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Can Reciprocal Pair Data in Sheep be Used in the Event of Proximity Logger Failure?

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The use of remote sensing technology enables quantitative measurements of sheep and their behaviour to be obtained throughout day and night. These measurements can be obtained without the need for a human presence. Proximity loggers have also been used to measure contact levels between cows and calves (Swain and Bishop-Hurley 2007). The loggers use an ultra high frequency (UHF) transceiver that transmits a unique code. They also receive and log signals from other units within a predetermined distance (Broster *et al* 2012).

Proximity loggers were attached to a total of 85 ewes over 4 experiments to record contact levels. Data were analysed to evaluate the reliability of the loggers in quantifying contacts between various classes of sheep. As proximity loggers both transmit and receive a signal the number and duration of contacts between each reciprocal pair of collars should be similar. The output from the proximity loggers provided a record of the date, time and identification of first contact with any other collar, and the length of that contact.

For 3 of the 4 experiments reciprocal data for three classes of animals (ewe-ewe, ewe-offspring and siblings) were plotted for all collar pairs that were both transmitting and receiving a signal while for the fourth experiment reciprocal data was collected only for ewe-ewe contacts. Both the total number and duration of contacts were plotted. This provided 221 ewe-ewe, 75 ewe-offspring and 24 sibling pairs for analysis. The data from all experiments were combined into the appropriate animal class and the collar pairs were compared using linear regression.

Overall the data demonstrated that there was a strong correlation between the pairs of collars in both the duration ($r^2=0.9878$) and number ($r^2=0.9128$) of contacts. For all of the different classes of animals the correlation for contact duration was higher than that of contact numbers (Table 1).

Table 1. Correlation (r^2) between reciprocal collar pairs for duration and number of contacts

Class	Contact duration	Contact number
All	0.9878	0.9128
Ewe-ewe	0.9659	0.9113
Ewe-offspring	0.9555	0.7905
Siblings	0.9712	0.9663

That the reciprocal pairs of collars returned a similar number of contacts and contact start distance agrees with the findings of Swain and Bishop-Hurley (2007) where the correlation (r^2) between pairs of collars was greater than 0.95. This justifies the use of pairs of collars when only one is working. Swain and Bishop-Hurley (2007) found similar correlations between cows and calves for both numbers of contacts and contact duration. However, for both ewe-ewe and ewe-offspring pairs this study found the correlations for contact numbers to be much lower than that for contact duration.

For the ewe-ewe collars the reduction in correlation may have been due to interference from other ewes. As sheep move in flocks, ewes without collars may also have impacted on the signal strength of the collars when moving between two collared animals. However, for the ewe-offspring pairings it is more likely that the lower level of correlation for contact numbers was the result of differences in collar height. That the correlations for contact number and duration for the siblings were similar supports this explanation.

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Swain D.L. and Bishop-Hurley G.J. (2007). *Appl. Anim. Behav. Sci.* **102**,1

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