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BREEDING BLACK GROUSE IN ARTIFICIAL CONDITIONS IN HUNGARY

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ABSTRACT. The black grouse is an endangered and vulnerable species in several of Europe's countries. From Hungary they became extinct in the 19th century. Their last occurrence was reported in the Nyirseg area, where we have dealt since 2006 with keeping these birds in artificial conditions and breeding them on behalf of the species reintroduction, in the area of the NYÍRERDO Forestry. The breeding stock originates from Germany. Over the course of the last few years we could follow the efficiency of lekking and reproduction. In 2009 we have already closed the third successful breeding period: 169 eggs came from the breeding farms. In this study we summarise our breeding results between 2007 and 2009. Our work enables us to possess a stable bird stock within a few years, which contributes to saving this species.

Keywords: Tetrao tetrix, Nyírség area, breedig, artificial conditions, egg production

INTRODUCTION

The black grouse's status in Hungary is now an extinct species; however this bird is protected by the KöM decree no. 13/2001. Their nature conservation value is 50 000 HUF. They became extinct from Hungary in the early twentieth century, and were still hunted at the end of the 19th century. The last occurrence was recorded in 1966 from the Bükk-plateau.

The black grouse is protected in several countries abroad. They are on the red list of The World Conservation Union (IUCN) and in 2006 they were rated as a near threatened (NT) species with lower risk. This category means they have been evaluated to the IUCN criteria but do not qualify for critically endangered (CT), endangered (E) and vulnerable (V) now, but are close to qualifying for or likely to qualify for a threatened taxon in the near future – by IUCN (2001).

According to the EU Birds Directive (79/409/EEC) this species is included in the Red Book of West- and Middle-Europe's countries, in the Annex II/2 and III/3 (Faragó, 2002).

The drastic decline (Warren et al., 2008; Storch, 2007) of the black grouse population which covers most of Europe's countries was influenced by many factors (Selas, 2003; Bowker et al., 2007). The major cause of black grouse decline are habitat changes (Pearce-Higgins et al., 2007), fragmentations and habitat losses (Brotons et al., 2003). These isolated bird stocks were going to become extinct because of their health position and decreased viability (Höglund et al., 2007; Caizergues et al., 1997). Probably, in Hungary – directly and indirectly, too – the climate change, the high number of predators, the intensification of the forestry and hunting all had an adverse effect on black grouse (Faragó, 2002).

Their name alludes to their habitat: commonly they like to stay in birch-mixed forest and in pine-groves. We can observe a tight relationship between their habitat use and dietetic habit. In an adequate habitat which is suitable for the birds, the insect supply and the flora is rich in different species and it provides safety to the population (Starling-Westerberger, 2001). An adult bird's elemental nutririons are birch buds, pine needles and sprouts, and alder catkins, besides which this bird also eats insects in the summer (Witherby et al., 1958). From the herbaceous plants, beloved species are the blueberry (Vaccinium myrtillus) and the juniper's (Juniperus communis) berries (Faragó, 2002). For the chicks, most important is the insect supply (Wegge et al., 2008) because they eat alone ants, cocoons, caterpillars, spiders and other little animals at the beginning of their life (Glutz von Blotzheim, 1964).

There have been some experiments before to breed this species in artificial conditions. People recognized that the black grouse can be kept only in pens under cover, and their propagation depends on the success of the gravid eggs (Róth, 1927).

The NYÍRERDŐ Corporation started the work to reintroduce the black grouse in 2005 (Bartucz et al., 2007). They involved the different department authorities like the Ministry of Environment and Water, and the Hortobágy National Park. The forestry was shaped for breeding farms in which to place the birds (Gúth I, Gúth II, Egyek, Haláp).

Our long-term aim is to reintroduce this once hunted bird by establishing a parent stock in the Nyírség region, in a natural or near-natural environment. To this end our most important job is to develop keeping-, feeding- and breeding technologies via the adaptation of foreign technologies. We intend to breed the parent stock and rear them in accordance

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with ethological characteristics, and we also ensure adequate egg production during the egg laying period.

MATERIALS AND METHODS

The establishing of the breeding farms

The idea to reintroduce the black grouse to Hungary involved first the Hortobágy National Park's staff, in 2004. Later the program was taken up by the NYÍRERDŐ Plc. In 2005 the work was started on the area of the forestry; they developed the first pens of the breeding farm called Gúth I. The first birds arrived from Germany to there in 2006.

The forestry entrusted in 2006 the University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management, Department of Nature Conservation, Zoology and Game Management to join to the program with a scientific work.

In 2007 for the program's expansion we created further breeding farms on the forestry's region: under the authority of the Forestry Gúth, Haláp and Hajdúhadház. The now operational breeding farm's names are: Gúth I. and II., Haláp and Egyek.

Deploying the birds

In 2005 four hens and four cocks arrived from Germany. They composed the base of the Hungarian breeding stock. In 2006 another ten hens and four cocks arrived. The last bird stock from abroad arrived in 2007.

Keeping technology

To create the Hungarian keeping technology we felt we should adapt elements of the German keeping technology to the conditions of the Nyírség.

We placed the birds in every breeding farm into closed pens with the minimum area of 4x12 m, with an internal height of 2-2.5 m. After training them to the new place usually we put together one cock with 2-6 hens but beyond the lekking period we put together more cocks into one pen. We have to cut down the primary wing quill-feathers by both sex. This helps to protect the birds from injuries caused by fright or stress.

The ground is concrete underlay covered with sterilized gravel and sand in every case. The coops are two-thirds roofed in, closed off with wire gauze against smaller birds, rodents and predators.

We ensure in every pens the sandbath and the resting-place. The 2x1 m large feeding grid ensures that the feed and water to stay contamination-free. With the help of this the birds can't eat the feed falling down from the feeder.

We ensured roosting for the birds on the branches with locating plants, using mostly pines.

Feeding technology

In connection with the food we have to separate the juvenile and the adult birds because they have different nutriment requirements. The chicks with the age of one day till the age of four weeks get turkey chick starter feed. We complete this food until the age of two-three weeks with curd cheese, grinded boiled eggs and little pieces of mealworms (*Tenebrio molitor*).

The chicks get room-temperature water mixed with vitamins. When they reach the age of 12 weeks we substitute gradually their food with a turkey grower feed.

Adult birds have primarily a forage mixture. They eat it during the whole year except the mating season. Expletively they get grated apple and carrot and also green forage in the season: budding seeds, chive (*Allium schoenoprasum*), common chickweed (*Stellaria media*) and plant (*Plantago* sp.); we also ensure them berries like blueberry (*Vaccinium myrtillus*).

One month before the mating season we start to prepare the birds for egg laying. We change the forage mixture gradually to pheasant feed and subserve the condition required to the egg laying with mealworms, catkin and bud.

Fig. 1-3 Incubation with machines and sitting hens (Source: personal archive)

Breeding technology

As this is a polygamous species we should create the parent stocks by spring approaching. In one pen we placed one cock with 3-6 hens that will shape one tribe. In spring, cocks start to be introduced; in turn hens start to lay eggs on the ground into a forward-shaped nest. An average clutch size can hold 7-10 eggs.

We collect the eggs every day and write on it the letter – and number („E", „G I." or „G II.") – which marks the breeding farms and the date of the gathering. After collecting we store the eggs for a few days

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(maximum 7-10) in a fridge at the temperature of 12°C and then the brood can start (Fig. 1-3). We use for it sitting hens with small body size, or else an incubator of the type Midi 100 FSK and Midi F230S.

The chicks hatch on the 24-28th days and after they dry off we take them to the place which secures the conditions needed by the chicks. In the fore breeding boxes we secure the required temperature with an infra lamp and the necessary humidity with often spraying. The food and the water are ensured for the chicks from the first day.

We ferry across the chicks who reached the age of six weeks to the pens developed by the adult birds where we keep them in the same conditions as the adults.

RESULTS AND DISCUSSIONS

Feeding

The compiled forage mixture based of the foreign technology included 17 sorts of seeds:

1. winter wheat (*Triticum aestivum*) 10%
2. rye (*Secale cereale*) 5%
3. oat (*Avena sativa*) 5%
4. barley (*Hordeum vulgare*) 5%
5. rice (*Oryza sativa*) 5%
6. white panicum (*Echinochloa frumentacea*) 5%
7. white (*Panicum miliaceum album*) and red millet (*Panicum miliaceum rubrum*) 5%
8. oil-flax (*Linum usitatissimum*) 5%
9. hemp seed (*Cannabis sativa*) 5%
10. sorghum (*Sorghum bicolor*) 5%
11. sunflower (*Helianthus annuus*) 10%
12. seeds of foxtail species (*Setaria* sp.) 5%
13. forage pea (*Pisum sativum*) 10%
14. safflower (*Carthamus tinctorius*) 5%
15. buckwheat (*Fagopyrum esculentum*) 5%
16. rape (*Brassica napus*) 5%
17. groundnut (*Arachis hypogaea*) 5%

However, the birds didn't consume every seed, so we have changed the mixture's contents over the years. We excluded the groundnut in the first range, mainly because owing to its oil content it is susceptible to become rancid quickly, which depresses the forage mixture's shelf-life.

The forage mixture fed currently includes:

- forage pea,
- winter wheat,
- oat,
- barley,
- white and red millet,
- sorghum,
- oil-flax,
- sunflower,
- rye,
- white panicum,
- hemp seed,
- safflower,
- buckwheat,
- rape,
- seeds of foxtail species.

Lekking

In spring of 2009 we created the parent stocks; therefore we shaped 10 separate tribes. We placed two tribes in the breeding farm called Gúth I., five tribes in Gúth II. and three tribes in Egyek.

During placement of the tribes we took care to minimize any disturbance. We put the different groups into the most far-away pens because the cocks can disturb each other with their call. The cocks have an expressive red wattle which became wider by-and-by during the mating season. It shows they are ready to fertilize the females. The cocks started displaying in April. While they sounded noisy tunes accompanied with a love-dance they produced a distinctive bubbling sound.

The males placed in the cock-pens were allowed also to each other's voices, to show who is the most dominant. We changed one of the tribe's cocks with one from the cock-pens because during lekking he didn't made any temperamental sound or love-dance. The other male had started more intensively lekking earlier, without any hen.

The hens accepted the cocks. On April 24 the first egg was laid by a hen from Gúth II. On April 26 and 27 other eggs followed the first one.

Egg production

In 2009 the black grouse hens laid 169 eggs in total after lekking. After collecting we stored the eggs for a few days in a fridge, till the necessary amount came together which was suitable to put under the sitting hens or into the incubator.

At the beginning of the egg laying we collected only a few eggs which were laid by the hens sporadically during this period. Following that we placed under sitting hens the first assembled 22 eggs on May 10 (in 2009), then later the next 25 eggs on May 23.

When the egg production became more intensive – on May 31 and June 14 – we first inlayed 63, and after that 57 eggs into the incubators (Midi 100 FSK and Midi F230S) and adjusted the temperature to 37,9°C and the humidity to 60-65%.

The chicks were hatched on average after 27-29 days:

- June 7-8: 6 chicks
- June 21: 11 chicks
- June 27-29: 29 chicks
- July 13: 18 chicks

We collected in 2007 together 27 eggs from the black grouse hens for which the hatching rate exceeded 40%. In the next year the number of the laid eggs increased, which correlated with the bigger bird stock, however the hatching rate was only at about 23%.

The optimal immunostaining was obtained by using the dilution 1:400 of the primary antibody, which didn't allow an unspecific reaction (background) in the pancreas and gut of all species of poikilotherm

vertebrates under study. Thus, with this dilution variable amounts of immunoreactive endocrine cells and nerve fibers appeared disseminated in both organs. Their occurrence and density varied widely along the intestine and among the species investigated and only slightly among the individuals of the same species (Table 1). Mention should also be made that in the gut of animals studied no immunolabelled ganglions and intrinsic nerve plexuses were recorded.

In 2009 the egg production to a certain degree decreased. Even so, 67 chicks hatched from 169 eggs, and due to this the hatching rate was on the upgrade (39-40%).

After their hatching we measured the chicks till their outplacement into the pens to set out their weekly growth (*Fig. 4-6*). We placed them into the fore breeding boxes in accordance with their age and then measured the average weight of every age-group.

We measured three age-groups on the 3rd and 10th of June (*Fig. 7*): the chicks from the first (age of 25 and 32 days) and second (age of 12 and 19 days) hatching from under sitting hens, and later the chicks of the first hatching from incubator (age of 6 and 13 days). Even though the one-week long growth shows increasing tendency, however we did find discrepancy between the age-groups.

Table 1

	Hatching success		
Year	**Eggs (number)**	**Hatched chicks (number)**	**Hatching rate (%)**
2007	27	11	40.74
2008	204	47	23.04
2009	169	67	39.65

Fig. 4-6 Growth from the one-day chick to the age of 6 months (Source: personal archive)

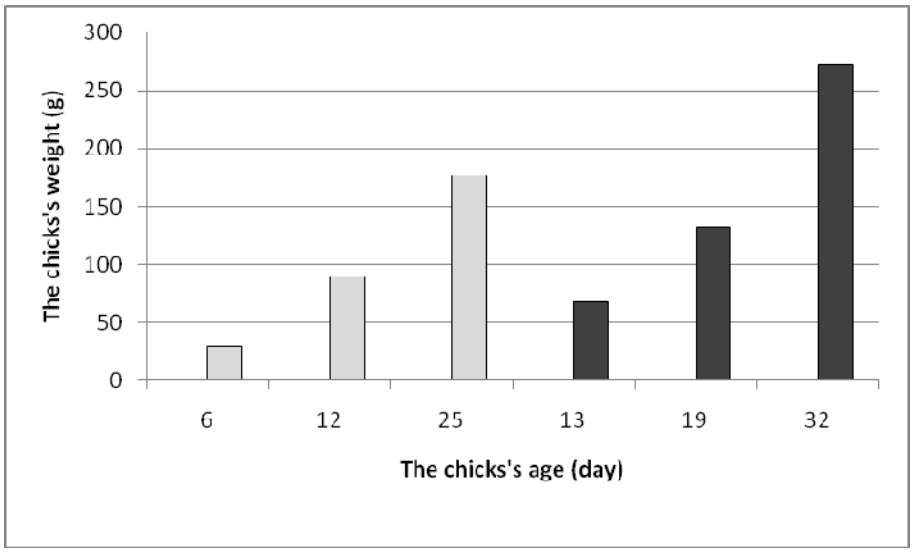

Fig. 7 The one week long growth of the black grouse chicks

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Table 2

The number of the chicks who reached the age of 6 months

Year	Chick number (specimen)	The chicks's survival succes (%)
2007	6	55
2008	11	23
2009	26	39

At the first incubation – in the year 2007 – from 11 hatched chicks 6 reached the age of six months. In 2008 already we had 11 and in 2009 26 chick specimens (*Table 2*). Examining the chicks' survival success, this tendency follows the hatching rate: in the first year, 55% of the chicks were successfully raised. After this, in 2008, this percentage fell back to 23% and then in 2009 we recorded growth again (39%).

CONCLUSIONS

In the long run we can say that the cocks courted the hens vigorously in every year, however we noticed the most intensive lekking in 2009. In 2008, along with the bird stock growth the egg production increased also, while in 2009 there was a lesser decline. The younger hens started egg laying earlier than the older ones – but their egg production was lower. In spite of lower egg production more chicks were hatching than in the past years.

During the three years we have managed to adapt the external keeping-, feeding- and breeding technologies to the conditions of the Nyírség.

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