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Use of outdoor ranges by laying hens in different sized flocks

Sabine G. Gebhardt-Henrich*,[1], Michael J. Toscano[1], Ernst K.F. Fröhlich

Center for Proper Housing: Poultry and Rabbits, FVO, Burgerweg 22, CH-3052 Zollikofen, Switzerland

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ABSTRACT

In studies assessing outdoor range use of laying hens, the number of hens seen on outdoor ranges is inversely correlated to flock size. The aim of this study was to assess individual ranging behavior on a covered (veranda) and an uncovered outdoor run (free-range) in laying hen flocks varying in size. Five to ten percent of hens (aged 9–15 months) within 4 small (2–2500 hens), 4 medium (5–6000), and 4 large (≥9000) commercial flocks were fitted with radio frequency identification (RFID) tags. Antennas were placed at both sides of all popholes between the house and the veranda and the veranda and the free-range. Ranging behavior was directly monitored for approximately three weeks in combination with hourly photographs of the free-range for the distribution of hens and 6 h long video recordings on two parts of the free-range during two days. Between 79 and 99% of the tagged hens were registered on the veranda at least once and between 47 and 90% were registered on the free-range at least once. There was no association between the percentage of hens registered outside the house (veranda or free-range) and flock size. However, individual hens in small and medium sized flocks visited the areas outside the house more frequently and spent more time there than hens from large flocks. Foraging behavior on the free-range was shown more frequently and for a longer duration by hens from small and medium sized flocks than by hens from large flocks. This difference in ranging behavior could account for the negative relationship between flock size and the number of hens seen outside at one point of time. In conclusion, our work describes individual birds' use of areas outside the house within large scale commercial egg production.

1. Introduction

Animal friendly production systems are gaining popularity in Europe and elsewhere (Magdelaine and Mirabito, 2001). Especially in poultry, animal welfare concerns are being raised by the public regarding intensive husbandry practices, particularly in regard to high density systems with thousands of animals (Kunzmann, 2011). Perceived natural production and animal welfare are central concepts mentioned by consumers regarding quality of food (Brunsjø, 2002 in Grunert, 2005). Laying hens ranging outside fit into these perceived concepts. For instance British consumers consider free-range eggs more animal-friendly than cage eggs (Bennett and Blaney Ralph, 2003).

However, most laying hens are kept in large flocks and only a small percentage can be seen outside the house at any one time (e.g. Bubier and Bradshaw, 1998). Generally, flock size inversely correlates to the number of hens

* Corresponding author. Present address: Research Center for Proper Housing: Poultry and Rabbits (ZTHZ), Division of Animal Welfare, VPH Institute, University of Bern, Switzerland. Tel.: +41 31 631 5752.
E-mail addresses: sabine.gebhardt@vetsuisse.unibe.ch (S.G. Gebhardt-Henrich), michael.toscano@vetsuisse.unibe.ch (M.J. Toscano), ernst.froehlich@blv.admin.ch (E.K.F. Fröhlich).
[1] Present address: Research Center for Proper Housing: Poultry and Rabbits (ZTHZ), Division of Animal Welfare, VPH Institute, University of Bern, Switzerland.

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observed outside (Bubier and Bradshaw, 1998; Bestman and Wagenaar, 2003; Gilani et al., in press; Hegelund et al., 2005; Kijlstra et al., 2007; Whay et al., 2007), although other factors, e.g. stocking density and rearing conditions with or without access to outside areas can affect this behavior, were not controlled for and represent confounds (except in Gilani et al., in press). It is also not clear whether the same birds consistently venture onto the range, or whether different birds use the range at different times. Recent findings by Richards et al. (2011) indicated that the majority of the flock ventured into the pophole at some point during the laying cycle, though they were unable to confirm if birds continued onto the range or the associated duration. Other influences on the percentage of a flock observed outside include genetics (Icken et al., 2008), weather (Gilani et al., in press; Hegelund et al., 2005) (Richards et al., 2011), experience through exposure to an outside area during rearing (Grigor et al., 1995a; but see Gilani et al., in press) or age (Bestman and Wagenaar, 2003; Icken et al., 2008), cockerel presence and ratio, cover (Bestman and Wagenaar, 2003; Gilani et al., in press; Hegelund et al., 2005), light intensity in the house and pop hole availability (Gilani et al., in press), diversity of structures (Zeltner and Hirt, 2008), vegetation (Nicol et al., 2003), and the presence of keel bone fractures (Richards et al., 2012). Different reasons for the unexpected low range usage may include: fear (of predation, novelty) (Grigor et al., 1995b), presence of unfamiliar birds (Grigor et al., 1995c), missing feeding times in the hen house (Bubier and Bradshaw, 1998), or unattractive habitat (e.g. due to destruction by the hens) (Bubier and Bradshaw, 1998). Higher stress can also be associated with a higher use of the outdoor area (Mahboub et al., 2004).

Range size is typically proportional to flock size but often most hens are seen in a small area immediately surrounding the house (Hirt et al., 2000; Zeltner and Hirt, 2003; Elbe et al., 2005). The concentration of grazing may lead to a problematic accumulation of nitrogen due to feces (Aarnink et al., 2006) and destruction of grass cover. Given the lack of accurate information regarding individual hens' usage of the range and the implications for flock management, we sought to provide this information using a radio frequency identification (RFID) system that could accurately track the passage of hens' entry and exit onto the range. The aim of this study was to assess individual ranging behavior within system containing a covered (veranda) and an uncovered outdoor run (free-range) in laying hen flocks varying in size. Verandas provide many potential welfare benefits of outdoor runs. Verandas also provide their own benefits including: space for extensive locomotion, foraging, dust-bathing, lower density in the house and the veranda, and reduced exposure to UV light while protecting birds from adverse weather, predation, and infection from wild birds. In pursuit of this aim we monitored the frequency and duration of visits to the outdoor areas, the behavior of birds on the range, as well as the distance from the house. We also assessed these variables to determine the effect of flock size (independent of stocking density).

2. Materials and methods

2.1. Flocks

Characteristics of the investigated flocks are shown in Table 1. The particular flock sizes chosen were based on Swiss legislation which limits number of laying hens that a farmer is allowed to keep to a maximum of 18,000 (Verordnung, 916.344, 26.11.03, http://www.admin.ch/opc/de/classified-compilation/20030950/index.html#a2, accessed 31.05.13). Thus, commercial flocks numbering from 2000 to 18,000 hens were chosen for investigation. As most laying hens in Switzerland are white hybrids and no large flocks with brown hybrids were available, all flocks ($n = 8$) in the small (2000–2460 hens) and large (9000–18,000 hens) categories were white. Half (two) of the medium sized flocks consisted of brown hybrids. All hens were between 9 and 14 months of age. During rearing after the 42nd day of age flocks had access to a veranda but not to a free-range. They were given access

Table 1
Attributes of the investigated flocks and the number of tags which were recovered during depopulation (% recovered), how many tagged hens were registered at the antennas inside of the house (% house), at the antennas at the outer side of the popholes between house and veranda or the antennas at the inner side of the popholes between veranda and free-range (% veranda), and at the antennas on the free-range (% free-range). LSL are white and LB are brown hens. The number and the width [m] of the popholes between house and veranda and veranda and free-range are given. On farm 5 the size of the popholes between veranda and free-range were variable and ranged between 1.2 (1 pophole) and 4.6 m (4 popholes).

# hens	Hybrid[a]	Season	Farm	House–veranda	Veranda–free-range	% recovered	% house	% veranda	% free-range
2000	HN White	Spring 09	1	4 (1.15)	3 (1.5)	84	99	98	90
2000	LSL	Fall 09	2	2 (3)	1 (5)	68	87	82	72
2000	HN White	Spring 10	3	5 (1.2)	2 (1.2)	72	97	90	63
2460	HN White	Fall 08	1	5 (1.2)	3 (1.5)	77	97	90	66
5000	LB	Fall 08	4	8 (1.2)	8 (1.5)	72	97	96	85
5600	HN Brown	Spring 10	1	13 (1.3)	11 (1.5)	88	100	99	90
6000	HN White	Fall 09	3	9 (1.2)	3 (4.6)	91	98	96	47
6000	LSL	Spring 09	5	8 (1.2)	5 (var.)	82	98	91	78
9000	LSL	Fall 10	6	–	13 (3)	68.2	–	–	70
9000	LSL	Fall 10	6	–	13 (3)	82	–	–	70
12,000	LSL	Spring 08	7	15 (1.5)	10 (2)	22	83	79	56
18,000	LSL	Fall 09	8	21 (1.2)	15 (2.25)	85	88	83	59

[a] Hybrids: LSL, Lohmann Selected Leghorn; LB, Lohmann Brown (www.ltz.de); HN White, H&N Nick Chick; HN Brown, H&N Brown Nick (www.hn-int.com).