Identifying calving location preferences of cows and first calf heifers using GPS technology

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A new system to remotely monitor calving using intra-vaginal birthing sensors and GPS tracking collars was used to determine time and location of calving events in a 2,215 ha uncleared native pasture paddock at Manbulloo station (near Katherine, NT). This technology enabled calving females to be found for observation in an extensive situation that would not usually be achievable.

The birthing sensor system has been described by Schatz *et al*. (2020). When a calving event begins and the sensor is expelled, the rapid change in temperature initiates a signal that ultimately results in a calving alert being sent by email and it is immediately viewable on a website. Once an expulsion alert is received the location of the calving cow is obtained from a website operated by the company that sells the GPS tracking collars (Smart paddock Pty Ltd). Birthing sensors were inserted into 189 pregnant cows on 14/8/2019 and the cows were fitted with GPS tracking collars that recorded their location every 15 minutes. Not all GPS tracking collars were working correctly at the time of calving and not all expelled birth sensors could be found (they were difficult to find in the timbered paddock with long grass). Therefore, data was only used for 69 cows whose expelled birth sensors were found (confirming the birth location). The confirmed birth location's distance from water was calculated using the QGIS software package. Differences for cow and heifer birth locations from water compared using Kruskal-Wallis equality-of-populations rank test in Stata/IC 16.1.

Cows calved between 19/9/2019 and 2/1/2020 and conditions were very dry and hot up until mid-December and during this period the cows tended to congregate around the single water trough during the day and graze out in the late afternoon and at night. Calving sites of cows were dispersed quite evenly throughout the majority of the paddock although some "hot spots" where calving was concentrated were identified. These were places where at least four cows calved at the same location. In contrast, heifers calving for the first time all calved in different locations and tended to calve nearer to the water trough than older cows. On average heifers calved 1.19 km (maximum = 2.07 km) from the water trough which was significantly ($P<0.05$) closer than cows (average = 2.78 km, maximum = 5.75 km) (Table 1). On average cows calved 1.59 km further from the water trough than heifers. Some heifers calved within 0.05 km of the water trough and cows within 0.5 km, which shows that not all calving females prefer to calve in isolation independent from the herd. A limitation of this study was that there were only 7 observations for heifers. Identification of additional heifer calving locations will allow for further analysis of calving location preferences and potentially identify a contributing factor to neonatal calf loss. This should be possible in future studies with improved GPS tracking collars.

Table 1. Summary of distance of calving sites from the water point for cows and first calf heifers.

	Count	Average distance to water (Km)	Min. distance to water (Km)	Max. distance to water (Km)
Cow	61	2.78	0.05	5.75
Heifer	7	1.19	0.50	2.07
Difference (Cow – Heifer)		1.59	0.45	3.68

References

T. Schatz, E. Fordyce, M. Wooderson, K. McCosker, R. Boughton (2020). *Evaluation of a birthing sensor system to remotely identify calving*. In press – 2020 AAAS conference proceedings, Perth, Australia.