

Factors affecting fertility in northern Australian beef herds.

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The northern Australia beef industry operates in extremely diverse and harsh environments which are challenging to female reproductive performance. Overcoming these challenges requires an understanding of Genotype x Environment interaction for fertility traits, ensuring that the most appropriate genotype is matched to specific environmental conditions. Female fertility traits require intensive recording regimes to be accurately captured. Recording intensive fertility traits in commercial herds is often unfeasible, as such, information about fertility traits in northern beef cattle primarily stems from research herds and seed-stock producers. Here we investigated the effect of covariates on a potentially high throughput fertility trait in commercial herds.

Three reproductive traits were recorded from ~24 768 commercial heifers (*Bos indicus* and *Bos indicus* cross) across 54 collaborating commercial herds in northern Australia. Heifers were examined for puberty at ~600 days using ovarian ultrasound (CL600), receiving a score of reproductive tract maturity; 1=follicles<10mm, 2=follicles>10mm, 3=Corpus Luteum (CL) present, 4=pregnant <10wks, 5=pregnant >10wks. The use of a single scan allows for accurate recording in the extensive environments of northern Australia. In conjunction with CL600, heifers were recorded for covariates including; liveweight, hip height, body condition score (BCS) and contemporary group. Two subsequent pregnancy test results were recorded, pregnancy 1 (PD1) as a maiden heifer and pregnancy 2 (PD2) as a result of first rebreed.

The project data was compiled using excel and R (version 3.6.3). CL600 was treated as a categorical, whilst the records of PD1 and PD2 were compressed from 'months pregnant' to a binary (pregnant, non-pregnant) trait. The relationship between CL600, PD1 and PD2 and the covariates and fixed effects was examined using a generalised linear model (glm) with logit link and ordinal regression. Preliminary results found ~43% of heifers (n=20935) to be pubertal or pregnant at CL600. Results of PD1 and PD2 found ~71% pregnancy (PD1 n=13061 ; PD2 n=2497) which aligned closely to similar studies in northern Australia (McGowan, et al. 2014). The results for PD2 fall within the range of results achieved by previous studies (McGowan, et al. 2014; Schatz & Hearnden 2008).

Weight was positively and beneficially correlated with CL600 ($P < 0.05$), each additional kilogram of liveweight increased the odds reproductive maturity by 1.4%. The odds of maturity increased with BCS, although this relationship plateaued beyond BCS 4 (Figure 1a). Weight and BCS were found to have significant ($P < 0.05$) relationships to both PD1 and PD2. Significant differences ($P < 0.05$) in CL600, PD1 and PD2 were noted between collaborating herds which, illustrates the significant impact of different environments and management practices on animal performance (Figure 1b).

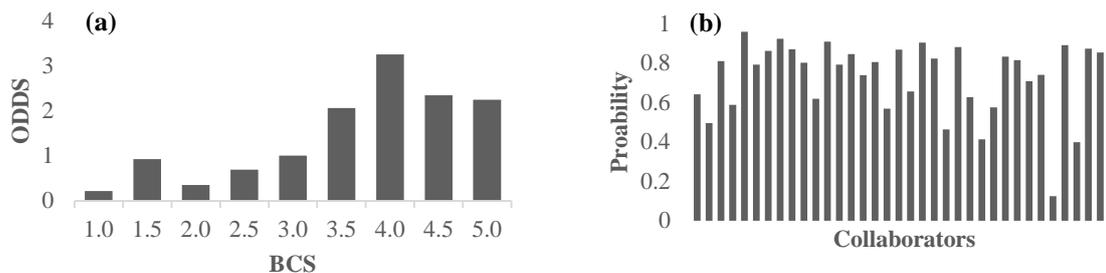


Figure 1. Significance of factors (a) odds ratio results showing relative odds of maturity, measured as CL600, for BCS (b) probability of pregnancy at PD1 for separate herds.

The results highlight that heifers must have sufficient liveweight and body condition to reach puberty and become pregnant. Understanding the interactions between fertility and growth traits is an important knowledge base for appropriately managing fertility in northern cattle.

References

- McGowan MR et al. (2014) *Meat and Livestock Australia*, Sydney.
Schatz T J, and Hearnden MN (2008) *Australian Journal of Experimental Agriculture*. **48**(7), 940-944.