Genetics of temperament and fertility in northern Australian beef cattle.

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Introduction

Fertility and temperament are important drivers of productivity in the northern beef industry. Temperament is simpler to evaluate than fertility traits in extensive production systems. A genetic correlation between temperament and fertility would allow for indirect selection for fertility by measuring temperament alone.

Aims: Estimate heritability of fertility and temperament traits, investigate genetic correlation between the fertility and temperament.
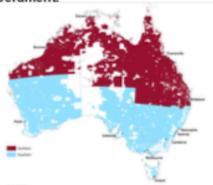

Figure 1. Australian beef cattle production zones. Northern indicated in Maroon.

Methods

Data was obtained from the Cooperative Research Centre for Cattle and Beef Quality (CRC) and the Smart Futures Fund. Harsh environments in northern Australia require tropically adapted Brahman (BRAH) and Tropical composites (TROPCOMP) cattle with high *Bos indicus* content.

Fertility traits:
o **PPAI**: Period of non-cyclicity following calving.
o **AGECL**: Age at which a Corpus Luteum (CL) is detected, indicating puberty. Multiple scans 4-6 weeks apart.
o **Tscore**: Score of 0-5 reflecting maturity of the reproductive tract. Single scan at ~ 600 days.

Temperament Trait:
o **Flighttime**: Time taken to cover a set distance exiting the crush. Longer flighttime indicates 'better' temperament.

These animals were from unrelated populations, linked only by genomic information.
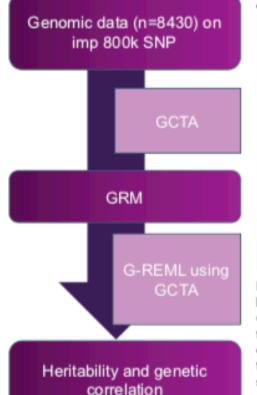
Figure 2. Project Workflow

Genomic data (n=8430) on imp 800k SNP

GCTA

GRM

G-REML using GCTA

Heritability and genetic correlation

Figure 3. Brahman cattle are in widespread use across northern Australia.

Table 1. Heritability of fertility and temperament traits from the G-REML analysis. Correlation between Flighttime and fertility traits. Standard errors are given in brackets.

Trait	n	h²	R² to Flighttime
AGECL (BRAH)	922	0.56(0.08)	**-0.01(0.10)**
AGECL (TROPCOMP)	999	0.37(0.08)	
PPAI (BRAH)	582	0.44(0.11)	**-0.06(0.11)**
PPAI (TROPCOMP)	822	0.24(0.08)	
Tscore	3696	0.19(0.03)	**-0.03(0.07)**
Flighttime	4645	0.33(0.03)	**NA**

Discussion

Heritability estimates of PPAI, AGECL, Tscore and Flighttime were sufficiently larger than the standard error to suggest moderate to high heritability (Table 1). Genetic correlation between Flighttime and all three fertility traits was less than the standard error, suggesting the correlation between these traits to be effectively zero (Table 1). The results indicate that selection for improved temperament would produce neither a beneficial or antagonistic response to selection in fertility traits.

Conclusions

o **Flighttime, AGECL, PPAI and Tscore sufficiently heritable to respond to direct selection.**

o **Genetic correlation between temperament and fertility traits was effectively zero.**

o **Indirect selection for fertility by measuring temperament is not possible.**

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