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BEHAVIOUR PATTERNS OF THE CAGE-HOUSED BREEDING FLOCK OF PHEASANTS (*PHASIANUS COLCHICUS*)

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Abstract

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The aim of this work was to investigate the behaviour patterns of a cage-housed breeding flock of pheasants during the day in the early stage of laying period, and evaluate the differences in behaviour patterns between male and female pheasants. Observations were carried out with a flock of common pheasants (*Phasianus colchicus*) consisting of 1 male and 5 female pheasants aged 2 years that showed a minimum rate of aggression in the previous laying. Behaviour patterns of birds were studied using a 15-minute video recording taken at each hour during the day (from 7 a.m. until 7 p.m.). The rates of activities such as feeding, movement, resting, scratching, preening, mating and aggression in female pheasants differed significantly from those in the male, as observed throughout the day. The rate of feeding had 2 peaks in hens (in early morning and late evening). Generally, the feed intake in females was observed throughout the day whereas the male received feed less frequently but at a higher rate, particularly in the afternoon. The highest rate of movement was observed for both male and female pheasants in morning hours followed by a decline in movement activities which was slow in hens and rapid in the cock, with the subsequent second peak before dark. Except for 7 a.m., resting was among behaviour patterns with the highest rate in both genders throughout day, with lower rates in females as compared to the male. The stereotype behaviour was observed in hens more frequently, with a peak in a period from 9 a.m. to 12 a.m. The highest frequency of mating was observed in the evening after 7 p.m.

pheasants, sex, captive breeding, battery cages, ethology, diurnal rhythm

As in other countries, the substantial number of raised breeding pheasants in the breeding season is housed in cage systems in Czech pheasantries (Zapletal *et al.*, 2010). Keeling and Gonyou (2001) have reported that the housing of domestic hens in conventional cages with higher stocking densities is associated with decreased egg production, higher mortality rate, more cases of feather pecking and cannibalism, and increased fearfulness. When pheasants are housed in conventional cage-systems, the situation is similar in some respects. Such pheasants may show behavioural disorders that often result in various forms of aggression and cannibalism, seldom causing significant deterioration of health status or even death.

Creating the optimum environment for animals is a key prerequisite for animal welfare. In poultry raising, the results of production performance, health and behaviour patterns in birds document to which extent the respective conditions of husbandry satisfy the needs of animals. Positive results in poultry husbandry cannot be achieved without thorough knowledge of poultry behaviour (Appleby *et al.*, 2004).

Current scientific literature contains hardly any data describing the details of behavioural patterns in pheasants housed in battery cages in the breeding season. The aim of our study was to investigate the behavioural patterns of a cage-housed breeding flock of pheasants during the day in the early stage

of the laying period, and to identify respective differences in behaviour patterns between male and female pheasants.

MATERIAL AND METHODS

Animals used and experimental design

The monitoring of ethological activities of pheasants was performed in 2009 in the Jinačovice pheasantry, which is a special establishment of the University of Veterinary and Pharmaceutical Sciences Brno. Observations were carried out in a breeding group of common pheasants (*Phasianus colchicus*) consisting of 1 male and 5 hens aged 2 years (i. e. in their second laying period). All pheasants showed a very good level of nutrition at the end of the previous laying period and a minimum rate of aggressive forms of behaviour in the previous laying period which made them a suitable reproduction group for ethological observation. On the basis of our observation in the previous years we found that the occurrence of aggressive behaviour patterns during a breeding period is less frequent at the beginning of the breeding season, therefore the observation was carried out in this time. For the reason of pheasants' complete adaptation to the new housing system the observation was carried out on Day 16 after the pheasants were housed in the laying cage (16 April 2009).

The housing system consisted of a 2-tier cage battery. Pheasants to be monitored were placed on the upper tier, approximately in the middle of a row of cages. The laying cage was equipped with a wire-floor, five automatic nipple drinkers, a trough feeder located in front of the cage's front wall with the manual administration of feeds. The dimensions of the cage were as follows: length – 200 cm, depth – 85 cm, back height – 58 cm and front height – 70 cm. The floor had a slope towards the front cage's wall to enable the collection of laid eggs. Perches, laying nests, claw-shortening devices and litter for dust-bathing were not part of the cage. The pheasants were only fed with the pelleted feeding mixture BŽN (ADW Agro a. s.). The feed was given into the feed trough a day before in the evening in sufficient quantity for the whole next day, during the monitoring only a part of feed was given in the afternoon. Lighting was only ensured by day light, the particular day of the experiment was bright and sunny. The outside temperature at 1.00 pm was 17 °C.

The monitoring of ethological activities of pheasants was based on a video recording obtained using the Canon MV5i camera permanently attached to a tripod placed at the solid, constant point during observation, approximately in the middle of the front wall and in a distance of 1.6 metre from the cage. In order to prevent a potential influence of the presence of the camera on pheasants' behaviour, the camera with the tripod was placed at the point 3 days before observation. All working and any other activities that could affect the behaviour of birds were carried out in respective premises for laying technologies outside the recording.

The main aim of the monitoring was to obtain an objective video recording of birds' behaviour throughout the light day, i.e. from 7:00 a.m. until 7:15 p.m. In principle, the camera recorded 20-minute segments at the beginning of every hour (i.e. at 7:00 a.m., 8:00 a.m., 9:00 a.m., etc.). The whole video recording taken throughout the day was subsequently transformed into the digital form and edited by removing the first two minutes from each recorded segment in order to eliminate the possibility of influencing the birds' behaviour because of the camera manipulation. To normalize the length of a particular evaluated segment in every hour only a 900-second video recording was used. Resultant edited and labelled recordings taken at individual hours were combined on a DVD to evaluate the behaviour patterns in pheasants.

Monitored behaviour patterns in pheasants

The behaviour patterns evaluated in both genders at particular daily hours are listed in Tab. I. Besides behaviour patterns mentioned in Tab. I, female pheasants also showed "escape", i.e. a physical activity associated with an attempt of an individual to escape from the attack, whereas the male showed "crowing-call" (i.e. very loud, sudden, thick-voiced, and harsh call followed by a brief, loud, wing-drumming sound) and "courtship" (the male's behaviour to arouse the hen's interest to mate – the cock walks with short steps towards the female, turns his side to the female and shows his sexual traits extended, with his body feathers being fluffed out, with the tail and back feathers being shifted towards the female, with the nearer wing being drooped and with the tail spread and vibrating).

The duration of all above-mentioned activities was recorded in seconds within individual 15-minute sequences taken at each hour, followed by calculating the respective portions in per cent. Ethograms of individual female pheasants were evaluated followed by calculating the average duration of particular behaviour patterns in all hens within the evaluated hours.

Statistical analysis

Statistical evaluation was performed by the Statistica version 9.0 using the Yates corrected χ-2 test to compare the duration of particular behaviour patterns (in seconds) related to the total, constant duration of a particular sequence (900 s) taken at each hour.

RESULTS AND DISCUSSION

The frequency of evaluated behaviour patterns in female pheasants in 15-minute segments at individual hours is provided in Tab. II. The rate of feeding was relatively higher in morning hours, as indicated in evaluated segments. However, it

I: *Monitored behaviour patterns in both genders*

Behaviour pattern	Description
Feeding	all activities at the feeding trough; feed intake, pecking at or manipulating both the feeding trough and the feed, whether or not the feed was consumed
Drinking	all activities at the drinking waterer; the imbibing of water, pecking at or manipulating the waterer, whether or not water was consumed
Defecation	the excretion of faeces
Movement	all activities associated with gait, jumping, flying, changing the body position without any apparent purpose (it may be accompanied by wing-flapping)
Resting	standing, sitting or lying with the head close to the body in a relaxed position, including sleeping
Scratching	all activities associated with the scratching and scraping of the ground, cage's walls or the feeding trough with limbs
Preening	the cleaning of feathers using the beak or claws at standing or lying
Stereotype behaviour	activities associated with a periodic activity without any apparent purpose such as purposeless walking along the front wall of the cage, sticking the head and neck out of the cage not being associated with feed intake and attempting to jump out of the cage; activities associated with pecking at different parts of the cage without any apparent purpose
Mating	direct activity associated with copulation
Feather pecking	both mild and vigorous pecking /pulling/ pinching at the feathers
Aggression	including all forms of pecking at other individual except for feather pecking; sporadic pecking, targeted attack, a set of pecks in order to hurt the other animal, cannibalism, the pecking of hens by the male pheasant in order to disturb hens and induce mating

culminated in the evening at 7 p.m., i. e. before dark. This is in an agreement with the findings made by Jensen (2009) in hens of domestic fowls and by Appleby *et al.* (2004) in laying birds who reported the highest frequency of feed intake in early morning hours and before dark. However, the male pheasant (Tab. III) devoted most time to feeding in the afternoon (between 2 p.m. and 3 p.m.); the increased rate was also observed at 8 a.m. A comparison between the rate of feed intake in male and female pheasants shows that females performed this activity during the whole day whereas the male received the feed less frequently and for a longer time interval. The lower frequency of drinking was recorded in female pheasants throughout the day, with a slightly higher rate in early morning hours and late evening hours. The same activity in the male pheasant was observed only briefly at 2 p.m. in the evaluated sequences. Defecation was recorded for both genders at a minimum rate, thus in hens at 12 a.m. and in the male in the afternoon.

The level of movement in both male and female pheasants was significantly the highest during morning hours followed by a gradual decline in females and a rapid decline in the movement activity in the male, reaching a minimum at 2 p.m. and 3 p.m. in hens, and at 2 p.m. in the cock. A slight increase in movement was observed at 7 p.m.

Koubek and Kubista (1990) have found that activities such as feeding, drinking, and movement in the monitored pheasants were the most frequent during early morning hours and during evening hours, which is in a good agreement with our observations. Except for 7 a.m., resting was among behaviour patterns with a generally highest rate during the day in both genders, with significant differences being observed in the rate of resting between male and females. Hens showed lower values throughout the day, with the highest rate being recorded between 3 and 6 p.m. However, the cock exhibited this passive behaviour pattern for the major part of the day. Scratching was observed in females throughout the day, particularly culminating at 2 p.m. Similar activity in the male was only seen sporadically, with a slight increase in evening hours.

Preening was observed in both genders at a relatively low rate throughout the day, with a noticeable increase at 2 p.m., particularly in the male. In the same time interval, the male's preening activity induced the same activity in all females for a short period of time. Webster and Hurnik (1994) have reported that the preening in the flock of poultry – similar to drinking and dust bathing – tend to be performed synchronously. Preening as such is very important to birds since it helps keep the feathers well groomed. During preening the feather is also oiled with lipids released from the uropygial gland, which helps to maintain the feather in a good condition, and birds also dislodge and eliminate parasites living on their skin (Ostfeld and Lewis, 1999). Tanaka and Hurnik (1992) have found that domestic hens kept in battery cages showed a lower rate of preening than those reared in more spacious systems. The rate of stereotype behaviour was significantly higher in hens as compared to the cock. The higher rate of stereotype behaviour in hens was observed in morning hours; reaching a peak at 12 a.m. (up to 34.3%) whereas in the cock, the rate of stereotype behaviour was mainly detected

II: *The ethogram illustrating the behaviour patterns observed in female pheasants in a cage during 15-minute sequences recorded at particular hours*

Behaviour pattern		Hours													P
		7	8	9	10	11	12	13	14	15	16	17	18	19	
Feeding	(%)	3.8	1.5	3.2	3.2	0.2	0.2	1.2	0.5	0.7	1.2	1.2	3.2	11.3	**
Drinking	(%)	1.5	0.2	0.3	0.7	0.5	0.3	0.5	0.2	0.3	0.2	0.7	1.0	1.5	ns
Defecation	(%)	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	ns
Movement	(%)	45.0	40.3	36.3	34.5	35.8	34.4	30.5	17.5	19.5	27.0	34.3	19.0	28.1	**
Resting	(%)	29.8	32.7	32.5	31.5	29.8	26.6	53.5	37.8	49.9	50.8	47.5	60.0	33.8	**
Scratching	(%)	5.8	5.2	4.3	4.7	6.3	3.2	8.7	22.8	9.4	8.4	9.3	8.2	7.4	**
Preening	(%)	1.0	1.5	2.5	0.2	0.8	0.2	0.8	3.8	2.8	0.2	1.5	1.8	2.3	**
Stereotype behaviour	(%)	12.0	18.0	20.2	22.0	26.2	34.3	2.8	15.7	15.5	11.9	4.5	5.2	3.4	**
Mating	(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	7.0	**
Feather pecking	(%)	0.2	0.2	0.0	0.3	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.2	ns
Aggression	(%)	0.3	0.3	0.2	1.0	0.2	0.3	0.5	0.5	0.5	0.2	0.7	0.4	5.0	**
Escape	(%)	0.5	0.2	0.5	2.0	0.2	0.3	1.0	1.0	0.3	0.2	0.3	0.2	0.0	ns
Total in 900 s	(%)	100	100	100	100	100	100	100	100	100	100	100	100	100	

** – P<0.01; * – P<0.05; ns – non significant

III: *The ethogram illustrating the behaviour patterns observed in the male pheasant in a cage during 15-minute sequences recorded at particular hours*

Behaviour pattern		Hours													P
		7	8	9	10	11	12	13	14	15	16	17	18	19	
Feeding	(%)	0.0	8.7	0.5	0.0	0.0	2.2	0.0	9.5	10.0	0.0	0.0	0.0	2.3	**
Drinking	(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	ns
Defecation	(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.0	0.0	ns
Movement	(%)	52.3	15.5	20.2	14.8	14.0	17.2	16.2	12.3	30.6	14.4	13.3	14.0	33.2	**
Resting	(%)	41.0	68.3	74.3	69.8	79.8	74.8	72.0	52.0	40.2	80.7	69.3	73.2	42.5	**
Scratching	(%)	1.0	0.0	0.0	3.2	0.0	0.0	0.5	2.8	0.0	0.8	5.7	1.3	6.2	**
Preening	(%)	0.5	1.3	0.5	0.5	1.5	1.5	0.0	7.2	0.5	0.8	0.5	0.8	1.8	**
Stereotype behaviour	(%)	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.5	0.0	0.0	ns
Crowing-call	(%)	1.5	1.0	1.5	1.0	1.5	1.5	0.0	0.5	1.0	1.0	1.0	0.5	1.0	ns
Courtship	(%)	3.2	5.2	2.5	10.2	2.2	2.8	7.5	13.2	12.4	2.3	9.2	8.2	2.7	**
Mating	(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	7.0	**
Feather pecking	(%)	0.0	0.0	0.2	0.0	0.3	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	ns
Aggression	(%)	0.5	0.0	0.3	0.5	0.7	0.0	0.8	1.7	3.8	0.0	0.0	1.0	3.3	**
Total in 900 s	(%)	100	100	100	100	100	100	100	100	100	100	100	100	100	

** – P<0.01; * – P<0.05; ns – non significant

at 1:00 p. m. Fraser and Broom (1997) have reported that the stereotypes occur in situations where an individual lacks control of its environment. In some cases, the animal seems to be frustrated whereas in other cases the future events are rather unpredictable. Furthermore, the authors also state that even a minimal appearance of some stereotypes usually indicates poor welfare.

Courtship as the male's behaviour pattern was observed in the cock throughout the day, with an increased rate at 10 a.m. and particularly between 1 p.m. and 4 p.m. and also at 5 p.m. and 6 p.m. This behaviour pattern is also associated with a crowing-call, which was manifested by the cock at a very low rate and quite consistently throughout the day.

During the evaluated day, the laying of eggs by hens was also monitored. Generally, all eggs were laid during afternoon hours, namely – 1 egg between 12.25 a.m. and 1.00 p.m., 2 eggs between 1.25 p.m. and 2.00 p.m., 1 egg between 3.00 p.m. and 3.25 p.m. and 1 egg between 4.25 p.m. and 5.00 p.m. (data not shown in the table). Mating between the cock and hens was observed at 3 p.m., 6 p.m. and particularly at 7 p.m., during the evaluated sequences. Appleby *et al.* (2004) have reported that the distribution of mating throughout the day is affected by the egg-laying cycle, because fertility decreases around the time of oviposition. Domestic hens usually lay eggs in the morning, as compared to quails that lay eggs in the afternoon and usually mate in the morning and in the evening (Ottinger *et al.*, 1982). A significant increase in the rate of mating found in our evaluation at 7 p.m. resulted from mating between the cock and 4 out of 5 hens. This was also associated with an increased rate of aggressive behaviour in this period of time such that the male pecked the top of the head of mated hens. Different aggressive patterns of behaviour were observed in hens throughout the day, culminating at 7 p.m., being particularly associated with cannibalism. Cannibalism was also observed in the cock at the same period of time and in the hen with which the cock mated previously. In fact, pecking at the top of the hen's head by the male escalated in a series of very aggressive pecks that resulted in skin damage on the hen's head. This was immediately followed by attacks of other two hens that lasted for a significantly longer period of time. The attacked hen showed no attempt to escape at that moment, and remained sitting at the same place in the cage. Appleby *et al.* (2004) have reported that the aggressive pecks sometimes break the skin and if animals with such injuries are not separated from others, pecking in such circumstances may lead to cannibalism. Authors also state that the aspect of cannibalism that is least understood is that the pecked bird often makes surprisingly little effort to escape, in spite of the fact that it may be in severe pain. Sometimes this may be because the pecked bird is a low-ranking individual, which has been pecked aggressively so often that it has learned that it cannot escape, and so "freezes".

The escape of hens from a potential attack by other hen or the cock was observed throughout the day at a rather low rate. In fact, there were two hens that became the target of the attack by the cock or other hens, particularly by one dominant hen.

It should be emphasized that the monitoring was performed with the selected breeding flock of pheasants that showed a minimum tendency to aggressive behaviour in the previous laying period and in the early stage of the current laying period. This flock should therefore serve as a control for the evaluation of other flocks that showed a substantially higher rate of aggressive behaviour patterns. However, it follows from Tab. II and Tab. III that the acts of aggressive behaviour also occurred in this flock. This supports the finding made by Swarbrick (1985) that pheasants kept in captivity are often prone to feather pecking and cannibalism.

However, due to the relatively low rate of feather pecking and aggressiveness, the rates of individual behaviour patterns in the monitored breeding flock can be used to compare the rate of behaviour patterns of other cage-housed flocks of pheasants, or to innovate cage systems in order to improve the welfare of cage-housed pheasants during a laying period.

SUMMARY

The aim of this work was to investigate the behaviour patterns of a cage-housed breeding flock of pheasants during the day in the early stage of laying period, and evaluate the differences in behaviour patterns between male and female pheasants. Observations were carried out with a flock of common pheasants (*Phasianus colchicus*) consisting of 1 male and 5 female pheasants aged 2 years that showed a minimum rate of aggression in the previous laying. Behaviour patterns of birds were studied using a 15-minute video recording taken at each hour during the day (from 7 a.m. until 7 p.m.). The rates of activities such as feeding, movement, resting, scratching, preening, mating and aggression in female pheasants differed significantly from those in the male, as observed throughout the day. The rate of feeding had 2 peaks in hens (in early morning and late evening). Generally, the feed intake in females was observed throughout the day whereas the male received feed less frequently but at a higher rate, particularly in the afternoon. The highest rate of movement was observed for both male and female pheasants in morning hours followed by a decline in movement activities which was slow in hens and rapid in the cock, with the subsequent second peak before dark. Except for 7 a.m., resting was

among behaviour patterns with the highest rate in both genders throughout day, with lower rates in females as compared to the male. The stereotype behaviour was observed in hens more frequently, with a peak in a period from 9 a.m. to 12 a.m. The highest frequency of mating was observed in the evening after 7 p.m.

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