEK 1986). In climatic respect the region has been classified in category CH 6 (QUITT 1975), showing the following characteristics :

- annnual mean air temperature 3.9 °C
- annnual total precipitation 985 mm
- growing season lasting 110 days.

In that region of the Czech Republic, the most extensive mortality and disintegration of spruce stands occurred in the course of the 1970s. Their removal and subsequent planting of supplementary woody plants, above all, *Picea pungens* and *Betula spp.* was followed by the development of a diverse mosaic of mixed stands, non-planted clearings and numerous previous peat areas. One of such areas is the Grünwald peat bog, forming the centre of our study area (43 ha). In the past, some parts of the peat bog had been drained by a system of deep channels, and peat was extracted in such places. At present these areas are mostly grown with sedges (*Carex spp.*). In the middle of the peat bog there are growths of birch, dense stands of *Pinus mugo* and probably also remains of the indigenous stand of *Pinus rotundata*. The herb layer growing in more dry places is dominated by such species as *Eriophorum vaginatum, Empetrum nigrum, Vaccinium uliginosum, Calluna vulgaris* and *Vaccinium myrtillus*. The peat bog is surrounded by young stands of *Picea pungens, Betula spp., Pinus mugo, Alnus sp., Sorbus aucuparia* and *Larix sp.* where *Calamagrostis villosa* is the dominant species in the herb layer. In close vicinity of the peat bog are extensive meadows which have not been mown until 1999. Another environmental type are remains of mature spruce or beech forest.

Material and Methods

Distribution and numbers

The distribution of black grouse was mapped throughout the year. The model area was systematically walked, recording observed birds as well as traces indicating their presence (such as feathers, faeces, dusting places, footprints). All such observations were entered in the maps.

Since 1988 spring censuses of displaying blackcocks has taken place annually in the study area. They were censused in their gregarious leks but also the so-called soloists (blackcocks displaying individually) were located. The censuses took place in the last decade of April to the second decade of May (depending on weather conditions and the advanced stage of the lek), under participation of several observers, so that the census could take place in the whole area at the same time.

Telemetric monitoring

During the spring lek (end of March to mid-May) the blackcocks were trapped in their gregarious lek on Oldrissky vrch Hill. Spring traps 80 by 80 cm in size were set around a hen serving as bait. In 1998 two hens were used for these purposes but in the subsequent year they were no longer available and were replaced by pheasant hens. This modified method was only successful at the beginning of the lek when wild black grouse hens rarely visited the lek.

Six blackcocks were captured in the course of 3 years (see **Tab. I**). They were wing-tagged, provided with aluminium rings of the National Museum in Prague and equipped with a necklace radio tag 9 g in weight, viable for 11 months and with the signal detectable within a range of around 2 km. The cocks were monitored at intervals of 2-3 weeks throughout the year. The triangulation method was used to locate the cocks (STORCH 1993, FRANCESCHI & MATTEDI 1993, ROLSTADT & WEGGE 1989).

The locations of the cocks were entered in a map. On the basis of these data the sizes of their home ranges in the successive years were determined using the Kämpfer-Lauerstein method. Besides, the all-day activity and distances of the daily movements of the cocks were studied.

Table I. Review of blackcocks captured
Récapitulatif des coqs capturés et marqués

Name of marked blackcock	Start of observation	End of observation	Cause
JURA	May 1998	April 1999	End of radio-tag lifetime
HUGO	April 1999	November 1999	Cock caught by red fox
MILAN	April 1999	October 1999	End of signal
RADEK	May 1999	October 1999	End of signal
KUBA	April 2000	September 2000	Observation continues
OTIK	April 2000	September 2000	Observation continues

Habitat preference

The habitat types preferred were determined using two methods:

Method I

The first method was based on mapping the habitat types in the study area. On the basis of these data, maps showing habitat types, height categories and ground coverage categories were produced using the Arcview 3.0 programme. Combining these maps with data on the occurrence of the cocks within the study area we established the preferred habitats and their individual categories.

Method II

The second method used here was based on telemetric monitoring of six tagged cocks. Data obtained in this way were used to establish seasonal home ranges and, within them, the predominant habitat types. According to the vegetation cover, each of the sites was included in one of three categories, viz., open area, young forest stand, or mature forest stand. The term «open area» denotes an area grown with only herbaceous vegetation, in our case especially the area on Oldrissky vrch Hill, used as a lek in spring and, later in the period of culminating growing season, as a sheltering place and feeding ground. The term «young forest stand» denotes here a mixed stand 1-4 m tall, with 60-70% ground coverage of the shrubby vegetation, consisting chiefly of blue spruce, larch, birch, and rowan. The term «mature forest stand» denotes non-logged islets of older Norway spruce and beech stands.

Diet composition

The diet composition was determined from faecal analyses. Samples containing 15-25 faecal pellets each were collected in successive seasons of the year (spring, autumn, winter). Invariably each sample has a standard volume of 1 ml and is prepared from one or more faecal pellets if possible. Because of the dense and closed herb layer, we did not succeed to collect sufficient material in summer. In all, 100 samples were analysed using the method described by MALKOVA (1996).

Results and Discussion

Numbers and distribution

Two gregarious leks were found in the study area but only one of them has been regularly visited by a larger number of cocks. This place lies in close vicinity of the Grünwald peat bog on Oldrissky vrch Hill. In the last three years the numbers of black grouse appear to be stable. Their total numbers were determined as 21-23 cocks in 1998, 19-22 cocks in 1999, and 25-26 cocks in 2000 (see **Tab. II**). In the first two years the numbers of gregariously and individually displaying cocks were almost equal, gregarious leks rather prevailing. In 2000 only 5-6 cocks were recorded in the gregarious leks, the remaining 20 displaying individually.

Table II. Numbers of blackcocks leks in the Grünwald study area in the years of study
Nombre d'arènes de coqs dans la zone d'étude de Grünwald au cours des années d'étude

Year	Collective lek	Individual lek	TOTAL
1998	10 - 13	10	20 – 23
1999	10 - 13	9	19 – 22
2000	5 - 6	20	25 – 26

The decline of leks is most probably connected with a drop in the numbers of cocks. For example, SIMOVA (1996) reports, from the neighbouring Louèná region, that several gregarious leks existed there still in 1994, regularly visited by a rather large number of cocks. For the lek, the cocks used, above all, cultivated grazing fields for game. However, in the subsequent year the numbers of cocks dropped to almost a half and the collective leks declined. The local grazing plots began to be used only as individual and sporadic leks and the cocks began displaying mainly in young mixed stands of birch and blue spruce. However, this does not explain the situation in the Grünwald study area where the numbers of blackcocks has been almost stable in the past three years and a slight increase was recorded during the spring census. Compared to the preceding years, the level of disturbance (e.g. by hunters, foresters or farmers) was not higher and yet the number of the cocks in the lek decreased.

Telemetry

The tagged cocks did not move very far away from the lek throughout the year. They mainly utilised spaces lying to the south, especially the young forest stands at the northern edge of the Grünwald peat bog. The largest area was inhabited in summer (72 ha on average), followed by that in spring I (67 ha on average), spring II (50 ha on average) and autumn (37 ha on average), see

Tab. III. So far, our data from the winter season are insufficient but those obtained from the cock named Jura suggest that the area inhabited in winter would be smaller (12 ha).

Table III: Sizes of areas inhabited by tagged blackcocks in seasons of the year
Taille des zones occupées par les coqs marqués selon les saisons de l'année

Name	AREA (ha)					
	Spring I	Spring II	Summer	Autumn	Winter	TOTAL
JURA	72	16	54	25	12	104
HUGO	62	38	119	34	X	X
MILAN	X	57	118	41	X	X
RADEK	X	108	90	46	X	X
KUBA	X	51	26	X	X	X
OTIK	X	29	24	X	X	X
Average	**67**	**50**	**72**	**37**	**X**	**X**

(spring I: 16 Mar.-15 Apr., spring II: 16 Apr.- 31 May, summer: 1 Jun-15 Sep., autumn: 16 Sep.-15 Nov., winter 16 Nov.-15 Mar.)
X - no data or insufficient data

The sizes of the spring home ranges of the cocks in the Krusne Hory Mts. were noticeably smaller (16 to 108 ha) than, e.g., in Germany where SCHRÖDER *et al.* (1981) found the local cocks inhabiting, in the course of April and May, ranges of 128 to 356 ha. On the other hand, the summer home ranges in the Krusne hory Mts. (24 to 119 ha) correspond to those measured in Belgium 25 to 70 ha, KLAUS *et al.* 1990) and are still somewhat larger than, e.g., in Norway (19 to 43 ha, ROLSTAD *et al.* 1985). In autumn, our cocks inhabited home ranges 25 to 46 ha in size, whereas the home ranges inhabited by blackcocks in the French Alps in that season varied from 16 to 312 ha. From that region, data are also available on the size of winter home ranges (4 to 30 ha, ELLISON *et al.* 1989), which is comparable with our observation of 12 ha.

In the Grünwald study area the ranges inhabited by the individual cocks overlapped. All cocks utilised similar habitat types. Throughout the year they occurred in the immediate vicinity of the lek, moving away from it to a distance of at most 1.5 km. The first four cock captured visited the lek throughout the year except in winter. The meadows were not mown until last year's autumn and the dense herbaceous vegetation offered the black grouse sufficient shelter and fairly rich food supply from late spring until mid-autumn. The visits to the lek of the last two cocks (named KUBA and OTIK) during the mating season were rather infrequent, probably because the meadows were mown at the beginning of July.

The average distances of the all-day movements (see **Tab. IV**) were longest in spring I (1720 m) when the overwintered black grouse actively foraged over a rather large area. The following average distances moved were recorded

in the subsequent seasons: spring II, 1610 m; summer, 1230 m; autumn, 1130 m. Insufficient data are available for the winter season but it is assumed that the all-day activity of the birds would be the least in winter when the black grouse spend most of their time in snow shelters.

Table IV: Maximum and minimum distances of all-day movements of tagged blackcocks
Distances maximum et minimum desmouvements de coqs marqués tout au long de la journée

SEASON	LENGTH OF ALL-DAY MOVEMENT (m)		
	AVERAGE	MINIMUM	MAXIMUM
Spring I	**1720**	1250	1950
Spring II	1610	**500**	**3100**
Summer	1230	**500**	2450
Autumn	1130	950	1850
Winter		without data	

Habitat preference

Method I

In the study area young mixed stands with more than three woody plant species (see **Fig.1**), covering 22% of total area, are the predominant type of environment, followed by meadows with almost 20%. The largest percentage of displaying cocks (over 42%) was observed in these meadows where their lek was gregarious. 15% of displaying cocks each were recorded in sheer stands of blue spruce and in mixed stands with more than 3 woody plant species. Almost 45% of other observations were again made in meadows, which is probably due to the fact that this habitat type is considerably easy to survey. Outside the mating season the black grouse also frequently occurred in mixed stands with more than 3 woody plant species. It is interesting to note that they also frequently stayed in forest-free areas (11% of observations). In the study area, however, this habitat type is represented by less than 1%.

Over 40% of the study area is covered with stands in height category 4-10 m and taller (see **Fig. 2**). Stands 1-4 m tall cover 26% of the area the same as those without tree stands (forest-free areas, meadows and stream floodplains). Omitting the latter height category, where over 42% of cocks display, stand between 1 and 4 m tall are the environment type preferred for displaying. In it 31% of the total displaying cocks were censused. In these stands, too, almost 18% of other observations were made. More displaying cocks were recorded in stands 4-10 m tall (28%) and in treeless places (55%), which, in the former case, can be explained by greater percentage of such stands in the study area and, in the latter, by such terrain being very easy to survey.

In the study area, stands with ground coverage over 60 % distinctly predominate (see **Fig. 3**). However, these stands are not closed and compact but interrupted by large numbers of clearings and forest paths. n such stands the black grouse can find sufficient shelter from predators but, at the same time, they have freedom of movements and outlook. The clearings and forest paths

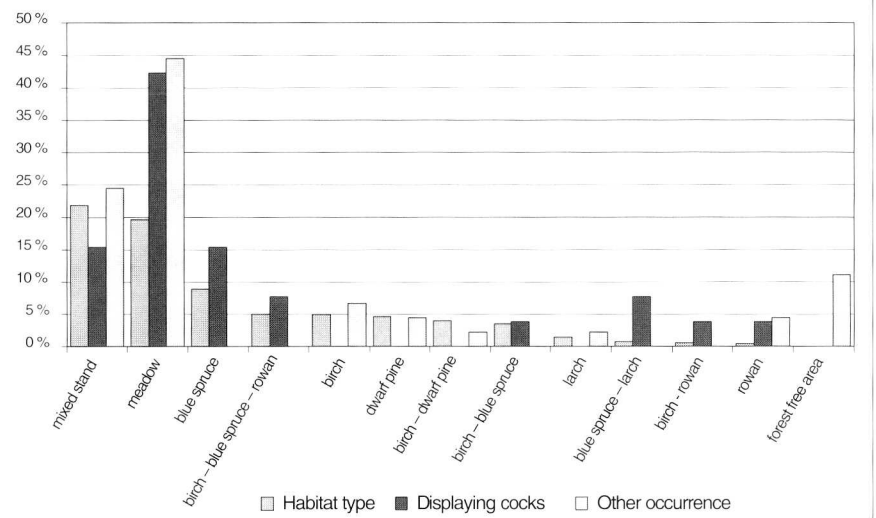

Fig. 1. Habitat types preferred by Black Grouse in the Grünwald study area
Types d'habitat préférés par le tétras lyre dans la zone d'étude de Grünwald

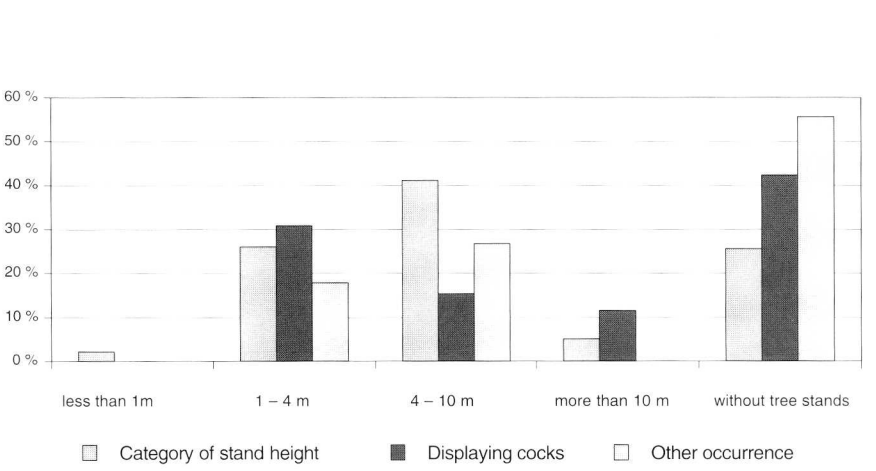

Fig. 2. Categories of tree stand height prefered by Black Grouse in th Grünwald study area
Catégories de hauteurs de peuplements préférés par le tétras lyre dans la zone d'étude de Grünwald

are also abundantly utilised for individual displaying. Apparently, this is why over 49% of displaying blackcocks have been recorded in such stands, habitats lacking tree stands having occupied the second rank with 42 % of displaying cocks. Around 11% displaying cocks utilised stands with ground coverage between 30 and 60%, which may be connected with the low presence of such environments in the study area. Stands showing the greatest ground coverage were also frequently utilised outside the displaying period, almost 40%.

These results correspond with those obtained in the neighbouring Louèná area where SIMOVA (1996) observed an unequivocal preference for mixed stands 1-4 m tall, with a 75% representation of blue spruce and 25% of biích. The woody plant ground coverage amounting to 60-70%.

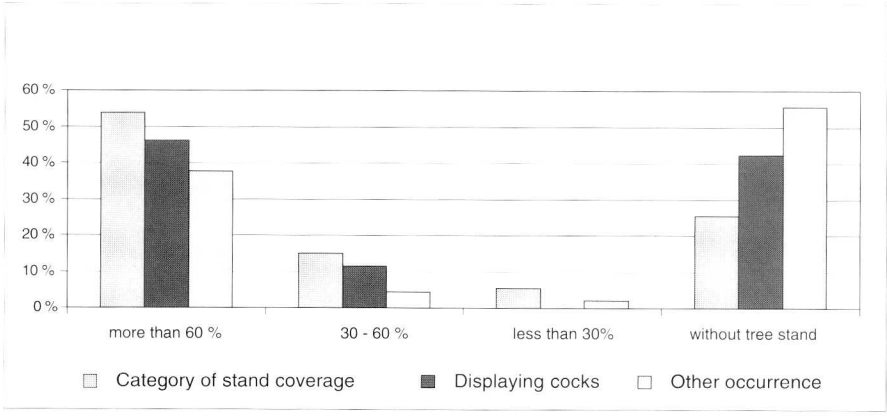

Fig. 3. Categories of stand cover prefered by Black Grouse in the Grünwald study area
Catégories de couverture du peuplement préférés par le tétras lyre dans la zone d'étude de Grünwald

Method II

Telemetric studies of tagged black grouse indicate that young stands are the preferred habitat type (see **Tab. V**). This habitat type is utilised throughout the year but chiefly in winter and spring I when they are represented on some 59 and 63% of the home range area respectively. Open areas, above all, meadows are most important during the display season (spring I, 33%; spring II, 47%). However, the cocks also frequently occur in this habitat type in summer (38%) when the tall herbaceous vegetation offers suitable cover and sufficient food supply. In a mature rowan-beech forest stand the cocks occurred mainly during autumn (25%) and winter (33%), which is probably due to the high food supply, e.g., rowan fruits, in that habitat type.

Table V: Percentages of habitat types in the home ranges of tagged blackcocks
Pourcentages des types d'habitats dans l'aire de distribution des coqs marqués

SEASON	Total area of home range (ha)	Open area (%)	Young tree stand (%)	Full-grown forest (%)	
Spring I	61	33	63	4	
Spring II	50	47	45	8	
Summer	72	38	55	7	
Autumn	37	20	55	25	
Winter	12	8	59	33	

(spring I: 16 Mar.-15 Apr., spring II: 16 Apr.- 31 May, summer: 1 Jun-15 Sep., autumn: 16 Sep.-15 Nov., winter 16 Nov.-15 Mar.)

Diet composition

In the study area the most important components of spring diet were inflorescences of *Eriophorum* (22%), buds and twigs of *Vaccinium myrtillus (19%),* leaves and stems of grasses (19%) and inflorescences of *Tussilago farfara* (11%). The remaining components, each of which was represented by less than 5%, amounted to 14% by volume of the samples analysed. This group predominantly included parts (leaves, flowers) of various forbs. From the nearby Louèná region, SIMOVA *et al.* (2000) report birch (25%), *Vaccinium myrtillus* (16%) *Trifolium repens* (16%) and grasses as the main components of spring food. There also were important shares of heather twigs (9%), sallow catkins (7%) and inflorescences of *Tussiago farfara* (5%). The differences in the diet composition in those two areas have been caused by different food supply, depending on poor representation of peat bogs (habitats with the most frequent occurrence of *Eriophorum*) and predominance of birch stands in the Loucná area. According to some authors (PAAR & WATSON 1988, BAINES 1994), the inflorescences of *Eriophorum* are among the common components of black grouse in areas with wetlands and peat bogs, the same as parts of blueberries and leaves of various forbs (CAYFORD 1990, DE FRANCESCHI 1992).

In summer it was impossible to collect sufficient material for diet analyses. Filed observations suggest, however, that in summer the major part may probably be played by seeds of various grasses, and fruits (e.g., of *Vaccinium uliginosum* and *V. myrtillus*). In a single black grouse stomach analysed in July 1994 in the Louèná part of the Krusne hory Mts., sedge seeds predominated (MALKOVA 1994).

The autumn diet of black grouse in the Gr¸nwald area was unequivocally dominated by rowan fruits (39%), and berries and twigs of *Vaccinium myrtillus* (35%). Grasses were represented by a mere 15% and birch by as little as 7%. In the Loucna region where mature rowan trees are poorly represented, the most important diet component included blueberry (41%), birch (27%) and grasses (23%) (SIMOVA *et al.* 2000).

In the winter faecal samples collected in the Grünwald area, birch was many times the single component. In all, it amounted to 83% by volume of the material analysed, grasses to only 10%, and blueberries to less than 5%. Similar results have also been reported by SIMOVA et *al.* (2000) from the Loucná region, where birch amounted to as much as 90% by volume of the samples. In many other European regions, birch is also the preferred winter diet (PICOZZI & HEPBURN 1984, PONCE 1987, ANDERLE 1991, HJELJORD *et al.* 1995).

Conclusion

The numbers of black grouse in the study area were stable during the past three years, those of censused cocks varying from 19 to 26. In the study area the black grouse occur irregularly, depending on the presence of suitable habitats. The Grünwald peat bog is the centre of their occurrence. There is only one major and regularly utilised gregarious lek.

Throughout the year the tagged cocks stayed in proximity of the lek (trapping area), moving away to a maximum distance of 1.5 km. They inhabited the largest home ranges in summer and early spring, the least one in winter.

Habitat types preferred by black grouse in the study area include, above all, meadows and young mixed forest stands consisting of three or more woody plant species, 1-4 m tall, and with ground coverage over 30%. Meadows were mainly utilised as leks, mixed stands by individually displaying cocks. However, black grouse abundantly occurred in both these habitat types even outside the mating season. In autumn and winter, the frequently utilised habitat types also include mature beech forests with an admixture of rowan trees.

Birch was unequivocally the predominating black grouse diet component throughout the year, followed by blueberries and grasses. The major components of their spring diet included parts of various forbs, and in the summer and autumn diets fruits and seeds played an important role. The winter diet was unequivocally dominated by birch.

Suggested Management

We consider it indispensable to carry out annual **monitoring of the distribution and numbers of black grouse** in the given area in order to study population and spatial developmental trends to which the respective measures should be adapted. Censuses should be carried out during the mating season, most suitably at the turn of April and May, under favourable weather conditions, when the mating season is at its peak in the conditions of the top parts of the Krusne hory Mts.

Protection and renewal of natural habitat types.

The presence of sufficiently large areas of preserved peat bogs is among the major conditions affording the existence of a viable population of black grouse. The peat bogs are important chiefly from the trophic point of view, and their character also predetermined their importance as suitable habitat types. In the past, a number of peat bogs were drained and subsequently afforested. Thus, it is necessary at present to start reconstructing them. In co-operation with the district authorities at Teplice, the first such measures have been implemented in the Grünwald peat bog. Dams preventing water from leaving the peat bog have been constructed in most draining ditches.

Optimising the status of secondary habitats and increasing the food supply.

All forestry work should be aimed at creating suitable species composition, height and spatial structure of tree stands. It is necessary to provide for a sufficient presence of young stands, above all, of birch but also other species, such as spruce, rowan, larch etc. broad-leaved tree species are the major food sources for black grouse and coniferous ones offer sufficient shelter from predators. However, such stand must not be too dense and closed, permitting free movements of birds and, at the same, enabling the herb layer, above all, blueberries, to develop. Moreover, the food supply is noticeably increased by non-reinforced forest paths which are also a frequent source of gastroliths, so important for black grouse, and cultivated grazing plots for game. At present there are enough stands with suitable species and age structure in the study area, yet these suitable habitats will dwindle with the development of vegetation. Thus, it is necessary to plan, already at present, the respective forestry measures.

Control of predators.

In the study area, the red fox is the major predator of black grouse. Following their vaccination against rabies, the numbers of red foxes have considerably increased. Thus, it is inevitable to continuously monitor and, if need be, control their numbers. The raven is another possible predator in the study area. Flocks of ravens counting 40-50 birds are not unusual in autumn.

Excluding both legal and illegal shooting.

In the study area the last exceptional shooting permits were issued in 1995. The present declining trend in the numbers of black grouse in the Czech Republic does not suggest that their shooting could be renewed. However, cases of illegal shooting are known in other parts of this country. The only way to prevent illegal hunting is seen in close co-operation with local hunters organisations.

Limiting disturbance during black grouse breeding season and in winter.

The study area is very sparsely populated by humans and both tourism and recreation are poorly developed here for the time being. However, plans are already in preparation to open several border crossings for pedestrians and to open a Czech-German skiing trunk road, both of which could certainly lead to increased levels of black grouse, particularly during winter. Therefore, we are taking active parts in negotiations with the respective authorities concerning the line of the trunk road and placing the border crossings so that the most precious localities of black grouse occurrence be spared.

Co-operation with the respective authorities, foresters, hunters and local inhabitants is considered absolutely essential. Also, information of the wide public may contribute to the active protection of black grouse a great deal. The suitable forms of informing the public include popular lectures, propagation materials and articles in local press.

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ZUSAMMENFASSUNG : Ökologie des Birkhuhns (*Tetrao tetrix)* in der Grünwalder Heide

Das Naturschutzgebiet Grünwalder Heide liegt in Scheitelpartien von Erzgebirge (Nordböhmen, Bezirk Teplice) und ist einer der Orte, wo Birkhuhn in dieser Region häufiger vorkommt. Auf dem Gelände dieser Heide wird seit dem Jahre 1997 komplexe Erforschung ökologischer Ansprüche des Birkhuhns durchgeführt. Es werden hierbei verfolgt: zahlenmäßiger Stand und Verbreitung dieser Art, ihre Standortsansprüche, Zusammensetzung der Nahrung und telemetrisch auch die Aktivität im Raum.

Die Grünwalder Heide gehört zum Typ der Hochmoore und erstreckt sich auf der Fläche von etwa 30 ha in der Seehöhe von 850 m. Seinerzeit wurde sie wegen Torfstecherei teilweise entwässert. In der Mittelpartie ist die Heide teilweise von Bergkiefer *(Pinus mugo)*, stellenweise auch von Birke *(Betula sp.)* bestockt, in der Kräuterschicht dominieren die Arten Scheidiges Wollgras *(Eriophorum vaginatum)*, Krähenbeere *(Empetrum nigrum)*, Moorheidelbeere *(Vaccinium uliginosum)*, Heidekraut *(Calluna vulgaris)* und Heidelbeere *(Vaccinium myrtillus)*. Der eigentliche Torfgrund ist von Jungbeständen der Blaufichte *(Picea pungens)*, Birke, Bergkiefer und Erle umringt. Dicht in der Nähe befinden sich ausgedehnte Wiesen- und Ackerflächen, die nicht mehr bewirtschaftet werden.

Zahlenmäßiger Stand und Verbreitung des Birkhuhns wird auf einer Fläche von etwa 25 km^2 untersucht. Auf diesem Territorium befindet sich nur ein einziger größerer Balzplatz, der gesellig besucht wird, und zwar auf dem Berg «Oldrissky», wo im Frühling 1997 10 Hähne, im Jahre 1998 10-12 und 1999 10-13 Hähne aufgezählt wurden. In übrigen Territoriumteilen balzen die Hähne nur individuell - in jungen Birken- Fichten- und Erlenbeständen, ggf. auf angrenzenden Wiesen. Insgesamt wurden im Jahre 1998 21-23 Hähne, im Jahre 1999 19-22 Hähne aufgezählt. Im Laufe des Jahres bewegen sich die Birkhühner auf dem Torfmoorgelände und in Jungbeständen der Ersatzbaumarten, vom

Frühling bis zum Herbst besuchen sie oft ihre Balzplätze. Im Herbst und Winter wurden sie auch in einem älteren Buchenbestand mit beigemischten Ebereschen beobachtet. Aus telemetrischer Beobachtung von 4 bezeichneten Hähnen sowie aus anderen Beobachtungen bzw. Funden von Aufenthaltszeichen geht hervor, daß außerhalb des Torfmoors die Birken- Fichten- oder gemischten Bestände von 4 m Höhe und 0,6 Schlußgrad bevorzugt werden. Ausdehnung der Örtlichkeit, die einzelne Hähne im Laufe des ganzen Jahres bewohnten, war in Ordnung von 100 ha. Am größten war die Wohn- und Bewegungsfläche im Frühjahr (vor der Balzzeit) - etwa 70 ha, am geringsten im Winter - etwa 10 ha. Die Zusammensetzung der Nahrung wurde in der Frühlings-, Herbst- und Winterperiode aufgrund der Analyse von Losungsproben ermittelt. Die bedeutendsten Bestandteile der Frühligsnahrung waren in diesem Gebiet Blüten von Sheidiges Wollgras *(Eriophorum vaginatum)* (22%), Knospen und Zweigchen von Heidelbeere *(Vaccinium myrtillus)* (19%), Grashalme (19%) und Blüten von Huflattich *(Tussilago farfara)*. Auf sonstige Bestandteile entfällt weniger als 5%. In der Herbstnahrung überwogen eindeutig Afterfrüchte von Eberesche *(Sorbus aucuparia)* (39%), Beeren und Zweigchen der Heidelbeere (35%).

Gräser wurden lediglich mit 15% vertreten und Birke sogar mit 7%. In Winterproben wurde jedoch die Birke in vielen Fällen als einziger Bestandteil festgestellt. Im Durchschnitt bildete sie 83% vom Volumen des analysierten Materials, die Gräser nur noch 10% und die Heidelbeere weniger als 5%.

Die Erforschung dieses Territoriums sollte zum Entwurf von derartigen Maßnahmen des Managements führen, die für die Erhaltung und Entfaltung der Birkhuhnpopulation geeignete Bedingungen sichern könnten. Außer einer Revitalisierung des Torfgrundes handelt es sich um Festsetzung geeigneter Bestockungsziele der benachbarten sekundären Baumbestände, womit auch die Sicherung an genügendem Nahrunsangebot zusammenhängt. Von besonderer Wichtigkeit ist in diesem Sinne die Anknüpfung einer effektiven Zusammenarbeit mit Ortsorganen des Naturschutzes, der Forstwirtschaft und vor allem mit hier ansässiger Bevölkerung.

Shlüsselwörter : Birkhuhn, *Tetrao tetrix*, Ökologie, Habitat, Management, Telemetrisch, Räumliche Aktivität, Krusne Hory Monts, Czesch Republik.

RESUME : Ecologie du Tétras lyre (*Tetrao tetrix*) dans la Réserve Naturelle de la bruyère de Grünwald dans les Montagnes de Krusne hory (République Tchèque)

La Réserve Naturelle de la Bruyère de Grünwald, située sur les hauteurs des montagnes de Krusne hory (district de Teplice, au nord-ouest de la Bohême) est un des sites de cette zone où le tétras lyre (*Tetrao terix*) est fréquemment observé. La bruyère de Grünwald est une tourbière bombée de quelque 30 ha, à l'altitude 850 m. Certaines parties de cette tourbière ont été drainées jadis pour faciliter l'extraction de la tourbe. Sa partie centrale est partiellement envahie de pins buissonnants (*Pino mugo*) et de bouleaux (*Betula sp.*). La strate herbacée est dominée par les linaigrettes (*Eryophorum vaginatum*), la camarine noire (*Empetrum nigrum*), la myrtille de loup (*Vaccinium uliginosum*), la bruyère

commune (*Calluna vulgaris*) et la myrtille (*Vaccinum myrtillus*). La partie principale de la tourbière est également entourée par de jeunes plants de substitution tels que l'épicéa piquant (*Picea pungens*) bouleau, pin buissonnant, et aulne vert (*Alnus viridis*). On trouve également à proximité des champs non cultivés et des pâtures. Depuis 1997, un programme complexe de recherches sur les exigences écologiques du tétras lyre a été mis en place : il porte sur le recensement des effectifs, la répartition, l'utilisation de l'habitat, le régime alimentaire, et l'activité spatiale (suivis par télémétrie).

Les nombres et la répartition des tétras ont été étudiés sur 25 km^2. Il n'y a qu'une seule arène de parade de quelque importance, sur les espaces dégagés de la colline Oldrisky ; 10 coqs y ont été notés au printemps 1997, 10-12 en 1998, 10-13 en 1999 et 5-8 en 2000. Des coqs solitaires peuvent être observés paradant dans les jeunes plants de bouleaux, épicéas et aulnes, dans d'autres parties du parc et, occasionnellement, dans les prairies. En 1998, le nombre total de coqs observés en parade fut de 21-23, contre 19-22 en 1999 et 20-22 en 2000.

Le champ d'action des tétras se répartissait toute l'année sur la tourbière principale et dans les zones de jeunes plants. Du printemps au début de l'automne, ils visitaient fréquemment l'arène. Ils furent aussi observés dans une forêt mâture avec sous-bois fourni de sorbiers (*Sorbus aucuparia*). Le suivi par télémétrie de 4 coqs, les observations directes et les traces indiquent que, en dehors de la tourbière, les bouleaux, épicéas, ou les boisements mélangés jusqu'à une taille de 4 m et avec un recouvrement au sol de 60 % sous la strate arborée étaient préférés. La taille de l'espace total fréquenté par chacun des coqs suivis au cours de l'année est de 100 ha. Les mouvements les plus importants des coqs et l'espace le plus vaste utilisé (autour de 70 ha) se situent en début de printemps, avant la période de parade, tandis que l'aire d'activité la plus faible (quelque 10 ha) se situe en hiver.

L'étude de l'alimentation par l'analyse des fientes a été menée au printemps, en automne et en hiver. Les composants principaux du régime printanier sont les fleurs de linaigrettes (22 %), les brindilles et bourgeons de myrtilles (19 %), les débris de graminées (19 %) et les fleurs de tussilage (*Tussilage farfadet*) (11 %). Le reste des items ne participe qu'à raison de moins de 5 %. En automne, le menu du tétras est dominé par les sorbes (39 %) et brindilles et baies de myrtilles (35 %) ; les graminées ne représentent que 15 %, et le bouleau 7 %. En général, le bouleau compte pour 83 % du total du volume hivernal, les graminées seulement 10 % et les myrtilles moins de 5 %. Dans beaucoup de cas, toutefois, le bouleau était le seul constituant trouvé dans le menu hivernal.

La recherche conduite dans ce site fournit des informations utiles pour améliorer les activités de gestion et assurer de bonnes conditions pour la conservation et le développement de cette population de tétras lyres. Parallèlement à la revitalisation de la tourbière, un objectif important est d'arriver à aménager dans les plantations voisines une composition d'essences favorable aux tétras, et assurant une quantité suffisante de nourriture. Une coopération avec les autorités forestières et les communautés locales est très importante pour le succès des buts de conservation.

Mots-clés : Tétras lyre, *tétrao tetrix*, télémétrie, habitat, écologie, régime alimentaire, activité spaciale, gestion Kusne Hory Mts., République tchèque.

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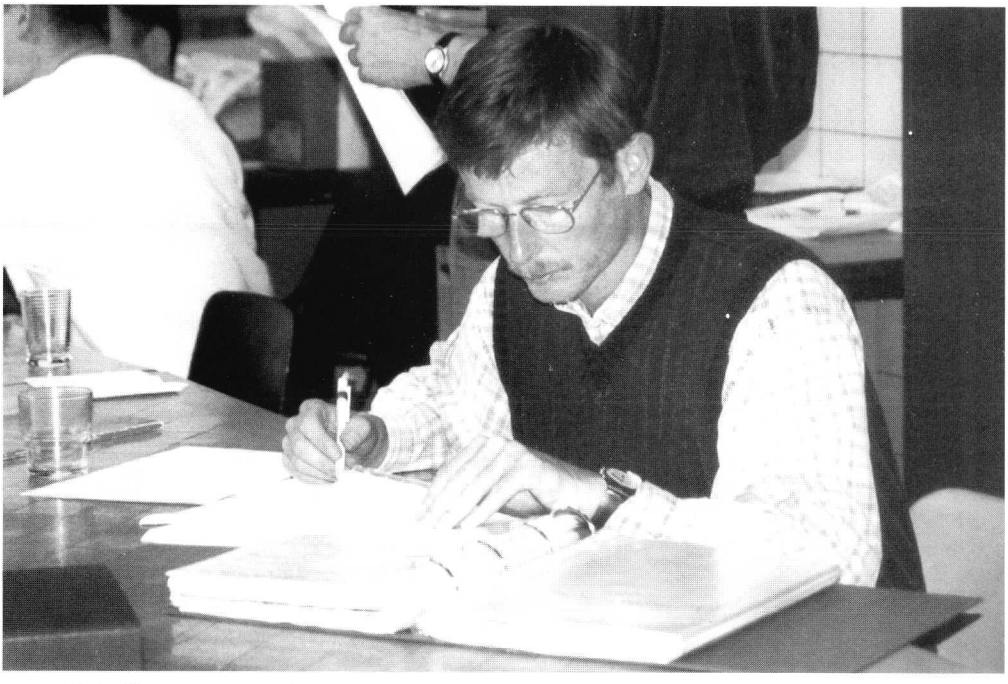

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