Bayesian change-point analysis of grazing sheep behaviour to identify lambing[1]

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The main aim in analysing data for animal movement is to reveal behavioural mechanisms by which the animal utilises complex and variable environments. Movement data also reflects behaviours that are heterogeneous. Statistical analysis of multidimensional, auto-correlated and irregular interval movement data is difficult. Animal tracking devices such as collars with global positioning system (GPS) capabilities enable continuous and automatic tracking of an animal's position and the value of suck spatial-temporal information is improved if the corresponding activity of the animal is known. GPS animal tracking devices (collars) were used in the spring (Sep-Nov) of 2008 and 2009 to monitor movement of 20 pregnant grazing fine wool Merino ewes. Mean daily velocities (m/s) were calculated for three time periods within a day: 0500-1100h, 1200-1800h and 1900-0400h and subjected to Bayesian change-point analysis (BCP) in an attempt to identify when a change in behaviour (reduction in velocity) occurred and if this was associated with lambing. The approximate day of lambing, within 48h, was known to have occurred between 16 and 29d into the data collection period for both years. In 2009, 5 ewes were closely monitored for lambing date and BCP successfully indentified a change-point that could be associated with lambing in the majority of ewes monitored. This method was then applied to movement data collected in 2008 to identify lambing for that season. Based on the analysis, the time period 0500-1100h appeared to be the best in which to determining lambing using BCP. Posterior probabilities and means calculated using BCP appears to be a useful and robust methodology that could be incorporated into decision support tools for farmers to help in decision making based on movement data from GPS collars.

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