

Tracking individual laying hens in group housing

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Introduction

Many animal species live in social groups and show complex social behaviour. Social behaviour has been well studied on various levels, ranging from classical ethological approaches, i.e. behavioural observations, to experimental and evolutionary approaches focussing on the fitness value of group living. Yet while research on smaller groups has provided important insights into behavioural mechanisms, such research on larger groups has been hampered by the inability to keep track of the movement and behaviour of individuals. For large populations, predominantly approaches have been taken that describe group or flock behaviour, for instance swarming behaviour in birds [1], schooling behaviour in fish [2] and social dynamics in humans [3], but those approaches usually do not allow linking individual characteristics to group behaviour. In smaller groups, an individual-based approach allows us to link the characteristics of a given individual to the behaviour of the group. However, challenges arise when these methods are applied to large groups of animals due to challenges associated with a larger number of animals interacting with each other and very different social dynamics.

Tracking individuals in groups

To be able to study the effects of individual variation on behaviour of large groups, it is essential to bridge the gap between individual behaviour and group behaviour. This is specifically important in husbandry systems, where animals are kept in large groups and where “unwanted” behavioural traits, like damaging behaviour, can spread like an epidemic throughout the group. The laying hen provides an excellent model to study this: in commercial practice, laying hens are kept in very large groups where almost nothing is known on individual behaviours. To date, various approaches have been taken to study the behaviour of individual laying hens in group housing. Collins [4] used video tracking to track individual broilers. One disadvantage of video tracking, however, is that it is very difficult to identify and keep track of your focal animal, especially in large groups. A second possibility is to use RFID technology, with PIT tags on the legs of the animals that are read when birds pass an antenna. The success of this approach is mainly linked to the correct placement of the antennas. Kjaer [5] formed a grid of antennas and used this set-up to show differences in general activity levels between birds from high and low feather pecking lines, linking feather pecking to hyperactivity. RFID technology can also be very useful to study use of an outdoor run, where birds have to pass a narrow pop-hole in order to get access to that area. By placing antennas in the pop-holes, you can get a good idea of individual use of the outdoor area [6]. Using an approach like this, we are currently investigating how outdoor usage is influenced by initial location in the poultry house (near or far from the pop-holes) and by other behavioural characteristics of the individual bird (for instance personality traits).

Sensor technology

Probably the best opportunities for tracking individual hens in groups are offered by sensor technology, using active sensors. Using this method, location of individuals can be monitored continuously and also be combined with accelerometer and proximity data. An important aspect of this type of tracking is that the tags should not change the behaviour of the focal animal or make the focal animal more or less attractive for social interactions. Daigle et al. [7] showed that no effects on behaviour were found when using lightweight (10 g) sensors. Using the same system, Quwaider et al. [8] showed that location tracking using the sensors was for 84% similar to the results yielded by video tracking the same birds. Furthermore, they showed that the accelerometer data could be used to automatically quantify specific behaviours, by linking accelerometer data to video data. Another promising tracking method is proximity logging: when you want to understand social behaviour of a group of animals, it is a

very powerful tool to be able to record social interactions between individuals in that group. Further, if you think of damaging behavior, such as feather pecking, proximity data could be very useful to identify the culprits: i.e. the bird that was most frequently near the birds with severe feather damage. To be able to collect this kind of data, we will use the Encounternet® system, a system our group also uses to track wild song-birds, in group-housed laying hens. This system combines the ability to detect bird location with accelerometer and proximity data.

Conclusion

Sensor technology provides powerful tools to investigate behaviour of individual laying hens in group housing systems. These approaches will allow us to better understand social behaviour of laying and to investigate the effects of genetic and early-life manipulations on social behaviour. Further, more robust methodology, such as RFID technology, could also be used to investigate social behaviour and use of facilities on commercial farms. Together, this type of methodology should help us to provide a better understanding of the role of individual animals in large groups and may also offer useful tools to identify individuals that negatively affect group performance. Such tools could for instance be used by breeding companies, when selecting the birds for the next generation.

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