Count your Chickens: Measuring Behaviour using a Series of JPEG Pictures.

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Background

Previous work has revealed that broilers use space heterogeneously, preferring the area along walls to the center of the house [1,2,3]. This results in high local densities, and may therefore increase severity of welfare problems related to high densities. Light is thought to have a great impact on the distribution of broilers [4]. Light emitting diodes (LED) are more efficient, durable, and retain the light intensity for considerable longer periods than the traditionally used fluorescent lighting (FL) [5,6]. We therefore hypothesized that by using LED lighting instead of fluorescent lighting, the distribution of light intensity would be more homogenous, and that this would instigate a more homogenous distribution of broiler, resulting in improved welfare and performance. The aim was therefore to investigate on farm the effect of LED lighting vs fluorescent lighting on spatial distribution in broilers.Thus, to determine the spatial distribution of broilers we wanted to count broilers in areas of known size (4.15-4.70 m^2) at different times during production runs. In addition, resource competition between the broilers was also investigated by counting the number of broilers drinking and feeding in these areas. Due to hygienic concerns the producer would not allow installation of video cameras in the broiler houses that would include up to 100 m long cables per camera. Game cameras powered by batteries were chosen instead. Typically they take pictures based on a motion detector, but the Bolyguard SG-560K camera also has time lapse, taking pictures every "x" minutes. This feature fitted well with our intentions of scanning every two hours. With a 16Gb SSD card and powerful batteries the cameras could be left in place for the six weeks of a production run.

Measuring behaviour

Data were collected from every second hour of the photoperiod on days 8, 13, 18, 23, 28, and 33 of age from six flocks of broilers housed in each of the two lighting environments. In order to alleviate the time consuming work of counting broilers manually on printed photos, a VB.Net program for counting on screen was written. In the program, when clicking on a broiler on a loaded picture a mark appeared. To make navigation easier in the large number of photo-files, some buttons (Forward, Reverse, etc.) were added, resulting in JPEG_Film.exe. This was further elaborated by reading the information of when the picture was taken, "DateTimeTaken", directly from the MetaData of the loaded JPEG file, resulting in the final program; JPEG_Film_Meta.exe. Using this program on a Windows8 tablet pc and with a stylus, generates the possibility of counting and logging the coordinates of an enormous number of broilers in a very short time. At the same time, tags can be added to the data, indicating location, behaviour, etc.

Using the program

Click and enter your initials [1]. Click and choose an ethogram file [2]. The 63 possible elements of the ethogram will appear here, divided over three levels. You can choose elements at any time. All clicks on elements will be registered in the dataset with the datetime stamp of the current picture [3]. Click and choose the directory with the pictures you want to use [4]. This shows the number of JPEG files in the chosen directory [5], loads the first JPEG picture [6], and shows its datetime stamp [7]. Click and enter the number of the JPEG you want to use and click [Stop/Show], or scroll up and/or down to it. While scrolling new pictures are not shown. Only when stopping the picture loads and its datetime appears [8]. Choose the length of the pauses between the pictures. The shortest possible pause depends on the pc used. If you choose longer pauses you can note events (or follow an animal) while the "film" is running [9].

If you have a picture every 2 hours and you want to scan every 6 hours then jump three pictures [10]. Now run the "film" [Forward] or [Reverse]. click [Stop/Show] [11] on and count the observation you are interested in [12].
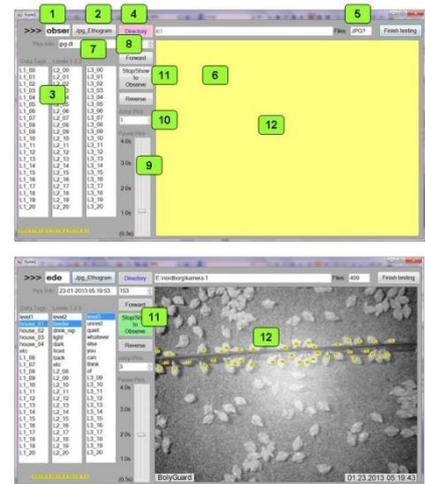
Results

The spatial distribution of broilers in the house did not differ between treatments, but it was found to be more homogenous the older the broilers were (treatment: $F_{1,390} = 0.82$; $P = 0.37$; age: $F_{5,391} = 43.95$; $P < 0.0001$). Likewise, competition over space allowance at the feed trough did not differ between treatments, but age affected the distribution of the broilers along the feed troughs (treatment: $F_{1,390} = 0.17$; $P = 0.68$; age: $F_{5,391} = 6.98$; $P < 0.0001$). The distribution of broilers relative to drinking nipples depended on both treatment ($F_{1,390} = 5.46$; $P = 0.02$) and age ($F_{5,390} = 15.35$; $P < 0.0001$); broilers in the LED treatment were more evenly distributed and the distribution was found in both treatments to be more homogenous the older the broilers were.

Try it!

The JPEG_film_meta program is open source, so if you want to try it contact erikl.decker@gmail.com.

References

1 Arnould, C., Faure, J.M. (2004). Use of pen space and activity of broiler chickens reared at two different densities. *Applied Animal Behaviour Science* 87, 153-170.

2 Arnould, C., Fraysse, V., Mirabito, L. (2001). Use of pen space by broiler chickens reared in commercial conditions: ccess to feeders and drinkers. *British Poultry Science* 42, S7-S20.

3 Newberry, R.C., Hall, J.W. (1990). Use of pen space by broiler chickens - effects of age and pen size. *Applied Animal Behaviour Science* 25, 125-136.

4 Davis, N.J., Prescott, N.B., Savory, C.J., Wathes, C.M. (1999). Preferences of growing fowls for different light intensities in relation to age, strain and behaviour. *Animal Welfare* 8, 193-203.

5 Doe U S (US Department of Energy). 2009. LED measurement series: LED luminaire reliability. <http://www2.unca.edu/environment/documents/luminaire-reliability.pdf>. Accessed 12 December 2013.

6 Khan, N., Abas, N. (2011). Comparative study of energy saving light sources. *Renewable & Sustainable Energy Reviews* 15, 296-309.