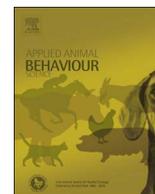




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Provision of a resource package reduces feather pecking and improves ranging distribution on free-range layer farms

Isabelle C Pettersson*, Claire A Weeks, Christine J Nicol

Animal Behaviour & Welfare Group, School of Veterinary Sciences, University of Bristol, Langford House, Langford, Bristol BS40 5DU, United Kingdom

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ABSTRACT

The effect of a resource package designed to reduce inter-bird pecking and increase range use was tested on fourteen free-range farms in the UK. The package comprised two types of objects intended to attract pecking behaviour: 'pecking pans' containing a particulate pecking block, and wind chimes; plus long, narrow shelters placed just outside the popholes, bridging a barren area 2–10 m from the house, with the aim of improving bird distribution on the range. We predicted that if the resource package succeeded in these aims, overall bird welfare would also be improved. Fourteen commercial farms were enrolled for this two-year study. Flocks were assessed for pecking behaviour, range use and general indicators of welfare at 40 weeks in Year 1 without the resource package. The resource package was then added to the same houses at the start of the next flock cycle in Year 2. The new flocks were assessed in the same way at 40 weeks with additional observations taken of their use of the resource package at 25 and 40 weeks. These additional observations showed that most aspects of pecking behaviour directed at the pecking pans remained consistent from 25 to 40 weeks although a reduction in substrate pecking frequency was seen ($p < 0.001$) and birds perched on the pan for longer ($p = 0.033$) and more often ($p = 0.010$) at 40 weeks. Although consistent within houses, wind chime use was very variable between houses, with pecking observed in only 8 of the 14 houses. The number of birds under the shelters increased from 25 to 40 weeks ($p = 0.018$), as did the proportion of birds that went under a shelter within 5 min of entering the range area ($p = 0.021$). Birds were more likely to use a shelter within 5 min if they exited the shed via a pophole within 10 m of the shelter rather than a pophole more than 10 m away at both 25 weeks ($p < 0.001$) and 40 weeks ($p = 0.001$).

A reduction in gentle feather pecking ($p = 0.001$) and severe feather pecking ($p = 0.018$) behaviour was seen when the resource package was provided in Year 2. Range distribution also improved, with a greater proportion of birds seen 2–10 m from the house ($p = 0.023$). Additionally, the proportion of abnormal eggs ($p = 0.010$), headshaking behaviour ($p = 0.009$) and the percentage of wet/capped litter ($p = 0.043$) decreased in Year 2.

1. Introduction

Consumers perceive that free-range systems provide a higher standard of welfare for laying hens than alternative housing systems (Bennett et al., 2016; Pettersson et al., 2016a). Due in part to this perception, 44% of the national UK flock are now housed in free-range systems (DEFRA, 2016). There are a number of welfare benefits associated with these systems. Access to an outdoor range reduces the risk of feather pecking behaviour (Green et al., 2000; Lambton et al., 2010) and may provide further opportunity to fulfil behavioural needs such as foraging and dustbathing (Weeks and Nicol 2006). However, range use is often low (Pettersson et al., 2016b) and mortality and injurious pecking behaviour are generally at higher levels than recorded in cage systems (Sherwin et al., 2010; Weeks et al., 2016).

There are many drivers encouraging farmers to improve flock welfare such as consumer opinion, assurance schemes and price premiums for producers performing better in audits. Under the RSPCA Assured (RSPCA 2013) or British Lion Quality (BEIC 2013) schemes it is now a requirement for producers to implement strategies to reduce feather pecking, for example by placing safe items throughout the house for birds to peck at. Resources that stimulate foraging behaviour are most successful at redirecting pecks away from conspecifics (Dixon et al., 2010). These have been widely tested in small experimental groups (for example: Dixon et al., 2010; McAdie et al., 2005; Wechsler and Huber-Eicher, 1998) but apart from Lambton et al. (2013) there have been few controlled trials on commercial farms. Pecking items for commercial use need to be attractive to the birds (Jones et al., 2000), affordable and with reasonable longevity to reduce the labour associated with

* Corresponding author.

E-mail address: i.pettersson@bristol.ac.uk (I.C. Pettersson).

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replenishing them.

A second focus with potential to improve bird welfare is to encourage greater range use by improving its accessibility and resources. Greater range use is known to be beneficial because it reduces stocking densities in the house, may reduce feather pecking and provides greater opportunity to meet the behavioural needs of the birds (reviewed by Pettersson et al., 2016b). However, in current systems, range use at a given time is often below 10% (Pettersson et al., 2016b) and birds cluster near popholes (Hegelund et al., 2005; Zeltner and Hirt 2003), causing poached ground and increased risk of disease through high stocking densities and faecal contamination in the area. Range cover has been shown to improve range use and to encourage birds away from the house among other benefits (Bright et al., 2011; Hegelund et al., 2005; Rault et al., 2013; Zeltner and Hirt, 2003, 2008). However, tree cover and artificial shelters are often sited over 10 m from the house, leaving a barren area of ‘no-mans-land’ between the house and the rest of the range (Chiello et al., 2016).

This is one of the few replicated, controlled experimental trials to be performed on commercial farms as most similar studies use very few flocks (e.g. Zeltner and Hirt, 2003), are observational (e.g. Gilani et al., 2014; Hegelund et al., 2005) or use unmatched control flocks (e.g. Lambton et al., 2013; Zimmerman et al., 2006). Despite the practical difficulties associated with conducting controlled research on working farms, there is a need for relevant research under these conditions. This study aimed to assess, using animal-based measures, the effect of providing a resource package on free-range flock welfare by conducting a pre- and post-intervention experiment using 14 commercial farms. Pecking behaviour and range use were of particular interest, but measures of overall bird welfare were also collected. These included production, mortality and litter quality, as well as behavioural indicators of welfare such as headshaking that have only recently been validated (Nicol et al., 2009). The resources provided included two types of pecking objects, and shelters designed to encourage birds further out onto the range, which were all selected to be practical for commercial use. It was hypothesised that (i) birds would use the new resources (ii) provision of the resource package would specifically reduce inter-bird pecking and improve range use and distribution, and (iii) if these aims were achieved, other measures of bird welfare would also show an improvement.

2. Materials and methods

Fourteen commercial free-range laying hen houses were used in this study, across two years. All flocks supplied a ‘high welfare’ brand in the UK and feed was obtained from the same company. Ten of these houses contained single-tier (also known as flat-deck) systems and four had multi-tier systems. Flock sizes ranged from 6000–16,000 birds (mean: 13,725) and all flocks were beak-trimmed. Flocks had not had access to

the range during rear and were allowed outside for the first time between 19 and 22 weeks (industry standard). See Table 1 for detailed house and flock information. Welfare and behaviour assessments took place during the first flock cycle (year 1) when the birds were at approximately 40 weeks of age (38–42 weeks). A resource package was installed for the next flock cycle (year 2) and welfare and behaviour assessments took place twice at approximately 25 weeks (24–26) and 40 weeks (39–43) of age.

2.1. Welfare assessment and behaviour observations

A detailed welfare assessment of the flock was carried out during the 40 week visit in year 1 and a farmer questionnaire was administered. See Table 2 for a description of the methodology and welfare measures recorded. In year 2 the farmer was re-interviewed and the same welfare assessment was performed during the 40 week visit. As commercial flocks are now generally kept for longer than 12 months (due to modern genotypes maintaining production for longer) it was not possible to match the 40 week visits to season in all cases. Precipitation was different in only two flocks across the observations where drizzle was recorded in year 1 but not in year 2. Additional behaviour observations relating to use of the newly provided resources were performed for both the 25 and 40 week visits in year 2 (Table 2). All observations were performed between 08.30 and 16.00 with the observations generally matched for time of day across visits.

A variety of scoring systems were used for welfare measures on individual birds. Body condition was scored on a 0–3 scale (where 0 is poor) based on the system by Gregory and Robins (1998). Keel damage was scored using a 0–2 scale (where 0 is no damage) based on the technique described in Wilkins et al. (2004). Plumage damage was scored using a 1–4 scale on 5 body areas (where 4 is perfect plumage), summed to give a total score out of 20. Comb wounds were scored on a 0–2 scale (where 0 is no damage) and both this and the plumage scoring scale were adapted from Tauson et al. (2004). Any signs of cannibalism or vent pecking were recorded as yes/no but were excluded from the analysis due to low incidences.

2.2. Resource package

Based on observations in year 1, the scientific literature, and discussions with industry stakeholders, three resources were designed and installed in each house and/or range in year 2.

Commercially available pecking pans (Vencomatic, Yorkshire, UK) were installed at 1 per 750 birds in each house. These consisted of a green plastic round feeder pan on a grey plastic base, containing a hard, particulate substrate designed to attract birds to peck (see Fig. 1a). All pans were distributed throughout the inside of each house, with an additional pan placed on each side of the range. The pan on the range

Table 1
Flock information and resource provision for the fourteen houses studied.

House	Size	Genotype (Year 1)	Genotype (Year 2)	System	Shelters (2 per side)	Pecking Pans (1 per 750)	Chimes (1 per 4000)
1	16000	Novogen Brown	Novogen Brown	Multi-tier	2	21	4
2	11700	Novogen Brown	Novogen Brown	Single-tier	2	16	3
3	6950	Lohmann Brown	Novogen Brown	Single-tier	2	9	2
4	16000	Lohmann Brown	Lohmann Brown	Multi-tier	2	21	4
5	16000	Novogen Brown	Novogen Brown	Single-tier	4	21	4
6	6000	Hylina	LSL Lohmann White	Single-tier	4	8	2
7	16000	ISA Warren	Bovan Brown	Single-tier	4	21	4
8	15000	Lohmann Brown	Novogen Brown	Single-tier	4	20	4
9	12500	Lohmann Brown	Lohmann Brown	Single-tier	4	17	3
10	16000	Lohmann Brown	ISA Brown/Hylina	Single-tier	4	21	4
11	16000	Shaver	Shaver	Multi-tier	2	21	4
12	12000	Novogen Brown	Novogen White	Single-tier	4	16	3
13	16000	Hylina	Lohmann Brown	Multi-tier	4	21	4
14	16000	Lohmann Brown	Lohmann Brown	Single-tier	4	21	4

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