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Individual Ranging Behaviour of Laying Hens

Automatic Registration with RFID Technology

An automatic identification and registration system has been developed which records the ranging behaviour of laying hens with RFID transponders. Results on the reliability of identification and the ranging behaviour of an entire flock over a full laying period are described. The transponders integrated into a wing tag enabled more than 97% of all laying hens to be identified correctly while passing the pop hole. Evaluations of the ranging behaviour showed that the winter garden was used only by a maximum of 50% of the animals and the length of stay varied between 2 and 8 hours per day.

With the revision of the Animal Protection - Farm Animal Housing Decree from 28th February 2002 [1], EU directive 1999/74/EC [2] was implemented in Germany. Thus, a ban on cage housing of laying hens will be enforced in January 2007. In addition, the enriched cage, which is approved EU-wide, will not be permitted in Germany. As a result, alternative laying hen housing in the form of floor-, aviary-, and free-range housing will be intensified. For free-range housing, the decree specified a range size of at least 4 m^2 per hen. Moreover, the range should be permanently accessible for the hens. So far, however, well-founded scientific results documenting the ranging behaviour over a longer period have not been available. The electronic pop hole provides the possibility of collecting reliable animal-individual data concerning free-range utilisation by animals from different origins/families. The electronic pop hole can supply data for the breeding of animals from suitable origins for free-range housing and for the revision of relevant regulations.

Material and Method

The developed identification- and registration-system is based on individual electronic animal identification with the aid of transponders which are read and registered using two antennas while the animals are passing the pop hole [3]. In an experimental barn with four compartments, four electronic pop holes per flock (750 laying hens per flock) were installed between the barn and the winter garden (KSR). All hens were marked with passive transponders (Sokymat FDX transponders, 12 mm • 2.1 mm, 131 kHz), which were inserted in a wing tag (Agrident GmbH, type DPW 101). Two flocks of the origin Lohmann Tradition (flocks LT 8 and LT 10) and one flock of the origin Lohmann Silver (flock LS 8) were used for the observations. From the flock LT 10 (laying period from 7 October 2003 to 13 September 2004) ranging behaviour data were collected and evaluated over an entire laying period.

The reliability of identification was examined on the one hand by visually evaluating video recordings - one of 14 hours and two of 15 hours - taken with the aid of digital CCD cameras (Panasonic, type WV-

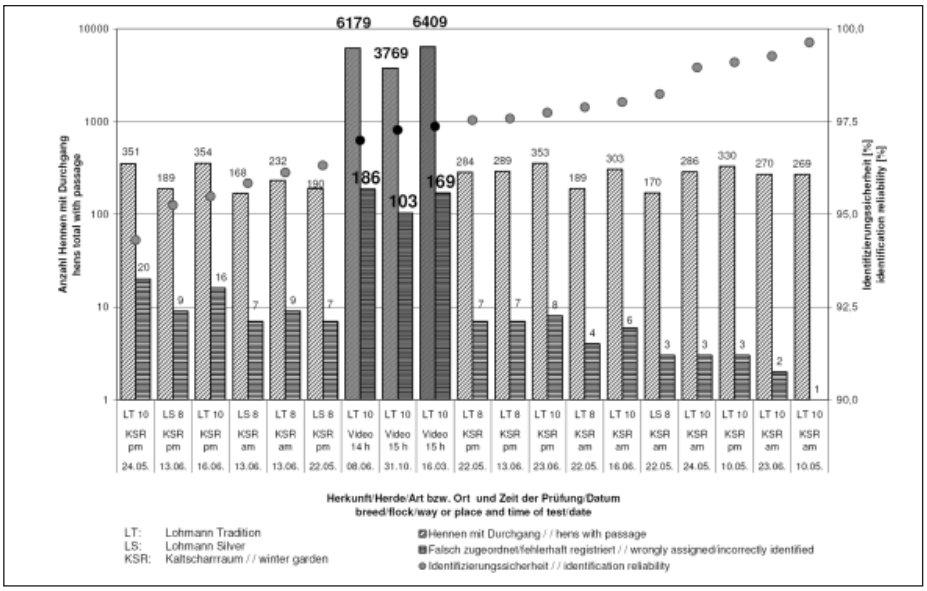

Fig. 1: Identification reliability at the electrononic pop hole

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Keywords

Electronic animal identification, automated data recording, ranging behaviour, laying hens

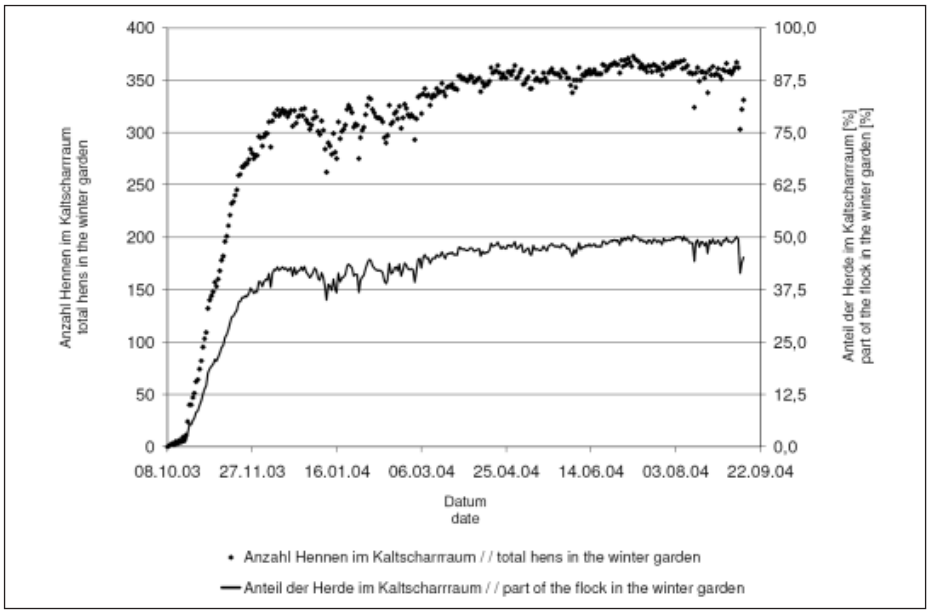

Fig. 2: Ranging behaviour of the flock LT 10

BP550 and WV-BP510) and a four-quadrant multiplexer (Dedicated Micros, type Sprite 4 Plex) with an analog video recorder (Panasonic, type TL 700) or a digital long-term recorder (Dallmeier, type DLS 6 S1-edition) and on the other hand by means of random in situ checks of hens in the winter garden using a hand-held reader (Hotraco Micro ID, type DHL 001). During the in situ checks, all hens in the winter garden were identified by hand after the pop holes had been closed. The results were compared with the automatically collected data regarding the whereabouts of the animals.

Reliability of Identification

When the reliability of identification was examined, more than 16,000 passes through the electronic pop hole were evaluated with the aid of video recordings in the flock LT 10 taken on three days. The resulting average identification rate was 97.2% with slight scattering between 97.0% and 97.4% (*fig. 1*: dark columns). In addition, less labour-intensive in situ checks of all three flocks were carried out on six days both in the morning and the afternoon. During this time, a total of more than 4,000 passes were evaluated. In principle, the average identification reliability of 97.4% confirmed the results of the video evaluation even though the values of the individual checks ranged between 94.3% and 99.6% (*fig. 1*: light columns). Concerning the achieved identification reliability of more than 97%, the system examined can be considered very suitable for the automatic registration of the ranging behaviour of laying hens. If some animals were not able to be identified in the pop hole, this was mainly the result of two hens being in the reading range of one antenna so that none of them was able to be read out or of an animal passing the hole too quickly.

Ranging Behaviour

The data concerning ranging behaviour were analysed on a flock basis. Figure 2 shows the number of individual laying hens which visited the winter garden at least once a day. Flock LT 10 was reared in an aviary without the possibility of ranging outside. This is also likely to be the reason why the animals first had to get used to the winter garden and ranging continuously increased during the first two months after the birds where placed in. At the end of December, ~ 43% of the flock visited the winter garden at least once a day. During the winter months, this value remained at approximately the same level. Afterwards, it grew to almost 50% by the end of April. During the following five months, this percentage stayed virtually unchanged. The finding that not all hens use the outdoor area is also confirmed by other authors. In one study, for example, where wider pop holes were used, the reported ranging rate was only 30 - 40 % [4].

Figure 3 shows the average time spent by the hens in the winter garden. For this evaluation, individual visits lasting more than 10 hours were not considered because it was assumed that in these cases (0.4%) the animals had not been identified in the pop hole. It is striking that the average duration of the hens' daily visits reached its first maximum of more than 4 hours already one month (beginning of November) after the hens where placed in. Afterwards, the duration of the visits dropped to approximately 2 to 3 hours and then increased continuously to more than 8 hours until the beginning of August before it fell again to about 5 hours towards the end of the laying period. The mean duration of the daily visits is highly correlated (r = 0.75) with the average day temperature (sliding average over 30 days). This illustrates that the duration of the hens' visits in the winter garden is dependent upon the air temperature and the season along with other factors.

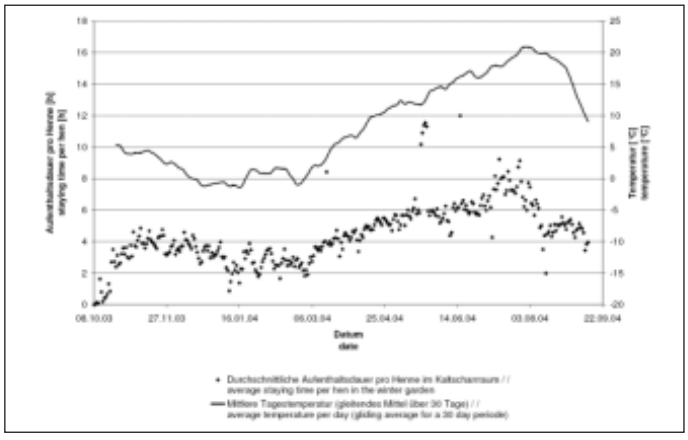

Fig. 3: Average staying time of the hens in the winter garden and course of average daily temperature

Conclusions and Further Prospects

The electronic pop hole is well suited for the registration of the ranging behaviour of individual animals. The presented results only show a few of the possible evaluations using the aid of the electronic pop hole. For breeding purposes, data regarding families and individual animals can also be analysed and thus enable important assessments concerning the suitability of different origins for free range housing to be given. Whether enlarging the pop hole leads to higher utilisation of the free range by the animals is intended to be determined in more detailed studies with the aid of a different type of RFID technology.

Literatur

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