

## Effect of perches on morphology, welfare and behaviour of captive reared pheasants

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### ABSTRACT

This study investigated the effect of providing elevated perches in growing pens on the morphology and behaviour of young pheasants. Pheasants reared with perches from one week old were observed roosting off the ground significantly more frequently when moved into a pen containing trees at five weeks old than pheasants reared without perches (roosting pheasants: 24.3% vs. 6.7%;  $p < .01$ ). The presence of perches reduced the level of plumage damage caused by feather pecking (damage scores: 2.3% vs. 2.1%;  $p < .05$ ). Pheasants reared in huts with perching were larger overall than those from control huts, in particular were heavier (weights: 356.9 g vs. 345.2 g) and had longer and thicker *tarsi* than control pheasants (60.61 mm vs. 59.35 mm and 4.715–6.571 mm vs. 4.705–6.412 mm, respectively). Since roosting on tree branches is an important anti-predator behaviour, providing perches at an early stage of life in the captive rearing environment may be helpful in order to improve survival of the captive reared pheasant after release in the wild. Furthermore, the study suggests that a simple and easy husbandry technique, providing elevated perches, may improve the welfare and fitness of farm-reared game birds.

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### Introduction

It is widely known that the survival of artificially reared *phasianidae* in nature is much lower than survival of wild *phasianidae*. Farm reared birds show behavioural differences from wild birds and in particular they show poor anti-predator behaviour (Deeming et al. 2011; Dowell 1992). For example, Garson et al. (1992) reported that artificially reared cheer pheasants *Catreus wallichii* roosted on the ground at night and therefore were prone to predation. The condition that pheasants experience when raised under captive conditions greatly differ from the natural situation (an absence of parents during rearing, group size, availability of cover and so on). Pheasants and other *phasianidae* released for hunting or restocking are generally artificially reared in unnatural and spatially simple environments (Buner & Schaub 2008). Individuals that are subjected to unnatural or artificial rearing conditions prior to release may lack the opportunities to acquire essential survival skills, such predator detection and avoidance, food acquisition and processing techniques (Whiteside et al. 2015). The morphology and behaviour of pheasants are

influenced by conditions experienced in the first stage of life (Ohlsson & Smith 2001; Ohlsson et al. 2002; Ferretti et al. 2012; Orledge et al. 2012; Santilli et al. 2012) and may have fitness consequences. Furthermore, appropriate design of the artificial rearing environment is considered fundamental to ensure bird welfare. A study on breeding pheasants showed that sight barriers may improve welfare by reducing potentially harmful aggressive interactions (Deeming et al. 2011). Laying pheasant hens kept in enriched cages (with perches and a hiding place) were less stressed and fearful than pheasants kept in conventional cages (Hrabcakova et al. 2012). Recently Whiteside et al. (2016) showed that the enrichment of rearing habitats of pheasants during the first weeks of life, achieved by adding elevated perches, provoked an interrelated suite of morphological, cognitive and behavioural changes, culminating in decreased mortality of birds after their release in the wild.

The aim of our study was to evaluate the effect of the presence of elevated perches on the morphology and behaviour of young pheasants and, in particular, on roosting behaviour which is one of the main

anti-predator behaviour of this species (Whiteside et al. 2016).

## Material and methods

The experiment was performed in 2016 at the Centro Pubblico di Produzione Selvaggina di Castagneto Carducci (Livorno, Italy), a small game farm managed by the local hunting club. In April, 300-day-old pheasants from a commercial supplier were randomly allocated to one of the six huts of 2.5 m × 3.5 m (50 chicks per huts). Three huts were provided with perches in the form of wooden scaffolds with perches placed at 30, 60 and 120 cm in height, whereas the other three huts were used as controls without any perching. Water and age-appropriate commercial game-feed was available *ad libitum* throughout the whole rearing period. At the 5th week, a sample of 30 birds for each treatment (15 male and 15 female) were weighed ( $\pm 1$  g) and measured for tarsus length and thickness (min and max) using a digital calliper ( $\pm 0.1$  mm) following methods in Bagliacca et al. (1985). Plumage damage on the back and neck of the sampled pheasants was evaluated using a scale ranging from 0 (low/no damage) to 5 (high levels of damage) following methods in Riber et al. (2007).

In the fifth week, all the birds were marked with coloured leg bands, identifying which of the two treatments they had been reared in, and were placed in a 20 m × 6 m × 3.5 m pen containing trees and elevated artificial perches. At dusk, for the following three weeks, we observed pheasants roosting on trees or perches and identified their rearing condition from their leg bands.

## Statistical analysis

Morphological measures were analysed within huts by GLM in relationship to sexes treatments and

their interaction. Since damage scores are not normally distributed, GzLM (Ordinal Logistic Fit test) was performed according to the same previous model. Percentages of roosting pheasants were simply analysed by a series of Fisher's exact tests with the assumed probability that 50% of birds came from each treatment group, since at dusk it was not possible to discriminate males from females (SAS 2009).

## Results and discussion

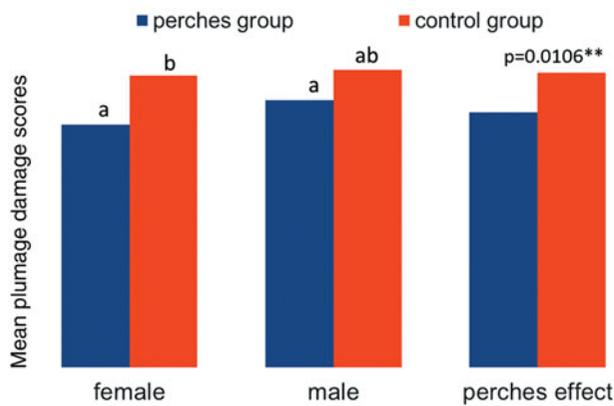
Pheasants reared in huts with perching were larger overall than those from control huts (MANOVA: Perching Pillai's Trace  $F=2.90$ ,  $p=.025$ ). As expected in a sexually dimorphic species, males were larger than females (MANOVA: Sex, Pillai's Trace  $F=45.6$ ,  $p<.001$ ), but there was no differential effect of the provision of perches between the sexes (MANOVA: Perching\*Sex Pillai's Trace  $F=0.23$ ,  $p=.92$ ). The differences were primarily driven by differences in body mass (MANOVA: Dependent variable = Mass,  $F=4.12$ ,  $p=.045$ ).

Our four morphometric measures of body size could be summarised by a single component which explained 62.3% of the total variance, with all four measures loading on the first PC with scores of  $>0.65$ . Pheasants reared in huts where perching had been added were heavier and had longer and thicker tarsi when five weeks old than pheasants reared in control huts where there was no opportunity to perch (Table 1). As expected in a sexually dimorphic species, males were larger than females (Sex  $F=166.6$ ,  $p<.001$ ). The presence of perches in a rearing pen acted in the same way on males and females (interactions not significant Perching\*Sex  $F=0.58$ ,  $p=0.449$ ). Pheasant reared in the huts with perches showed less plumage damaged than pheasants reared in the huts

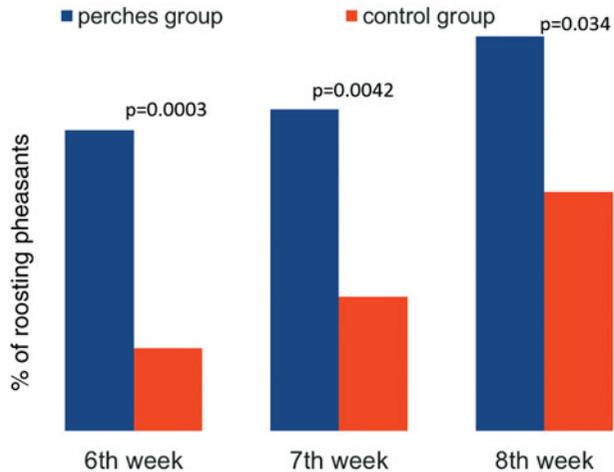
**Table 1.** Morphological measures collected at the 5th week of age ( $n=30$  each subgroup).

	Body weight, g	Tarsus length, mm	Max tarsus thickness, mm	Min tarsus thickness, mm
No perches				
Male	384.5 <sup>a</sup>	60.97 <sup>ab</sup>	6.65 <sup>a</sup>	4.86 <sup>a</sup>
Female	305.8 <sup>b</sup>	57.72 <sup>c</sup>	6.17 <sup>b</sup>	4.55 <sup>b</sup>
With perches				
Male	391.8 <sup>a</sup>	62.09 <sup>a</sup>	6.81 <sup>a</sup>	4.83 <sup>a</sup>
Female	321.9 <sup>b</sup>	59.12 <sup>bc</sup>	6.33 <sup>b</sup>	4.60 <sup>b</sup>
No perches	345.2	59.35	6.41	4.71
With perches	356.9	60.61	6.57	4.72
Standard error of mean	2.88	0.33	0.04	0.03
F values of tested effects				
Perches	4.12*	3.65*	3.73*	0.04, ns
Sex	166.6***	22.2***	33.7***	25.8***
Interaction sex* perches	0.58, ns	0.04, ns	0.002, ns	0.64, ns

Subgroupings bearing different letters differ per  $p<.05$ : <sup>a</sup>significant effect; <sup>b</sup> $p<.05$  tested effects; \*significant effect  $p<.05$ ; \*\*\*high significant effect  $p<.001$ .



**Figure 1.** Plumage damage scores observed when pheasants were transferred to the flying pen at five weeks old ( $n=30$  each subgroup;  $F$  values: 6.386\*\*, 0.922<sup>ns</sup> and 0.344<sup>ns</sup> for perches, sex and sex\*perches, respectively).



**Figure 2.** Roosting pheasant percentages in the flying pen (provided with trees and perches) ( $n=120$  each subgroup).

without perches (GzLM: Perching  $LR\chi^2=6.85$ ,  $df=1$ ,  $p=.009$ , Figure 1) although we found no difference in damage either between the overall sexes (GzLM: Sex  $LR\chi^2=2.28$ ,  $df=1$ ,  $p=.13$ ) and no interaction between sex and perching provision (GzLM: Perching\*Sex  $LR\chi^2=0.48$ ,  $df=1$ ,  $p=.49$ ). Roosting behaviour after release into large outdoor pens was strongly affected by early rearing conditions with pheasants from huts with perching added were more likely to be detected roosting off the ground at night than birds from control huts (Figure 2) although the difference decreased with time, probably because non-roosting pheasants learned to roost by the roosting pheasants.

Pheasant roosting behaviour was positively affected by early access to perches. Since roosting on tree

branches is an important anti-predator behaviour, providing perches early in life in the captive rearing environment may be helpful to improve survival of pheasants immediately after their release in the wild (Whiteside et al. 2016). Mortality of captive reared pheasants in the wild is very high (up to 48.2% during their first 10 days after the release, Robertson 1988) and is primarily due to predation (Ferretti et al. 2012) in the first few weeks after release. Early exposure to a more naturalistic environment gives the birds opportunities to develop an appropriate anti-predator behaviour. In addition to effects on behaviour, perches affect the morphology of birds: flying to perches and wing flapping to balance on elevated perches stimulates a greater development of pectoral and thigh muscles and consequently increases skeletal mass (Whiteside et al. 2016). Increased pectoral mass may facilitate increased take-off power which in turn benefits predator evasion (Tobalske & Dial 2000). Poor flying ability is typical of captive reared pheasants compared with wild ones and it is considered one of the factors that causes their low survival in the wild (Dowell 1992). In this study, the differences in morphology (body mass and bone thickness) between treatment and control groups were lower than those found by Whiteside et al. (2016), perhaps because of a shorter study period and a smaller sample size in the current study.

The presence of perches serves as habitat enrichment and seems to reduce feather damage to pheasants by reducing their levels of aggression to one another. Young pheasants interact violently as they assert dominance and this can be marked in confined commercial rearing system (Deeming et al. 2011). Access to perches may offer an opportunity to escape aggression from dominant individuals, with subordinates using the raised positions.

## Conclusions

The study showed that a cheap and simple modification to the heated huts, i.e. the provision of perches, produces a series of positive effects on the behaviour and welfare of young pheasants reared for early releasing purpose. Pheasants reared in huts with perches showed lower plumage damage and a higher propensity to roost on tree branches or elevated perches after their transfer to the flying pens. This improved behaviour may reduce mortality from ground predators when pheasants are released in the wild. The simple provision of perches early in life in the heated huts may provide a cheap device, accessible to every game farmer, that improves the welfare

and anti-predator behaviour of pheasants destined to be released in the wild.

### Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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