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Why the capercaillie population (*Tetrao urogallus* L.) in mountain forests in the Central Slovakia decline?

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Abstract

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From 1981–2010, population dynamics of the capercaillie *Tetrao urogallus* L. was studied on forty-three leks in the Western Carpathians (Slovakia). Nest and chick losses were also studied. Altogether, 94 nests with clutches, 124 hens with chicks in June and 132 in the period between 1st August and 15th September were checked. Results demonstrate a marked decrease (>50%) in numbers of cocks and hens on twelve monitored leks (28%) and a slight decrease (<50%) on ten display grounds (24%). During the study period, capercaillie cocks became extinct on eleven (25%) leks and in their surroundings. More or less constant numbers were found on only eight leks (19%) and a slight increase occurred on only 2 leks (4%). The mean number of juveniles per a hen was 1.9 over the whole study. The average number of chicks accompanying a hen significantly decreased during the study period. Female chicks were consistently outnumbering male chicks. Predation appeared to be of major importance in limiting numbers of capercaillie chicks. Out of 94 capercaillie clutches 59 (63%) were destroyed. Predaceous pressure on chicks was high in spite of the fact that with progressing breeding season, the food offer for predators was continually increasing.

Key words

capercaillie, population dynamics, Slovakia, Western Carpathians

Introduction

Capercaillie (*Tetrao urogallus* Linnaeus, 1758) is a large ground-nesting grouse species with precocial chicks inhabiting, in small isolated populations, also Central-European mixed spruce-beech-fir and mountain spruce forests in the Western Carpathians (Klaus et al., 1986; Saniga, 1996a, 1996b, 1996c). These forests have been undergoing radical changes from a natural regime to a managed system, especially in the course of the last century. Continuous multi-aged forests have been transformed to patchworks of even-aged stands.

In the recent years, more attention has been directed towards the effects of forest habitat changes on faunal diversity and performance of wildlife populations (e.g. Helle, 1985; Väisanen et al., 1986; Lindén, 1989; Storaas et al., 1999). In terms of landscape ecology, this large-scale change in forest management is expected to have profound effects on spatial patterns and range use of wildlife species, especially those having home ranges and cruising radii within the critical area interval (Rolstad and Wegge, 1989a). Capercaillie belongs to this area-sensitive category, inhabiting old forests most of the year, and having seasonal ranges between 10 and 1,000 hectares in size (Wegge and Larsen, 1987).

In recent few decades, populations throughout most of western Europe have declined markedly (e.g. Nováková and Šťastný, 1982; Klaus et al., 1986; Klaus and Bergmann, 1994; Saniga, 1999). A decline in capercaillie populations has also been observed during the last 20–30 years in Fennoscandia and Russia (e.g. Rajala and Lindén, 1984; Rolstad and Wegge 1989a).

This paper reports on the findings of a thirty-year capercaillie population study in the mountain forests

of Central Slovakia (West Carpathians). This study is aimed at:

1. Examining population dynamics of the capercaillie on leks and their surroundings
2. Chick losses during the summer in this forest-dwelling tetraonid
3. Evaluation of the sex ratio in the chicks
4. Evaluation of the relationship between nest and chick losses and predaceous factors
5. Explore reasons for the persistent downward trend in numbers that was documented over the study period.

Material and methods

The field work was conducted in the mountains of Central Slovakia (Veľká Fatra Mts, Malá Fatra Mts, Kremnické vrchy Mts, Starohorské vrchy Mts, and Nízke Tatry Mts, 18°50'–19°10' E; 48°47'–49°19' N) from 1981–2010.

The topography rises from 600 m a.s.l. to 1,530 m a.s.l. The climate is moderately continental with a mean temperature of the warmest month (July) of 14.5 °C and minus 5.5 °C for the coldest (January). Yearly mean precipation is 1,000– 1,400 mm, and the ground is usually covered with snow from mid-November to late March or April (depending on the see-level and exposure).

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

Capercaillies are difficult to count at most times of year, but it is practicable to count the number of cocks displaying on leks in spring (Klaus et al., 1986). Accuracy of quantitative investigations depends on the exact timing of the census. In the initial phase of display activity (late March), cocks do not visit leks regularly. The period between 20th April and 10th May is most suitable for surveys of the capercaillie in Central Europe (Saniga, 1998a). In this period, hens also visit the leks regularly.

In 1981–2010, a total of forty-three leks were monitored during the spring display season. The study was largely carried out by observing birds from the vicinity of the leks, so that they were left not disturbed. Observation sites were usually occupied in the evening before the arrival of the males and were usually abandoned when the morning display ended. Capercaillies were counted at least twice during the spring display season on the lek. The leks were censused especially during the period between 20th April to 10th May (peak of lekking activity). A possible bias in the material is that data from some leks were not obtained during this peak period. The numbers of hens present on the leks are considered underestimated in comparison to cocks, as hens are much less conspicuous on the leks. Altogether 652 evening and 1,088 morning observations were carried out on the forty-three leks during the spring display season.

Results and discussion

Spring density in natural forests

Spring density of the capercaillie during 1989–1991 in natural forests varied between 0.5 ind./100 ha (in dwarfed pine stands), 1.4–1.9 ind./100 ha (forests of the spruce vegetation tier), and 2.0–2.7 ind./100 ha (forests of the spruce-beech-fir vegetation tier). In the period 1999–2001, there was found a dramatic decline in the spring density in the natural forests: 0.1 ind./100 ha (in dwarfed pine stands), 0.7–1.1 ind./100 ha (forests of the spruce vegetation tier), and 0.9–1.3 ind./100 ha (forests of the spruce-beech-fir vegetation tier). The density estimate for dwarfed pine stands was affected by a methodological bias due to the proportionately shorter length of transect. In contrast to the situation in Fennoscandia and Russia, long-term population studies of capercaillie based on censuses of leks during the display season are scarce in Central Europe (Müller, 1974). In Norway, Wegge (1983) found out a density around 2.5 ind./100 ha. Rajala (1974) found the capercaillie density to be 5.98 ind./100 ha in central Finland. According to Klaus et al. (1986), this density is the upper limit for optimal habitats.

Population dynamics on leks

Results demonstrate a marked decrease (>50%) in numbers of cocks and hens on twelve monitored leks (28%) and a slight decrease (<50%) on ten display grounds (24%). During the study period, capercaillie cocks became extinct on eleven (25%) leks and in their surroundings. Comparable numbers were found on only eight leks (19%) and a slight increase occurred on only two leks (4%). The average number of birds per lek was 6.3 cocks and 6.0 hens when the monitoring started in 1981. It declined to 1.5 cocks ($r = 0.83$, $p = 0.001$, $y = –0.189x + 20.588$) and 1.5 hens ($r = 0.67$, $p = 0.001$, $y = –0.142x + 15.823$) per lek in 2010 (Table 1). Findings of this study concerning the numbers of cocks and hens visiting the leks during the display season agree roughly with Koivisto and Pirkola (1961), who monitored 185 leks in Finland. They found 2.3–5.2 cocks and 2.8–3.9 hens per lek.

Table l. Presence of capercaillies on examined 43 leks during spring display season (West Carpathians, Slovakia, 1981–2010)

Year	Checked	Individuals		Average per lek	
	leks	Males	Females	Males	Females
1981	4	25	24	6.3	6
1982	4	24	27	6	4.3
1983	7	31	27	4.4	3.9
1984	7	31	28	4.4	4
1985	7	23	29	3.3	2.7
1986	6	24	17	4	2.8
1987	8	18	19	2.3	2.4
1988	8	27	17	3.4	2.1
1989	13	40	28	3.1	2.2
1990	23	74	43	3.2	1.9
1991	23	78	52	3.4	2.3
1992	21	68	52	3.2	2.5
1993	23	67	62	2.9	2.7
1994	17	53	55	3.1	3.2
1995	25	71	61	2.8	2.4
1996	22	50	46	2.3	2.1
1997	22	41	46	1.9	2.1
1998	10	21	27	2.1	2.7
1999	10	19	25	1.9	2.5
2000	9	16	22	1.8	2.4
2001	10	17	26	1.7	2.6
2002	62	118	104	1.9	1.7
2003	72	116	128	1.6	1.8
2004	69	124	119	1.8	1.7
2005	79	137	110	1.8	1.4
2006	73	124	108	1.7	1.5
2007	66	112	93	1.7	1.4
2008	73	110	116	1.5	1.6
2009	74	111	108	1.5	1.4
2010	56	84	82	1.5	1.5
Altogether	903	1,854	1,701	2.1	1.9

Surrounding habitats are expected to influence lek population size in the capercaillie (Larsen and Wegge, 1984). Forest stands over 80 years old with suitable age and spatial structure covered 20–90% of the area within 1 km of the checked lek centres. On four leks surrounded by forest with only 20–30% old growth, 1–2 cocks displayed. On the contrary, on six leks with 80–90% old growth 5–12 cocks displayed (Table 2). Comparing the number of cocks on forty-three leks with the proportion of old-growth forest (>80 years old forest with suitable spatial structure) within 1 km radius of a lek, a statistically highly significant correlation between the amount of old-growth forest and the number of cocks attending a lek was found (Pearson correlation coefficient $r = 0.725$, $p < 0.01$). This supports Wegge and Rolstad's (1986) findings that leks surrounded by a high proportion of old-growth forest supported more males than leks in fragmented areas. On nine out of eleven leks where capercaillies disappeared completely during the study period the surrounding habitat changed drastically. Presence of old-growth forests with suitable spatial structure within 1 km radius of a lek declined to less than 20%.

When old natural forests are fragmented by clearcuts, the landscape lose qualities which are very important to this tetraonid. Transformation of the forest landscape from old-growth forests to clearcuts and younger stands augments the number of small rodents.

Table 2. Relationship between the amount of old forests (over 80 years old) within a 1 km radius of the lek centres and the maximum number of cocks attending a lek (West Carpathians, Slovakia, 1981–2010, r = 0.025, p < 0.01)

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

This presumably favours higher densities of generalist predators (especially marten and fox), which prey on capercaillie eggs and chicks (Rolstad and Wegge, 1989b). Furthermore, the fragmentation of continuous forest habitat and its replacement with young stands unsuitable for capercaillie disrupts the social organization of capercaillie populations, particularly the formation of lek communities (Klaus and Bergmann, 1994).

Chick losses during summer

Between 1st August and 15th September, 81 out of 132 recorded capercaillie hens led chicks (Table 3). The mean number of juveniles per hen was 1.9 over the whole study. The average number of chicks accompanying a hen significantly decreased during the study period (r = 0.77, p = 0.0003, y = –0.409x + 41.155).

Predaceous pressure on chicks was high in spite of the fact that, as breeding season progressed, food offer for predators was continually increasing. Mean clutch size in capercaillie was 6.8 eggs (n = 94). In nests which were not destroyed or abandoned (n = 37), on average 5.7 chicks hatched. Hen led on average only 2.4 chicks (n = 124) in June and only 1.9 chiks (n = 132) in the period between 1st August and 15th September.

Nest losses in capercaillie depend on many factors as habitat type, vegetation cover, timing of the egg-laying, egg colour, nest localization, or weather conditions (Müller, 1984). Predaceous pressure on capercaillie chick losses is modified by regional differences, but also depends on season and other factors (Klaus et al., 1986). An uncamouflaged nest is detected and robbed by corvid birds (raven, jay) with a high probability. On the contrary, mammalian predators use much olfactory cues, thus nest camouflage does not play a significant role (Klaus et al., 1986).

Sex ratio in the chicks

Of all broods observed in the mountains of Central Slovakia in the period between 1st August and 15th September, 96 were counted with confidence. Chick numbers varied between two and six. Broods of three were encountered most frequently, making up more than 1/3 of all broods seen. The mean brood size was 2.2. Broods were significantly larger in the beginning of the study period than in later years (Table 3).

Only 53 broods totalling 171 chicks were sexed with confidence. They consisted of 69 males and 102 females. Female chicks were consistently outnumbering male chicks. The deviation from 1 : 1 ratio was in each case significant at ten-percent probability or smaller when tested by χ^2 using Yate's correction ($\chi^2 = 12.41$, $p < 0.001$). The sex ratio was clearly related to the size of the brood. In thirteen 2-chick broods, seven consisted solely of females, in five there was one of each sex and one consisted solely of males. In both cases, the deviation from the 1 : 1 ratio was statistically significant. The difference seemed to even out as broods become larger, but the pattern was inconsistent. Table 4 illustrates the predominance of female chicks and how the sex ratio is related to the size of brood. There was a remarkable increase in the proportion of chick females when brood size decreased from three to two. When comparing the sex composition between successively larger broods, there were no statistical difference between sizes three, four, five, and six, whereas the difference between two and three was significant at ten percent probability (t = 2, 25, p < 0.10, 31 df, one-tailed t-test). Brood sizes one and two had significantly fewer males than did any other brood size.

Predators influencing the capercaillie populations

Predation appears to be the major factor in limiting the numbers of birds, including capercaillie. Out of 75 capercaillie clutches 49 (65%) were destroyed. Main mammalian egg predators of the capercaillie were found stone marten (*Martes martes* (L.)), pine marten (*Martes foina* (Erxl.)), mustelids (*Mustela* sp.), and red fox (*Vulpes vulpes* L.) (altogether 18%), wild boar (*Sus scrofa* L.) (6%), and brown bear (*Ursus arctos* L.) (4%).

Table 3. Observations of capercaillie hens with chicks between 1st August and 15th September (West Carpathians, Slovakia, 1983–2010, n = 132)

Year	Number of chicks						Average per hen
	0	2	3	4	5	Total	
1983			1	1	1	3	4
1984		1		1		3	4
1986			1	2	1	4	4
1987		1	1		1	3	3.3
1989			2	3		5	3.6
1990		2	2	2		6	2.7
1991	2	3	3			8	1.9
1992	3		2	2		7	2
1993	2	1	2			5	1.6
1994			1	1		2	3.5
1995	3		2	2		7	2
1996	3		2	2		7	2
1997	4	2	2	1		9	1.6
1998	3		1	2		6	1.8
1999	4		1	2		7	1.6
2000	2	3	2			7	1.7
2001	3		2	2		7	2
2002	1	2				3	1.9
2003	3		1			4	1.6
2004	2	2				4	1.6
2005	2	2				4	1.9
2006	3			1		4	2
2007	3		1	1		5	2
2008	2	1	1			4	1.9
2009	3		1			4	1.2
2010	3		1			4	0.8
Total	51	20	32	25	3	132	1.9

Table 4. Composition of capercaillie broods sampled between 1st August and 15th September (West Carpathians, Slovakia, 1983–2010, n = 53)

Proportion Size	n	Males	Females	M/F	% Males	% Females
2	13	0.54	1.46	0.37	26.9	73.1
3	20	1.2	1.8	0.67	40	60
4	16	1.75	2.25	0.78	43.7	56.3
5	3	2.33	2.67	0.88	46.7	53.3
6	1	3	3	1	50	50
Altogether	53	1.3	1.92	0.68	40.4	59.6

According to Klaus (1984), proportion of wild boar on capercaillie nest loss can locally reach 30%. Main avian egg predators were corvid birds, particularly jay (*Garrulus glandarius* (L.)) and raven (*Corvus corax* L.) (altogether 18%).

In the years with very cold weather during May (heavy snowfall), nests were destroyed by snow cover and abandoned (21%). Four clutches (8%) were found abandoned, their hens probably having been predated by goshawk (*Accipiter gentilis* (L.)), golden eagle (*Aquila*

chrysaetos (L.)), and ural owl (*Strix uralensis* Pall.), or by some of the mammalian predators – lynx (*Lynx lynx* L.) The damage agent was not known in 12 destroyed and abandoned nests (25%).

Predaceous pressure on capercaillie nests decreased significantly during the incubation period (74% nest losses during the first half of May, n = 49; 54% in the second half of May, n = 35). Decreased nest losses during the incubation period were expected, as on the timing of the capercaillie egg-laying, there does not breed any bird species, except birds of prey and owls. The capercaillie nests quite early in the spring, prior to the onset of breeding of most sedentary and migratory birds. Thus the predaceous pressure on this forest-dwelling grouse is much higher in the first half of May than later – when 53–59 bird species breed in forest habitats inhabited by these tetraonids (Saniga, 1994, 1995a, 1995b). A second factor is that nests placed on the ground at the beginning of May may be too exposed to predators, until the vegetation has adequately developed (Fuller, 1995). Thus the predaceous pressure on early breeding birds is expected to be much higher than in later stages of the breeding season.

Fences, wires and disturbances

Out of 23 perished adult capercaillies, collision with fences was a common cause of death to 11 (48%) capercaillies. Fences used in mature forests, where browsing by deer is preventing the growth and development of natural regeneration, presents a considerable hazard to the capercaillie, especially when a fence runs through a forest. Two capercaillies were found to be killed on cables of the ski-lifts.

Enthusiastic gamekeepers and birdwatchers anxious to view a lek were harmful to displaying capercaillies. Similarly, forest management during the display season caused continued disturbance and had a deleterious effect on lekking capercaillies. Tourism is a significant limiting factor in most capercaillie habitats in Central Europe (Klaus and Bergmann, 1994).

Conclusions

Several factors have contributed to the recent dramatic decline in capercaillie population in the mountains of the Western Carpathians. Habitat deterioration has probably played a main role. The correlation between the amount of old forest and the number of cocks attending a lek has been significant. The presence of older trees has appeared to be important for capercaillie in Western Carpathians, as elsewhere. Other factors have also contributed to the rapid decline. The recent decline in numbers has also been associated with an increase in rainfall and snowfall in early June. The number of rain- and snow-days in this crucial period, when most of the chicks hatch, has been inversely associated with capercaillie breeding success. Deteriorating climatic conditions for capercaillie could override any improvements in habitat quality (Moss and Picozzi, 1994). Predation has appeared to be the major factor in limiting the numbers of capercaillie populations. Fences have also been an important cause of capercaillie mortality. Continued disturbance caused by gamekeepers, enthusiastic birdwatchers and forest managers also had a deleteriorous effect on lekking capercaillies. The future of capercaillie populations in the Western Carpathians will depend on the way in which the forest resources will be used, and also on the effects of air pollution on forest health, ground vegetation and the abundance of insects available to chicks during the first weeks of their life (Porkert, 1991). Habitat improvement via forest management practices should be the most successful way to save the species.

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References

Fuller, R.J. 1995. *Bird life of woodland and forest.* Cambridge: Cambridge University Press. 244 p.

Helle, P. 1985. Effects of forest fragmentation on bird densities in northern boreal forests. *Ornis fenn.*, 62: 35–41.

Klaus, S. 1984. Predation among capercaillie in a reserve in Thuringia. In Lovel, T. and Hudson, P. (eds). In *3rd International grouse symposium, York*. Paris: International Council for Game & Wildlife Conservation, p. 334–346.

Klaus, S., Bergmann, H.H. 1994. Distribution, status and limiting factors of capercaillie (Tetrao urogallus*)* in central Europe, particularly in Germany, including an evaluation of reintroductions. *Gibier Faune Sauvage, Game Wildl*., 11: 57–80.

Klaus, S., Bergmann, H.H., Andreev, A.V., Müller, F., Porkert, J., Wiesner, J. (eds). 1986. *Die Auerhühner*. Wittenberg-Lutherstadt: Ziemsen Verlag. 276 p.

Koivisto, I., Pirkola, M. 1961. Behaviour and number of the capercaillies and black grouses on leks. *Suom. Riista*, 14: 53–64.

Larsen, B.B., Wegge, P. 1984. Habitat characteristics of territorial capercaillie cocks during the breeding season. In Lovel, T., Hudson, P. (eds). *3rd International grouse symposium, York*. Paris: International Council for Game & Wildlife Conservation, p. 236–246.

Lindén, H. 1984. Changes in Finnish tetraonid populations and some factors influencing mortality. *Finn. Game Res.*, 39: 3–11.

Lindén, H. 1989. Characteristics of tetraonid cycles in Finland. *Finn. Game Res.*, 46: 34–42.

Moss, R., Picozzi, N. 1994. *Management of forests for capercaillie in Scotland*. Forestry Commission Bulletin, 113. London: Her Majesty's Stationary Office, p. 1–32.

Müller, F. 1974. Hahn in Ruh. *Pirsch*, 26: 50–52.

Müller, F. 1984. The loss of capercaillie clutches – an evaluation of a ten year study on simulated nests in the western Rhön mountains. In Lovel, T., Hudson, P. (eds). *3rd International grouse symposium, York*. Paris: International Council for Game & Wildlife Conservation, p. 347–353.

Nováková, E., Šťastný, K. 1982. Bestand und Bestandsentwicklung des Auerhuhns in Böhmen und Mähren. In Kempf, C. (ed.). In *Actes du Colloque intermational sur le grand tétras (Tetrao urogallus major), Colmar (France), les 5, 6 et 7 octobre 1981*. Colmar: IREPA, p. 35–42.

Porkert, J. 1991. Nebelfrost als das Aussterben von Tetraoniden fördernder Faktor in den Ostsudeten. *Acta ornithoecol.*, 2: 195–209.

Rajala, P. 1974. The structure and reproduction of Finnish populations of Capercaillie, Tetrao urogallus, and Black Grouse, Lyrurus tetrix, on the basis of later summer census data from 1963–66. *Finn. Game Res.*, 35:1–51.

Rajala, P., Lindén, H. 1984. Finnish tetraonid populations in 1982–83 according to the August route-censuses. *Suomen Riista*, 31: 92–99.

Rolstad, J. 1986. Effects of logging on capercaillie Tetrao urogallus leks. II. Cutting experiments in south-eastern Norway. *Scand. J. Forest Res.*, 4: 99–109.

Rolstad, J., Wegge, P. 1987. Habitat characteristics of Capercaillie Tetrao urogallus display grounds in southeastern Norway. *Holarct. Ecol.*, 10: 219–229.

Rolstad, J., Wegge, P. 1989a. Capercaillie Tetrao urogallus populations and modern forestry – a case for landscape ecological studies. *Finn. Game Res.*, 46: 43–52.

Rolstad, J., Wegge, P. 1989b. Effects of logging on capercaillie Tetrao urogallus leks. III. Extinction and recolonization of lek populations in relation to clearfelling and fragmentation of old forest. *Scand. J. Forest Res.*, 4: 129–135.

Saniga, M. 1994. Bird community of the forests of the spruce-beech-fir vegetation tier in the Veľká and Malá Fatra mountains. *Biologia, Bratislava*, 49: 787–794.

Saniga, M. 1995a. Breeding bird communities of the fir-beech to the dwarfed-pine vegetation tiers in the Veľká and Malá Fatra mountains. *Biologia, Bratislava*, 50: 185–193.

Saniga, M. 1995b. Seasonal dynamics of the bird assemblages in the natural forests of the spruce vegetation tier. *Folia zool.*, 44: 103–110.

Saniga, M. 1996a. Habitat characteristics of capercaillie (Tetrao urogallus) leks in central Slovakia. *Biologia, Bratislava*, 51: 191–199.

Saniga, M. 1996b. Distribution, habitat preferences and breeding biology of the Capercaillie (Tetrao urogallus) population in the Veľká Fatra mountains (West Carpathians). *Biologia, Bratislava*, 51: 201–211.

Saniga, M. 1996c. Population study of capercaillie (Tetrao urogallus) in the Ľubochňa valley (Veľká Fatra Mts., Slovakia). *Folia zool.*, 45: 17–29.

Saniga, M. 1998a. Daily activity rhythm of capercaillie (Tetrao urogallus). *Folia zool.*, 47: 161–172.

Saniga, M. 1998b. Kvantitatívno-kvalitatívne poškodenie lesných drevín cicavcami a vtákmi vo výsadbách a náletoch [Quantitative-qualitative damage of the woody plants by the mammals and birds in the plantings and natural seedings]. *Lesn. Čas.*, 44: 101–109.

Saniga, M. 1999. Population dynamics of Capercaillie Tetrao urogallus on leks in Central Slovakia in the period 1981–1997. *Vogelwelt*, 120, Suppl.: 235–240.

Storaas, T., Kastdalen, L., Wegge, P. 1999. Detection of forest grouse by mammalian predators: A possible explanation for high brood losses in fragmented landscapes. *Wildlife Biol.*, 5: 187–192.

Väisanen, R.A., Jarvinen, O., Rauhala, P. 1986. How are extensive, human-caused alterations expressed on the scale of local bird populations in boreal forests? *Ornis scand.*, 17: 282–292.

Wegge, P., Rolstad, J. 1986. Size and spacing of capercaillie leks in relation to social behaviour and habitat. *Behav. Ecol. Sociobiol.*, 19: 401–408.

Wegge, P., Storaas, T. 1990. Nest loss in capercaillie and black grouse in relation to the small rodent cycle in southeast Norway. *Oecologia*, 82: 527–530.

Prečo klesá populácia tetrova hlucháňa (*Tetrao urogallus* L.) v horských lesoch stredného Slovenska?

Súhrn

V rokoch 1981–2010 bola skúmaná populačná dynamika tetrova hlucháňa (*Tetrao urogallus* L.) na štyridsiatich troch tokaniskách v Západných Karpatoch (Slovensko).

Sledované boli tiež straty na znáškach a mláďatách tohto tetrovovitého vtáčieho druhu. V júni sa sledovalo 124 samíc s kuriatkami a v časovom intervale od počiatku augusta do polovice septembra bolo monitorovaných 132 sliepok. Výsledky demonštrujú značný pokles (>50 %) v počte kohútov a sliepok na dvanástich monitorovaných tokaniskách (28 %) a mierny úbytok (<50 %) na desiatich miestach tokania (24 %). Počas skúmaného obdobia sa kohúty tetrova hlucháňa vytratili z jedenástich tokanísk (25 %). Viac-menej stabilné počty tetrovov hlucháňov boli zaznamenané na ôsmich miestach tokania (19 %). Mierny nárast v populácii tejto lesnej kury bol zistený iba na dvoch tokaniskách (4 %). Počas celého obdobia výskumu pripadalo na jednu samicu v priemere 1,9 mláďat v časovom intervale od začiatku augusta do polovice decembra. Počet mláďat vodených sliepkou signifikantne klesal počas skúmaného obdobia. Medzi mláďatami samičie pohlavie prevyšovalo samčie. Predácia bola limitujúcim faktorom ovplyvňujúcim prežívanie hluchánčiat. Z 94 hlucháních znášok 59 (63 %) bolo zničených predátormi. Predačný tlak bol najvyšší na počiatku inkubačnej doby, kedy v životnom prostredí tetrova hlucháňa hniezdi minimum vtáčích druhov, čo spôsobuje maximálnu orientáciu predátorov na tento vtáčí druh. K dramatickému znižovaniu početnosti tetrova hlucháňa v pohoriach Západných Karpát prispieva viacero negatívnych faktorov pôsobiacich v súčinnosti (drastické lesohospodárske zásahy do životného prostredia, turistické aktivity, masový a živelný časovopriestorovo nelimitovaný zber lesných plodov, nevhodné klimatické pomery v čase inkubácie a liahnutia mláďat).

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