Remote oestrus detection in ewes using GPS technology

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The Australian Merino industry has undergone significant decline in recent years due to falling consumer demand for wool products, low commodity prices and a movement toward mixed enterprises over sole wool production (Australian Wool Innovation 2010; Morris *et al.* 2012). Current reproductive performance of Australian sheep enterprises is poor, with an average of only 76.9 lambs born per 100 ewes (Hatcher *et al.* 2010). This is particularly evident within the wool industry, as Merinos are considered to have low reproductive performance (Hatcher *et al.* 2010). As wool production remains a significant agricultural industry in Australia, improved reproductive efficiency is essential for industry sustainability (Australian Bureau of Statistics 2012; Morris et al. 2012). However, the ability to improve sheep reproductive efficiency relies on the capacity to accurately detect oestrus. The objectives of this study were to examine the accuracy of GPS remote sensing technologies for detection of an animal's location and the ability of GPS to remotely monitor ewe movement at oestrus. GPS units were deployed on mixed age Merino ewes (38 maiden and 40 experienced ewes) following hormonal oestrus synchronisation, with all GPS data being collected and analysed following the experimental period. In addition, animals were visually observed during both non-oestrus and oestrus, with each animal's location and activity being recorded. Validation of the accuracy of GPS to determine each ewe's location was carried out through a comparison of GPS point locations and direct visual observations. Positional accuracy of the GPS collars was estimated to be between 90 – 94%. Ewe speed of movement, used as an indication of diurnal movement patterns, was found to increase in the early morning of the day of oestrus compared to non-oestrus days ($P < 0.001$). Speed of movement also had a significant impact on the number of mounts each ewe received, with faster moving animals receiving an increased number of mounts at all hours of the day ($P = 0.02$). No difference in sexual activity was detected between maiden and experienced ewes. The present study demonstrates a change in ewe diurnal activity at oestrus, suggesting the onset of sexual activity can be remotely detected as a period of increased speed of movement

followed by a return to 'normal' activity. Thus, further development of commercial remote monitoring technologies such as GPS could facilitate accurate oestrus detection and improved reproductive management in extensive sheep systems.

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